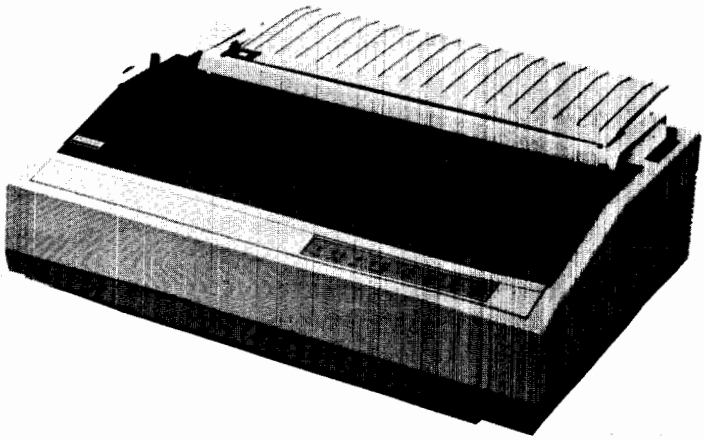
DotMax 24
USER'S GUIDE



FUJITSU

FUJITSU AMERICA, INC.

***** PREFACE *****

This guide represents the FUJITSU DotMax 24 Series of Matrix Printers as manufactured at the time of publication. Every effort has been made to ensure that information in this guide is complete and accurate. Fujitsu America has reviewed this guide but cannot be held responsible for errors and omissions.

Fujitsu also publishes a Maintenance Manual and a parts catalog for this printer. Please request additional publications from your dealer or authorized Fujitsu America representative.

We reserve the right to make changes and improvements to this product without obligation to incorporate these changes and improvements into units previously shipped.

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Edition A October 1985

Thank you for purchasing the **Fujitsu DotMax 24 Printer. You have made a wise selection.** Your DotMax printer will provide years of quality, high speed, reliable, and versatile printing.

***** STANDARD FEATURES *****

Features found in your DotMax 24 printer are listed in the following table.

TABLE OF STANDARD FEATURES
EXCEPTIONAL PRINT QUALITY A 24-wire print head provides up to 360 horizontal and 180 vertical dots per inch and single-pass letter quality and graphics printing.
HIGH SPEED PRINTING Up to 288 characters per second with automatic bidirectional printing logic saves printing time and increases your printer's productivity.
OUTSTANDING RELIABILITY A simplified print mechanism results in outstanding reliability and ease of maintenance.
CHARACTER SPACING Characters per inch (CPI) may be 10, 12, 18, proportional, or programed in increments of 1/120" or 1/180". Characters per print line are 136 at 10 CPI, 163 at 12 CPI, and 244 at 18 CPI.
LINE SPACING Lines per inch may be 3, 6, 8, or programed in increments of 1/48" or 1/180".
SERIAL AND PARALLEL INTERFACES RS-232 Serial and Centronics Type Parallel allows easy interfacing to most host systems.

TABLE OF STANDARD FEATURES (Continued)

CHARACTER SETS/GRAPHICS
All character sets have international characters. With the DotMax 24I or 24C you select an IBM Graphic Printer character set. With the DotMax 24D you select the Diablo 96 character ASCII character set. Character sets are shown in Appendix E.

LETTER QUALITY
Printed characters are comprised of 36 horizontal and 24 vertical dots. Average English text is printed at 96 characters per second at 12 CPI.

CORRESPONDENCE QUALITY (DotMax 24D only)
Printed characters are comprised of 18 horizontal and 24 vertical dots. Average English text is printed at 192 characters per second at 12 CPI.

DRAFT MODE
Printed characters are comprised of 12 horizontal and 24 vertical dots. Average English text is printed at 288 characters per second at 12 CPI.

MULTIPLE FONTS
The DotMax 24 Series offers Letter Quality, Draft Quality, and Correspondence mode print fonts. With the optional Font Cartridge you get additional fonts and can down-load character sets. Fonts are shown in Appendix A

PAPER HANDLING
Friction feed and forms tractor are standard on all DotMax 24 printers. Optional cut sheet feeders are available in single bin, dual bin, or dual bin plus envelope bin models.

TABLE OF STANDARD FEATURES (Continued)

FORMS HANDLING
Prints an original and up to 4 copies, handles forms from 6 to 16 inches in width.

OTHER STANDARD FEATURES INCLUDE:

- **SELF TEST**
- **PROGRAMMED PRINT MODES**
- **DOUBLE WIDTH CHARACTERS**
- **EMPHASIZED PRINT MODE**
- **DOUBLE STRIKE PRINT MODE**
- **ITALIC CHARACTERS** (24I and 24C only)
- **SUPERSCRIPT/SUBSCRIPT**
- **PRINTS IN COLOR** (24C only)

***** PURPOSE OF GUIDE *****

This guide is designed to help you install, set-up, and use your DotMax 24 printer. Our goal is to explain the many features in your printer in a clear and easy to understand manner.

Three versions of the DotMax 24 printer are offered.

DotMax 24D - which emulates the Diablo 630 Daisy-Wheel Printer.

DotMax 24I - which emulates the IBM Graphics Printer.

DotMax 24C - the color version of the DotMax 24I which emulates the Epson JX-80 Printer.

To determine the version of your printer, check the self-test print pattern (see page 1-8, a DotMax 24I or 24C prints more graphic symbols then a 24D).

The material in this guide applies to all three versions unless otherwise noted.

***** PURPOSE OF GUIDE *****
(Continued)

This guide is written for both the novice and the experienced user. In this guide you will find procedures, tables, and illustrations. Summary information is given in concise terms and you will find a reference to additional detail where applicable.

This guide is organized to present information in the order that it is most likely to be required. You will also find the Table of Contents helpful when you are using this guide to locate a particular procedure or bit of information.

The Quick Start Chart lists the steps you should take to install and test your printer.

***** INSTALLATION PRECAUTIONS *****

- Install your printer on a level surface where it will not be vibrated.
- Do not install your printer in direct sunlight or near a heater where it may become overheated.
- Do not block ventilation around your printer.
- Do not operate your printer in a humid or dusty environment.
- Use a power outlet that is not shared with industrial equipment that generates electrical noise.
- Use the proper AC voltage.
- Do not allow obstacles near the platen knob that may prevent the platen from turning.

***** QUICK START CHART *****

You may be tempted to connect your printer and learn how to use its many features as you gain experience. You may also be tempted to leave this manual on a shelf and read it only if necessary. Please resist these temptations.

Your DotMax 24 printer is friendly, but you'll find it easier to master by taking just a few moments to review this guide before you try to connect and use your printer.

The Quick Start Chart, on the back of this page, is a summary of the steps we recommend you follow to set up and operate your DotMax printer.

***** APPLICATION SOFTWARE SET UP *****

Don't panic if your Fujitsu DotMax printer is missing from the list of printer options in the installation instructions for your application software.

If you have a DotMax 24D printer, set your control panel switches as described in Section 3 and instruct your software package that it is working with a Diablo Model 630 daisy wheel printer.

If you have a DotMax 24I or 24C printer, set your control panel switches as described in Section 3 and instruct your software package that it is working with an IBM Graphics or Epson JX-80 Printer.

Examine the self-test pattern (see page 1-8) to determine if you have a DotMax 24D, 24I or 24C. A DotMax 24I or 24C printer will print more graphic symbols then a DotMax 24D printer. A 24C (with a color ribbon) will print in different colors.

Sections 5 and 6 (Command Sets) are written for programmers developing custom software packages.

See **REFER TO:** item/page for additional information.

YOUR DOTMAX 24 QUICK START CHART		
WHAT TO DO	**WHAT TO CHECK**	**REFER TO:**
Unpack Printer	Received items for shipping damage	Shipping carton
Perform inventory	Receipt of ordered items	Page 1-2
Remove tape and open cover	Shipping restraints and printer elements	Page 1-3 and page 1-4
Remove shipping restraints	Carriage for ease of side to side movement	Page 1-3
Install paper guide	Paper guide can be moved up and down	Page 1-4
Install ribbon	Ribbon is between guide and print head	Ribbon carton or page 2-8
Attach AC Cable	Ensure voltage is OK	Page 1-7
Insert paper	Paper width & position	Page 2-17 or page 2-19
Run Self-Test	Printer performance Section 4 has troubleshooting hints	Page 1-8
Connect interface cable	Type of interface and interface connection	Page 1-12
Prepare printer for host operations	Control Panel switches (DIP switch settings)	Section 3
Use your printer with your host	Printer performance Section 4 has troubleshooting hints	

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LIST OF TABLES

SECTION 1

INSTALLATION AND SELF-TEST

1.1 UNPACK THE PRINTER

Printer unpacking instructions are given on the shipping carton and summarized below.

Inspect the shipping carton and packing material as you unpack your printer.

Unlatch and remove the plastic handles on each side of the carton, and lift the top box off the carton.

Remove the ribbon cassette and paper guide from the carton.

Lift the printer out of the carton. The printer weighs about 40 pounds and the weight is evenly distributed.

Place the printer on a sturdy desk or table, near the printer's operating location.

Remove the User's Guide, the AC power cable, and the Sheet Feeder Supports from the shipping carton.

These supports are used only with an optional Rutishauser sheet feeder, see Appendix B.

Remove the printer and the accessories from their protective plastic shipping bags.

Remove the tape from the top cover and open it, remove the shipping restraints (see paragraph 1.3), and identify major printer components (see paragraph 1.4).

Notify your dealer or shipping agent of any shipping damage.

Store the shipping material for possible reshipment of the printer.

1.3 SHIPPING RESTRAINTS

Figure 1-2 shows the location of a cardboard print head restraint and a plastic print head carriage restraint (shipping restraints for the DotMax 24C are slightly different than shown here).

With the top cover open, locate and remove the shipping restraints by lifting them out of the printer.

These restraints must be reinstalled, before you transport the printer, to prevent print head movement and possible damage.

Slide the print head from side to side, along the print line. The print head must move without binding to allow the printer to operate correctly.

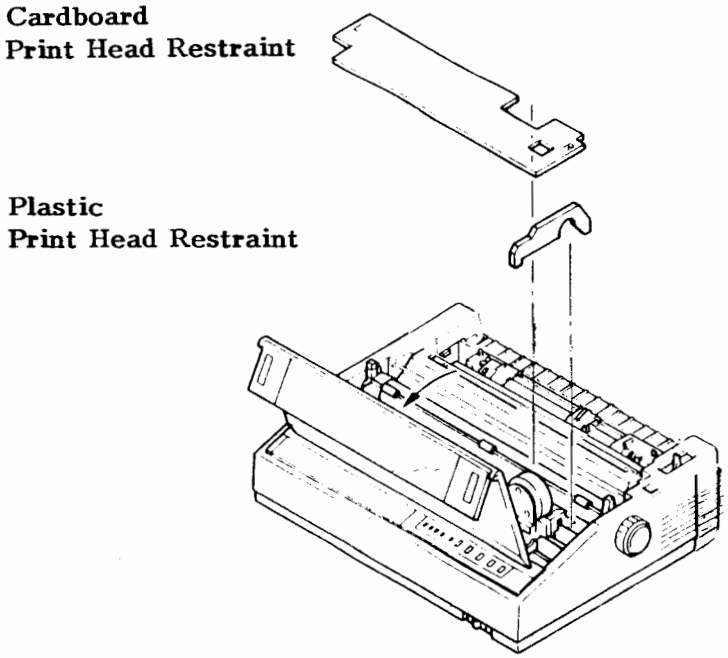


Figure 1-2 Shipping Restraints

1.4 PAPER GUIDE

Install the paper guide, as shown in Figure 1-3, by inserting its tabs into the holes at the back of the top cover.

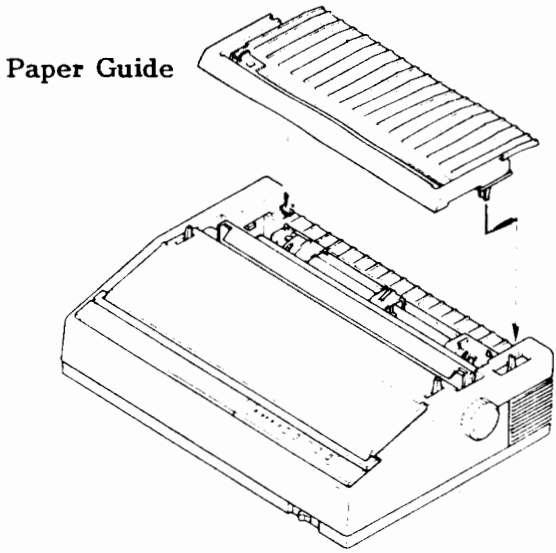


Figure 1-3 Paper Guide Installation

1.5 PRINTER ELEMENTS

Refer to Figure 1-4. Major printer elements are:

1) Front cover - raise for access into printer, for ribbon installation, paper thickness adjustment, etc.

2) Column scale - use to manually align the left edge of the paper.

3) Paper guide - use to load cut sheets of paper and to guide continuous forms.

4) Platen - used with the print head for printing.

1.5 PRINTER ELEMENTS (Continued)

5) Paper bail - holds paper against the platen.

6) Forms tractor - holds and feeds continuous forms (can be seen with the paper guide removed, or with the front of the paper guide raised).

7) Paper release lever - sets friction or tractor feed.

8) Paper bail lever - manual control for paper bail.

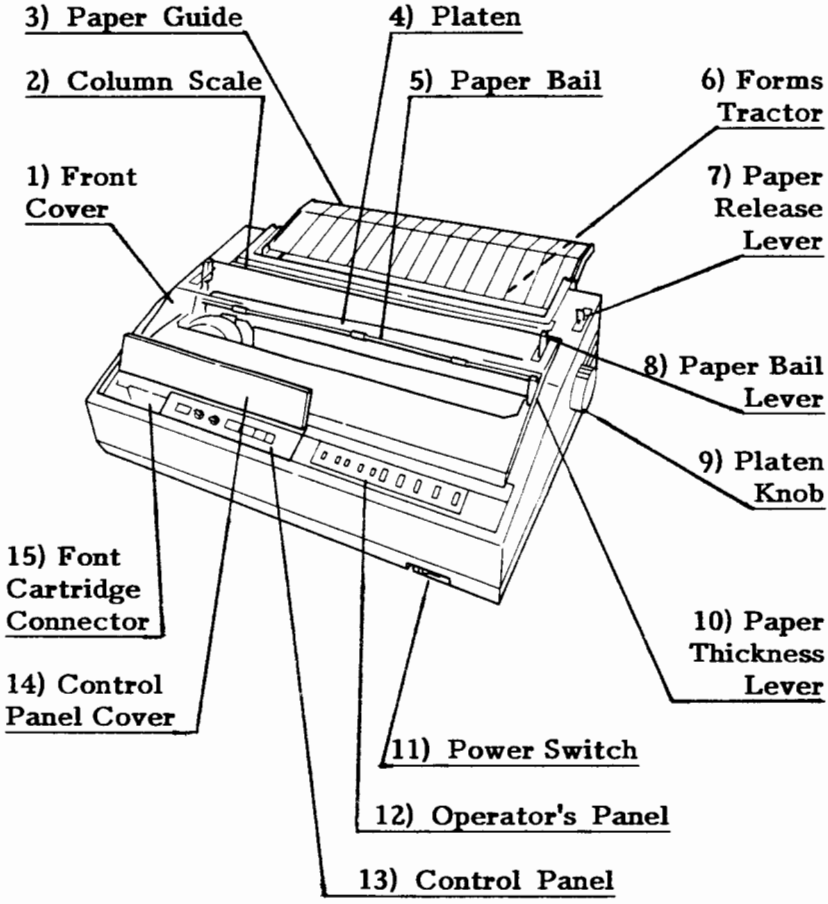


Figure 1-4 Major Printer Elements

1.5 PRINTER ELEMENTS (Continued)

9) Platen knob - used to manually feed paper in the printer.

10) Paper thickness lever - varies the gap between the print head and the platen.

11) Power switch - initializes the printer and illuminates the power lamp.

12) Operator's panel - used by the operator for manual control of the printer. The panel is shown in Figure 1-5 and explained in Section 2.

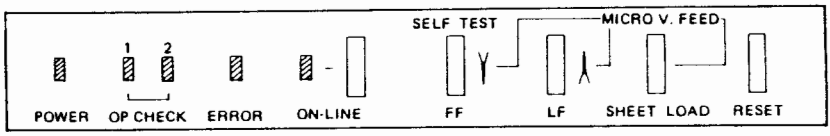


Figure 1-5 Operator's Panel

13) Control panel - used to set default parameters in the printer. The panel is shown in Figure 1-6 and explained in Section 3.

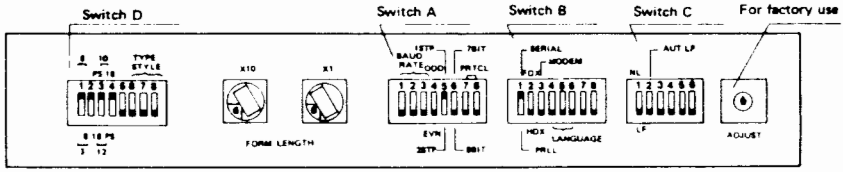


Figure 1-6 Control Panel

14) Control panel cover - protective cover over Control panel. Raise by pressing on either ribbed corner.

15) Font Cartridge Connector - an optional font cartridge is installed in this opening.

1.6 REAR VIEW OF PRINTER

Figure 1-7 identifies the components on the rear of the printer.

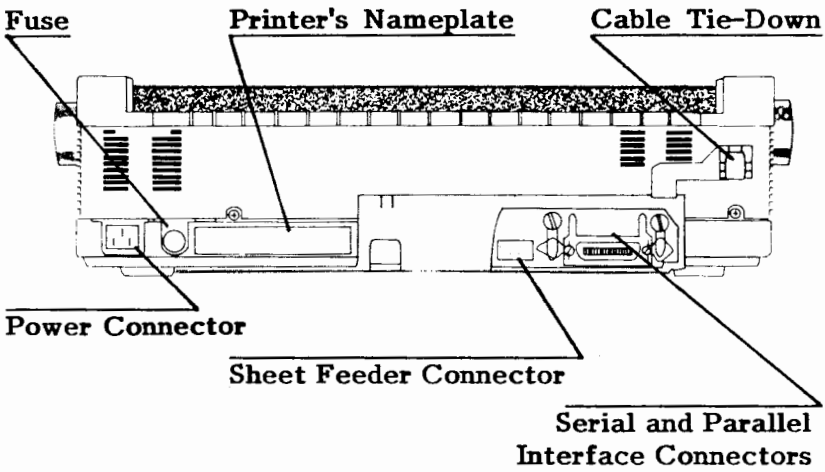


Figure 1-7 Rear View of Printer

1.7 ATTACH THE AC CABLE

Your printer normally operates from any standard wall outlet (100-120 Volts AC); a 220-240 Volts AC option is available from the factory.

The required power is printed on the printer's nameplate on the rear of your printer (see Figure 1-7). **Carefully check the power requirements for your printer before attaching the AC cable and turning power on.**

For safety reasons ensure that the ground pin in the power cable is connected to electrical ground in your power outlet.

Do not turn on the power switch until a ribbon cassette is loaded (to run self-test). Ribbon cassette installation is explained on the package of each new cassette and in paragraph 2.4.

1.8 RUN SELF-TEST

Ensure a ribbon cassette is installed (see paragraph 2.4) and paper is inserted (see paragraph 2.6 cut sheets or 2.7 continuous form) before running self-test.

Check for a normal printer initialization cycle by turning the power switch Off and then On, before starting self-test. During a normal printer initialization cycle, when power is turned on:

Power lamp will light;
Print head moves to the left side and then to the center of the print line;
On-Line lamp will light (if the top cover is closed and paper is inserted - or if the paper release lever is set towards the rear of the printer).
See section 4 if you have different results.

Start the self-test print pattern as follows:

Turn power off
Hold the SELF TEST (FF) switch down
Turn power on
Self-test printing starts upon completion of the initialization cycle
Release the FF switch
Self-test continues until the Reset switch is pressed, the top cover is opened, paper runs out, or power is turned off

The self-test print out consists of printing the character set for each type style for each language (8 type styles and 8 languages are supplied in a standard printer).

A sample of the DotMax 24D self-test print pattern is shown in Figure 1-8, the DotMax 24I is shown in Figure 1-9, and (as shown in Figure 1-10) the DotMax 24C is the same as the DotMax 24I with color. Control panel switches were at factory settings for these samples.

Notice that the DotMax 24I (or 24C) print patterns have more graphic symbols in each character set than the 24D. These additional graphic symbols identify the printer as a DotMax 24I (or 24C).

```
TYPE STYLE 0 LANGUAGE 0
¢!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHI
klmnopqrstuvwxyz{|}~¬

TYPE STYLE 1 LANGUAGE 0
¢!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHI
klmnopqrstuvwxyz{|}~¬

TYPE STYLE 2 LANGUAGE 0
¢!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHI
klmnopqrstuvwxyz{|}~¬

TYPE STYLE 3 LANGUAGE 0
¢!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHI
klmnopqrstuvwxyz{|}~¬

TYPE STYLE 4 LANGUAGE 0
¢!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHI
klmnopqrstuvwxyz{|}~¬

TYPE STYLE 5 LANGUAGE 0
¢!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHI
klmnopqrstuvwxyz{|}~¬

TYPE STYLE 6 LANGUAGE 0
¢!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHI
klmnopqrstuvwxyz{|}~¬

TYPE STYLE 7 LANGUAGE 0
¢!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHI
klmnopqrstuvwxyz{|}~¬

TYPE STYLE 0 LANGUAGE 1
¢!"£$%&'()*+,-./0123456789:;<=>?@ABCDEFGHI
klmnopqrstuvwxyz{|}~¬

TYPE STYLE 1 LANGUAGE 1
¢!"£$%&'()*+,-./0123456789:;<=>?@ABCDEFGHI
klmnopqrstuvwxyz{|}~¬
```

Figure 1-8 DotMax 24D Self-Test Print Pattern

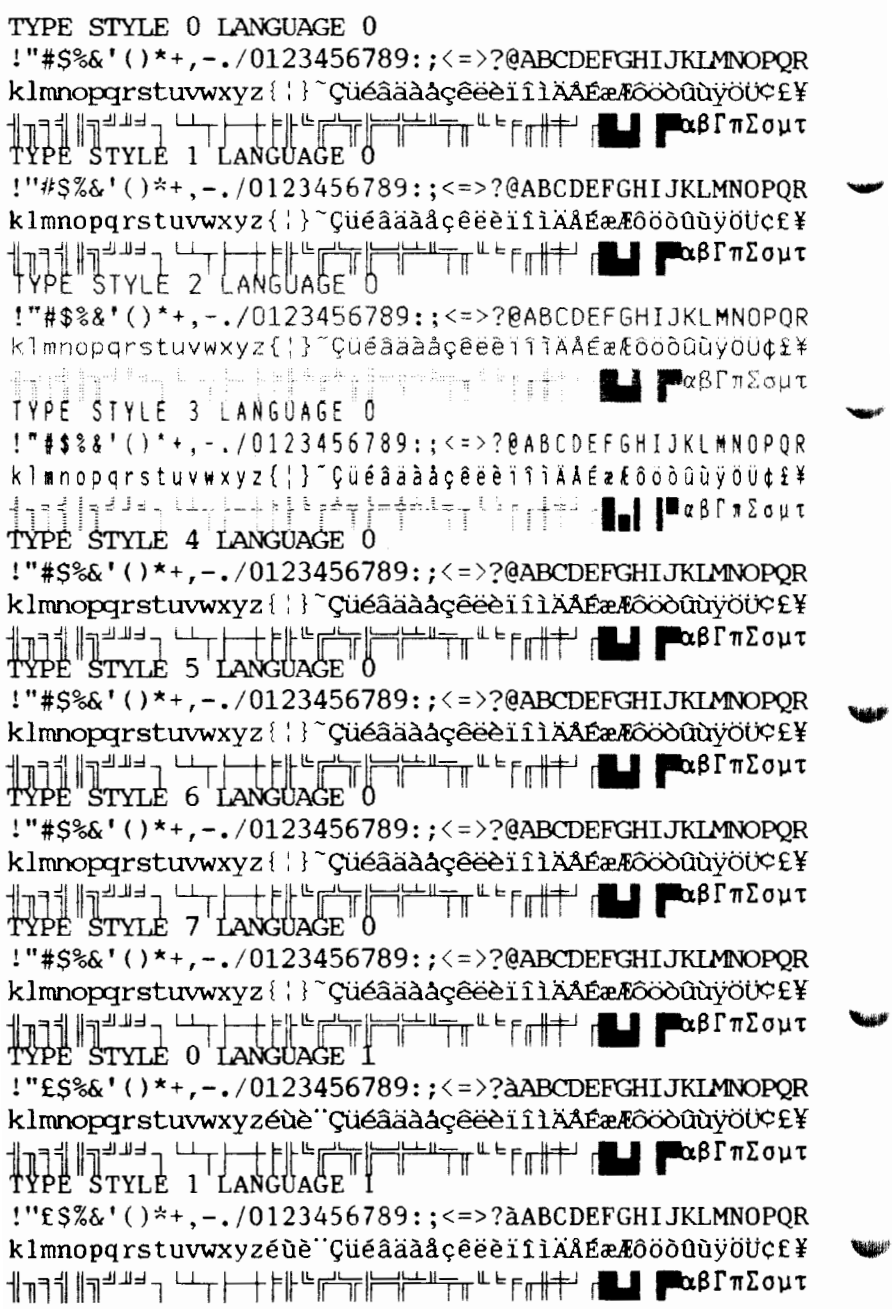


Figure 1-9 DotMax 24I Self-Test Print Pattern

Colors are repeated after two sets of type styles.

Figure 1-10 DotMax 24C Self-Test Print Pattern

1.9 CONNECTING AN INTERFACE CABLE

Your printer has a 36-pin connector for a Centronics Type parallel interface cable and a 25-pin connector for a RS-232 serial interface cable.

Obtain the correct interface cable for your system. Cables are available from most dealers, independent cable manufacturers, and others.

With the information given in Sections 7 and 8 of this guide you can make your own interface cable.

Make sure your computer and printer are turned off before connecting an interface cable.

Refer to Figure 1-11.

When the cover plate is down the serial interface connector is exposed, when the cover plate is upward the parallel interface connector is exposed.

Loosen the holding screws and position the cover plate, to expose the interface connector for your system.

Refer to your system documentation to determine the type of interface cable required for your system.

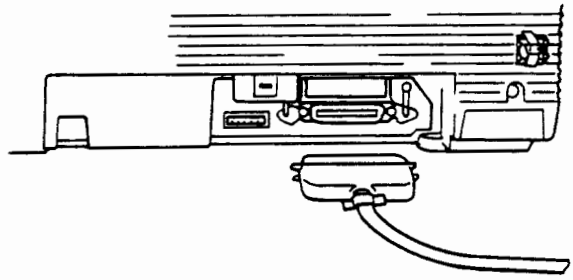


Figure 1-11 Interface Connectors

1.9 CONNECTING AN INTERFACE CABLE (Continued)

Connect one end of the cable into your printer and the other end into your computer. Refer to your computer documentation for more information on your computer's connection.

Clamp the interface cable to the printer as shown in Figure 1-12.

Parallel interface information is given in Section 7 and Serial interface information is given in Section 8.

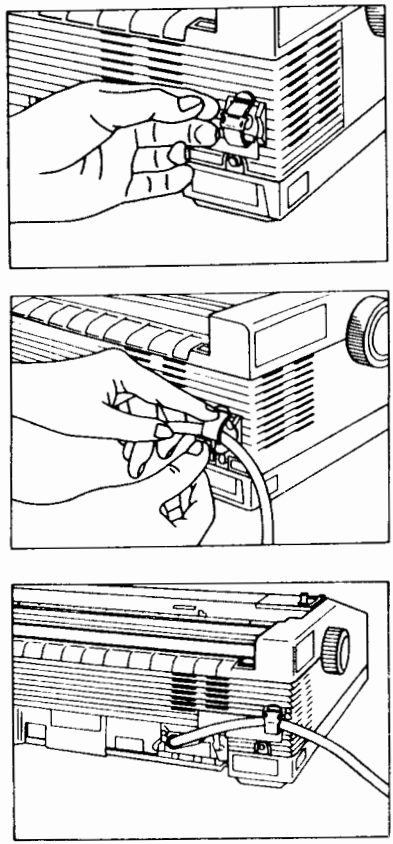


Figure 1-12 Clamping the Interface Cable

SECTION 2

OPERATION

This section describes the Operator's Panel, ribbon cassette installation, the paper thickness adjustment and paper loading.

2-2 OPERATOR'S PANEL LAMPS (Continued)

ERROR Lamp - flashes, and OP CHECK lamps 1 and 2 also flash, when a circuit malfunction is detected by the printer.

When using a serial interface, a communication error will light the Error lamp, sound a buzzer, and a ? (question mark) symbol is substituted for the character transmitted when the error occurs.

ON-LINE Lamp - When this lamp is lit your system can communicate with your printer over the interface cable. This lamp is lit when power is turned ON and:

The front cover is closed and paper is inserted.

The front cover is closed and the paper release lever is set towards the rear of the printer (even with paper removed).

The ON-LINE switch is pressed, when the front cover is closed and paper is inserted.

Indicator Lamps

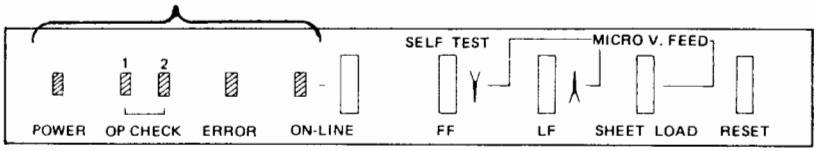


Figure 2-1 Operator's Panel - Indicator Lamps

A buzzer (behind the panel) will sound if:

An error condition is detected
The front cover is opened during a printing operation

2.3 OPERATOR'S PANEL SWITCHES

ON-LINE Switch - Sets ON-LINE or OFF-LINE mode on your printer.

Press the ON-LINE switch, **when in ON-LINE mode,** to place the printer in OFF-LINE mode. The ON-LINE lamp will be turned off and printing from the host is stopped in the OFF-LINE mode.

Take your printer **OFF-LINE** to change the ribbon cassette or load paper. Characters, that your computer has transferred to the printer (that have not been printed) will be stored in the printer's data buffer. If power is not shut off, characters in the printer's data buffer are printed when the printer is returned ON-LINE (when you press this switch again).

Press the ON-LINE switch **when in OFF-LINE mode,** to place the printer in ON-LINE mode and allow it to communicate with your host system (Power must be on, paper must be inserted, and the front cover must be closed before the printer enters ON-LINE mode).

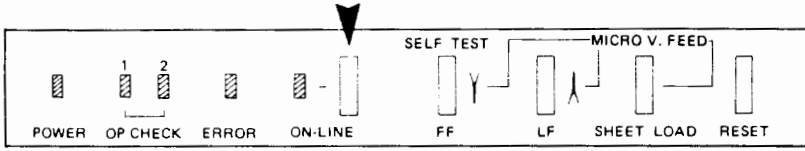


Figure 2-2 Operator's Panel - ON LINE Switch

FF (Form Feed) Switch - Press this switch to advance the paper to the first line on the next sheet of paper. This switch is inactive when the front cover is open.

The length of paper fed, when the FF switch is pressed, depends on the setting on the two FORM LENGTH dial switches and the two Line Spacing DIP switches (SWD-1 and SWD-2) in the Control Panel. The printer will feed 11 inches of paper when SWD-1 and SWD-2 are set ON (for 6 lines per inch) and both FORM LENGTH dial switches are set to 6 (for 66 lines per page). See Section 3 for additional instructions on setting Form Length.

When you press the FF switch the paper will advance to the top of form, (if form length and line spacing switches are correctly set).

You can change the location of top of form, when the printer is OFF-LINE, by advancing the paper to the desired position and pressing the RESET Switch

Top of form location is also changed if you rotate the platen (or press any MICRO V. FEED switch) when power is turned on).

Holding the FF switch down while turning the power switch ON will start Self-Test, see page 1-8 for additional Self-Test information. Turn the power switch to the OFF position or press the RESET Switch to terminate Self-Test.

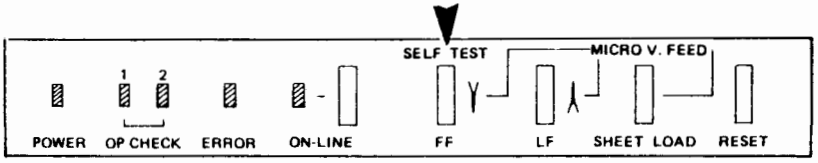


Figure 2-3 Operator's Panel - FF Switch

2.3 OPERATOR'S PANEL SWITCHES (Continued)

LF (Line Feed) Switch - Press this switch momentarily to move the paper one line in the forward direction. Holding this switch down will cause continuous line feeding. This switch is inactive when the front cover is open.

Line spacing depends on the setting in DIP switches SWD-1 and SWD-2 in the Control Panel. See Section 3 for additional information on these switches.

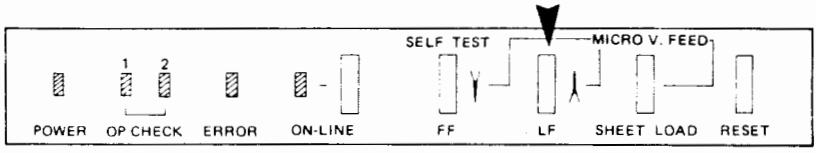


Figure 2-4 Operator's Panel - LF Switch

MICRO V.FEED (Micro vertical feeding) - To precisely adjust the position of the paper inside the printer:

Hold the SHEET LOAD Switch down and press the LF switch (Arrow pointed upwards) to advance the paper an increment of 1/180 inch.

Hold the SHEET LOAD Switch down and press the FF switch (Arrow pointed downwards) to retract the paper an increment of 1/180 inch.

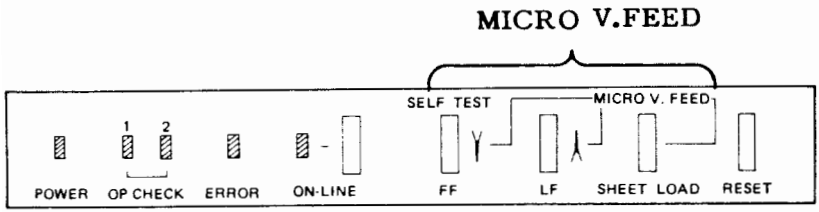


Figure 2-5 Operator's Panel - MICRO V.FEED

SHEET LOAD Switch - Use this switch to load or unload paper into the printer. When the paper release lever is set to the front of the printer, SHEET LOAD will load continuous form from the tractors. When the paper release lever is set to the rear of the printer SHEET LOAD will load cut sheet paper.

Cut sheet paper load/unload procedure is given in paragraph 2.6. Continuous form load/unload procedure is given in paragraph 2.7. A convenient way to change between continuous form and cut sheet paper is given in paragraph 2.8.

RESET Switch - Use this switch to initialize the printer or, when using the serial interface, to clear a communication error.

Press this switch with the printer in OFF-LINE, after changing the Control Panel switches, to cause the printer to use the new Control Panel Switch settings as default settings.

If you press this switch when the data buffer is empty, an immediate printer initialization cycle will occur (see Section 4).

If you press this switch when the data buffer is not empty, the ON-LINE lamp will flash (to alert you that data is in the buffer) and the printer initialization cycle will not start; until you press the RESET switch a second time. If you do not want to lose the data in the print buffer, press the ON-LINE switch and the data in the buffer will be printed.

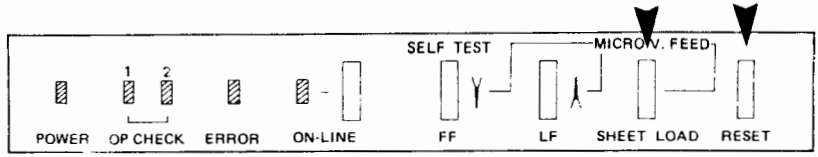


Figure 2-6 Operator's Panel - SHEET LOAD/RESET

2.4 INSTALLING A RIBBON CASSETTE

The DotMax 24D and 24I use a black (single color) ribbon and the DotMax 24C may use either a four color or the single color ribbon. Refer to paragraph 2.4.2 for color ribbon installation instructions.

RIBBON INSTALLATION NOTES:

Handle the ribbon cassette carefully after removing the transportation tab to prevent ribbon damage or jamming.

When installing a ribbon cassette, do not allow the ribbon to touch the print head guide shaft (which may cause it to be stained with grease and reduce print quality).

After ribbon installation, if power is OFF, slide the print head, from side to side, to ensure the ribbon will advance correctly.

Power should not be turned OFF and the print mechanism cannot be moved if data is stored in the print buffer.

2.4.1 Single Color Ribbon Installation

Refer to Figure 2-7. Remove the transportation tab from the cassette by squeezing it while pulling it out.

Unlock the ribbon release, by squeezing the two barely visible black tabs towards each other. When released, a spring loaded roller, inside the cassette, will be pressed against the ribbon.

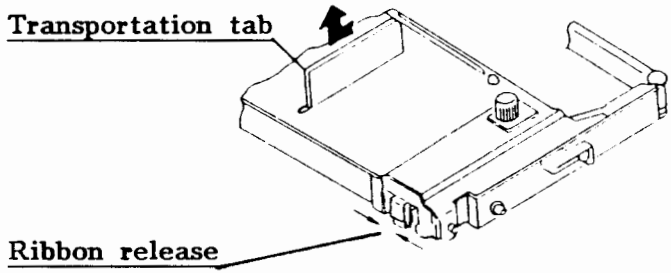


Figure 2-7 Ribbon Cassette - Transportation Tab

2.4.1 Single Color Ribbon Installation (Continued)

Refer to Figure 2-8.

Rotate the ribbon feed knob in a clockwise direction (shown by an embossed arrow on the cassette) to remove excessive slack from the ribbon.

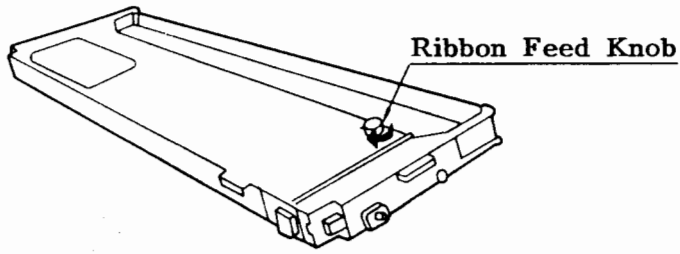


Figure 2-8 Ribbon Cassette - Ribbon Feed Knob

Refer to Figure 2-9. Put the paper thickness lever into position 9, to increase the gap between the print head and the platen.

Place the cassette into the printer as follows:

Insert the left and right guide pins, on the rear of the ribbon cassette, into the notches at the end of each side frame.

Carefully push the ribbon cassette downward, while pivoting it on the pins, to snap it into place.

Route and install the ribbon in front of the print head, and around the guide post as shown in Figure 2-10.

Rotate the Ribbon Feed knob to take any slack out of the ribbon.

Adjust the paper thickness lever (see paragraph 2.5).

Refer to the instructions on the ribbon cassette package if you have any questions.

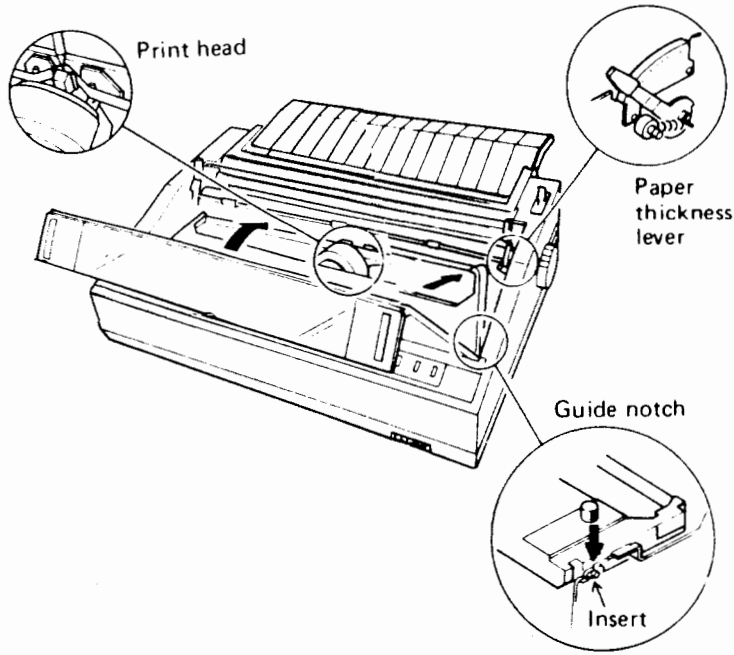


Figure 2-9 Ribbon Cassette - Mounting

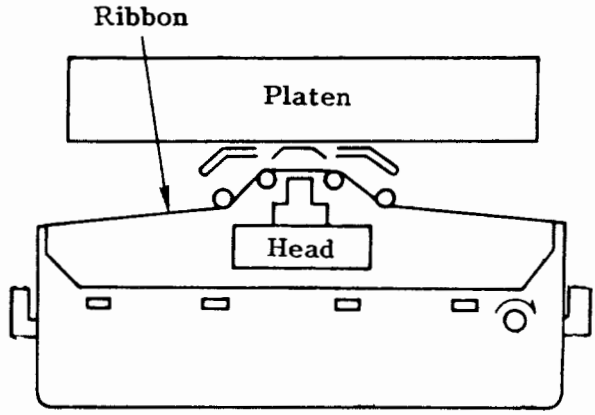


Figure 2-10 Routing of Ribbon

2.4.2 DotMax 24C Color Ribbon Installation

The DotMax 24C printer uses a four-color ribbon or a black ribbon cassette. The DotMax 24C printer is supplied with a four-color ribbon cassette.

The four-color ribbon cassette is moved up and down with a motor to align the required color (on the ribbon) in front of the print head. If more than one color is required (magenta and yellow to print green) the print head makes an additional pass for each color to be printed.

A black ribbon cassette is installed (in the 24C) like the color cassette, the only difference is the mounting of the cassette on top of the switch and the routing of the ribbon around the guide post as shown in Figure 2-16.

Refer to Figure 2-11. Remove the transportation tab from the cassette by squeezing it while pulling it out.

Unlock the ribbon release, by pushing the Release tab upward. When the tab is released, a spring loaded roller, inside the cassette, will be pressed against the ribbon.

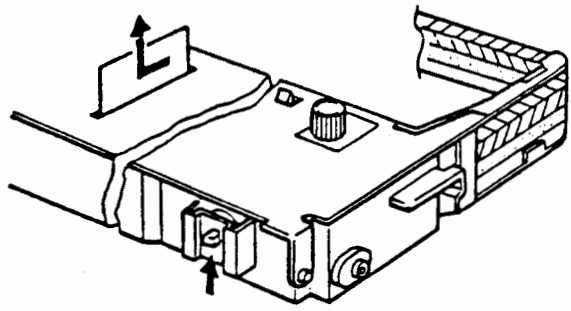


Figure 2-11 Color Ribbon Cassette - Release Tab

2.4.2 DotMax 24C Color Ribbon Installation (Continued)

Refer to Figure 2-12.

Rotate the ribbon feed knob in a clockwise direction (shown by an embossed arrow on the cassette) to remove excessive slack from the ribbon.

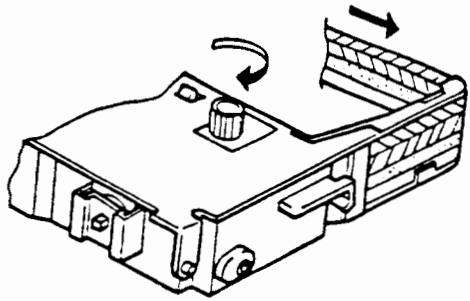


Figure 2-12 Color Ribbon Cassette - Feed Knob

Refer to Figure 2-13.

Push the corner of the ribbon cassette mounting platform downward (to move the ribbon shift mechanism upward) then pull the paper thickness lever to position 9 (to get maximum distance between the print head and platen).

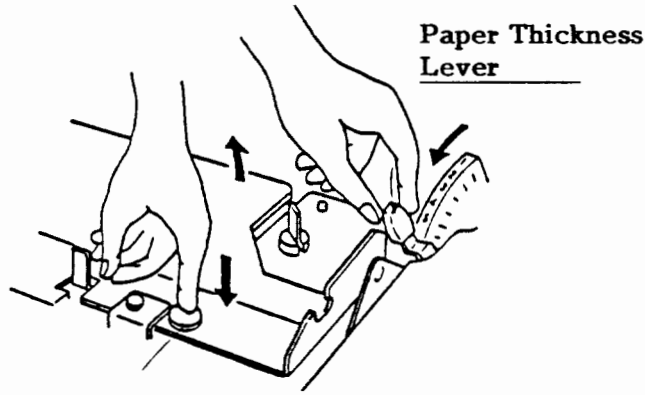


Figure 2-13 Color Ribbon Cassette - Platform

2.4.2 DotMax 24C Color Ribbon Installation (Continued)

Refer to Figure 2-14. The left end of the paper bail can be latched upward by pushing the lever towards the rear of the printer while lifting it upward. This provides additional space for routing the ribbon.

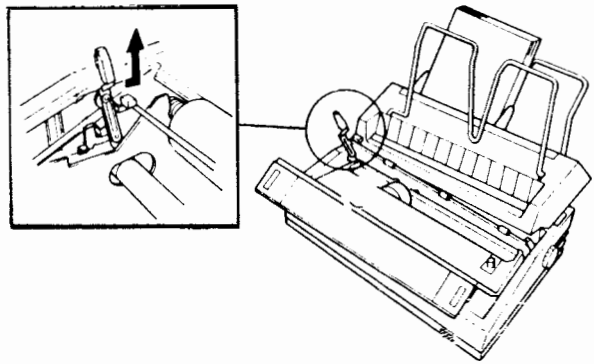


Figure 2-14 Raising the Paper Bail

Refer to Figure 2-15

Place the cassette into the printer by inserting the left and right guide pins (on the rear of the ribbon cassette) into the notches at the end of each side frame.

Carefully push the ribbon cassette downward, while pivoting it, to snap it into place.

Route and install the ribbon in front of the print head, and around the guide post as shown in Figure 2-16.

Lower the left end of the paper bail (by pulling it forward while pushing it downward).

Place the thickness lever into the desired position.

Rotate the ribbon feed knob to remove excess slack from the ribbon.

Refer to the instructions on the ribbon cassette package if you have any questions.

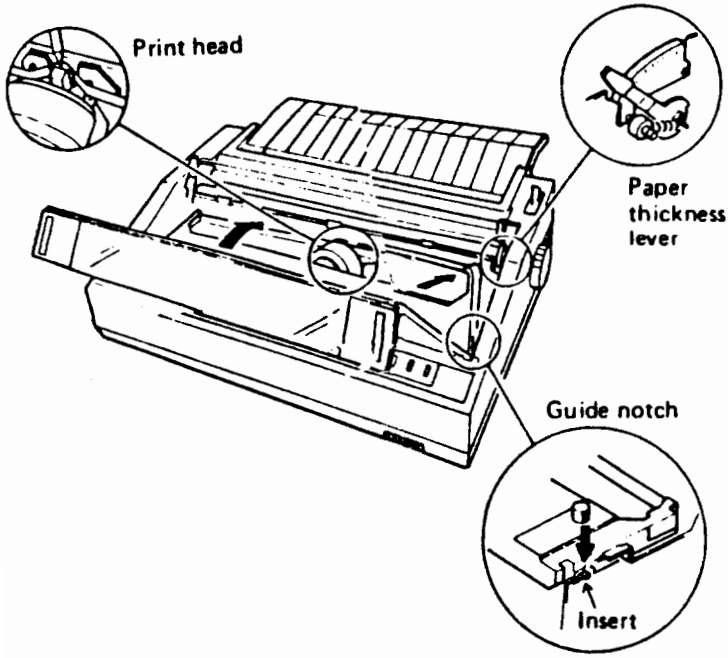


Figure 2-15 Color Ribbon Cassette - Mounting

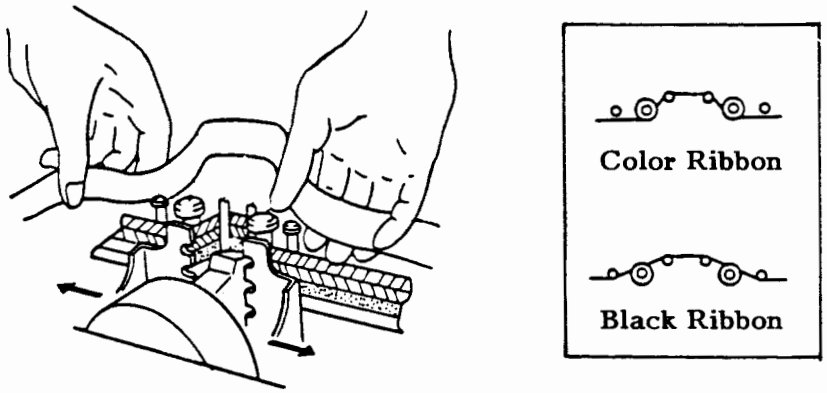


Figure 2-16 Routing the Color Ribbon

2.5 ADJUSTING PAPER THICKNESS

You can use various types of paper in your printer, and adjust the paper thickness lever, to change the gap between the print head and the platen to correspond to the number of copies and the thickness of paper you are using.

The print head moves about 0.05mm (0.002") toward or away from the platen for each notch position on the paper thickness lever.

One notch difference corresponds to about one sheet of paper.

Set the paper thickness lever before loading paper.

Adjust the paper thickness lever as follows:

Refer to Figure 2-17.

Locate the paper thickness lever at the right side frame of the printer.

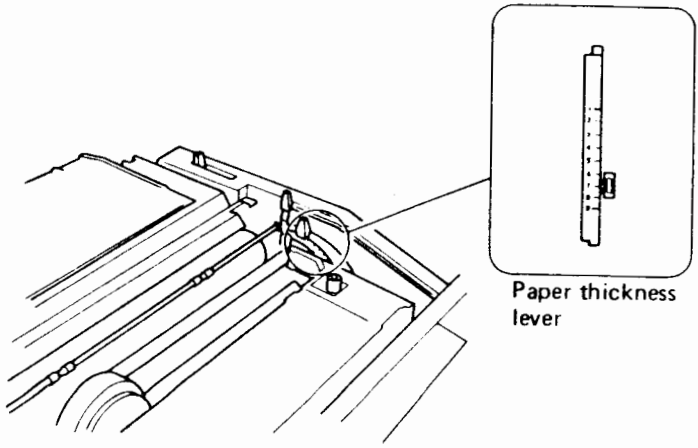


Figure 2-17 Paper Thickness Lever

2.5 ADJUSTING PAPER THICKNESS (Continued)

Select a setting for the lever as shown in Table 2-1

Table 2-1 Paper Adjust Lever Settings

Type of Paper	Notch Position
Single part	1 or 2
Two part	2
Three part	3
Four part	4
Envelope	3 or 4
Ribbon exchange	9

When using thick paper, use a higher notch position number to allow for a wider gap, regardless of the number of copies in the paper.

If the printed characters are faint, due to a wide gap, use a lower notch position number.

Total thickness may vary with the thickness of carbon paper and glue. Adjust the lever accordingly.

If lever setting is too narrow:

Paper may be damaged at its left and right margins

The ribbon may smear the paper as the paper is advanced

Line feeding may be inaccurate

The ribbon may come off its guides, or be loose during printing

If lever setting is too wide:

Printing may be light and characters may be missing

2.6 LOADING CUT SHEET PAPER

Make sure the AC power cable is connected, before starting this procedure, because the printer's auto-load feature will be used (and power is required).

See paragraph 2.8 for a paper change procedure, if you were printing on continuous forms.

If you plan to run self-test, we recommend that you use continuous form that is greater than 12 inches wide. Self test prints up to 75 characters per print line in the center portion of the platen and if printing occurs off the paper the print head and platen may be damaged.

Refer to Figure 2-18.

Place the paper thickness lever to correspond to the thickness of the paper to be loaded.

Turn the power switch to the ON position (a normal power initialization cycle will occur, see paragraph 4.1).

Push the Paper Release Lever towards the rear of the printer.

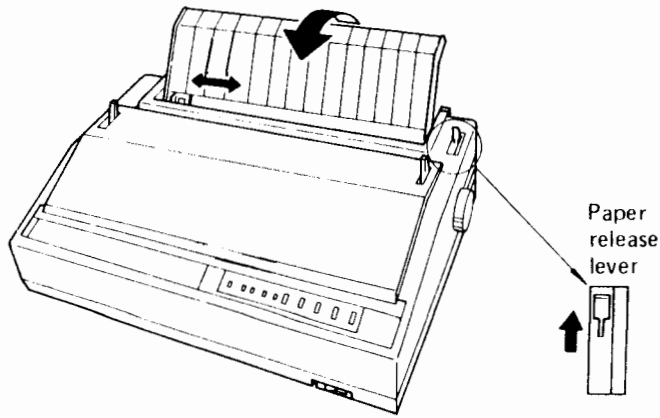


Figure 2-18 Loading Cut Paper - Paper Release Lever

2.6 LOADING CUT SHEET PAPER (Continued)

Refer to Figure 2-19.

Lift the rear of the Paper guide.

If required, move the gray colored sliding stop (on the paper guide) to help align the paper to the desired print column.

Place a sheet of cut paper into the paper guide. It will be behind the platen. If the paper is not inserted correctly, a paper feed error or skewed feeding may occur.

Press the SHEET LOAD switch. The paper bail automatically moves away from the platen and a sheet of paper is automatically fed, until the top of the paper is about 1" above the print head.

Align the paper bail rollers, if required, as you would on a typewriter.

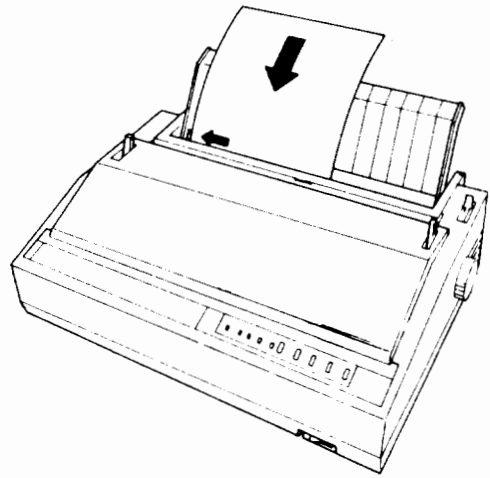


Figure 2-19 Loading Cut Paper - SHEET LOAD

2.7 LOADING CONTINUOUS FORM

As explained in paragraph 2.8, you only have to load continuous form once. After you have continuous forms in the printer, your DotMax printer makes it easy for you to change between printing on individual sheets of paper and continuous forms.

The following procedure assumes that this is the first time you are loading continuous forms.

If you are going to run self-test, make sure the form is centered (or use wide paper). Self-test uses the center part of the print line and prints 75 characters per line. If printing occurs off the paper, the print head and platen may be damaged.

Refer to Figure 2-20 and locate the form tractors.

Move either form tractor by pulling the tab towards the front of the printer while sliding the tractor.

Slide the right hand form tractor towards the right side of the printer (just to get it out of the way).

Place the left forms tractor at the approximate position for printing the left margin on your form.

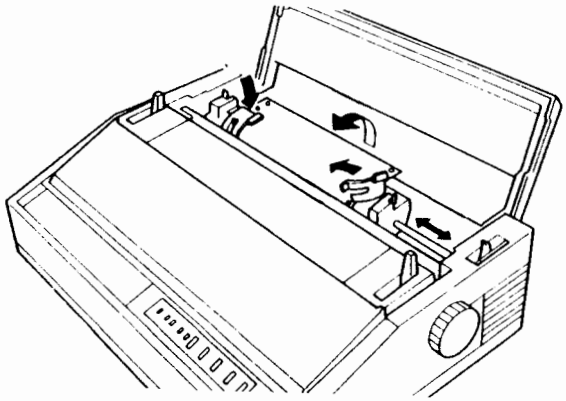


Figure 2-20 Form Tractors

2.7 LOADING CONTINUOUS FORM (Continued)

Open both form tractors.

Place the holes (in the left side of the form) over the pins on the left tractor and close the tractor.

Move the right tractor under the paper, place the holes (in the right side of the form) over the pins in the right tractor and close the tractor.

Move the right hand tractor (and installed form) if required to remove slack from the paper.

Ensure the Paper release lever is towards the front of the printer.

Advance the form into the printer (beyond the platen) by turning the platen knob clockwise (to load the form into the printer) while pulling the paper bail lever forward (to get it out of the form's path).

Close the top cover and turn the power switch ON, an initialization cycle will occur, see paragraph 4.1.

Use the MICRO V. FEED switches on the operator's panel to align the paper vertically (up and down).

2.8 CHANGING CONTINUOUS FORM TO CUT PAPER

When continuous forms are in the printer, you change to cut sheet paper as follows:

Ensure Paper Release Lever is in forward position

Press SHEET LOAD switch (the form unloads)

Push Paper Release Lever to rear position

Insert Cut Sheet Paper behind platen

Press SHEET LOAD switch (the paper loads)

NOTE: The continuous forms remains in the form tractors but does not move as long as the Paper Release Lever (see Figure 2-21) is in the rear position.

When you have finished printing your cut sheet paper, change to continuous form by merely placing the Paper Release Lever to its forward position and pressing the SHEET LOAD switch. The continuous forms will load.

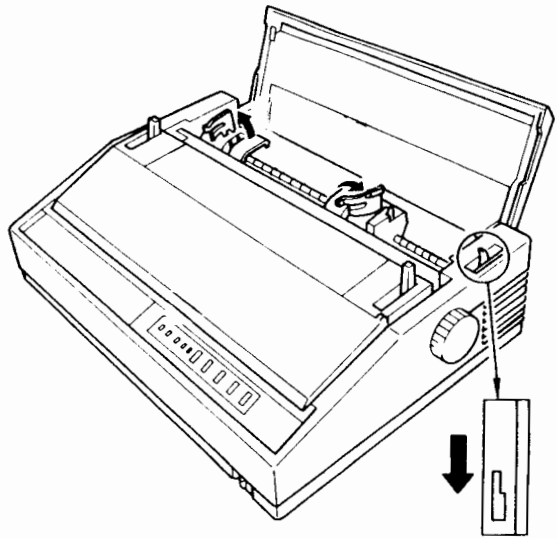


Figure 2-21 Paper Release Lever

SECTION 3

CONTROL PANEL SWITCHES

This section describes the Control Panel's switches. These switches set default parameters for your printer. With these switches you are able to select some of the printer's features to suit your application.

Your switch selections are read by the printer only during a printer initialization cycle (at power on time) and when the RESET switch is pressed.

Parameters that are set by a DIP switch, may be overridden by your application software.

As explained in this section, the default parameter set by some of these switches may depend on the type of printer (DotMax 24I/24C or 24D) or type of interface (Parallel or Serial) used on your printer.

We suggest that you record the switch settings that work with your application, printer, and interface in this section.

3.2 DIP SWITCH D PARAMETERS ALL PRINTERS

Refer to Figure 3-3 and Tables 3-1 and 3-2.

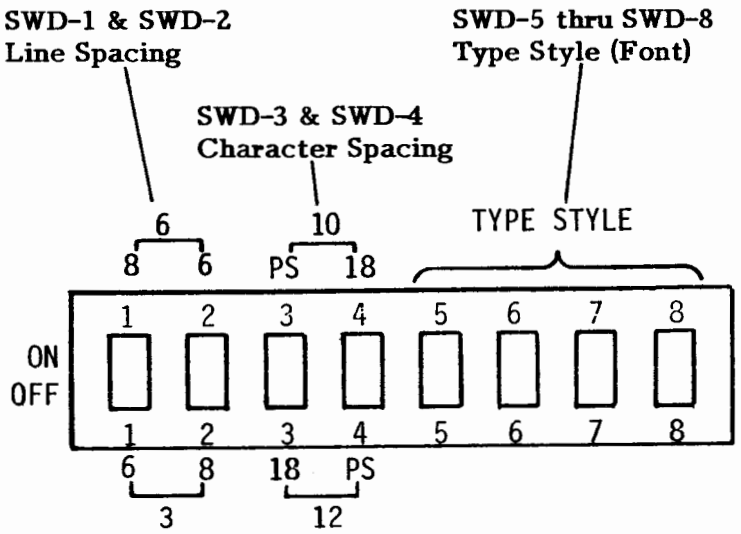


Figure 3-3 DIP SWITCH D - ALL PRINTERS

Line and character spacing default parameters are set by DIP switch D (SWD-1 through SWD-4). These parameters are set on all printers regardless of printer or interface type. Line spacing is given in Table 3-1. Character spacing (pitch) is given in Table 3-2.

Default Type Style (or type font) is set by DIP switch D (SWD-5 through SWD-8). Selection of Type Style depends on printer type. DotMax 24D Type Styles are listed in Table 3-3. DotMax 24I and 24C Type Styles are listed in Table 3-4.

All Type Styles (Type Fonts) are shown in Appendix A.

3.2.1 DIP SWITCH D - LINE and CHARACTER Spacing

Table 3-1 LINE SPACING - ALL PRINTERS		
SWD-1	**SWD-2**	**LINE SPACING**
OFF	OFF	3 lines per inch
ON	OFF	8 lines per inch
ON	ON	6 lines per inch

Table 3-2 CHARACTER SPACING - ALL PRINTERS		
SWD-3	**SWD-4**	**CHARACTER SPACING**
OFF	OFF	12 characters per inch (Elite)
ON	OFF	Proportional spacing
OFF	ON	18 characters per inch
ON	ON	10 characters per inch (Pica)

Character fonts designed for 10 characters per inch will overlap when 12 or 18 characters per inch are selected.

All character fonts, except the condensed character font, will overlap when 18 characters per inch is selected.

Proportional spacing establishes character spacing in accordance with each character's width.

3.2.2 DIP SWITCH D - TYPE STYLE -DOTMAX 24D

Table 3-3 TYPE STYLE (FONT) - DOTMAX 24D

SWD-5	SWD-6	SWD-7	SWD-8	TYPE STYLE
OFF	OFF	OFF	OFF	Courier 10*
ON	OFF	OFF	OFF	Prestige Elite*
OFF	ON	OFF	OFF	Boldface*
ON	ON	OFF	OFF	Correspondence
OFF	OFF	ON	OFF	Draft
ON	OFF	ON	OFF	Compressed*
OFF	ON	ON	OFF	Not specified
ON	ON	ON	OFF	Not specified
OFF	OFF	OFF	ON	Cartridge font 0
ON	OFF	OFF	ON	Cartridge font 1
OFF	ON	OFF	ON	Cartridge font 2
ON	ON	OFF	ON	Cartridge font 3
OFF	OFF	ON	ON	Not specified
ON	OFF	ON	ON	Not specified
OFF	ON	ON	ON	Not specified
ON	ON	ON	ON	Not specified

* Designates Letter Quality type font

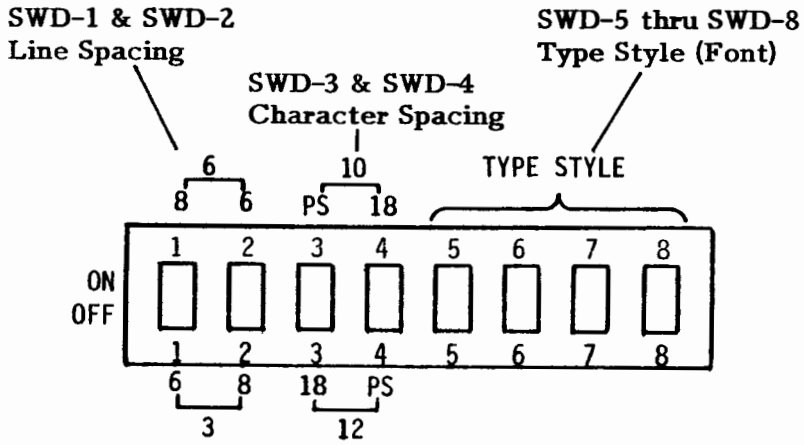


Figure 3-3 DIP SWITCH D DOTMAX 24D

3.2.3 DIP SWITCH D - TYPE STYLE DOTMAX 24I/24C

Table 3-4 TYPE STYLE (FONT) - DOTMAX 24I/24C

SWD-5	SWD-6	SWD-7	SWD-8	TYPE STYLE (FONT)
OFF	OFF	OFF	OFF	Set 2 Font 0 Courier 10*
ON	OFF	OFF	OFF	Set 2 Font 1 Prestige Elite*
OFF	ON	OFF	OFF	Set 2 Font 2 Draft
ON	ON	OFF	OFF	Set 2 Font 3 Compressed*
OFF	OFF	ON	OFF	Set 1 Font 0 Courier 10*
ON	OFF	ON	OFF	Set 1 font 1 Prestige Elite*
OFF	ON	ON	OFF	Set 1 Font 2 Draft
ON	ON	ON	OFF	Set 1 Font 3 Compressed*
OFF	OFF	OFF	ON	Cartridge Set 2 Font 0
ON	OFF	OFF	ON	Cartridge Set 2 Font 1
OFF	ON	OFF	ON	Cartridge Set 2 Font 2
ON	ON	OFF	ON	Cartridge Set 2 Font 3
OFF	OFF	ON	ON	Cartridge Set 1 Font 0
ON	OFF	ON	ON	Cartridge Set 1 Font 1
OFF	ON	ON	ON	Cartridge Set 1 Font 2
ON	ON	ON	ON	Cartridge Set 1 Font 3

*Designates Letter Quality type font

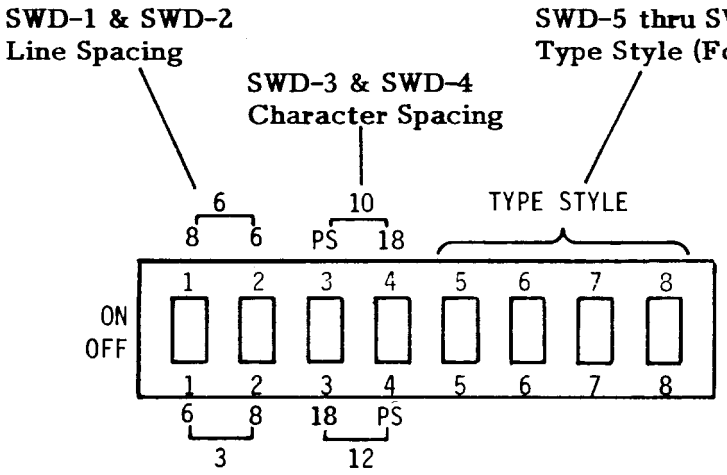


Figure 3-3 DIP SWITCH D DOTMAX 24I/24C

3.3 FORM LENGTH SWITCHES

The form length dial switches are applicable to all DotMax printer types. These switches select the number of lines on each sheet of paper (from 00 to 99).

Form length will vary with line spacing (established with SWD-1 and SWD-2).

See Figure 3-4. Form length is 11 inches, when line spacing is 6 lines per inch and these switches are set at 66.

Form length is also 11 inches, when line spacing is 8 lines per inch and these switches are set at 88.

Form length is still 11 inches, when line spacing is 3 lines per inch and these switches are set at 33.

The top of form will change from page to page if form length is not correctly set and continuous form is used.

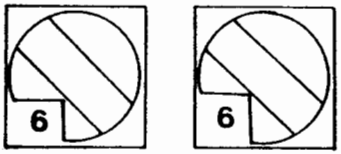


Figure 3-4 FORM LENGTH SWITCHES - ALL PRINTERS

3.4 DIP SWITCH A PARAMETERS

The parameters set by DIP Switch A vary with the type of interface, refer to Table 3-5 and Figure 3-5.

Table 3-5 DIP SWITCH A PARAMETERS

SWITCH	PARALLEL Interface	SERIAL Interface
SWA-1	Ignored	Baud rate
SWA-2	Ignored	Baud rate
SWA-3	Ignored	Baud rate
SWA-4	Ignored	Data format
SWA-5	Ignored	Data format
SWA-6	7/8 bit ASCII code	Data format
SWA-7	Busy signal timing	Protocol
SWA-8	Busy signal timing	Protocol

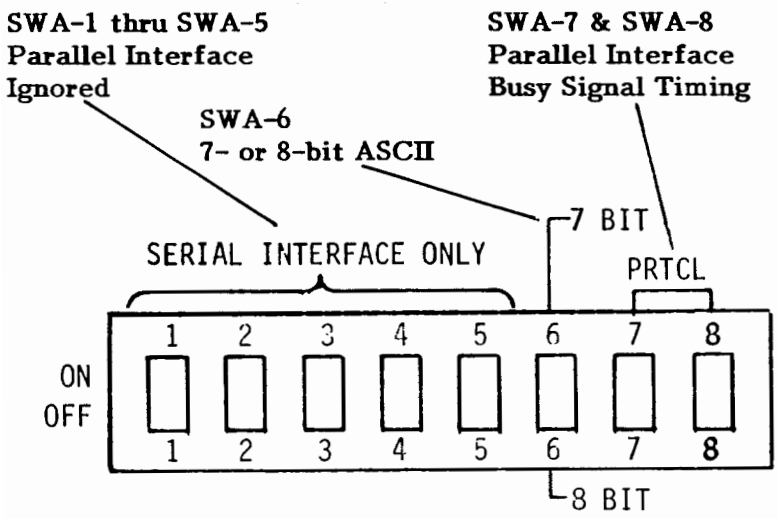


Figure 3-5 DIP SWITCH A - INTERFACE DEPENDENT

3.4.1 DIP SWITCH A - PARALLEL INTERFACE

When a Parallel interface is connected DIP switch A positions SWA-1, -2, -3, -4 and -5 are ignored.

Parameters set by DIP Switch A positions SWA-6, -7, and -8 (when a Parallel Interface is used) is shown in Table 3-6.

Refer to Figure 3-6A (and your system documentation).

Table 3-6 DIP Switch A - PARALLEL INTERFACE

SWA-6	SWA-7	SWA-8	ASCII Code/Busy signal Timing
OFF	--	--	Sets 8-bit ASCII Code
ON	--	--	Sets 7-bit ASCII Code
--	OFF	OFF	Busy Signal true at leading edge of Strobe signal to trailing edge of Acknowledge signal
--	ON	OFF	Busy Signal true at trailing edge of Strobe signal
--	OFF	ON	Busy Signal true at leading edge of Strobe signal
			DSTB ACKNLG
	OFF	OFF	BUSY
	ON	OFF	BUSY
	OFF	ON	BUSY

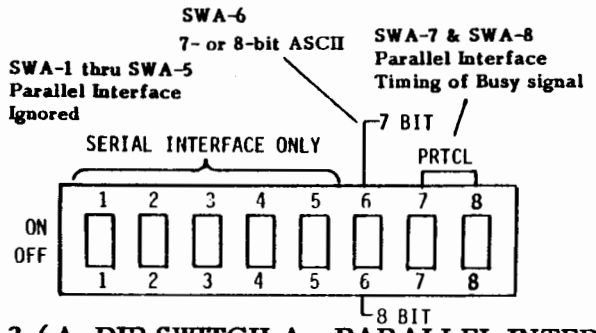


Figure 3-6A DIP SWITCH A - PARALLEL INTERFACE

3.4.2 DIP SWITCH A - SERIAL INTERFACE

Refer to Figure 3-6B. Parameters set by DIP Switch A, when a Serial interface is used, is shown in Tables 3-7, 3-8 and 3-9.

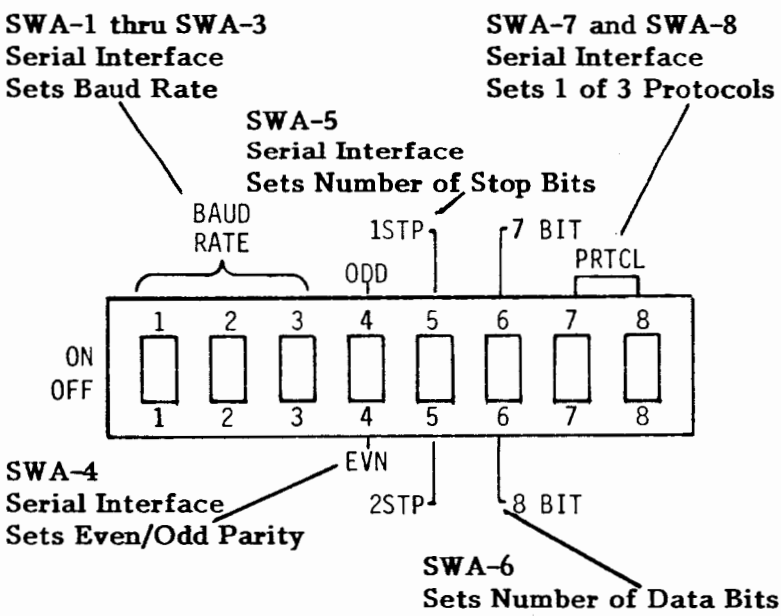


Figure 3-6B DIP SWITCH A - SERIAL INTERFACE

Table 3-7 DIP SWITCH A - SERIAL INTERFACE

SWA-1	SWA-2	SWA-3	Baud Rate
OFF	OFF	OFF	110 Baud
ON	OFF	OFF	300 Baud
OFF	ON	OFF	600 Baud
ON	ON	OFF	1200 Baud
OFF	OFF	ON	2400 Baud
ON	OFF	ON	4800 Baud
OFF	ON	ON	9600 Baud
ON	ON	ON	Not specified

3.4.2 DIP SWITCH A - SERIAL INTERFACE (Continued)

Table 3-8 DIP SWITCH A - SERIAL INTERFACE

SWA-4	SWA-5	SWA-6	Parity	Stop Bits	Data Bits
OFF	OFF	OFF	None	1	8
ON	OFF	OFF	Mark	1	7
OFF	ON	OFF	Even	1	8
ON	ON	OFF	Odd	1	8
OFF	OFF	ON	Even	2	7
ON	OFF	ON	Odd	2	7
OFF	ON	ON	Even	1	7
ON	ON	ON	Odd	1	7

SWA-4 = Parity (Odd/Even or Mark)
SWA-5 = Number of Stop Bits (1 or 2)
SWA-6 = Number of Data Bits (7 or 8)

Table 3-9 DIP SWITCH A - SERIAL INTERFACE

SWA-7	SWA-8	Communication Protocol
OFF	OFF	RC (Reverse Channel)
ON	OFF	DTR (Data Terminal Ready)
OFF	ON	XON/XOFF (DC1/DC3)
ON	ON	Echo Test

The DotMax 24D always uses the ETX/ACK (End of Text/Acknowledge) protocol in conjunction with the switch selected protocol.

Refer to your system documentation if you have questions about these parameters.

3.5 DIP SWITCH B PARAMETERS

Refer to Figure 3-7 and Tables 3-10, 3-11 and 3-12.

The parameters set by these switches depends on the type of interface used by the printer and the type of printer.

Table 3-10 DIP SWITCH B - PARAMETERS

SWB-1	Sets type of Interface ON = Serial Interface OFF = Parallel Interface
SWB-2	Ignored with Parallel Interface With Serial Interface (See Table 3-11) ON = Full Duplex mode OFF = Half Duplex mode
SWB-3	Ignored with Parallel interface With Serial Interface (See Table 3-11) ON = Modem connection OFF = Local connection
SWB-4	Language - See Table 3-12
SWB-5	Language - See Table 3-12
SWB-6	Language - See Table 3-12
SWB-7	Ignored with DotMax **24D** Sets IBM Graphic or Epson printer mode with DotMax **24C** ON = Epson JX-80 OFF = IBM Graphic Printer
SWB-8	Reserved for future use

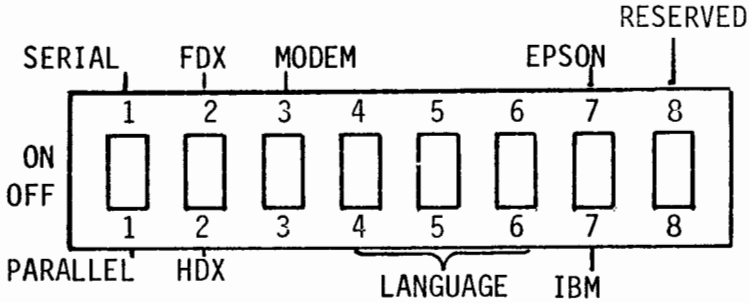


Figure 3-7 DIP SWITCH B - PARAMETERS

Table 3-11 DIP Switch B - SERIAL INTERFACE

SWB-2	SWB-3	Duplex	CTS	CD	DSR
ON	ON	Full	Enabled	Disabled	Enabled
OFF	ON	Half	Enabled	Disabled	Enabled
ON	OFF	Full	Disabled	Disabled	Disabled
OFF	OFF	Half	Enabled	Disabled	Disabled

SWB-2 sets Full or Half Duplex mode. SWB-3 controls serial interface signals CTS (Clear to Send), CD (Carrier Detect), and DSR (Data Set Ready).

Table 3-12 DIP Switch B ALL PRINTERS

SWB-4	SWB-5	SWB-6	Language
OFF	OFF	OFF	United States
ON	OFF	OFF	United Kingdom
OFF	ON	OFF	German
ON	ON	OFF	French
OFF	OFF	ON	Italian
ON	OFF	ON	Spanish
OFF	ON	ON	Swedish
ON	ON	ON	Danish

3.6 DIP SWITCH C PARAMETERS

Refer to Figure 3-8. Parameters set by DIP switch C are applicable to all DotMax printer types.

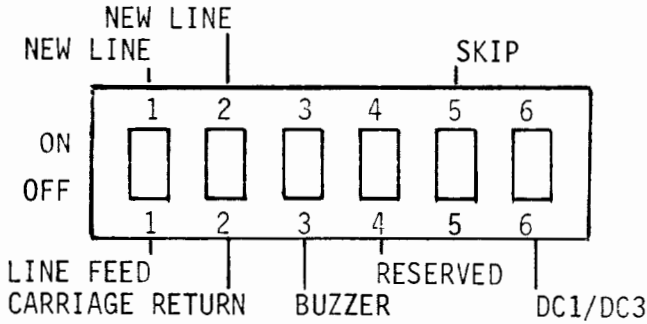


Figure 3-8 DIP SWITCH C ALL PRINTERS

Table 3-13 DIP Switch C ALL PRINTERS.		
SWC-1	ON	= Carriage Return and Line Feed with a LF control code
	OFF	= Line Feed only with a LF control code
SWC-2	ON	= Carriage Return and Line Feed with a CR Control code
	OFF	= Carriage Return only with a CR control code
SWC-3	ON	= Disables the buzzer
	OFF	= Enables the buzzer
SWC-4	---	Reserved for future use
SWC-5	ON	= Enables a 1" skip at the end of form (over perforations in continuous form)
	OFF	= Disables the skip at the end of form
SWC-6	ON	= Disables DC1 and DC3 control code function with the parallel interface
	OFF	= Enables DC1 and DC3 control code function with the parallel interface

3.7 ADJUST SWITCH

The Adjust switch, shown in Figure 3-9, is used by factory personnel to align vertical printing when performing bidirectional printing.

We recommend that you record this factory setting in case it is accidentally changed.

Figure 3-9 ADJUST SWITCH

3.8 CONTROL PANEL ABBREVIATIONS

Control Panel abbreviations are defined as follows:

1STP = One Stop Bit
2STP = Two Stop Bits
7BIT = 7-Bit ASCII Code data
8BIT = 8-bit ASCII Code data
AUT LF = Carriage Return and Line Feed with CR code
EVN = Even Parity
FDX = Full Duplex Mode
HDX = Half Duplex Mode
LF = Line Feed only with LF Code
NL = New Line (Carriage Return and Line Feed with LF Code)
PRLL = Parallel Interface
PRTCL = Protocol
PS = Proportional Spacing

SECTION 4

TAKING CARE OF YOUR PRINTER

This section describes the printer initialization cycle, gives basic troubleshooting hints, explains removal of a paper jam, cleaning procedures and repacking of your printer for transportation.

4.2 BASIC TROUBLESHOOTING

Your printer is designed to provide reliable operation, if it happens to malfunction use Table 4-1 to help identify and resolve the difficulty.

Check your computer and application software manual for additional suggestions. If self-test performs correctly you should suspect the interface connection or some other element in the system.

Table 4-1 Troubleshooting Hints

Symptom	Check
Power Lamp fails to light.	Power cord and connection. Fuse, replace if bad.
Printer will not initialize.	Cover, must be closed. Carriage for easy side to side movement.
Paper feed problem.	Paper path for obstruction. Pressure roller for correct position. Forms tractor for correct side to side settings.
Print is light.	Ribbon quality, replace if worn. Paper thickness control lever.
Printed characters have voids or vary in darkness.	Paper, ribbon and platen. Paper thickness control lever.
Poor print quality.	Paper thickness control lever. Ribbon cassette and pressure roller.

Table 4-1 Troubleshooting Hints
(Continued)

Symptom	Check
Will not print.	If an OP CHECK lamp is lit (Cover Open or Paper Out) check the sensors. Ribbon, must be correctly installed between print head and platen. Interface connection & cable.
Spacing is too large or too small between printed characters.	DIP switch D (SWD-3 and SWD-4) character spacing must be set to correspond with selected type font.
Incorrect characters printed.	DIP switch settings, host system Control code and Data code must agree with the printer's DIP switch settings (see section 3).
Ribbon breaks or jams.	Installation of ribbon (see paragraph 2-4).
Extra line feed, or no line feed.	DIP switch C (SWC-1 and SWC-2) New Line, Line Feed, and Carriage Return setting.

4.3 REMOVING A PAPER JAM

Remove a paper jam as follows:

Turn power off and open the front cover.

Pull the paper release lever towards the front of the printer.

Place the paper thickness lever into position 9.

Place the print head at either end of the print line.

Carefully pull the jammed paper from the printer, try to avoid tearing the paper.

Rotate the platen knob, as required, to help remove all scraps of paper from beneath the platen.

Move the print head into its center position.

Insert a fresh sheet of continuous paper into the form tractors and rotate the platen knob to advance the paper through the printer.

If the paper does not pass freely through the printer use 4 or 5 sheets of paper (folded together) and advance them through the paper path to push out any remaining paper.

Continue to pass paper through the printer until you are sure that all scraps have been removed.

Put the paper release lever and the thickness lever into their operating positions and close the top cover.

Turn power on, load paper and operate the printer.

4.4 CLEANING AND LUBRICATING

Operator maintenance is limited to cleaning the printer, ensuring there is lubrication on the print head shaft, and cleaning the platen.

CLEANING AND LUBRICATING NOTES:
Printer lubrication is generally not required and is best performed by a service technician.

Do not use alcohol to clean rubber parts (platen, rollers, etc.). Alcohol may cause the rubber to harden.

Clean the outer surfaces of the printer with a soft cloth dampened with a mild detergent.

With a small vacuum cleaner, the operator may remove accumulations of paper dust and particles from inside the printer.

Use a platen cleaner to remove ink from the platen and paper rollers.

Apply a small amount of the platen cleaner to a cloth, place the cloth against the platen (or paper rollers) and rotate the platen knob.

Dry the platen by applying a dry cloth to the platen.

Avoid getting the platen cleaner inside the printer.

4.5 REPACKING YOUR PRINTER

Use the carton and packing material supplied with the printer if you have to store or transport your printer.

Remove power from your printer and computer system.

Remove the interface cable, power cable, ribbon cassette, paper guide, and cut sheet feeder supports. Place these items into their plastic bags.

Clean the printer, if required.

Position the print head at the right margin.

Install the plastic and cardboard shipping restraints to prevent the print head from moving. See Figure 1-2 on page 1-3.

Ensure the top cover and control panel cover are closed and tape them shut.

Put the printer into its plastic bag

Lower the printer into the bottom portion of the shipping carton (on top of the two polystyrol pads).

Place the paper guide and ribbon cassette into their cardboard package and lower the package into the bottom portion of the shipping carton.

Place the upper portion on of the shipping carton on the shipping carton.

Secure the two portions of the shipping carton together with the two plastic handles to complete the packing procedure.

SECTION 5

DotMax 24D Command Set

This section explains the DotMax 24D commands. Refer to Section 6 if you have a DotMax 24I or 24C printer.

Most users will operate with application software and will not use the information in this section.

Specify your DotMax 24D as a Diablo Model 630 equivalent in your application software installation procedure.

The remainder of this section is written for programmers writing their own software routines.

Differences between a Diablo 630 API and DotMax 24D:

DotMax 24D prints with a 24-wire matrix print head; the 630 uses a print wheel.

DotMax 24D responds to bit image, download, and font copy commands; the 630 does not.

DotMax 24D has vertical movement in increments of 1/48" and 1/180"; the 630 has only 1/48".

DotMax 24D has horizontal movement in increments of 1/120" and 1/360"; the 630 has only 1/120".

DotMax 24D ignores reverse print, HyPlot, and other print wheel commands (see paragraph 5.16).

DotMax 24D offers enlarged print mode, bit image graphics, sheet feeder and motion commands that are not used by the Diablo Model 630 (see paragraph 5.15).

All DotMax 24D commands are listed in a Table at the back of this manual.

5.1 OVERVIEW

This section describes the DotMax 24D command set. These commands, in the form of Control Codes or Escape Code sequences, cause the printer to:

Exchange, store and print data,
Establish and reset different print modes (enlarged, shadow, bold, underscore, etc)
Format the printer's output
Control other functions performed by the printer

When a command specifies a change to a DIP (or Form Length) switch setting, the switch setting is over-ridden.

The host computer sends commands (and data) to the printer via the interface, under software control. For example a LPRINT statement (in BASIC) allows entry of a command. With the following BASIC routine the printer will print one line in normal print mode, then print in double-width print mode until instructed to resume normal print mode.

Turn on your system, load BASIC and enter:

```
10 LPRINT "Print is switch selected mode"
20 LPRINT CHR$(27);"w";CHR$(1);
30 LPRINT "Printed in Enlarged print mode"
40 LPRINT "Also in Enlarged print mode"
50 LPRINT CHR$(27);"w";CHR$(0);
60 LPRINT "Printed in switch selected mode"
```

Line 10 tells the printer to print in normal print mode.
Line 20 tells it to print in Enlarged print mode until cancelled.
Lines 30 and 40 are printed in Enlarged print mode.
Line 50 cancels Enlarged print mode.
Line 60 is printed in normal print mode.

This example used the LPRINT statement, but some versions of BASIC use a PRINT #1 statement.

The LPRINT statement can use the following formats to send information to the printer:

LPRINT "w"	ASCII Character
LPRINT CHR$(119)	Decimal character
LPRINT CHR$(&H77)	Two digit Hexadecimal character

Refer to your computer's technical or software manual for additional information

5.2 RESET AND SENSE COMMANDS

These commands allow remote reset of error conditions and set printer parameters to a predetermined state. These are direct execution commands, that are executed when the command is received.

Code	Decimal	Hex	Function
ESC SUB I	**27 26 73**	**1B 1A 49**	**Initialize Printer**

"I" is an uppercase "i". The printer is set to the operating parameters established when power was turned ON.

ESC CR P	**27 13 80**	**1B 0D 50**	**Remote Reset**

Command is queued and executed when read from the print buffer. Printer is set to the operating paramenters established when power was turned ON.

ESC SUB R	**27 26 82**	**1B 1A 52**	**Reset Error**

Restores the printer to its initial state after an error occurs, if the cause of the error has been corrected.

ESC SUB 1	**27 26 49**	**1B 1A 31**	**Request Status Byte 1**

"1" is the number one. Causes the STX character followed by Status Byte 1 to be sent over the serial interface. Bit definitions are given in Table 5-1.

Table 5-1 Status Byte 1 Bit Definitions

Bit #	Definition
0	Not Used
1	10 Pitch
2	Paper Out
3	Auto Line Feed
4	Cover Open
5	Printer Idle (No motion and receive buffer empty)
6	Printer in Check/Error condition
7	Parity Bit set

ESC SUB 3 27 26 51 1B 1A 33 Request Status Byte 3
Causes the STX character followed by Status Byte 3 to be sent to the computer over the serial interface. Bit definitions are given in Table 5-2.

Table 5-2 Status Byte 3 Bit Definitions

Bit #	Definition
0	Paper Out or Feeder Error
1	Paper Out or Feeder Error
2	Feeder Installed (See Note 1)
3	Feeder Installed (See Note 1)
4	Not Used
5	Feeder Installed (See Note 1)
6	Feeder in manual mode
7	Parity Bit (See Note 2)

Note 1. If a sheet feeder is installed its model number is identified by bits 2, 3, and 5 as shown in Table 5-3.

Note 2. Parity bit sets the sum of bits 0 to 7 even or odd to agree with DIP Switch A SWA-4

Table 5-3 Definition of Installed Feeder

Bit # 2 3 5	Feeder Model Installed
0 0 0	Not Specified or no Feeder
0 0 1	Model SF220 or ASF521*
0 1 0	Model RS966, RS1966, ASF522* or ASF523*
1 1 0	Model ASF580*

Code	Decimal	Hex	Function
ESC SUB SO	27 26 14	1B 1A 0E	Memory Test

This command is used only when a serial interface is installed. This command checks the printer's ROM and RAM and then transfers a STX character, followed by the test results byte, to the host system. The bit definitions of this test results byte are given in Table 5-4.

Table 5-4 Memory Test Result Byte

Bit	Memory Test Results
0	ROM defective
1	ROM defective
2	RAM defective
3	RAM defective
4	(Not Used)
5	(Not Used)
6	(Not Used)
7	Parity bit

* indicates a manufacturer's change for Fujitsu printers

5.3 PRINT MODE COMMANDS

Print mode is changed with the following commands. Default print mode, established by DIP switches, is restored when power is turned on, or when a selected print mode is reset.

Code	Decimal	Hex	Function
ESC w (SOH)	**27 119 1**	**1B 77 01**	**Set Enlarged Print**
ESC w (NUL)	**27 119 0**	**1B 77 00**	**Reset Enlarged Print**

Enlarged print mode is set until reset.

ESC W	**27 87**	**1B 57**	**Set Shadow Print**
ESC &	**27 38**	**1B 26**	**Reset Shadow Print**

Shadow Print is also reset by CR or ESC X

ESC O	**27 79**	**1B 4F**	**Set Bold Print**
ESC &	**27 38**	**1B 26**	**Reset Bold Print**

"O" is uppercase o. Bold print is also reset by CR or ESC X

ESC E	**27 69**	**1B 45**	**Set Underscore**
ESC R	**27 82**	**1B 52**	**Reset Underscore**

Underscore is also reset by ESC X

ESC P	**27 80**	**1B 50**	**Set Proportional Space**
ESC Q	**27 81**	**1B 51**	**Reset Proportional Space**
ESC S	**27 83**	**1B 53**	**Reset Proportional Space**

Proportional space (PS) is effective until reset

ESC X **27 88** **1B 58** **Cancel Word Processing print modes** (except proportional space)

ESC 7 **27 55** **1B 37** **Suppress Print Mode**

All printable characters are replaced by spaces in this mode. ESC codes and Control characters are not affected. Suppress Print mode is reset by CR.

5.3 PRINT MODE COMMANDS (Continued)

Code	Decimal	Hex	Function
ESC 3	27 51	1B 33	Set Graphic Mode
ESC 4	27 52	1B 34	Reset Graphic Mode

Graphic mode is also reset by a CR. Graphics mode has the following effects on the printer:

Carriage movement is separate from printing (the carriage is not moved when a symbol is printed).

Carriage movement occurs in 1/60" increments for the Space, Back-space, and absolute Tab commands (Relative Horizontal Tab operations are not effected).

Paper movement occurs in 1/48" increments for the LF command (Vertical tab, Form Feed, Top of Form, and Margin commands are not effected).

Half Line Feed and Negative Line Feed are not effected.

5.4 HORIZONTAL MOVEMENT COMMANDS

The print head is controlled and positioned by the following commands.

Code	Decimal	Hex	Function
SP	32	20	**Space,** moves the print head one HMI forward (like the space bar on a typewriter). Double-width spacing is performed in enlarged print mode
BS	8	08	**Backspace** moves the print head backwards one HMI in normal mode or 1/60" backwards in graphics mode. Direction is reversed in backward print mode (ESC 6)

5.4 HORIZONTAL MOVEMENT COMMANDS
(Continued)

Code	Decimal	Hex	Function
ESC BS	27 8	1B 08	**Backspace** moves the print head backwards 1/120 inch. Direction is reversed in backward print mode (ESC 6)
ESC \	27 92	1B 5C	**Uni-directional** print mode
ESC /	27 47	1B 2F	**Bi-directional** print mode
	Bi-directional print mode is set when power is turned on.		
ESC 5	27 53	1B 35	**Normal print mode**
ESC 6	27 54	1B 36	**Backward print mode**
	Normal print mode is established when power is turned on, with CR, or with an ESC 5 command. Backward print mode (set with ESC 6) moves the carriage to the left after printing. Space and Backspace motion is reversed; but Tab, CR, and paper motion remain unchanged.		
CR	13	0D	**Carriage Return**
	Returns print head to margin. If DIP switch C SWC-2 is ON a line feed is performed. If DIP switch C SWC-1 is ON a CR is also performed with each LF command. CR also resets many commands, see Table in back of manual.		
ESC US (n)	27 31 (n)	1B 1F (n)	**Set HMI** (Horizontal Motion Index) to (n-1)/120". (n) is between 1 and 126. Minimum HMI is 0 ((0)/120 = 0") and maximum HMI is 125 (125/120 = 1.05")

Code	Decimal	Hex	Function
ESC US (n)	27 31 (n)	1B 1F (n)	**Set HMI** (Horizontal Motion Index) to (n-1)/120" (Continued)

Note that (n) = (120/desired CPI) + 1

For example:

CPI	(n)
5	24
10	13
12	11
20	7

ESC S returns the CPI (character spacing) set by DIP switch D SWD-1 and SWD-2.

ESC b (n) **27 98 (n) 1B 62 (n) Set HMI** (Horizontal Motion Index to (n)/180". (n) is between 0 and 255 (NUL and DEL are not used). Minimum HMI is 0 (0/180 = 0") and maximum HMI is 255 (255/180 = 1.41").

Note that (n) = 180/desired CPI.

For example:

CPI	(n)
4	45
6	30
10	18
12	15
18	10

ESC S returns the CPI (character spacing) set by DIP switch D SWD-1 and SWD-2.

ESC DC1 (n) **27 17 (n) 1B 11 (n) Set Character Offset** (space beween characters) to (n)/120". (n) is between 0 and 64. Offset distance is from 0" to ±64/120" (0.5"). Bits 0 to 5 are the offset value and bit 6 is direction of offset (0 = positive and 1 = negative). Offset is changed with another ESC DC1 (n) command and cleared by CR or ESC X. Used with proportional spacing to set distance between characters.

5.5 HORIZONTAL TABBING COMMANDS

Absolute and relative horizontal tab stops are controlled with the following commands.

Code	Decimal	Hex	Function
HT	9	09	**Horizontal Tab,** moves print head to the next horizontal tab stop.
ESC 1	27 49	1B 31	**Set Horizontal Tab,** by specifying the desired number of spaces between tab stops (then entering ESC 1), or by positioning the print head at the desired tab stop location (then entering ESC 1).
ESC 2	27 50	1B 32	**Clear** all Horizontal and Vertical Tab Stops.
ESC 8	27 56	1B 38	**Clear Horizontal Tab Stop** at present print head location.
ESC HT (n)	27 9 (n)	1B 09 (n)	**Absolute Horizontal Tab,** moves print head to the horizontal position specified by (n). (n) is between 1 and 126 (the left most print position is 1). This code enables direct tabbing to any of 126 print columns. Print head location, at completion of the tab, is (n-1) times HMI.
ESC $ (n2) (n1)	27 36 (n2) (n1)	1B 24 (n2) (n1)	**Specifies the next absolute print position in 1/360" units with (n2) (n1).** (n2) is the high order digit and (n1) is the low order digit. (n2) is between 0 and 19, (n1) is between 0 and 127. Specify (n2) prior to (n1). Also (n2) times 256 +(n1) must not exceed 4895.

5.6 VERTICAL MOVEMENT COMMANDS

Paper motion is controlled and positioned by the following commands.

Code	Decimal	Hex	Function
FF	**12**	**0C**	**Form Feed,** advances form one page length (to next top of form).
LF	**10**	**0A**	**Line Feed,** moves the form upward one VMI (Vertical Motion Index). LF is performed with each CR if DIP switch SWC-2 is ON.
ESC LF	**27 10**	**1B 0A**	**Negative Line Feed,** moves the form downward one VMI . LF is performed with each CR if DIP switch SWC-2 is ON.
ESC U	**27 85**	**1B 55**	**Half Line Feed,** moves the form upward 1/2 VMI (ignored in graphics mode). If VMI is odd the form moves less than 1/2 VMI.
ESC D	**27 68**	**1B 44**	**Negative Half Line Feed,** moves the form downward 1/2 VMI (ignored in graphics mode). If VMI is odd the form moves less than 1/2 VMI.
ESC J (n)	**27 74 (n)**	**1B 4A (n)**	**Line Feed** of (n)/180". (n) is between 0 and 255. Minimum VMI is 0 increments (0") and maximum VMI is 255/180 increments (1.41").
ESC j (n)	**27 106 (n)**	**1B 6A (n)**	**Negative Line Feed** of (n)/180". (n) is between 0 and 255. Minimum VMI is 0 increments (0") and maximum VMI is 255/180 increments (1.41").

5.6 Vertical Movement Commands (Continued)

Code	Decimal	Hex	Function
ESC RS (n)	27 30 (n)	1B 1E (n)	**Set VMI to (n-1)/48".** (n) is between 1 and 126. Minimum VMI is 0" and maximum VMI is 125 (126-1/48 = 2.60"). Note that (n) = (48/LPI) + 1

For Example:

LPI	(n)
3	17
6	9
8	7

Code	Decimal	Hex	Function
ESC a (n)	27 97 (n)	1B 61 (n)	**Set VMI to (n)/180".** (n) is between 1 and 255. Minimum VMI is 0" and maximum VMI is 255 (255/180 = 1.41"). Note that (n) = 180/LPI

For Example:

LPI	(n)
3	60
6	30

5.7 VERTICAL TABBING COMMANDS

Vertical tab stops (paper motion) are controlled with the following commands:

Code	Decimal	Hex	Function
VT	11	0B	**Vertical Tab** Moves the paper to the next vertical tab stop.
ESC -	27 45	1B 2D	**Set Vertical Tab Stop,** by moving the paper to the desired line by a series of LF commands and then entering an ESC - command.
ESC 2	27 50	1B 32	**Clear** all vertical and horizontal tab stops.
ESC VT (n)	27 11 (n)	1B 0B (n)	**Execute absolute vertical tab.** The form is moved to the line designated by (n) (one of up to 255 lines on the page). A Tab that exceeds the page length is ignored.

5.8 PAGE FORMATTING COMMANDS

These commands set the left, right, top and bottom margins. Appendix F provides a definition of page formatting terms.

Code	Decimal	Hex	Function
ESC 9	**27 57**	**1B 39**	**Set Left Margin**
ESC 0	**27 48**	**1B 30**	**Set Right Margin**

Left and right margins are set by spacing or back spacing the print head to the desired position and then sending a set margin command.

When the left margin is set to a print position other than 1, the carriage can be moved beyond the margin setting with either an absolute horizontal tab or a back space command. Margins remain at the selected address when HMI is changed.

ESC T	**27 84**	**1B 54**	**Set Top Margin**
ESC L	**27 76**	**1B 4C**	**Set Bottom Margin**

After initialization or an ESC C command, the printer assumes paper is aligned at line 1 and page length as calculated (from the Form Length and Line Space switches). This establishes Top of Form and Top Margin at line 1; and Bottom Margin is set at the end of the page.

Top Margin is changed by advancing the paper to the desired location (by sending Line Feed commands) and then sending an ESC T.

Bottom Margin (always set lower on the form than the top margin) is changed by advancing the paper from the top margin to the desired bottom margin position (by sending Line Feed commands) and then sending an ESC L.

Code	Decimal	Hex	Function
ESC FF (n)	27 12 (n)	1B 0C (n)	**Set Page Length**

Page Length (Number of Lines per Page) is changed with this command. Page length (calculated from the Form Length and line spacing switches) is changed to the number of lines per page value set by (n), where (n) is between 1 and 126. This command sets top and bottom margins to Top of Form and Bottom of Page positions.

5.9 SELECT INTERNATIONAL CHARACTER SET

The Language selected by DIP Switch B (SWB-4, SWB-5, and SWB-6) is changed with this command (selected international characters are shown at the end of Appendix A).

Code	Decimal	Hex	Function
ESC " (n)	27 34 (n)	1B 22 (n)	**Select Language** (international character set), **designated by (n);** where (n) is 0 to 7 as shown in Table 5-5.

Table 5-5 Language Selection

Value of (n)	Language Selected
0	United States
1	United Kingdom
2	German
3	French
4	Italian
5	Spanish
6	Swedish
7	Danish

5.10 SELECT PRIMARY OR SUPPLEMENTARY CHARACTER SET

DIP Switch A SWA-6 sets 7-bit or 8-bit ASCII character code. In the supplementary character set only 8-bit ASCII characters are used.

Code	Decimal	Hex	Function
SO	**14**	**0E**	**Select the Supplementary character set**
SI	**15**	**0F**	**Select Primary character set**

SO code selects the supplementary character set represented by 128 to 255 (80 to FF hex). SI code selects the primary character set represented by 0 to 127 (00 to 7F hex). Printable ASCII symbols are shown in Appendix E.

5.11 BIT IMAGE GRAPHICS

Bit images are structured by 1-pin and 4-pin dots arranged in rows and columns.

Eight dots arranged in a column is a pattern byte. The smallest unit of the bit image (one column) is called a pattern element. There are 8-dot and 24-dot pattern elements.

The precision of an image can be determined by the size of a dot and how many pins are used to print a dot.

There are five Bit Image print commands and one Bit Image line feed command. The amount of line feed is determined by the last Bit Image print command before the line feed command.

Bit Image print and line feed commands are described in the following paragraphs.

Bit image printing is valid only when DIP switch A SWA-6 is set OFF (8 bit mode).

5-11 Bit Image Graphics (Continued)

See Figure 5-1, the five Bit Image print commands are:
ESC * 0 (n1)(n2) ESC * 1 (n1)(n2) ESC * 2 (n1)(n2)
ESC * 4 (n1)n2) ESC H (n1)(n2)
The Bit Image line feed command is: **ESC v**

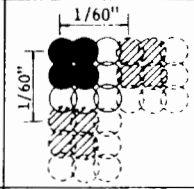
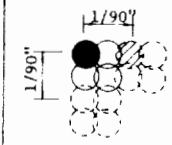
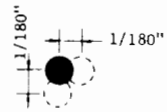
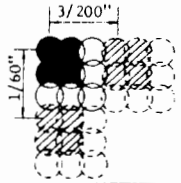
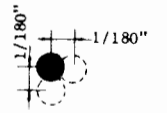
Image Command	Dot Density (V X H)	# of Image Data Bits	# of dots per print pattern	Line Spacing by ESC v
ESC*0(n1)(n2)	1/60 X 1/60	8		24/180"
ESC*2(n1)(n2)	1/90 X 1/90	8		16/180"
ESC*1(n1)(n2)	1/180 X 1/180	8		8/180"
ESC*4(n1)n2)	1/60 X 3/200	8		24/180"
ESCH(n1)(n2)	1/180 X 1/180	24		--

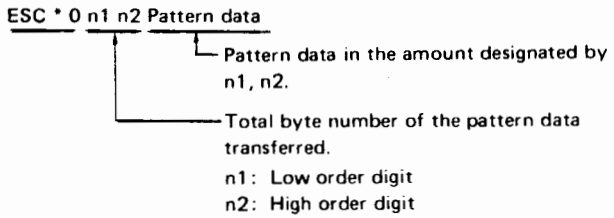
Figure 5-1 Bit Image Configuration Print Pattern

Code	Decimal	Hex
ESC * 0 (n1) (n2)	27 42 48 (n1) (n2)	1B 2A 30 (n1) (n2)

Bit Image printing at a density of 1/60" X 1/60", see Figure 5-2. The pattern data which can be sent for one line is 1 byte X 816 positions (13.6" X 60 dots per inch). If more than 816 bytes of pattern data are sent for one line the excess is ignored.

All 24 pins, in the print head, are used. With this command a line feed is 24/180 inch.

Command Composition



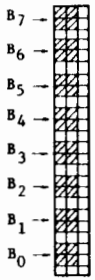


image data to be sent by this command for printing symbol "+ "

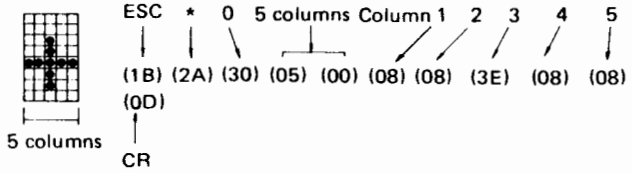


Figure 5-2 1/60 Bit Image Command Composition and Image Data to Print "+" Symbol

5.11 Bit Image Graphics (Continued)

Code	Decimal	Hex
ESC * 1 (n1) (n2)	27 42 49 (n1) (n2)	1B 2A 31 (n1) (n2)

Bit image printing at a density of 1/180" X 1/180", see Figure 5-3. The pattern data which can be sent for one line is 1 byte X 2448 positions (13.6" X 180 dots per inch). If more than 2,448 bytes of pattern data are sent for one line the excess is ignored.
Pins 1 to 8 of the 24 pins of the print head are used. With this command the line feed is 8/180 inch.

Command Composition

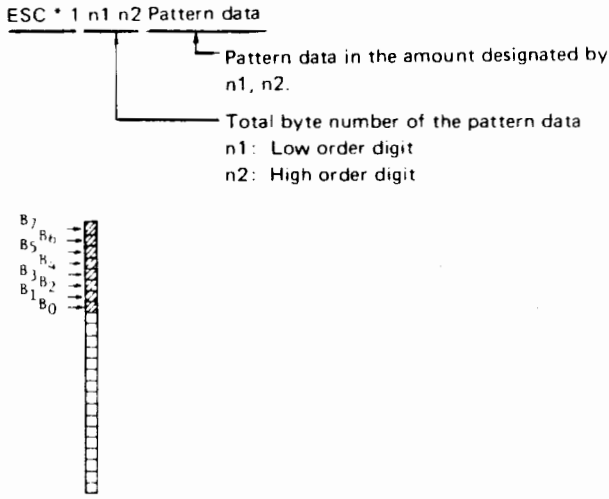


Figure 5-3 1/180" Bit Image Command Composition

Code	Decimal	Hex
ESC * 2 (n1) (n2)	27 42 50 (n1) (n2)	1B 2A 32 (n1) (n2)

Bit image printing at a density of 1/90" X 1/90", see Figure 5-4. The pattern data which can be sent for one line is 1 byte X 1224 positions (13.6" X 90 dots per inch). If more than 1,224 bytes are sent for one line the excess is ignored.
Pins 1 to 16 of the 24 pins of the print head are used. With this command the line feed is 16/180 inch.

Command Composition

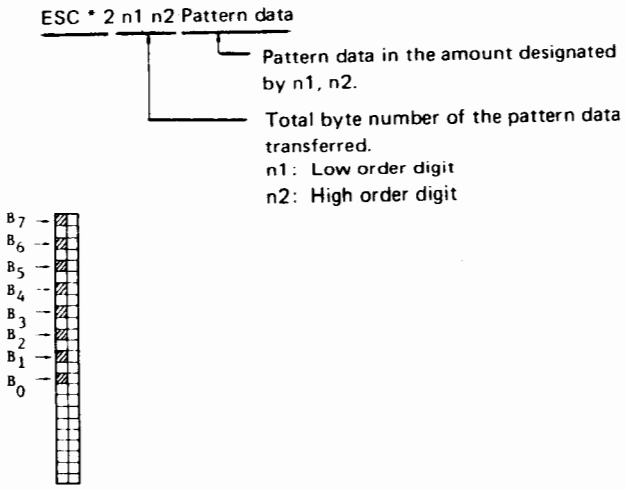


Figure 5-4 1/90" Bit Image Command Composition

Code	Decimal	Hex
ESC * 4 (n1) (n2)	27 42 52 (n1) (n2)	1B 2A 34 (n1) (n2)

Bit image printing at a density of 3/200" X 1/60", see Figure 5-5. This command generates a 9.6 " X 6.67" hard copy of the CRT image (640 X 400 horizontal X vertical dots). The pattern data which can be sent for one line is 1 byte X 906 positions (13.6" X 200/3 dots per inch). If more than 906 bytes of pattern data are sent for one line the excess is ignored.
All 24 pins of the print head are used. With this command the line feed is 24/180 inch.

Command Composition

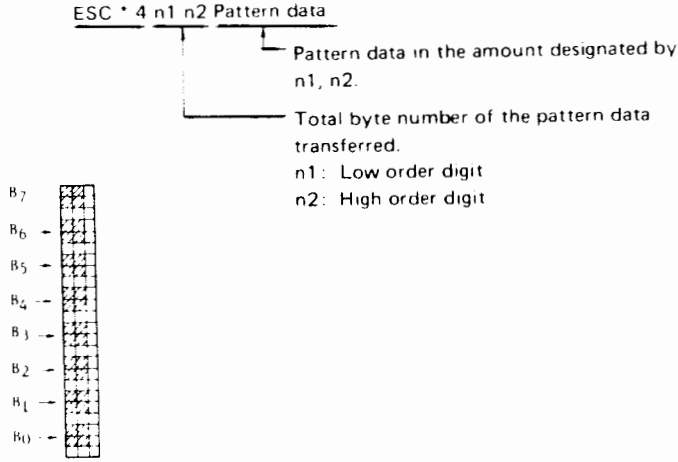


Figure 5-5 3/200" Bit Image Command Composition

Code	Decimal	Hex
ESC H (n1) (n2)	27 72 (n1) (n2)	1B 48 (n1) (n2)

24-Bit image printing, with 3 bytes in the vertical direction, at a density of 1/180" X 1/180", see Figure 5-6. The pattern data which can be sent on one line is 3 bytes X 2448 positions = 7344 bytes (13.6 X 180). If more than 7,344 bytes of pattern data are sent, the excess is ignored.
All 24 pins of the print head are used. With this command the line feed is 24/180 inch.

Command Composition

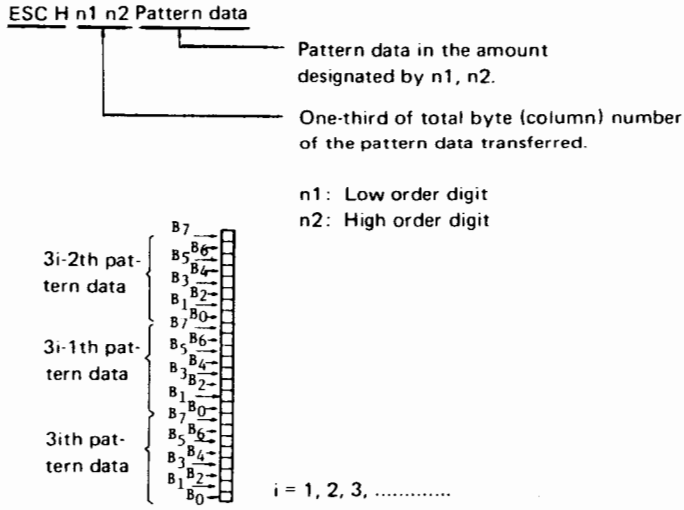
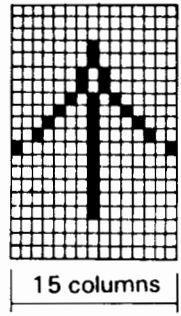


Figure 5-6 ESC H Bit Image Command Composition

5.11 Bit Image Graphics (Continued)

Refer to Figure 5-7. The 24 dots in each column are specified by three bytes (8 bits X 3); the upper 8 dots are specified by the 1st byte, the middle 8 by the 2nd byte and the lower 8 by the 3rd byte.



Hexadecimal image string:

(00)	(10)	(00)	(00)	(00)	(00)	(00)	(20)	(00)	(00)
(40)	(00)	(00)	(80)	(00)	(01)	(00)	(00)	(06)	(00)
(00)	(19)	(FF)	(80)	(06)	(00)	(00)	(01)	(00)	(00)
(00)	(80)	(00)	(00)	(40)	(00)	(00)	(20)	(00)	(00)
(00)	(00)	(00)	(10)	(00)					

When you chose 60 dots per inch mode, the data string is as follows:

(1B)	(48)	(OF)	(00)	(00)	(10)	(00)	(00)	(00)	(00)
(00)	(20)	(00)	(00)	(40)	(00)	(00)	(80)	(00)	(01)
(00)	(00)	(06)	(00)	(00)	(19)	(FF)	(80)	(06)	(00)
(00)	(01)	(00)	(00)	(00)	(80)	(00)	(00)	(40)	(00)
(00)	(20)	(00)	(00)	(00)	(00)	(00)	(10)	(00)	

Figure 5-7 Character Image Example and Image Data String

5.11 Bit Image Graphics (Continued)

Code	Decimal	Hex	Function
ESC v	**27 118**	**1B 76**	**Bit Image Line Feed**

This Line feed command advances the paper and bit image printing is continued. The length of the line feed (paper advance) is determined by the last bit image print command received before this bit image line feed command. If the bit image command is not included on that print line, the line feed amount is set by the VMI. The amount of line feed when using this command is shown below.

Image Command on Print Line	Line Feed Amount by ESC v Command
ESC * 0 (n1) (n2)	24/180 inch
ESC * 1 (n1) (n2)	8/180 inch
ESC * 2 (n1) (n2)	16/180 inch
ESC * 4 (n1) (n2)	24/180 inch
ESC H (n1) (n2)	24/180 inch

5.12 FONT CONTROL AND DOWN LOADING

Various type fonts (stored on the control board in the printer) and optional front cartridges are supported by the DotMax 24D.

Code	Decimal	Hex	Function
ESC # (n)	**27 35 n**	**1B 23 n**	**Font Selection**

The default type font, set by TYPE STYLE DIP Switches SWD-5 through SWD-8 on the Control Panel, is selected when the printer is initialized or reset. When a Font Select command is sent to the printer, the type font specified by the command is used until another Font Select command is sent or until the printer is reset.

5.12 Font Control and Down Loading (Continued)

As shown below, there are two locations of font storage: resident ROM and the font cartridge slot.

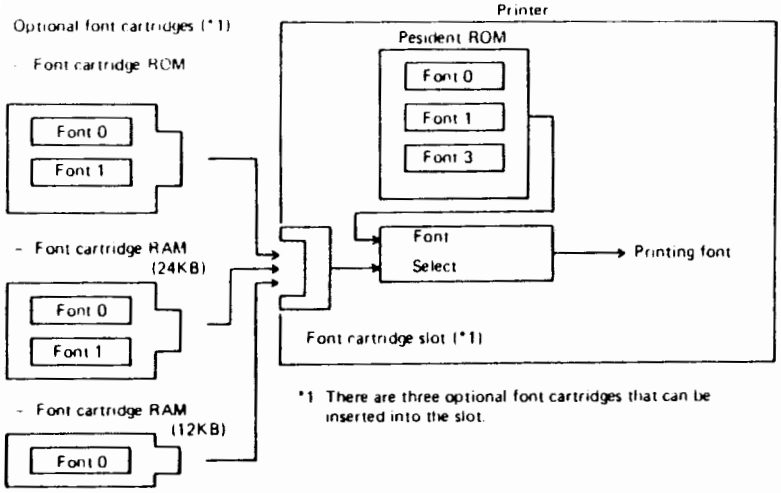


Figure 5-8 Font Select Outline

In the Font Selection command, (n) is equal to the sum of (n1) (n2) and (n3).

(n1) indicates the font selected by this command (see Font Select Table).

(n2) indicates the density of the printed characters (see Density Code Table).

(n3) indicates the ROM or RAM in which the font is located (see ROM/RAM Select Table).

Font Select (n1)

Font	Hex	Decimal
Font 0	0	0
Font 1	1	1
Font 2	2	2
Font 3	3	3
Font 4	4	4
Font 5	5	5
Font 6	6	6
Font 7	7	7

Density Code (n2)

Density	Hex	Decimal
Letter Quality (350 dots/inch)	10	16
Correspondence (180 dots/inch)	20	32
Draft Quality (120 dots/inch)	30	48

ROM/RAM Select (n3)

Rom/Ram Location	Hex	Decimal
Resident ROM	00	0
Font Cartridge ROM	40	64
Font cartridge RAM	C0	192

For the resident ROM font, the standard value of density (n) is as listed in the following table.

Density Code (n) for Resident ROM Font

Resident ROM Font	(n)	
	Hex	Decimal
Courier 10	10	16
Prestige Elite	11	17
Bold Face	12	18
Correspondence	23	35
Draft	34	52
Compression	15	21

As shown below, if a letter quality character is printed in correspondence quality the character size will double, and if draft quality is specified, the character size will triple.

AAAAAAAAAAAAAAAAAAAAAAAAAAAAA

The print line will accommodate 136 characters at 10 characters per inch. However, if a double or triple size character is printed in the 1st or 136th column (when other than proportional pitch is specified) the print line area will be exceeded and printing cannot be executed.

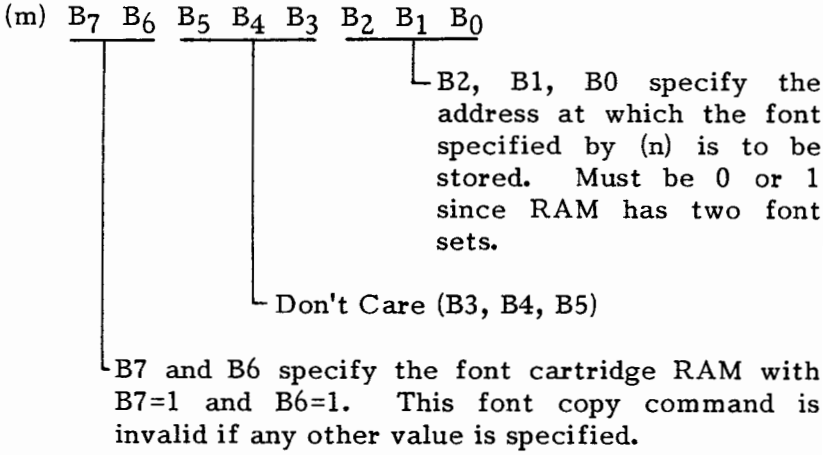
To avoid printing difficulty, line space must be specified or incomplete characters may be printed at the left and right ends of the print line. Both horizontal space (HMI) and character size must be specified.

Code	Decimal	Hex
ESC : NUL (m) (n)	**27 58 0 (m) (n)**	**1B 3A 00 (m) (n)**

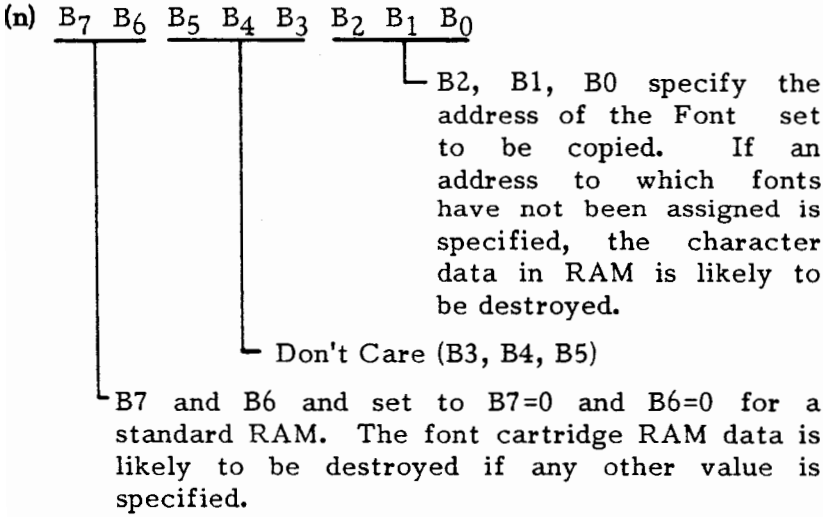
Copies the standard font set to the font set of the optional Font Cartridge RAM. This command is valid only when the optional Font Cartridge RAM is installed and 8-bit ASCII mode is selected.

(m) indicates the font set at the storage destination.
(n) indicates the font set to be copied.

Bit designation of (m) is shown below:



Bit designation of (n) is shown below:



Font Copy Destination RAM Selection (m)

Destination RAM Font	Hex
Store in Font 0 in the Cartridge	D0
Store in Font 1 in the Cartridge	D1

Font Copy Source ROM Selection (n)

Source ROM Font	Hex
Copy Standard ROM Font 0	10
Copy Standard ROM Font 1	11
Copy Standard ROM Font 2	12
Copy Standard ROM Font 3	13
Copy Standard ROM Font 4	14
Copy Standard ROM Font 5	15
Copy Standard ROM Font 6	16
Copy Standard ROM Font 7	17

Code

ESC 1 (m) (Cs) (Ce)
27 108 (m) (Cs) (Ce) - Decimal
1B 6C (m) (Cs) (Ce) - Hex
This Down Load command replaces part of the currently used font with a custom character font loaded into the optional font cartridge RAM. 1 is lower case L.

(m) specifies the dot density and the font location to be used. To determine the (m) value, obtain two values for density and font location from the tables below. Then, add the two values. The sum is (m).

Dot Density (Down Load) (m)

Density	Hex	Decimal
Letter Quality (360 dots/inch)	D0	208
Correspondence (180 dots/inch)	E0	224
Draft Quality (120 dots/inch)	F0	240

Font select (Down Load) (m)

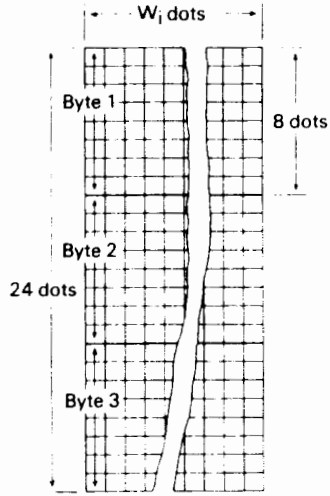
Font	Hex	Decimal
Font 0	00	0
Font 1	01	1

The characters to replace must be continuous in the ASCII code table. The first character of the sequence is specified by (Cs). The last character of the sequence is specified by (Ce). CS must be less than or equal to Ce.

5.12 Font Control and Down Loading (Continued)

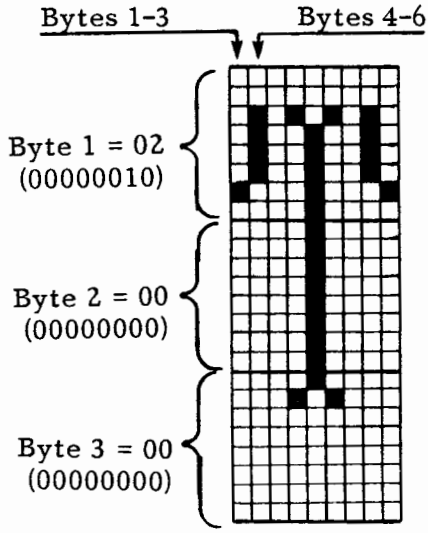
Functional codes (ASCII codes 0 to 31 in decimal) can be replaced with down load characters. Replaced functional codes will not function.

The image of a character to be down loaded is expressed as a matrix with 24 dots in a column and Wi dots in a row. (See the figure below). Wi = 36 for Letter Quality mode, WI = 18 for Correspondence mode, and WI = 9 for Draft mode. Wi must be less than 64.



Dot matrix for character

To design a character in the draft mode, layout a 24 x 9 dot matrix (see figure below). Darken those dots in the matrix which construct the character image. Then encode each eight bits (each byte) in the sequence. For example, (02) Hex, (00) Hex, and (00) Hex are the first three bytes of the letter T shown in the following figure.



Download image of "T"

Data is sent to the printer byte by byte. Because each column of the image consists of 24 dots or 24 bits of data, 3 bytes are needed to send data for each column of the image. Consequently, sending the image of a character with width Wi requires 3 times Wi bytes.

Column 1	Column 2		Column Wi
1	4		3Wi-2
2	5		3Wi-1
3	6		3Wi

Byte numbers for download image data

The characters image is sent in ascending byte number, because width, Wi, must precede the image data of each character.

Wi, byte 1, byte 2,..., byte 3 Wi

When a set of characters in a font is to be down loaded, the required data format is as follows:

Wi, byte 1, byte 2,..., byte 3 Wi (for the first character)
Wi, byte 1, byte 2,..., byte 3 Wi (for the first character)

.

.

.

Wi byte 1, byte 2,..., byte 3 Wi (For the (Ce) character)

Adjacent dots (for a horizontal line must not be two marks. To design a horizontal line, mark every other dot, and a continuous line will be printed because a dot actually overlaps adjacent dots.

Notes:

1. Down load command is ignored when RAM cartridge (option) is not installed.

2. This command down loads the characters. To print out the characters, use the Font Select command to specify the font you down loaded and send the corresponding character codes.

3. When the printer is turned on, or when it is reset with RAM cartridge installed, the Resident ROM Font 0 is copied to Font 0 in the font cartridge RAM, and Resident ROM Font 1 to Font 1 in the cartridge RAM.

4. The data of down load characters in one of the two sets (0 and 1) is cleared even when the characters are copied to the other font set with the font copy command.

Program example:

```
10 LPRINT "  ESC l+m+Cs+Ce+Data "
20 LPRINT "(Define DownLoad Character)"
30 LPRINT
40 LPRINT CHR$(27);"l";CHR$(240);
50 LPRINT CHR$(33);CHR$(33);
60 LPRINT CHR$(9);
70 LPRINT  CHR$(2);  CHR$(0);  CHR$(0);
80 LPRINT CHR$(60);  CHR$(0);  CHR$(0);
90 LPRINT  CHR$(0);  CHR$(0);  CHR$(0);
100 LPRINT CHR$(32);  CHR$(0); CHR$(64);
110 LPRINT CHR$(31);CHR$(255);CHR$(128);
120 LPRINT CHR$(32);  CHR$(0); CHR$(64);
130 LPRINT  CHR$(0);  CHR$(0);  CHR$(0);
140 LPRINT CHR$(60);  CHR$(0);  CHR$(0);
150 LPRINT  CHR$(2);  CHR$(0);  CHR$(0);
160 LPRINT CHR$(27);"#";CHR$(52);
170 LPRINT "! ! ! ! ! ! ! ! ! ! "
180 LPRINT CHR$(27);"#";CHR$(240);
190 LPRINT "! ! ! ! ! ! ! ! ! ! "
200 END
```

Print example

```
  ESC l+m+Cs+Ce+Data
(Define DownLoad Character)

! ! ! ! ! ! ! ! ! !
```

5.13 CUT SHEET FEEDER CONTROL FUNCTIONS

See Appendix B, the cut sheet feeders are controlled by ESC commands and embedded text commands from the host system. The embedded text commands must start and finish with a CR or LF. The carriage return (CR) or line feed (LF) will be executed, but the embedded text command //X// (where X represents 1, 2, R or C) will not be printed.

ESC commands set the feeder immediately and the embedded text commands select bins only.

A form feed or line feed command over a page boundary causes the paper at the platen to be ejected and another sheet of paper to feed from the last selected bin. The paper feed operation, as seen by the user, is similar to using a continuous form. Page size definition is the same with or without a feeder. ESC FF (n) defines lines per page.

Code	Decimal	Hex	Function
ESC EM 1	**27 25 49**	**1B 19 31**	**Feed from bin 1**
ESC I	**27 73**	**1B 49**	**Feed from bin 1**

Either command ejects any paper in the platen and feeds a new sheet of paper from bin 1 to top of form.

Note: This command is ignored when a SF220, RS916, RS966, RS1966, ASF521*, ASF522*, ASF523* or ASF580* Cut Sheet Feeder is not installed.

ESC EM 2	**27 25 50**	**1B 19 32**	**Feed from bin 2**
ESC K	**27 75**	**1B 4B**	**Feed from bin 2**

Either command ejects any paper in the platen and feeds a new sheet of paper from bin 2 to top of form.

Note: This command is effective only when a RS966, RS1966, ASF522*, ASF523* or ASF580* Cut Sheet Feeder is installed.

* indicates a manufacturer's change for Fujitsu printers

Code	Decimal	Hex	Function
ESC EM E	**27 25 69**	**1B 19 45**	**Feed from bin 3**

This command ejects any paper in the platen and feeds a new sheet of paper from bin 3 (envelope bin) to top of form.

Note: This command is only effective when an ASF523* or ASF580* Cut Sheet Feeder is installed.

Code	Decimal	Hex	Function
//1//	**47 47 49 47 47**	**2F 2F 31 2F 2F**	**Feed from bin 1**

This embedded text command feeds a new sheet of paper from bin 1 to the top margin (or print line 1 in the Graphics mode).

Note: This command is effective when a SF220, RS966, RS1966, ASF521*, ASF522*, ASF523* or ASF580* Cut Sheet Feeder is installed.

//2// 47 47 50 47 47 2F 2F 32 2F 2F Feed from bin 2

This embedded text command feeds a new sheet of paper from bin 2 to the top margin (or print line 1 in the Graphics mode).

Note: This command is effective when a RS966, RS1966, ASF522*, ASF523* or ASF580* Cut Sheet Feeder is installed.

//E// 47 47 69 47 47 2F 2F 45 2F 2F Select bin 3

This embedded text command feeds a new sheet of paper (or envelope) from bin 3 to the top margin (or to print line 1 in the Graphics mode).

Note: This command is effective when an ASF523* or ASF580* Cut Sheet Feeder is installed.

* indicates a manufacturer's change for Fujitsu printers

Code	Decimal	Hex	Function
ESC EM R	27 25 82	1B 19 52	Eject Paper

This command ejects the paper in the platen to the output stacker without feeding a new sheet of paper.

Note: This command is effective with approved Cut Sheet Feeders installed (except for a RS916).

Code	Decimal	Hex	Function
//R//	47 47 82 47 47	2F 2F 52 2F 2F	Select Eject

This embedded text command will eject the paper to the output stacker without feeding a new sheet of paper.

Note: This command is effective with approved Cut Sheet Feeders installed (except for a RS916 or RS1966).

//C//	47 47 67 47 47	2F 2F 43 2F 2F	Select Bins

This embedded text command will select bin 1 for the first paper feed, then select bin 2 thereafter, until a new bin select command is issued.

Note: This command is effective when a RS966, RS1966, ASF522* or ASF523* Cut Sheet Feeder is installed.

* indicates a manufacturer's change for Fujitsu printers

5.14 MISCELLANEOUS COMMANDS

These commands do not logically fit into the other classifications and are not complex enough to justify separate categories.

Code	Decimal	Hex	Function
DC1	17	11	**Select Printer**
DC3	19	13	**Deselect Printer**

The relationship between the ON-LINE switch, DC1/DC3 codes, and interface signals is shown in Figure 5-9.

ON-LINE switch	DC1/DC3	$\overline{\text{FAULT}}$	BUSY	$\overline{\text{ACKNLG}}$	Input data processing
Offline	DC1/DC3	LOW	HIGH	No pulses are output	Data entry is disabled
Online	DC1	HIGH	H/L	Pulses are output	Data entry is enabled Normal processing
	DC3	HIGH	H/L	Pulses are output	Data entry is enabled, but input data is discarded until the DC1 code is received

Figure 5-9 Select Printer Relationship

Code	Decimal	Hex	Function
BEL	7	07	**Sound the alarm** for about 0.25 seconds.
ESC Y	27 89	1B 59	**Print** "¢" (cent) symbol.
ESC Z	27 90	1B 5A	**Print** "¬" (Logical not) symbol.
ESC ?	27 63	1B 3F	**Set Auto Carriage Return**
ESC !	27 33	1B 21	**Reset Auto Carriage Return**
ESC =	27 61	1B 3D	**Automatic Centering** of print line.
ESC M	27 77	1B 4D	**Automatic Justify** of spaces between words on print line.

5.15 24D COMMANDS NOT USED BY THE 630

The commands listed in Table 5-6 are not used by a Diablo Model 630 Printer. These commands are implemented into application software with a software routine.

Contact your programmer or authorized Fujitsu representative for additional information.

Table 5-6 DotMax 24D Commands Unused in a Model 630

Print Mode Control	**(See Paragraph 5.3)**
ESC w (SOH)	Enlarged Print mode ON (cleared by ESC w NUL)
Horizontal Motion	**(See Paragraph 5.4)**
ESC b (n)	Set HMI to (n)/180 inch
Horizontal Tab	**(See Paragraph 5.5)**
ESC $ (n2) (n1)	Set absolute print position
Vertical Motion	**(See Paragraph 5.6)**
ESC J (n)	Execute forward single line feed of (n)/180 inch
ESC j (n)	Execute backward single line feed of (n)/180 inch
ESC a (n)	Set VMI to (n)/180 inches
Sheet Feeder Commands	**(See Paragraph 5.13)**
ESC I	Feed from bin 1
ESC K	Feed from bin 2

Table 5-6 DotMax 24D Commands (Continued)
Unused in a Model 630

Bit Image Graphics	(See Paragraph 5.11)
ESC * (m) (n1) (n2)	8-wire bit image mode
ESC H (n1) (n2)	24-wire bit image mode
ESC # (n)	Font select
ESC : (NUL) (m) (n)	Font copy
ESC 1 (m) (Cs) (Ce) (Wi)	Down load font

5.16 630 COMMANDS IGNORED BY THE DotMax 24D

The Model 630 commands listed in Table 5-7 are not used by the DotMax 24D. If one of these commands are sent to the DotMax 24D by the application software it will be ignored.

Contact your programmer or authorized Fujitsu representative for additional information.

Table 5-7 Model 630 Commands
Ignored by the DotMax 24D

Miscellaneous Commands	
ESC SO DC2	Enter print wheel Table Download mode (Exit by DC4)
ESC SYN(n)	Remote print wheel selection
ESC GS A	Disable NAK error code response from printer

Table 5-7 Model 630 Commands (Continued)
Ignored by the DotMax 24D

Miscellaneous Commands (Continued)	
ESC GS B	Re-enable NAK error code response from printer
HyPlot Commands	
ESC G	HyPlot Absolute Move (clear by CR)
ESC G BEL	HyPlot Absolute Mode (clear by CR)
ESC V	HyPlot Relative Mode (clear by CR)
ESC V BEL	HyPlot Relative Plot (clear by CR)
ESC . 'symbol'	Change plot character to 'symbol'
ESC , hv	Set plot precision
ESC 4	Exit HyPlot mode
Word Processing	
ESC %	Extend carriage settling time
ESC N	Restore normal settling time
ESC SO M	Program mode ON
ESC <	Enable Reverse Printing mode
ESC >	Disable Reverse Printing mode

SECTION 6

DotMax 24I and 24C Command Set

This section explains the Dotmax 24I and 24C commands. Refer to Section 5 if you have a DotMax 24D printer.

Most users will operate with application software and will not use the information in this section.

When installing an application software package, specify your DotMax 24I or 24C as equivalent to an IBM Graphic printer when DIP Switch B, (SWB-7) is Off, and specify it as an Epson JX-80 when DIP Switch Switch B, (SWB-7) is On.

The remainder of this section is written for programmers writing their own software routines.

The difference between the DotMax 24I and 24C is the color capability in the 24C only. All commands (except the 24C color commands) in this section apply to both models. All DotMax 24I and 24C commands are listed in a Table at the back of this manual.

6.1 OVERVIEW

This section describes the DotMax 24I and 24C command set. These commands, in the form of Control Codes or Escape Code sequences, cause the printer to:

Exchange, store and print data,
Establish and reset different print modes (enlarged, shadow, bold, underscore, etc)
Format the printer's output
Control other functions performed by the printer

When a command specifies a change to a DIP (or Form Length) switch setting, the switch setting is over-ridden.

6.1 Overview (Continued

The host computer sends commands (and data) to the printer via the interface, under software control. For example a LPRINT statement (in BASIC) allows entry of a command. With the following BASIC routine the printer will print one line in normal print mode, then print in double-width print mode until instructed to resume normal print mode.

Turn on your system, load BASIC and enter:

```
10 LPRINT "Print in switch selected print mode"
20 LPRINT CHR$(27);"W";CHR$(1);
30 LPRINT "Printed in Double-Width print mode"
40 LPRINT "Also in Double-Width print mode"
50 LPRINT CHR$(27);"W";CHR$(0);
60 LPRINT "Printed in switch selected mode"
```

Line 10 tells the printer to print in normal print mode.
Line 20 tells it to print in double-width mode until cancelled.
Lines 30 and 40 are printed in double-width mode.
Line 50 cancels double-width mode.
Line 60 is printed in normal print mode.

This example used the LPRINT statement, but some versions of BASIC use a PRINT #1 statement.

The LPRINT statement can use the following formats to send information to the printer:

LPRINT "W"	Character as it is
LPRINT CHR$(87)	Decimal character
LPRINT CHR$(&H57)	Hexadecimal, two digits

Refer to your computer's technical or software manual for additional information

6.2 RESET AND SENSE COMMANDS

These commands allow remote reset of error conditions and set printer parameters to a predetermined state.

Code	Decimal	Hex	Function
ESC SUB I	**27 26 73**	**1B 1A 49**	**Initialize Printer**

"I" is an uppercase "i". The printer is set to the operating parameters established when power was turned ON. The printer executes this command immediately without queueing it in the data buffer.

ESC @	**27 64**	**1B 40**	**Remote Reset**
ESC CR P	**27 13 80**	**1B 0D 50**	**Remote Reset**

Restores the printer to its initial state after an error occurs, if the cause of the error has been corrected. May be sent to the printer with other data. Either command is queued and executed when it is read from the print buffer.

6.3 PRINT MODE COMMANDS

Print mode is changed with the following commands. Default print mode, established by DIP switches, is restored when power is turned on, or when a selected print mode is reset.

Code	Decimal	Hex	Function
SO	**14**	**0E**	**Set Double-width**
ESC SO	**27 14**	**1B 0E**	**Set Double-width**
ESC W (SOH)	**27 87 1**	**1B 57 01**	**Set Double-width**
ESC W (1)	**27 87 49**	**1B 57 31**	**Set Double-width**
ESC W (NUL)	**27 87 0**	**1B 57 00**	**Reset Double-width**
ESC W (0)	**27 87 48**	**1B 57 30**	**Reset Double-width**

When SO or ESC SO sets double-width print mode it stays set until reset with:

DC4; ESC ! (n); ESC W (0); ESC J (n); LF; FF; Negative LF; VT; or ESC VT (n)

When ESC W (SOH) or (1) sets double-width print mode it stays set until reset with:

ESC W (NUL); ESC W (0); or ESC ! (n)

6.3 PRINT MODE COMMANDS (Continued)

Code	Decimal	Hex	Function
ESC SI	27 15	1B 0F	**Set condensed print**
DC2	18	12	**Reset condensed print**

Condensed printing is set with either the SI code or the DC 2 code. Condensed printing is reset with ESC ! (n).

ESC G	27 71	1B 47	**Set double-strike**
ESC H	27 72	1B 48	**Reset double-strike**

Double-strike is effective until reset with ESC H.

ESC E	27 69	1B 45	**Set emphasized printing**
ESC F	27 70	1B 46	**Reset emphasized printing.**

Emphasized printing is effective until reset with ESC F.

ESC - (n)	27 45 01	1B 2D 01	**Set underline mode**
	27 45 49	1B 2D 31	
ESC - (n)	27 45 00	1B 2D 00	**Reset underline mode**
	27 45 48	1B 2D 30	

Underline is effective until reset. (n) is 01 or 49 to set underline. (n) is 00 or 48 to reset underline.

ESC S (NUL)	27 83 0	1B 53 00	**Set superscript**
ESC S (SOH)	27 83 1	1B 53 01	**Set subscript**
ESC T	27 84	1B 54	**Reset superscript/ subscript**

Superscript or subscript are effective until reset with a ESC T.

ESC 4	27 52	1B 34	**Set italics**
ESC 5	27 53	1B 35	**Reset italics**

ESC 4 is not effective for character codes from 176 through 223; 244 and 245.

6.3 PRINT MODE COMMANDS (Continued)

Code	Decimal	Hex	Function
ESC p (SOH)	**27 112 1**	**1B 70 01**	**Set proportional spacing**
ESC p (n)	**27 112 49**	**1B 70 31**	**Set proportional spacing**
ESC p (NUL)	**27 112 00**	**1B 70 00**	**Reset proportional**
ESC p (n)	**27 112 48**	**1B 70 30**	**spacing**

Proportional spacing is effective until reset with an ESC p (NUL) or ESC p (n); where (n) is 1 to set or 0 to reset.

ESC ! (n) **27 33 n 1B 21 n Set/Reset print modes.**
Print modes are set according to the value of (n). Figure 6-1 gives the values of (n) and the corresponding print mode.

Value of (n)	7	6	5	4	3	2	1	0
(n)=1	Don't care	Set Proportional	Set Double-width	Set Double strike	Set Emphasized	Set Condensed	Don't care	Set Elite pitch
(n)=0	Don't care	Reset Proportional	Reset Double width	Reset Double strike	Reset Empha sized	Reset Condensed	Don't care	Set Pica pitch

Figure 6-1 Print Mode Set Bit Assignment

For Example: ESC ! @ sets Proportional Space
ESC ! Space sets Double width print
ESC ! (DLE) sets Double strike
ESC ! Backspace sets emphasize print
ESC ! (EOT) sets Condensed print
ESC ! (SOH) sets Elite character pitch
ESC ! (NUL) resets all modes to default

6.4 HORIZONTAL MOVEMENT COMMANDS

The print head is controlled and positioned by the following commands.

Code	Decimal	Hex	Function
SP	32	20	**Space** moves the print head one print position forward (like the space bar on a typewriter). Double-width spacing is performed in double-width print mode.
BS	8	08	**Backspace** moves the print head backward one print position (like the backspace key on a typewriter). Double-width back spacing is performed in double-width print mode.
ESC U (n)	27 85 1	1B 55 01	**Uni-directional print mode**
ESC U (n)	27 85 0	1B 55 00	**Bi-directional print mode** Bi-directional print mode is set when power is turned on. (n) is (SOH) or 1 to set Uni-directional print mode. (n) is (NUL) or 0 to set Bi-directional print move.
CR	13	0D	**Carriage Return** sends the print head to its margin. If DIP switch C SWC-2 is ON a line feed is performed. If DIP switch C SWC-1 is ON a CR is also performed with each LF command. CR also resets double-width print mode.
ESC M	27 77	1B 4D	**Set elite pitch (12 CPI)**
ESP P	27 80	1B 50	**Set pica pitch (10 CPI)** Pitch is changed with another pitch command. Default pitch is set by DIP Switch D (SWD-3 and 4).

6.4 HORIZONTAL MOVEMENT COMMANDS
(Continued)

Code	Decimal	Hex	Function
ESC US (n)	**27 31 (n)**	**1B 1F (n)**	**Set HMI to (n-1)/120".**

(n) is between 1 and 126. Minimum HMI is 1 (1-1/120 = 0"), and maximum HMI is 126 (126-1/120 = 1.04"). HMI is changed or reset when another spacing command is received. Note (n) = (120/CPI) + 1.

For example:

CPI	(n)
5	24
10	13
12	11

ESC h (n) **27 104 (n) 1B 68 (n) Set HMI to (n)/180".**
(n) is between 0 and 255. Minimum HMI is 0 (0/180 = 0") and maximum HMI is 255 (255/180 = 1.41"). HMI is reset or changed when another spacing command is received. Note (n) = 180/CPI.

For example:

CPI	(n)
4	45
6	30
10	18
12	15

ESC DC1 (n) **27 17 (n) 1B 11 (n) Set Character Offset** (space beween characters) to (n)/120". (n) is between 0 and 64. Offset distance is from 0" to ±64/120" (0.5"). Bits 0 to 5 are the offset value and bit 6 is direction of offset (0 = positive and 1 = negative). Offset is changed with another ESC DC1 (n) command and cleared by CR or ESC X. Used with proportional spacing to set distance between characters.

6.5 HORIZONTAL TABBING COMMANDS

Absolute and relative horizontal tab stops are controlled with the following commands.

Code	Decimal	Hex	Function
HT	9	09	**Horizontal** Tab, moves print head to the next horizontal tab stop.

ESC HT (n) **27 9 (n) 1B 09 (n) Absolute Horizontal Tab** moves print head to the horizontal position specified by (n). (n) is between 1 and 255 (the left most print position is 1). This code enables direct tabbing to any of 255 print columns.

ESC D (n1) . . . (nk)
27 68 (n1) . . . (nk) - Decimal
1B 44 (n1) . . . (nk) - Hex
Set Horizontal Tab at (n1) through (nk). Position 1 is the left margin and up to 160 tab stops can be set with this command.

ESC $ (n1) (n2)
27 36 (n1) (n2) - Decimal
1B 24 (n1) (n2) - Hex
Specifies the next print position in 1/360" units with (n2) (n1). (n2) is the high order digit and (n1) is the low order digit.
(n2) is between 0 and 19. (n1) is between 0 and 127. Specify (n2) prior to (n1). Also (n2) times 256 + (n1) must not exceed 4895.

6.6 VERTICAL MOVEMENT COMMANDS

Paper motion is controlled and positioned by the following commands.

Code	Decimal	Hex	Function
FF	**12**	**0C**	**Form Feed,** advances form one page length (to next top of form).
LF	**10**	**0A**	**Line Feed,** moves the forms one line upward, and resets double-width print mode. LF occurs with each CR if DIP switch SWC-2 is ON. A CR occurs with each LF if DIP Switch SWC-1 is ON.
ESC LF	**27 10**	**1B 0A**	**Negative Line Feed,** moves the form one line downward. LF is performed with each CR if DIP switch SWC-2 is ON. A CR occurs with each LF if DIP Switch SWC-1 is ON.
ESC J (n)	**27 74 (n)**	**1B 4A (n)**	**Single Line Feed of (n)/180".** (n) is between 0 and 255. Minimum motion is 0 (0/180 = 0") and maximum motion is 255 (255/180 = 1.41").
ESC j (n)	**27 106 (n)**	**1B 6A (n)**	**Single Negative Line Feed of (n)/180".** (n) is between 0 and 255. Minimum motion is 0 (0/180 = 0") and maximum motion is 255 (255/180 = 1.41").
ESC 0	**27 48**	**1B 30**	**Set Line Spacing at 1/8".** "0" is zero. After receipt of this command, each LF command results in an 1/8" line feed (8 lines per inch).

6.6 VERTICAL MOVEMENT COMMANDS (Continued)

Code	Decimal	Hex	Function
ESC 3 (n)	27 51 (n)	1B 33 (n)	**Set Line Spacing to (n)/180".** (n) is between 1 and 255. Minimum motion is 0 (0/180 = 0") and maximum motion is 255 (255/180 = 1.41"). After receipt of this command, each LF command results in an (n)/180" line feed. Note (n) = 180/LPI.

For example:

LPI	(n)
3	17
6	9
8	7

ESC 1	27 49	1B 31	**Set line spacing to 7/60".** This command sets line spacing at 7/60 inch.

ESC A (n)	27 65 (n)	1B 41 (n)	**Preset line spacing to n/60 inch (see ESC 2).** This command presets line spacing to n/60 inch. (n) is between 0 and 126. After this command is received, line spacing is preset to n/60. Line feeding continues with the previously set value, (ignoring this preset value) until an ESC 2 command is received. When an ESC 2 command is received, this preset value is set, and subsequent line feeding uses this preset value.

ESC 2	27 50	1B 32	**Set line spacing to preset value, also see ESC A (n) above.** This command sets line spacing at the value preset by the ESC A (n) command. If an ESC A (n) command has not been received, the ESC 2 command sets line spacing to 1/6 inch (default value of 6 lines per inch).

6.7 VERTICAL TABBING COMMANDS

Vertical tab stops (paper motion) are controlled with the following commands:

Code	Decimal	Hex	Function
VT	**11**	**0B**	**Vertical Tab.** Moves the paper to the next vertical tab stop. Performs the same as a LF command when no vertical tab positions are set. Also resets double-width print mode.

ESC B (n1) . . . (nk) NUL
27 66 (n1) . . . (nk) 0 - Decimal
1B 42 (n1) . . . (nk) 00 - Hex
Set Vertical Tabs. Tab locations are set in ascending order until a NUL code (00) is received. Vertical tab locations beyond page length are ignored. (n) is an ASCII character with a binary value between 0 and 254. A (n) value of 1 is the line below the top of the form.

ESC VT (n) **27 11 (n) 1B 0B (n) Execute absolute vertical tab.** The form is moved to the line designated by (n) (one of up to 255 lines on the page). The value of (n) determines the line number to which the form is moved.
The top and designated print lines are designated by the value of (n).
An Absolute Vertical Tab that exceeds the page length is ignored and tabbing cannot be performed beyond the end of the page (even if the number of lines on the page is fewer than 255).

6.8 PAGE FORMATTING COMMANDS

These commands set the left, right, top and bottom margins. Appendix F provides a definition of page formatting terms.

Code	Decimal	Hex	Function
ESC Q (n)	27 81 (n)	1B 51 (n)	**Set right margin**

This command sets the right margin at the print position designated by (n). (n) is between 1 and 255. The maximum print position number is based on character pitch. A print position beyond the length of the print line is ignored. When initially turned on, the printer is set to print up to 136 characters per line.

ESC l (n) **27 108 (n) 1B 6C (n) Set left margin**

l is lower case L. This command sets the left margin at the print position designated by (n). (n) is between 0 and 255. The left most print position is set (as the left margin) when (n) is set to 1.

ESC N (n) **27 78 (n) 1B 4E (n) Set skip perforations**

ESC O **27 79 1B 4F Reset skip perforations.**

The printer skips (n) lines on the current page and advance the paper to the first print line.

The number of skipped lines can be reset by a page length set command - ESC C (n) or ESC C (NUL) (n). If DIP switch SWC-5 is on, the printer skips 1 inch (default). In the reset command, O is an uppercase o.

6.8 PAGE FORMATTING COMMANDS (Continued)

Code	Decimal	Hex	Function
ESC C (n)	27 67 (n)	1B 43 (n)	**Set Page length to (n) lines.** (n) is between 1 and 127. Page length is stored as an absolute length in lines. This absolute length is determined by multiplying the current single-line spacing by (n).
ESC FF (n)	27 12 (n)	1B 0C (n)	**Set Page Length to (n) lines.** (n) is between 1 and 127. This command has the same function as ESC C (n).

ESC C NUL (n)

27 67 0 (n) - Decimal
1B 43 00 (n) - Hex
Set Page length to (n) inches.
(n) is between 1 and 22 (1 and 16 Hex). This command sets the page length in inches.

ESC FF (NUL) (n)

27 12 0 (n) - Decimal
1B 0C 00 (n) - Hex
Set page length to (n) inches.
(n) is between 1 and 22 (1 and 16 Hex). This command has the same function as ESC C NUL (n).

6.9 SELECT INTERNATIONAL CHARACTER SET

The Language selected by DIP Switch B (SWB-4, SWB-5, and SWB-6) is changed with this command. Selected international characters are shown at the end of Appendix A.

6.9 SELECT INTERNATIONAL CHARACTER SET (Continued)

Code	Decimal	Hex	Function
ESC R (n)	27 82 (n)	1B 52 (n)	**Select international character set designated by (n).** (n) is 0 to 7 or 48 to 55, as shown in Table 6-1.

Table 6-1 Language Selection

Value of (n)	Language Selected
0 or 48	United States
1 or 49	French
2 or 50	German
3 or 51	United Kingdom
4 or 52	Denmark
5 or 53	Swedish
6 or 54	Italian
7 or 55	Spanish

6.10 SELECT CHARACTER SET 1 OR 2

The character set selected by DIP Switch D (SWD-5, SWD-6, SWD-7 and SWD-8) is changed with this command. Selectable character sets are shown in Appendix A.

Code	Decimal	Hex	Function
ESC 7	**27 55**	**1B 37**	**Select character set 1**
ESC 6	**27 54**	**1B 36**	**Select character set 2.** ESC 7 selects Character Set 1 and ESC 6 selects Character Set 2. Both character sets are shown in the Code Conversion Tables in Appendix E.

6.11 BIT IMAGE GRAPHICS

Refer to Figure 6-2. Bit images are structured by dots arranged in rows and columns.

Eight dots arranged in a column is a pattern byte. The smallest unit of the bit image (one column) is called a pattern element. There are 8-dot and 24-dot pattern elements.

The precision of an image can be determined by the size of a dot and how many pins are used to print a dot.

Bit image printing is valid only when DIP switch A SWA-6 is set OFF (8 bit mode).

There are five Bit Image print commands and one Bit Image line feed command. The amount of line feed is automatically determined by the last Bit Image print command.

The Bit Image print and line feed commands are described in the following paragraphs.

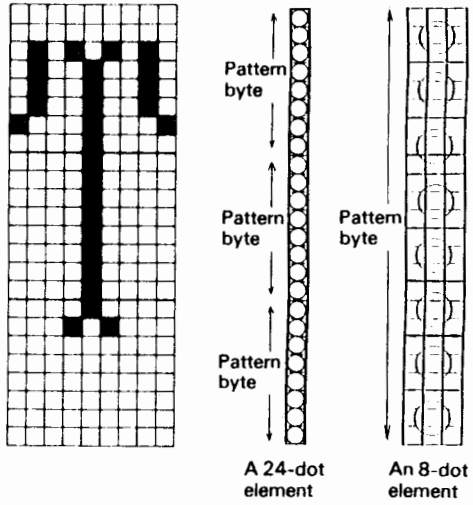


Figure 6-2 24 and 8 Dot Image Modes

6.11 BIT IMAGE GRAPHICS (Continued)

In 8-dot image modes, an image element consists of 8 dots, and a dot is printed with two shaded pins and one unshaded pin, as shown in Figure 6-3. An 8-dot image element is represented by a byte of data.

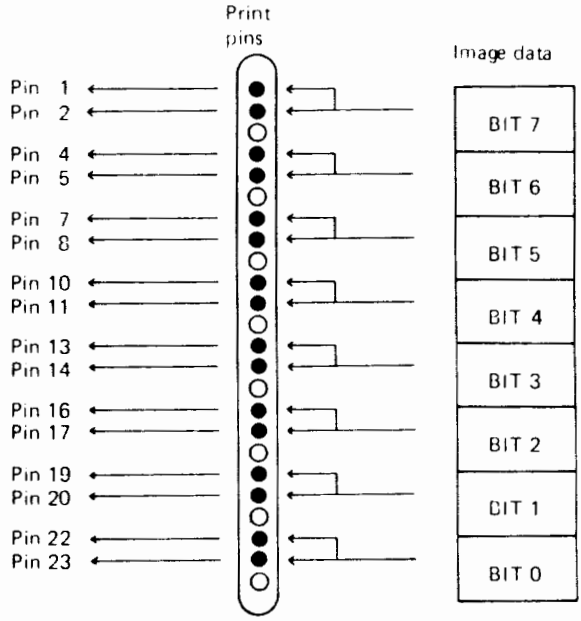


Figure 6-3 8-Dot Image Mode - Pin Design

6.11 BIT IMAGE GRAPHICS (Continued)

In 24-dot image mode, an image element consists of 24 dots, and a dot is printed with a single pin as shown in Figure 6-4. A 24-dot image element is represented by three bytes of data.

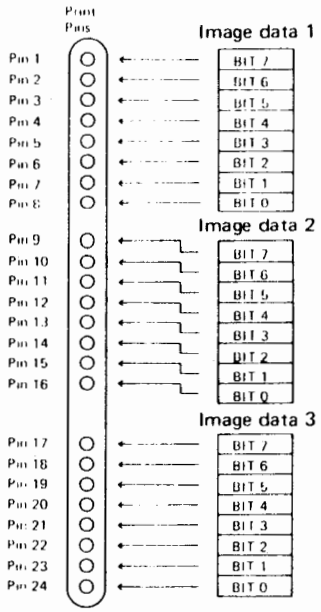


Figure 6-4 24-Dot Image Mode - Pin Assignment

Code	Decimal	Hex
ESC * (m) (n1) (n2) (p1) (p2). . .(pk)	27 42 (m) (n1) (n2) (p1) (p2). . .(pk)	1B 2A (m) (n1) (n2) (p1) (p2). . .(pk)

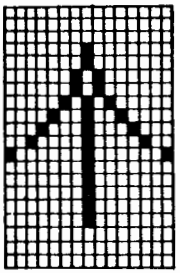
Set Image mode. (m) is between 0 and 40, (n1) is between 1 and 255, (n2) is between 0 and 19. This command causes the printer to print image data, from column 1 to the column designated by multiplying (n2)+(n1) by 256. Print mode is specified by (m), as shown in Table 6-2. This command prints one line, a picture image may require several commands to print the entire image.

Table 6-2 Image Modes

	(m)			Number of elements per line	Horizontal dot density (dots/inch)
	Dec	Hex	Mode		
8-dot image	0	00	Single Density	680	50
	1	01	Double Density	1360	100
	2	02	Double Speed & Double Density	1360	100
	3	03	Quadruple Density Image	2720	200
	4	04	CRT Image	906	200/3
	5	05	Plotter Image	816	60
	6	06	Not named	1224	90
24-dot image	32	20	Not named	816	60
	33	21		1632	120
	38	26		1224	90
	39	27		2448	180
	40	28		4896	360

6.11 BIT IMAGE GRAPHICS (Continued)

Figure 6-5 shows a character image example with a hexadecimal image string at single density image and a data string when 60 dots per inch mode is selected.



Hexadecimal image string:

(00) (10) (00) (00) (00) (00) (00) (20) (00) (00)
(40) (00) (00) (80) (00) (01) (00) (00) (06) (00)
(00) (19) (FF) (80) (06) (00) (00) (01) (00) (00)
(00) (80) (00) (00) (40) (00) (00) (20) (00) (00)
(00) (00) (00) (10) (00)

When you chose 60 dots per inch mode, the data string is as follows:

(1B) (20) (OF) (00) (00) (10) (00) (00) (00) (00)
(00) (20) (00) (00) (40) (00) (00) (80) (00) (01)
(00) (00) (06) (00) (00) (19) (FF) (80) (06) (00)
(00) (01) (00) (00) (00) (80) (00) (00) (40) (00)
(00) (20) (00) (00) (00) (00) (00) (10) (00)

Figure 6-5 Character Image Example and Data String

Code	Decimal	Hex
ESC K (n1) (n2) (p1) (p2). . .(pk)	**27 75 (n1) (n2) (p1) (p2). . .(pk)**	**1B 4B (n1) (n2) (p1) (p2). . .(pk)**

Set single density image. (n1) is between 0 and 255. (n2) is 0 or 1. This command causes the printer to print the amount of data specified by (n1) and (n2) in a single-density image.
See Table 6-2, this command corresponds to the single density mode of an ESC * (m) command.

Code	Decimal	Hex
ESC L (n1) (n2) (p1) (p2). . .(pk)	**27 76 (n1) (n2) (p1) (p2). . .(pk)**	**1B 4C (n1) (n2) (p1) (p2). . .(pk)**

Set double density image. (n1) is between 0 and 255. (n2) is between 0 and 3. This command causes the printer to print the amount of data specified by (n1) and (n2) in a double density image.
See Table 6-2, this command corresponds to the double density mode of an ESC * (m) command.

Code	Decimal	Hex
ESC Y (n1) (n2) (p1) (p2). . .(pk)	**27 89 (n1) (n2) (p1) (p2). . .(pk)**	**1B 59 (n1) (n2) (p1) (p2). . .(pk)**

Set double speed and double density image. (n1) is between 0 and 255. (n2) is between 0 and 3. This command causes the printer to print the amount of data specified by (n1) and (n2) in a double-density image at a speed that is twice as fast as the ESC L (n1) (n2) command.
See Table 6-2, this command corresponds to the double speed double density mode of an ESC * (m) command.

Code	Decimal	Hex
ESC Z (n1) (n2)	27 90 (n1) (n2)	1B 5A (n1) (n2)
(p1) (p2). . .(pk)	(p1) (p2). . .(pk)	(p1) (p2). . .(pk)

Set quadruple density image. (n1) is between 0 and 255. (n2) is between 0 and 7. This command causes the printer to print the amount of data specified by (n1) and (n2) is quadruple-density image.

See Table 6-2, this command corresponds to the quadruple mode of an ESC * (m) command.

6.12 FONT CONTROL AND DOWN LOADING

Various type fonts (stored on the control board in the printer) and optional front cartridges are supported by the DotMax 24I and 24C. The type font, set by the TYPE STYLE switches on the control panel, is selected when the printer is initialized or reset.

Code	Decimal	Hex
ESC % (m) (n)	27 37 (m) (n)	1B 25 (m) (n)

Font Select Command. When this command is sent to the printer, the type font specified by the command is used until another Font Select command is sent or until the printer is reset.

As shown in Figure 6-6, there are two locations of font storage:

Resident ROM and
Font Cartridge Slot

6.12 FONT CONTROL AND DOWN LOADING
(Continued)

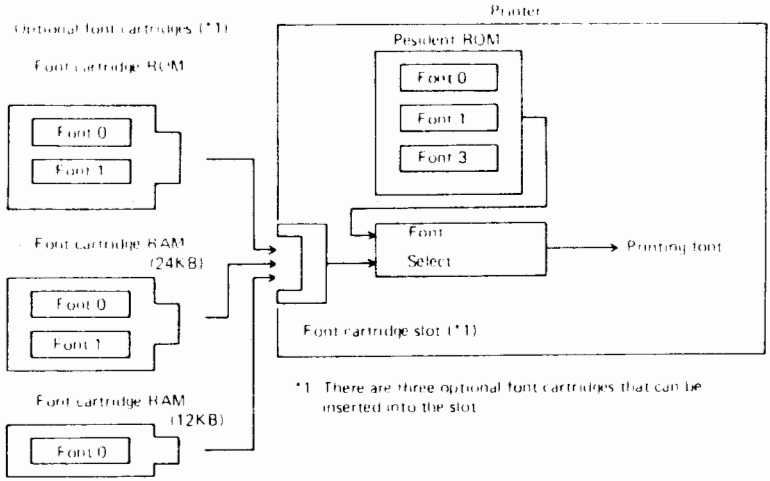


Figure 6-6 Font Select Outline

In the ESC % (m) (n) Font Selection command:

(m) is equal to the sum of (m1) and (m2)

(m1) indicates the ROM or RAM in which the font is located.

(m2) indicates the density of the printed characters.

(n) indicates the font to be selected.

For Font Select values of (n) see Table 6-3.

For ROM/RAM Select values of (m1) see Table 6-4.

For density code values of (m2) see Table 6-5.

Table 6-3 Font Select (n)

Font	Hex	Decimal
Font 0	0 or 30	0 or 48
Font 1	1 or 31	1 or 49
Font 2	2 or 32	2 or 50
Font 3	3 or 33	3 or 51
Font 4	4 or 34	4 or 52
Font 5	5 or 35	5 or 53
Font 6	6 or 36	6 or 54
Font 7	7 or 37	7 or 55

Table 6-4 ROM/RAM Select (m1)

ROM/RAM Location	Hex	Decimal
Resident ROM	00 or 30	00 or 48
Font Cartridge ROM	01 or 31 03 or 33	01 or 49 03 or 51
Font cartridge RAM	02 or 32	02 or 50

Table 6-5 Density Code (m2)

Density	Hex	Decimal
Font Determined Density	00	00
Letter Quality (350 dots/inch)	04	04
Correspondence (180 dots/inch)	08	08
Draft Quality (120 dots/inch)	0C	12

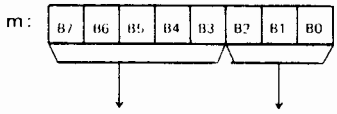
The standard values of (m) and (n), when using a Resident ROM font, are listed below.

Resident ROM Font Select (m) and (n)

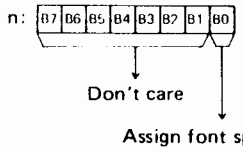
Resident ROM font	(m)		(n)	
	Hex	Dec	Hex	Dec
Courier 10	30	48	30	48
Prestige Elite	30	48	31	49
Draft	30	48	32	50
Compression	30	48	33	51

Code	Decimal	Hex
ESC : (NUL) (m) (n)	27 58 (0) (m) (n)	1B 3A (00) (m) (n)

Font Copy. This command copies a font from one of the fonts of the Resident ROM specified by (m) to the font cartridge RAM assigned as font (n). This command and ESC & enables custom fonts (see ESC & command). See Figure 6-7, (m) and (n) are determined as shown in Figure 6-7. This command is ignored when the font cartridge RAM (option) is not installed.



B2	B1	B0	Font selected
0	0	0	Font 0 of the Resident ROM
0	0	1	Font 1 of the Resident ROM
0	1	0	Font 2 of the Resident ROM
0	1	1	Font 3 of the Resident ROM
1	0	0	Font 4 of the Resident ROM
1	0	1	Font 5 of the Resident ROM
1	1	0	Font 6 of the Resident ROM
1	1	1	Font 7 of the Resident ROM



B0	Font
0	Copy as font 0 in the font cartridge RAM
1	Copy as font 1 in the font cartridge RAM

Figure 6-7 Source Font Selection for Font Copy

6.12 FONT CONTROL AND DOWN LOADING
(Continued)

Code	Decimal	Hex
ESC & (m) (Cs) (Ce)	27 38 (m) (Cs) (Ce)	1B 26 (m) (Cs) (Ce)

Download and Data string. This command enables the user to replace part of the currently used font with a custom-made character font loaded into the optional font cartridge RAM. (m) specifies the dot density and the font location to be used. To determine the value of (m), obtain the value for Dot Density and Font Select by using Tables 6-6 and 6-7. The sum of the two values is the number used as (m).

Table 6-6 Dot Density (Download)

Density		Hex	Decimal
Letter Quality	(360 dots/inch)	10	16
Correspondence	(180 dots/inch)	20	32
Draft Quality	(120 dots/inch)	30	48

Table 6-7 Font Select (Download)

Font	HEX/DEC
Font 0	0
Font 1	1

The characters to be replaced must be continuous in the ASCII code table. The character at the start of the sequence is specified by (Cs). The character at the end of the sequence is specified by (Ce).
(Cs) must be less than or equal to (Ce).

6.12 FONT CONTROL AND DOWN LOADING
(Continued)

Function codes (ASCII codes 0 to 31 in decimal) may be replaced with down loaded characters. Replaced function codes are no longer function codes.

See Figure 6-8. The image of a character to be down loaded can be expressed as a matrix with 24 dots in a column (each dot represented by a wire in the 24-wire print head), and Wi dots in a row.

Wi = 36 for Letter Quality; Wi = 18 for Correspondence mode; Wi = 9 for Draft mode; and Wi must always be less than 64.

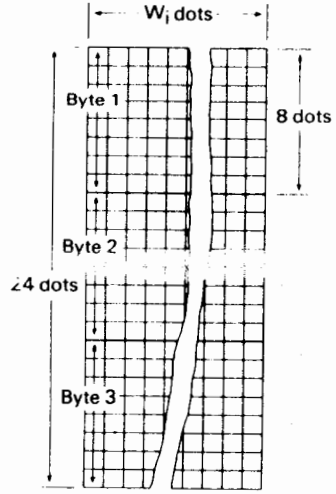


Figure 6-8 Dot Matrix for Character

6.12 FONT CONTROL AND DOWN LOADING
(Continued)

To design a character in draft mode, sketch a 24 by 9 dot matrix (See Figure 6-9). Darken the dots that make the character image. Then, encode each of the eight bits in the sequence numbered in Figure 6-9.

For example: (02)HEX, (00)HEX,. . .(00)HEX, is the draft mode image of letter "T" shown in Figure 6-9.

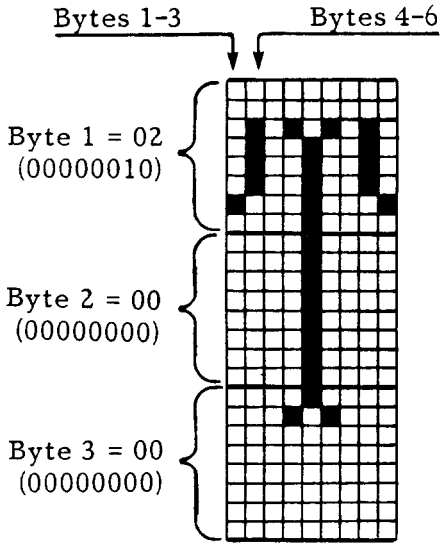


Figure 6-9 Download Image of "T"

Data is sent to the printer byte by byte. Because each column of the image consists of 24 dots or 24 bits of data, 3 bytes are needed to send data for each column of the image.

Consequently, sending the image of a character with width Wi requires sending 3 times Wi bytes.

Refer to Figure 6-10.

Column 1	Column 2	Column Wi
1	4	3Wi-2
2	5	3Wi-1
3	6	3Wi

Figure 6-10 Byte Numbers for Download Image Data

The image is sent in the ascending order of byte numbers as shown in Figure 6-10. As the data format width Wi must precede the image data of each character:

Wi, byte 1, byte 2,..., byte 3Wi

When a set of characters of a font is to be down loaded, the required data format is:

Wi, byte 1, byte 2,..., byte 3Wi (For character Cs)
Wi, byte 1, byte 2,..., byte 3Wi (For second character).

.

.

.

Wi, byte 1, byte 2,..., byte 3Wi (For character Ce)

Adjacent dots on a horizontal line must not be two marks. In other words, dots adjacent to a mark must be spaces. To design a horizontal line, mark every second dot, and a continuous line is printed because a printed dot actually overlaps its adjacent dots.

6.12 FONT CONTROL AND DOWN LOADING
(Continued)

All ESC & (m) (Cs) (Ce) commands are ignored when the optional RAM cartridge is not installed.

An ESC & command will only download the characters. To print the downloaded characters, use a font select command (to specify the downloaded font) and then send the corresponding print command.

When the printer is initially turned on, or when it is reset, with a RAM cartridge installed, resident ROM Font 0 is copied to Font 0 and resident ROM 1 is copied to Font 1 (in the cartridge RAM).

Program example:

```
10      LPRINT  " ESC &  m + Cs +Ce + Data"
20      LPRINT  " (Define Download Character)"
30      LPRINT
40      LPRINT  CHR$ (27);  "&"; CHR$ (48);
50      LPRINT  CHR$ (33);  CHR$ (33);
60      LPRINT  CHR$ (9);
70      LPRINT  CHR$ (2);   CHR$ (0);    CHR$ (0);
80      LPRINT  CHR$ (60);  CHR$ (0);    CHR$ (0);
90      LPRINT  CHR$ (0);   CHR$ (0);    CHR$ (0);
100     LPRINT  CHR$ (32)   CHR$ (0);    CHR$ (64);
110     LPRINT  CHR$ (31);  CHR$ (255);  CHR$ (128);
120     LPRINT  CHR$ (32);  CHR$ (0);    CHR$ (64);
130     LPRINT  CHR$ (0);   CHR$ (0);    CHR$ (0);
140     LPRINT  CHR$ (60);  CHR$ (0);    CHR$ (0);
150     LPRINT  CHR$ (2);   CHR$ (0);    CHR$ (0);
160     LPRINT  CHR$ (27);  "%";
170     LPRINT  CHR$ (12);  CHR$ (2);
180     LPRINT  "! ! ! ! ! ! ! ! ! !"
190     LPRINT  CHR$ (27);  "%";
200     LPRINT  CHR$ (13);  CHR$ (0);
210     LPRINT  "! ! ! ! ! ! ! ! ! !"
220     END
```

6.12 FONT CONTROL AND DOWN LOADING
(Continued)

Print Example:

```
ESC &+m+Cs+Ce+Data
(Define DownLoad Character)

! " # $ % & ' ( ) *
T T T T T T T T T T
```

6.13 CUT SHEET FEEDER CONTROL FUNCTIONS

See Appendix B, the cut sheet feeders are controlled by ESC commands and embedded text commands from the host system. The embedded text commands must start and finish with a CR or LF. The carriage return (CR) or line feed (LF) will be executed, but the embedded text command //X// (where X represents 1, 2, R or C) will not be printed.

The ESC commands set the feeder immediately and the embedded text commands select bins only.

A form feed or line feed command over a page boundary causes the last selected bin to feed and the user perceives the operation as a continuous form. Page size definition is the same with or without a feeder. ESC FF (n) defines lines per page.

6.13 Cut sheet feeder Control functions (Continued)

Code	Decimal	Hex	Function
ESC EM 1	**27 25 49**	**1B 19 31**	**Feed from bin 1**

This Command ejects the paper in the platen and feeds a new sheet of paper from bin 1 to top of form). This command is ignored when a SF220, RS916, RS966, RS1966, ASF521*, ASF522*, AFS523* or ASF580* Cut Sheet Feeder is not installed.

ESC EM 2	**27 25 50**	**1B 19 32**	**Feed from bin 2**

This command ejects the paper in the platen and feeds a new sheet of paper from bin 2 to top of form. This command is effective only when a RS966, RS1966, ASF522*, ASF523* or ASF580* Cut Sheet Feeder is installed.

ESC EM E	**27 25 69**	**1B 19 45**	**Feed from bin 3**

This command ejects the paper in the platen and feeds a new sheet of paper from bin 3 (envelope bin) to top of form. This command is effective only when an ASF523* or ASF580* Cut Sheet Feeder is installed.

Code	Decimal	Hex	Function
//1//	**47 47 49 47 47**	**2F 2F 31 2F 2F**	**Feed from bin 1**

This embedded text command feeds a new sheet of paper from bin 1 to the top margin. This command is effective when a SF220, RS966, RS1966, ASF521*, ASF522*, ASF523* or ASF580* Cut Sheet Feeder is installed.

//2//	**47 47 50 47 47**	**2F 2F 32 2F 2F**	**Feed from bin 2**

This embedded text command feeds a new sheet of paper from bin 2 to the top margin. This command is effective when a RS966, RS1966, ASF522*, ASF523* or ASF580* Cut Sheet Feeder is installed.

* indicates a manufacturer's change for Fujitsu printers

6.13 Cut sheet feeder Control functions (Continued)

Code	Decimal	Hex	Function
//E//	47 47 69 47 47	2F 2F 45 2F 2F	Select bin 3

This embedded text command feeds a new sheet of paper (or envelope) from bin 3 to the top margin. This command is effective when an ASF523* or ASF580* Cut Sheet Feeder is installed.

//R//	47 47 82 47 47	2F 2F 52 2F 2F	Select Eject

This embedded text command will eject the paper to the output stacker without feeding a new sheet of paper. This command is effective when an approved Cut Sheet Feeders is installed (except for a RS916 or RS1966).

//C//	47 47 67 47 47	2F 2F 43 2F 2F	Select Bins

This embedded text command will select bin 1 for the first paper feed, then select bin 2 thereafter, until a new bin select command is issued. This command is effective when a RS966, RS1966, ASF522* or ASF523* Cut Sheet Feeder is installed.

Code	Decimal	Hex	Function
ESC EM R	27 25 82	18 19 52	Eject Paper

This command ejects the paper in the platen to the output stacker without feeding a new sheet of paper. This command is effective when an approved Cut Sheet Feeders is correctly installed (except for a RS916).

6.14 MISCELLANEOUS COMMANDS

The following commands do not logically fit into the other classifications and are not complex enough to justify separate categories.

* indicates a manufacturer's change for Fujitsu printers

Code	Decimal	Hex	Function
DC1	17	11	**Select Printer**
DC3	19	13	**Deselect Printer**

The relationship between the ON-LINE switch, DC1/DC3 codes, and interface signals is shown in Figure 6-11.

ON-LINE SWITCH	SWC-6	DC1/DC3	-FAULT	BUSY	-ACKNLG	INPUT DATA
OFF-LINE	On or Off	DC1/DC3	Low	High	No output	Data entry disabled
ON-LINE	Off	DC1 set	High	High/Low	Output pulses	Data entry enabled Normal Processing
	Off	DC3 set	High	High/Low	Output pulses	Data entry enabled Input discarded until DC1 code received
	On	DC1 set	High	High/Low	Output pulses	Date entry enabled Normal processing
	On	DC3 set	High	High/Low	Output pulses	Data entry enabled Normal processing

Figure 6-11 Select Printer Relationship

Code	Dec	Hex	Function
BEL	7	07	**Sound the alarm** for about 0.25 seconds.
CAN	24	18	**Cancel all previous** data on the line containing this command
ESC <	27 60	1B 3C	**Move print head** to its home position.
ESC =	27 61	1B 3D	**Set MSB to 0,** forces MSB to be set at 0 (reset with ESC #).
ESC >	27 62	1B 3E	**Set MSB to 1,** forces MSB to be set at 1 (reset with ESC #).
ESC #	27 35	1B 23	**Reset MSB command.**
ESC m	27 109	1B 6D	**Automatic Justify** of spaces between words on print line (reset with ESC x).

6.14 MISCELLANEOUS COMMANDS (Continued)

Code	Decimal	Hex	Function
ESC 9	27 57	1B 39	**Enable paper-end sensor**

Causes the printer to enter the OFF-Line state when a paper-end condition occurs. Setting DIP switch C (SWC-4) to OFF has the same effect as this command.

ESC 8	27 56	1B 38	**Disable paper-end sensor**

Enables the printer to ignore the paper end signal. Setting DIP switch SWC-4 to ON has the same effect as this command.

ESC i (n)	27 105 01 27 105 49	1B 69 01 1B 69 31	**Set typewriter mode**
ESC i (n)	27 105 00 27 105 48	1B 69 00 1B 69 30	**Reset typewriter mode**

In typewriter mode, the printer prints characters if additional data is not received for about 0.2 second.

6.15 DOTMAX 24C COLOR SELECTION

This command is only active on the DotMax 24C.

Code	Decimal	Hex	Function
ESC r (n)	27 114 (n)	1B 72 (n)	**Select print color** (by changing the vertical position of the ribbon).

When this command is received subsequent data is printed in the color specified by (n). This is true for both bit image and character printing modes. When the printer is initialized, the default color is black (n=0). Table 6-8 gives the values of (n) for other colors. The selected color is changed when a new command is received.

6.15 DOTMAX 24C PRINT COLOR SELECTION
(Continued)

Colors not on the ribbon are created by a double-pass unidirectional printing. To minimize ribbon stain, any color mix sequence should always be yellow, magenta (red), cyan (blue) and black. Additional colors (not shown in Table 6-8) may be blended in unidirectional print mode-ESC U (SOH).

Table 6-8 DotMax 24C Color Selection

Color	1st Pass	2nd Pass	Decimal Value of (n)	Hex Value of (n)
Black	Black	-	0 or 48	00 or 30
Magenta	Magenta	-	1 or 49	01 or 31
Cyan	Cyan	-	2 or 50	02 or 32
Violet	Magenta	Cyan	3 or 51	03 or 33
Yellow	Yellow	-	4 or 52	04 or 34
Orange	Yellow	Magenta	5 or 53	05 or 35
Green	Yellow	Cyan	6 or 54	06 or 36
Brown	Magenta	Black	7 or 55	07 or 37

The sequence listed in Table 6-8 is also used in the DotMax 24C Self Test print pattern.

SECTION 7

PARALLEL INTERFACE DATA

The DotMax printer has two interface connectors. The upper connector is for the serial interface and the lower connector is for the parallel interface. The cable entry cutout has a plate which moves up or down to expose only the desired interface connector.

This section describes the lower connector, the parallel interface connector. Section 8 describes the serial interface,

7.1 PARALLEL INTERFACE OVERVIEW

Most variations of the Centronics type parallel interface can be supported by the DotMax printer.

The interface connector plug, for the cable, is an Amphenol DDK (57FE-30360) or equivalent. Figure 7-1 illustrates the connector layout.

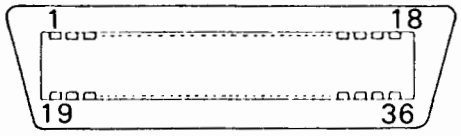


Figure 7-1 Parallel Interface Connector

7.2 PARALLEL INTERFACE PIN ASSIGNMENTS

Table 7-1 list the Centronics type parallel interface signals, gives the signal and return pin numbers, and defines each signal.

Table 7-1 Centronics Interface Signal Definitions

Signal Name	Signal Pin #	Return Pin #	Signal Definition
-DATA STROBE*	1	19	A 1.0 microsecond pulse used to strobe DATA signals into the printer. The printer reads the data bus at the Low level of this signal.
+DATA 1* +DATA 2* +DATA 3* +DATA 4* +DATA 5* +DATA 6* +DATA 7* +DATA 8*	2 3 4 5 6 7 8 9	20 21 22 23 24 25 26 27	8 data lines from the host. High level represents binary 1, Low level represents binary 0. Data 8 is the most significant bit. Signal must be High at least 1 microsecond before the falling edge of -DATA STROBE signal and must be held 1 microsecond after the rising edge.
-ACKNOWLEDGE	10	28	A 2 to 6 microsecond pulse that indicates the input of a character into the print data buffer or the end of an operation. Low indicates that the printer has received data and is ready for the next input.
+BUSY	11	29	A High level indicates that the printer **cannot** receive data. Typical conditions that cause a High BUSY level are buffer full, or an error condition. Timing of BUSY in relationship to -STROBE and -ACKNOWLEDGE can be changed by DIP switch settings.
+PAPER EMPTY	12		A high level indicates the printer is out of paper.
+SELECT	13		A high level indicates the printer is ON-LINE (Selected).
No Connection	14		Reserved signal line (+5 Volts).

* = Signal generated by the host system.

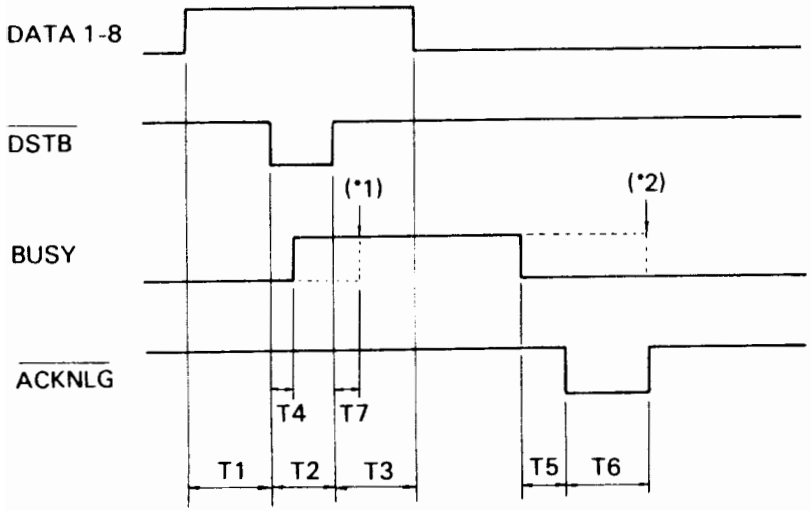
Table 7-1 Centronics Interface Signal Definitions (Continued)

Signal Name	Signal Pin #	Return Pin #	Signal Definition
No Connection	15		Reserved I/O signal line.
Signal Ground (SG)		16	Logic/Signal ground level (0 Volts).
Frame Ground (FG)		17	Printer Cabinet/Frame ground line.
+5 Volts DC	18		Connected directly to the +5 Volt power source in the printer.
Signal Ground (SG)		19/30	Twisted pair cable return lines.
$\overline{\text{-INPUT PRIME}}$*	31		A low pulse, over 50 micro-seconds, will clear the printer buffer and initialize the printer.
$\overline{\text{-FAULT}}$	32		A low signal level that indicates the printer is OFF-LINE, has a PAPER OUT or COVER OPEN condition, or another error condition has been sensed.
No Connection	33		Reserved output signal line.
No Connection	34		Not used
+5 Volts Regulate	35		Connected to the +5 Volt source through a 3.3K Ohm resistor.
No Connection	36		Reserved input signal line.

* = Signal generated by the host system.

7.3 PARALLEL INTERFACE SIGNAL TIMING

The timing relationship of the handshake (or protocol) signals in the Centronics type parallel interface is given in Figure 7-2.



T1 > 1 μs
T2 > 1 μs
T3 > 1 μs
T4 < 1 μs
T7 < 1 μs

0 μs ≤ 5T < 3 μs
2 μs < T6 < 6 μs

*1 Timing for DTR protocol
*2 Timing for RC protocol

Figure 7-2 Parallel Interface Timing

7.4 PARALLEL DRIVER/RECEIVER CIRCUITS

Figure 7-3 shows the Parallel interface output (Driver) circuit. The DotMax 24 uses a SN7406 or equivalent driver circuit.

Figure 7-4 shows the parallel interface input (Receiver) circuit. The DotMax 24 printer uses a SN74LS14 or equivalent receiver circuit. Voltage levels are 0V and +5V (nominal).

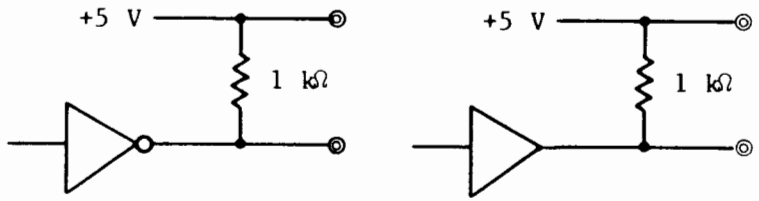


Figure 7-3 Parallel Interface Output Circuit

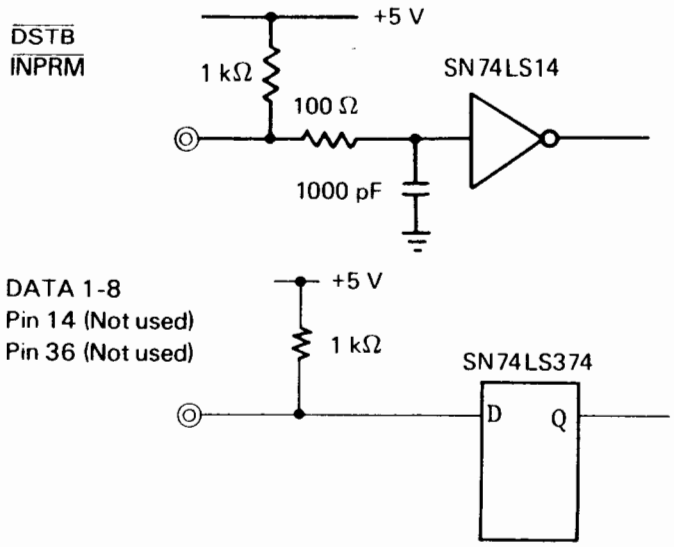


Figure 7-4 Parallel Interface Input Circuit

SECTION 8

SERIAL INTERFACE DATA

DotMax 24 printers have two interface connectors. The upper connector is for the serial interface and the lower connector is for the parallel interface. The cable entry cutout has a plate which moves up or down to expose only the desired interface connector.

This section describes the upper connector, the serial interface connector. Section 7 describes the parallel interface.

8.1 OVERVIEW OF RS-232 SERIAL INTERFACE

The DotMax transmits and receives (switch selectable) 7-bit or 8-bit asynchronous data at (switch selectable) Baud rates of 110, 300, 600, 1200, 2400, or 9600. The operator sets the bit configuration and baud rate with Control Panel switches (described in Section 3).

The interface connector plug, for the cable, is a Cannon Cinch DB-25P or equivalent. Figure 8-1 illustrates the printer's connector layout

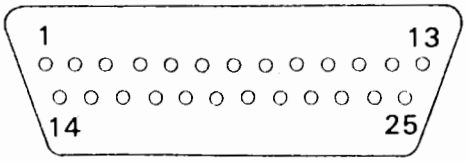


Figure 8-1 RS-232 Serial Interface Connector

8.2 COMMUNICATIONS PROTOCOL

A communications protocol is used, with the RS-232 interface, to prevent print buffer overflow when print data is received faster than the printer can empty the print buffer.

The operator selects DC1/DC3 (XON/XOFF), Data Terminal Ready (DTR), or Reverse Channel (RC) Protocol with Control Panel switches SWA-7 and SWA-8.

The communication protocol responds to conditions within the printer as described in the following paragraphs.

8.2.1 ETX/ACK Protocol

When the host system sends a string of print data, it includes an ETX control code character at the end of the data string. When the printer reads the ETX character (from its data buffer), it transmits an ACK character to the host to indicate that it has reached the end of the data string and is ready to receive more data. ETX signals are not printed.

When the first message is transmitted to the printer, the print operation begins and the computer may send additional messages to the printer. The host must ensure that transmitted data does not exceed the capacity of the print buffer (2K on DotMax 24I or 24C, 4K on DotMax 24D).

8.2.2 DC1/DC3 (Xon/Xoff) Protocol

This protocol is selected with Control Panel switches SWA-7 OFF and SWA-8 ON.

The printer will send a DC3 control code to the host when the print buffer is nearly full (within 255 bytes).

8.2.2 DC1/DC3 (Xon/Xoff) Protocol (Continued)

The host system should stop transmitting data when a DC3 control code is received, and wait for the printer to send a DC1 Control Code. A DC1 control code is transmitted by the printer when its buffer can receive additional data and no error conditions exist.

When the printer is first turned on, the +DTR signal is set true, and a DC1 (XON) code is transmitted from the printer.

8.2.3 Data Terminal Ready (DTR) Protocol

This protocol is selected with Control Panel switches SWA-7 ON and SWA-8 OFF.

This protocol will cause the Data Terminal Ready (+DTR) interface signal to become LOW when the print buffer is nearly full (within 255 bytes)

The +DTR interface line will go high (to indicate the printer is ready to receive data) when the print buffer is ready to receive additional data and no error conditions exist.

8.2.4 Reverse Channel (RC) Protocol

This protocol operates exactly like the DTR protocol. The only difference is Reverse Channel protocol uses the Reverse Channel signal on pin 11 of the interface, and DTR protocol uses the DTR signal on pin 20 of the interface.

8.3 SERIAL DATA FORMAT

Serial data consists of a start bit, 7 or 8 data bits, a parity bit, and stop bits. A bit is in the mark (true) state when it is low and in the space (false) state when it is high.

8.3 SERIAL DATA FORMAT (Continued)

The number of data bits, parity, and number of stop bits are DIP switch selectable (see Section 3).

A typical transmission of the character "K" (with 7 data data bits and even parity) is shown in Figure 8-2.

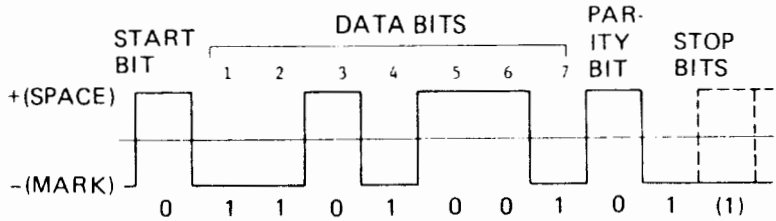


Figure 8-2 Serial Data Format

8.4 SERIAL INTERFACE DRIVER/RECEIVER CIRCUITS

Figure 8-3 shows the Serial interface output (Driver) circuit. DotMax 24 printers use a MC1488L to convert TTL signal lever levels (+5 to 0 Volts) to RS-232 levels (+12 to -12 Volts). A 1000 pF capacitor mutes noise on the output signal line.

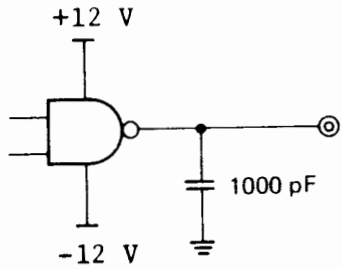


Figure 8-3 Serial Interface Output Circuit

8.4 SERIAL INTERFACE DRIVER/RECEIVER CIRCUITS (Continued)

Figure 8-4 shows the Serial interface input (Receiver) circuit. The DotMax 24 uses a MC1489AL to convert the RS-232-C (+12 to -12 Volts) levels to TTL (+5 to 0 Volts) levels.

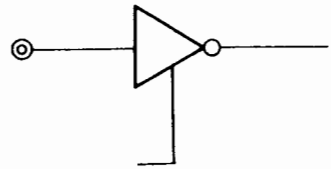


Figure 8-4 Serial Interface Input Circuit

8.5 RS-232-C PIN ASSIGNMENTS

Table 8-1 list the RS-232-C interface signals and gives the name of each signal

Table 8-1 RS-232-C Interface Signal Definitions

Signal	Name	Printer Pin #	CCITT	TelCo Circuit
FG	Frame Ground	1	101	AA
-TD	-Transmitted Data	2	103	BA
-RD	-Received Data	3	104	BB
+RTS	+Request to Send	4	105	CA
+CTS	+Clear to Send	5	106	CB
+DSR	+Data Set Ready	6	107	CC
SG	Signal Ground	7	102	AB
CD	+Carrier Detect	8	N/A	N/A
+RC	+Reverse Channel	11	N/A	N/A
+DTR	+Data Terminal Ready	20	108	CD

Pins 9, 10, 12 through 19, 21 through 25 are unused.

8.6 SIGNAL DEFINITIONS

Frame (Chassis) Ground - Safety ground.

Signal Ground - Common signal ground.

Transmitted Data - Serial data bits are sent to the host over this line.

Received Data - Serial data bits are received from the host over this line.

Request to Send - High level is sent to the host when printer initialization is complete, stays high until power is shut off.

Clear to Send - The host sets this signal high when it is ready to receive transmitted data from the printer.

Data Set Ready - Indicates transmission and reception are enabled. The host must set this signal high when data is to be sent or received.

Carrier Detect - Indicates carrier signal from the host has been received. The host must set this signal high before transmitting data to the printer.

Reverse Channel - Operates like the Data Terminal Ready signal described below (not used in the standard RS-232-C interface).

Data Terminal Ready - High state indicates that the printer is ready to receive or transmit data.

APPENDIX A.1 24I and 24C FONT TABLES

Font 0 - Courier 10

DOTMAX 24I/24C

DOTMAX 24I/24C

L\H	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL	DLE	SP	0	@	P	`	p	Ç	É	á	▒	└	╙	α	≡
1	SOH	DC1	!	1	A	Q	a	q	ü	æ	í	▓	┴	╘	ß	±
2	STX	DC2	"	2	B	R	b	r	é	Æ	ó	─	┬	╒	Γ	≥
3	♥	DC3	#	3	C	S	c	s	â	ô	ú	┼	├	╓	π	≤
4	♦	DC4	$	4	D	T	d	t	ä	ö	ñ	╞	─	╫	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	╟	┼	╪	σ	⌡
6	♠	SYN	&	6	F	V	f	v	å	û	ª	╚	╞	┘	µ	÷
7	BEL	ETB	'	7	G	W	g	w	ç	ù	º	╔	╟	┌	τ	≈
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	¿	╩	╚	▌	Φ	°
9	HT	EM	)	9	I	Y	i	y	ë	Ö	⌐	╦	╔	▐	Θ	∙
A	LF	SUB	*	:	J	Z	j	z	è	Ü	¬	╠	╩	▀	Ω	·
B	VT	ESC	+	;	K	[	k	{	ï	¢	½	═	╦	▄	δ	√
C	FF	FS	,	<	L	\	l	|	î	£	¼	╬	╠	∞	n
D	CR	GS	-	=	M	]	m	}	ì	¥	¡	╧	═	▌	φ	2
E	SO	RS	.	>	N	^	n	~	Ä	₧	«	╨	╬	▐	ε	■
F	SI	US	/	?	O	_	o	DEL	Å	ƒ	»	╤	╧	▀	∩	SP

DOTMAX 24I/24C

DOTMAX 24I/24C

Font 1 - Prestige Elite

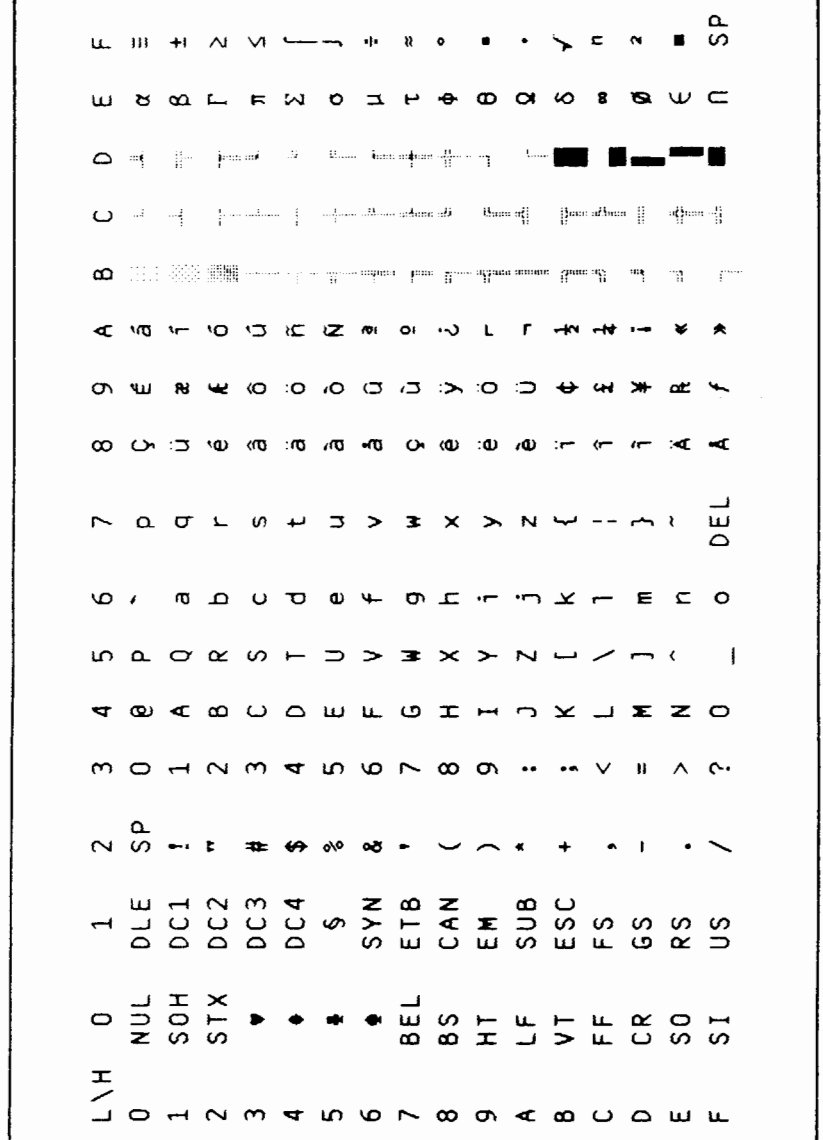
DOTMAX 24I/24C DOTMAX 24I/24C

L\H	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL	DLE	SP	0	@	P	`	p	Ç	É	á	▒	└	╨	α	≡
1	SOH	DC1	!	1	A	Q	a	q	ü	æ	í	▓	┴	╤	ß	±
2	STX	DC2	"	2	B	R	b	r	é	Æ	ó	─	┬	╥	Γ	≥
3	♥	DC3	#	3	C	S	c	s	â	ô	ñ	┼	├	╙	π	≤
4	♦	DC4	$	4	D	T	d	t	ä	ö	Ñ	╞	─	╘	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	ª	╟	┼	╒	σ	⌡
6	♠	SYN	&	6	F	V	f	v	å	û	º	╚	╞	╓	µ	÷
7	BEL	ETB	'	7	G	W	g	w	ç	ù	¿	╔	╪	╫	τ	≈
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	⌐	╩	╡	╪	Φ	°
9	HT	EM	)	9	I	Y	i	y	ë	Ö	¬	╦	┐	┘	Θ	∙
A	LF	SUB	*	:	J	Z	j	z	è	Ü	½	╠	┌	┌	Ω	·
B	VT	ESC	+	;	K	[	k	{	ï	¢	¼	═	▌	▄	δ	√
C	FF	FS	,	<	L	\	l	|	î	£	¡	╬	▐	▀	∞	ⁿ
D	CR	GS	-	=	M	]	m	}	ì	¥	«	╧	▀	▄	ø	²
E	SO	RS	.	>	N	^	n	~	Ä	₧	»	╨	▄	▀	∈	■
F	SI	US	/	?	O	_	o	DEL	Å	ƒ	▪	┐	▄	▀	∩	SP

DOTMAX 24I/24C DOTMAX 24I/24C

Font 2 - Draft

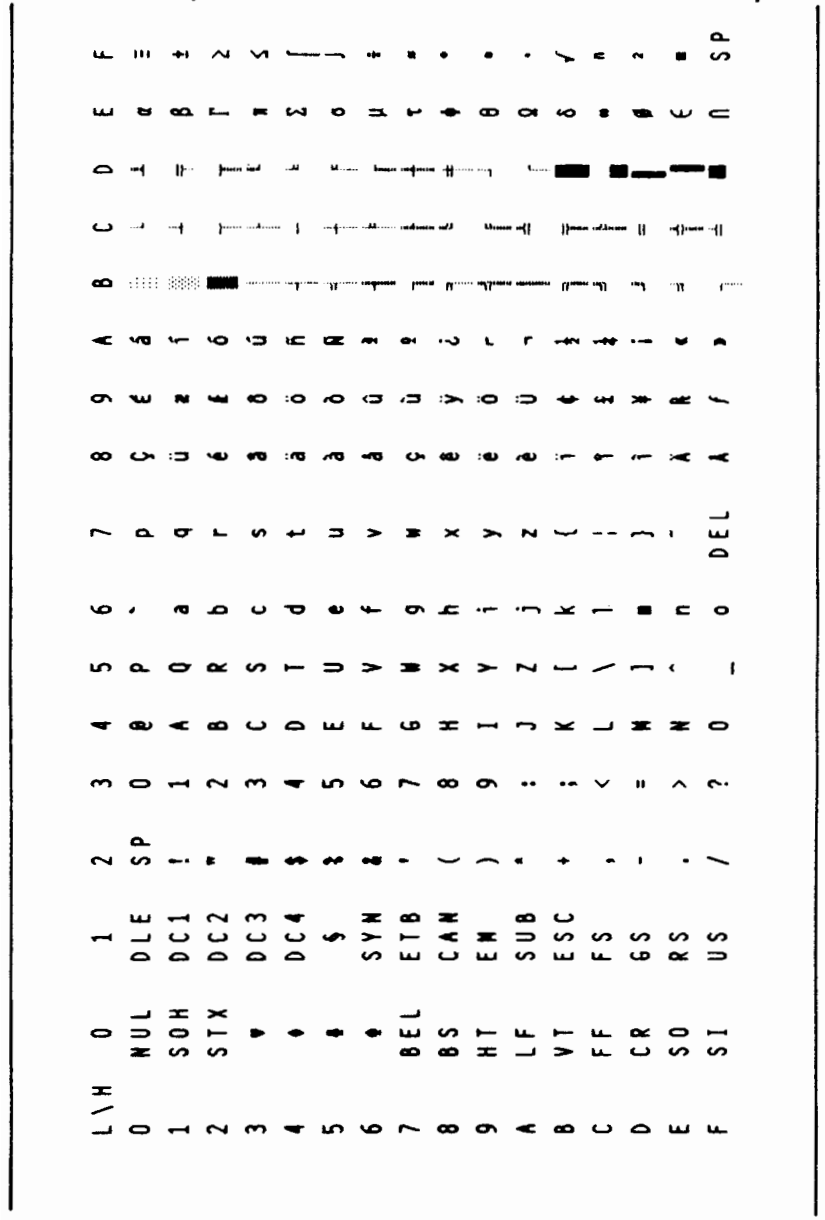
DOTMAX 24I/24C DOTMAX 24I/24C



DOTMAX 24I/24C DOTMAX 24I/24C

Font 3 - Compression

DOTMAX 24I/24C DOTMAX 24I/24C



DOTMAX 24I/24C DOTMAX 24I/24C

APPENDIX A.2 DOTMAX 24D FONT TABLES

Font 0 - Courier 10

DOTMAX 24D DOTMAX 24D

L\H	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	¦
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	DEL
		ESC Y ¢				ESC Z ¬		

DOTMAX 24D DOTMAX 24D

Font 1 - Prestige Elite 12

DOTMAX 24D ——— DOTMAX 24D

L\H	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	¦
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	DEL
		ESC Y				ESC Z		
		ç				¬		

DOTMAX 24D ——— DOTMAX 24D

Font 2 - Boldface

DOTMAX 24D — DOTMAX 24D

L\H	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	¦
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	DEL
		ESC Y				ESC Z		
		¢				¬		

DOTMAX 24D — DOTMAX 24D

Font 3 - Correspondence

DOTMAX 24D — DOTMAX 24D

L\H	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	¦
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	DEL
		ESC Y				ESC Z		
		¢				¬		

DOTMAX 24D — DOTMAX 24D

Font 4 - Draft

DOTMAX 24D — DOTMAX 24D

L\H	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	¦
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	DEL
		ESC Y				ESC Z		
		¢				¬		

DOTMAX 24D — DOTMAX 24D

Font 5 - Compression

DOTMAX 24D — DOTMAX 24D

L \ H	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	¦
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	DEL
		ESC Y				ESC Z		
		¢				¬		

DOTMAX 24D — DOTMAX 24D

DotMax International Characters

HEX	23H	24H	40H	5BH	5CH	5DH	5EH	60H	7BH	7CH	7DH	7EH
DEC	35	36	64	91	92	93	94	96	123	124	125	126
U.S.A.	#	$	@	[	\	]	^	`	{	|	}	~
FRANCE	£	$	à	°	ç	§	^	`	é	ù	è	¨
GERMANY	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
U.K.	£	$	@	[	\	]	^	`	{	|	}	~
DENMARK	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	£	$	§	°	ç	é	^	ù	à	ò	è	ì
SPAIN	£	$	§	¡	Ñ	¿	^	`	°	ñ	ç	~

APPENDIX B
CUT SHEET FEEDERS

Optional cut sheet feeders are available from your Fujitsu dealer. Paragraph B.1 gives the model number of the currently supported sheet feeders. Paragraph B.2 describes sheet feeder installation. Paragraphs B.3 through B.7 describe various sheet feeder operations. See section 5 or 6 for information on software commands.

B.1 SUPPORTED MODELS

The printer can be equipped with any of the following cut sheet feeder model numbers.

Single Bin	Dual Bin	Triple Bin
SF220 RS916 ASF521*	RS966 ASF522* RS1966	ASF523* ASF580*

Fujitsu produces the SF220.

Rutishauser Data AG produce the RS966, RS916 and RS1966.

Buro und Datentechnick (BDT) produce the ASF521*, ASF522*, ASF523* and ASF580*.

Consult your dealer for specifications and additional performance data on available sheet feeders.

* indicates a manufacturer's change for Fujitsu printers.

B.2 SHEET FEEDER INSTALLATION

Refer to Figure B-1.

1. **CONFIRM PRINTER POWER IS OFF.**

2. Open the front cover.

3. Move the paper release lever towards the rear of the printer.

4. Pull the paper bail lever forward (away from the platen) while pushing the lock lever down until it catches the paper bail lever.

5. Lift and remove the column scale.

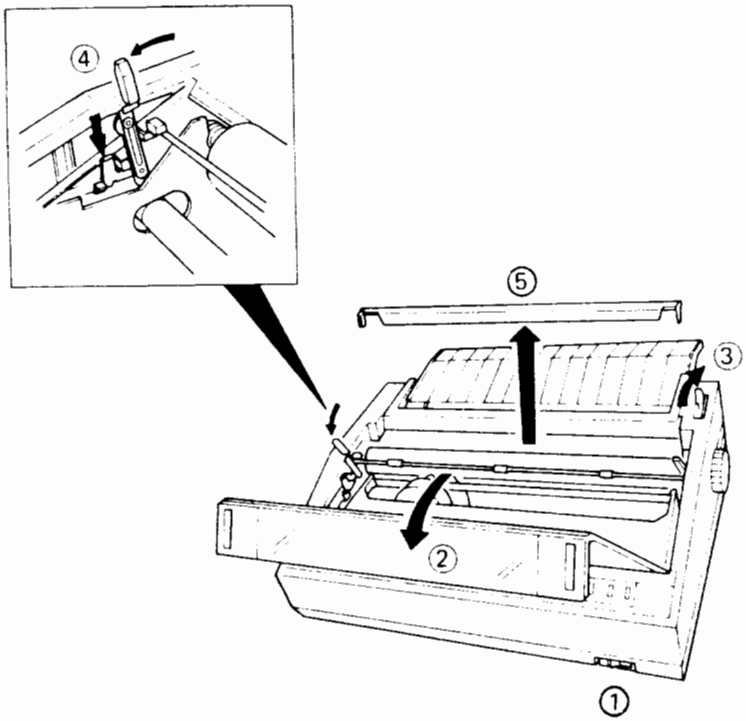


Figure B-1 Preparing the Printer

B.2 SHEET FEEDER INSTALLATION (Continued)

Refer to Figure B-2.

If installing a Rutishauser Sheet Feeder, the rubber supports (supplied with the printer) must be installed under the paper guide.

Proceed as follows:

1. Lift the rear of the paper guide.

2. Place the form tractors in the center of the support shaft

3. Clip a rubber support at each end of the support shaft

4. Return the paper guide to its original position

Remove the rubber supports when using continuous form.

Attach the feeder to the printer as described in the Sheet Feeder's manual.

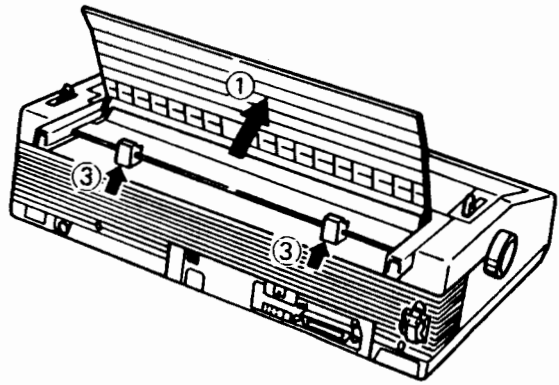


Figure B-2 Installing the Rubber Supports

B.2 SHEET FEEDER INSTALLATION (Continued)

If your sheet feeder has a cable it must be connected to the printer prior to operation, proceed as follows:

Refer to Figure B-3 and B-4. **CONFIRM POWER IS OFF** and ensure the pins in the cable connector match the holes in the printer connector.

Insert the cable connector and clamp it with the interface cable clamp.

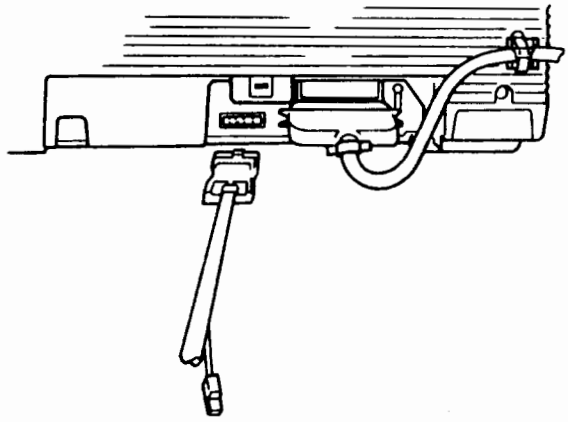


Figure B-3 Connecting the Sheet Feeder Cable

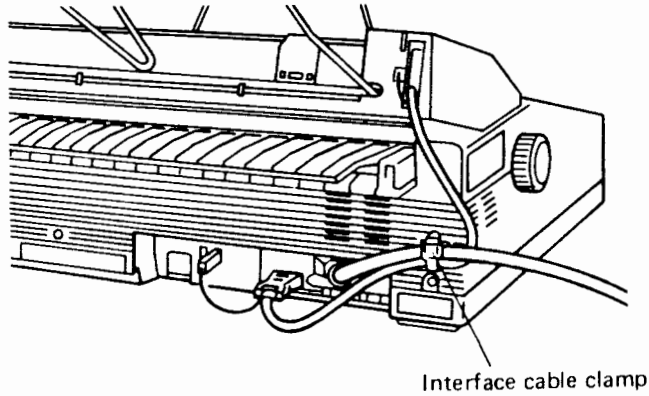


Figure B-4 Clamping the Sheet Feeder Cable

B.3 SET THE FORM LENGTH SWITCHES

Set the Form Length switches as described in section 3. If installing a Rutishauser Model RS916 add two inches to the paper length to determine the correct switch settings. Refer to Table B-2.

Table B-2 Form Length with the Model RS916

Paper Length	RS916 Line Setting	Lines per inch	Form Length Switches
11 inches	13	6	78
11 inches	14	6	84
11 2/3 inches	14	6	84

B.4 LOADING PAPER

Insert paper into the Sheet Feeder's bin(s) using directions in the Sheet Feeder's manual. The printer loads paper, according to Model number, in the method shown in Table B-3 and described in notes A through S on the following page.

Table B-3 Sheet Feeder Paper Load Method

Model Number	Paper Loading Method
SF220	A, C, S, M, L
RS916	M, L
RS966	A, B, C
RS1966	A, B, C
ASF521*	A, C, S
ASF522*	A, C, S
ASF523*	A, C, S
ASF580*	A, C, S

* indicates a manufacturer's change for Fujitsu printers

B.4 LOADING PAPER (Continued)

A = Automatically loaded when the printer receives a printable character code.

B = Loaded when you press the Feeder's Bin Select Switch.

C = Loaded when a feed command is received from the keyboard or a print program.

L = Loaded when you press the LF (Line Feed) switch on the printer.

M = Loaded when you manually turn the printer's platen knob.

S = Loaded when you press SHEET LOAD switch on the printer.

Note: With the Model SF220, after loading paper with the SHEET LOAD switch, adjust the print position by manually turning the platen knob, or with the MICRO V. FEED switches, as explained in Section 2.

B.5 PAPER EJECT

Loaded cut sheet paper is ejected from the sheet feeder, when you press the FF (Form Feed) switch on the printer.

B.6 PAPER OUT CONDITION

When a paper bin runs out of paper, the OP CHECK 2 lamp will light, and the ON-LINE lamp will extinguish.

To resume printing, insert paper into the empty bin and proceed as described below by feeder model number:

SF220/ASF521*/ASF522*/ASF523*/ASF580* - Press the SHEET LOAD switch on the printer, paper will load and the OP CHECK lamp will extinguish. Press the ON-LINE switch to continue printing.

RS966/RS1966 - Press the RESET switch on the RS966 the OP CHECK 2 lamp will extinguish. Press the ON-LINE switch on the printer to continue printing.

* indicates a manufacturer's change for Fujitsu printers

B.6 PAPER OUT CONDITION (Continued)

RS916 - Printing ends while printing the last sheet of paper. Insert paper into the empty bin, press FORM FEED on the printer (to eject the partially printed paper), press ON-LINE to resume printing from the first print line of the page that was ejected.

B.7 SHEET FEEDER COMMAND SEQUENCES

Commands may very depending on your computer and software package. Refer to Sections 5 or 6 and your computer or software manual for additional information.

Sheet Feeder commands are broadly divided into two categories:

ESC Code and **Embedded Text** commands

ESC Code and Embedded Text Commands are explained in Sections 5 and 6. Use Embedded Text commands if your computer or software package does not allow use of ESC Code commands.

B.7.1 Embedded Text Commands

The function of Embedded Text commands are:

//1// Select paper bin 1
//2// Select paper bin 2
//E// select envelope bin
//R// Eject paper from the feeder
//C// Select bin 1 for first feed, then select bin 2 until a new command is received

These commands must be preceded and followed by a LF or CR. When your Embedded Text command is the only entry (on a line) your computer will automatically send a LF or CR before and after the command. Embedded Text commands are not printed.

B.7.2 WordStar Embedded Text Commands

WordStar will not allow you to use ESC Code commands and you must use Embedded Text commands to control the Sheet Feeder.

If you are using 8 1/2" X 11 2/3" paper and an RS966 Sheet Feeder (with 6 lines per inch set in SWD-1 and SWD-2, and 70 (11 2/3 X 6 = 70) set in the FORM LENGTH switches) set-up and use WordStar as follows.

Open a WordStar file and enter:

```
.PL70
//1//
Print on paper from bin 1.
.PAGE
//2//
Now print on paper from bin 2.
.PAGE
```

The .PL70 (Dot command) changes WordStar's page length from 66 to 70 lines. Without this command the page break on your screen would be different than the printer's page break.

The //1// Embedded Text command selects paper bin 1.

The printable characters on the 3rd line tells the printer to load the paper and print the message.

The .PAGE (Dot command) sends a FF or a series of LF control codes to eject the printed page.

The //2// Embedded Text command selects paper bin 2.

The second message is printed and the paper is ejected as described above for bin 1.

If you don't want to change the page break on your screen place a .MB12 (Dot command) after the .PL70. This changes WordStar's bottom margin to 12 lines (an increase of 4 lines) and allows the lines per page on your screen to remain the same.

B.7.2 WordStar Operation Without Commands

You can use the Sheet Feeder without commands, as if you were using continuous form, with paper from bin 1 only, as follows.

Set the FORM LENGTH switches to match the paper size and Sheet Feeder model, see paragraph B.4.

Insert a FF or series of LF control codes, with a .PA (New Page Dot Command) after entering your text.

WordStar will eject the printed page and load fresh paper.

B.7.3 Sheet Feeder BASIC Commands

When using 11" paper, an SF220 Sheet Feeder, and 6 lines per inch. Set FORM LENGTH switches to 66 and enter the following routine:

```
10LPRINT "Cut Sheet Feeder"
20LPRINT "works like"
30LPRINT "a continuous"
40LPRINT "forms tractor."
50LPRINT "CHR$(12);
60LPRINT "This is on"
70LPRINT "new paper"
```

Upon receiving the first printable character (in the "Cut Sheet Feeder" message) the printer loads paper and prints the first message (up to line 50). The "CHR$(12); command (in line 50) sends a FF and the printer ejects the printed page of paper. You could send a series of 62 LF control codes instead of the FF, since you used 4 lines before line 50, and a fresh page would be loaded.

You cannot select a paper bin without using a Sheet Feeder command.

APPENDIX C
OPTIONAL FONT CARTRIDGE

In addition to the printer's resident fonts (shown in Appendix A) you can use optional font cartridges.

Font cartridges are supplied in electrostatic proof cases. Handle your cartridges with appropriate care.

C.1 TYPES OF FONT CARTRIDGES

There are ROM and RAM font cartridges.

ROM font cartridges allow you to use additional fonts, like Letter Gothic.

RAM font cartridges allow you to download characters from your host system.

C.2 INSTALLING A FONT CARTRIDGE

Install your font cartridge as follows:

Open the electrostatic case and remove the cartridge.

TURN OFF PRINTER POWER. ALWAYS ENSURE POWER IS OFF WHEN INSTALLING OR REMOVING A FONT CARTRIDGE.

Open the Control Panel cover and insert your font cartridge, as shown in Figure C-1.

Turn printer power ON.

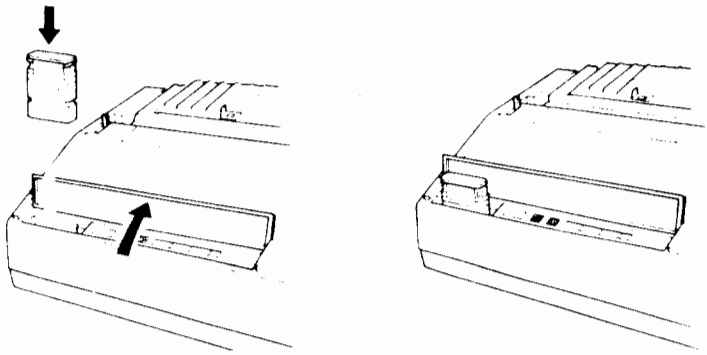


Figure C-1 Inserting Your Font Cartridge

C.3 USING YOUR FONT CARTRIDGE

You can switch from the printer's resident font to your cartridge font by setting DIP switches SWD-5 through SWD-8 (on the Control Panel) to the desired font, or by sending ESC commands to your printer.

A label, on each font cartridge, shows the SWD switch settings for that cartridge, see Figure C-2.

See Section 5 or 6 for font cartridge commands.

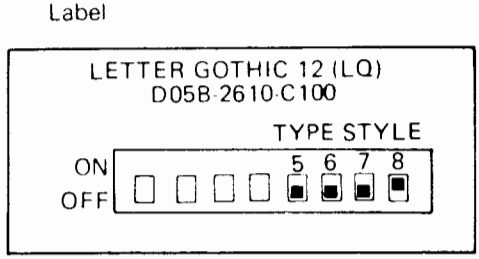


Figure C-2 DIP Switch Font Cartridge Selection

APPENDIX D
PRINTER SPECIFICATIONS

Print Method:	Impact dot matrix with a 24-wire print head
Printing Speed:	Draft Quality prints 288 characters per second at 12 CPI
	Correspondence Quality prints 192 characters per second at 12 CPI
	DotMax 24D Letter Quality prints 96 characters per second at 12 CPI
Character Matrix: (Horizontal X Vertical)	Draft Quality is 12 X 24 dots
	Correspondence Quality is 18 X 24 dots Letter Quality is 36 X 24 dots
DotMax 24D Character Set and Character Fonts:	Character set has 96 ASCII characters with European symbols and characters
	Character fonts are Courier 10, Prestige Elite, and Boldface
DotMax 24I/24C Character Sets and Character Fonts:	Character set 1 has 96 ASCII characters, 16 European characters, 48 graphic characters, 16 Greek characters, 16 math and extra symbols
	Character set 2 has 96 ASCII characters, 48 European characters, 48 graphic characters, 16 Greek characters, 21 math and extra symbols
	Character fonts are Courier 10, and Prestige Elite
Optional Font Cartridges:	Scientific 12, Letter Gothic 12, Orator, and Light Italic (check with your dealer for the latest font information)
Downloadable Font Cartridge:	Contains storage space for one or two 96-character set(s)

Printer Specifications (Continued)

Character Spacing:	1/10", 1/12", 1/18", Proportional space, and programmable increments of 1/120" or 1/180"
Print Line:	136 Characters per line at 10 CPI 163 Characters per line at 12 CPI 244 Characters per line at 18 CPI
Line Spacing:	1/3", 1/6", 1/8", or programmable in increments of 1/48" or 1/180"
Number of copies:	Up to 5, including the original
Forms:	6" to 16" wide, up to 0.013" thick
Ribbon:	Black fabric ribbon in an easily installed cassette (DotMax 24D/I/C) 4-color fabric ribbon in an easily installed cassette (DotMax 24C only)
Paper Handling:	Friction feed platen and rear feed forms tractors are standard Optional cut sheet feeders, as described in Appendix B
Interface:	Centronics Type Parallel and RS-232C Serial interfaces are standard
AC Power:	100 VAC to 120 VAC $\pm$10%, 50/60 Hz 220 VAC to 240 VAC $\pm$10%, 50 Hz

Operating Environmental Requirements:
5°C to 38°C, 10% to 90% RH

Storage Environmental Requirements:
-20°C to 60°C, 50% to 95% RH

Physical:
Height: 6.3 inches (160mm)
Width: 21.7 inches (550mm)
Depth: 15.0 inches (380mm)
Weight: 44 pounds (DotMax 24D/I)
50 pounds (DotMax 24C)

APPENDIX E
CODE CONVERSION TABLE

Numeric			ASCII character		
Deci-	Hexa-		DotMax 24I/C		DotMax
mal	decimal	Binary	Set1	Set2	24D
0	00	00000000	NUL	NUL	NUL
1	01	00000001	SOH	SOH	SOH
2	02	00000010	STX	STX	STX
3	03	00000011	ETX	♥	ETX
4	04	00000100	EOT	♦	EOT
5	05	00000101	ENQ	♣	ENQ
6	06	00000110	ACK	♠	ACK
7	07	00000111	BEL	BEL	BEL
8	08	00001000	BS	BS	BS
9	09	00001001	HT	HT	HT
10	0A	00001010	LF	LF	LF
11	0B	00001011	VT	VT	VT
12	0C	00001100	FF	FF	FF
13	0D	00001101	CR	CR	CR
14	0E	00001110	SO	SO	SO
15	0F	00001111	SI	SI	SI
16	10	00010000	DLE	DLE	DLE
17	11	00010001	DC1	DC1	DC1
18	12	00010010	DC2	DC2	DC2
19	13	00010011	DC3	DC3	DC3
20	14	00010100	DC4	DC4	DC4
21	15	00010101	NAK	§	NAK
22	16	00010110	SYN	SYN	SYN
23	17	00010111	ETB	ETB	ETB
24	18	00011000	CAN	CAN	CAN
25	19	00011001	EM	EM	EM
26	1A	00011010	SUB	SUB	SUB
27	1B	00011011	ESC	ESC	ESC
28	1C	00011100	FS	FS	FS
29	1D	00011101	GS	GS	GS
30	1E	00011110	RS	RS	RS
31	1F	00011111	US	US	US

CODE CONVERSION TABLE (Continued)

Numeric			ASCII character		
Deci-	Hexa-		DotMax 24I/C		DotMax
mal	decimal	Binary	Set1	Set2	24D
32	20	00100000	SP	SP	SP
33	21	00100001	!	!	!
34	22	00100010	"	"	"
35	23	00100011	#	#	#
36	24	00100100	$	$	$
37	25	00100101	%	%	%
38	26	00100110	&	&	&
39	27	00100111	'	'	'
40	28	00101000	(	(	(
41	29	00101001	)	)	)
42	2A	00101010	*	*	*
43	2B	00101011	+	+	+
44	2C	00101100	,	,	,
45	2D	00101101	-	-	-
46	2E	00101110	.	.	.
47	2F	00101111	/	/	/
48	30	00110000	0	0	0
49	31	00110001	1	1	1
50	32	00110010	2	2	2
51	33	00110011	3	3	3
52	34	00110100	4	4	4
53	35	00110101	5	5	5
54	36	00110110	6	6	6
55	37	00110111	7	7	7
56	38	00111000	8	8	8
57	39	00111001	9	9	9
58	3A	00111010	:	:	:
59	3B	00111011	;	;	;
60	3C	00111100	<	<	<
61	3D	00111101	=	=	=
62	3E	00111110	>	>	>
63	3F	00111111	?	?	?

CODE CONVERSION TABLE (Continued)

Numeric			ASCII character		
			DotMax 24I/C		DotMax
Decimal	Hexadecimal	Binary	Set1	Set2	24D
64	40	01000000	@	@	@
65	41	01000001	A	A	A
66	42	01000010	B	B	B
67	43	01000011	C	C	C
68	44	01000100	D	D	D
69	45	01000101	E	E	E
70	46	01000110	F	F	F
71	47	01000111	G	G	G
72	48	01001000	H	H	H
73	49	01001001	I	I	I
74	4A	01001010	J	J	J
75	4B	01001011	K	K	K
76	4C	01001100	L	L	L
77	4D	01001101	M	M	M
78	4E	01001110	N	N	N
79	4F	01001111	O	O	O
80	50	01010000	P	P	P
81	51	01010001	Q	Q	Q
82	52	01010010	R	R	R
83	53	01010011	S	S	S
84	54	01010100	T	T	T
85	55	01010101	U	U	U
86	56	01010110	V	V	V
87	57	01010111	W	W	W
88	58	01011000	X	X	X
89	59	01011001	Y	Y	Y
90	5A	01011010	Z	Z	Z
91	5B	01011011	[	[	[
92	5C	01011100	\	\	\
93	5D	01011101	]	]	]
94	5E	01011110	^	^	^
95	5F	01011111	_	_	_

CODE CONVERSION TABLE (Continued)

Numeric			ASCII character		
Deci-	Hexa-		DotMax 24I/C		DotMax
mal	decimal	Binary	Set1	Set2	24D
96	60	01100000	`	`	`
97	61	01100001	a	a	a
98	62	01100010	b	b	b
99	63	01100011	c	c	c
100	64	01100100	d	d	d
101	65	01100101	e	e	e
102	66	01100110	f	f	f
103	67	01100111	g	g	g
104	68	01101000	h	h	h
105	69	01101001	i	ı	ı
106	6A	01101010	j	j	j
107	6B	01101011	k	k	k
108	6C	01101100	l	l	l
109	6D	01101101	m	m	m
110	6E	01101110	n	n	n
111	6F	01101111	o	o	o
112	70	01110000	p	p	p
113	71	01110001	q	q	q
114	72	01110010	r	r	r
115	73	01110011	s	s	s
116	74	01110100	t	t	t
117	75	01110101	u	u	u
118	76	01110110	v	v	v
119	77	01110111	w	w	w
120	78	01111000	x	x	x
121	79	01111001	y	y	y
122	7A	01111010	z	z	z
123	7B	01111011	{	{	{
124	7C	01111100	¦	¦	¦
125	7D	01111101	}	}	}
126	7E	01111110	~	~	~
127	7F	01111111	DEL	DEL	DEL

CODE CONVERSION TABLE (Continued)

Numeric			ASCII character		
Deci-	Hexa-		DotMax 24I/C		DotMax
mal	decimal	Binary	Set1	Set2	24D
128	80	10000000	NUL	Ç	
129	81	10000001	SOH	ü	
130	82	10000010	STX	é	
131	83	10000011	ETX	â	
132	84	10000100	EOT	ä	
133	85	10000101	ENQ	à	
134	86	10000110	ACK	å	
135	87	10000111	BEL	ç	
136	88	10001000	BS	ê	
137	89	10001001	HT	ë	
138	8A	10001010	LF	è	
139	8B	10001011	VT	ï	
140	8C	10001100	FF	î	
141	8D	10001101	CR	ì	
142	8E	10001110	SO	Ä	
143	8F	10001111	SI	Å	
144	90	10010000	DLE	É	N/A
145	91	10010001	DC1	æ	
146	92	10010010	DC2	Æ	
147	93	10010011	DC3	ô	
148	94	10010100	DC4	ö	
149	95	10010101	NAK	ò	
150	96	10010110	SYN	û	
151	97	10010111	ETB	ù	
152	98	10011000	CAN	ÿ	
153	99	10011001	EM	Ö	
154	9A	10011010	SUB	Ü	
155	9B	10011011	ESC	¢	
156	9C	10011100	FS	£	
157	9D	10011101	GS	¥	
158	9E	10011110	RS	₧	
159	9F	10011111	US	ƒ	

CODE CONVERSION TABLE (Continued)

Numeric			ASCII character		
Deci-	Hexa-		DotMax 24I/C		DotMax
mal	decimal	Binary	Set1	Set2	24D
160	A0	10100000	á	á	
161	A1	10100001	í	í	
162	A2	10100010	ó	ó	
163	A3	10100011	ú	ú	
164	A4	10100100	ñ	ñ	
165	A5	10100101	Ñ	Ñ	
166	A6	10100110	ª	ª	
167	A7	10100111	º	º	
168	A8	10101000	¿	¿	
169	A9	10101001	⌐	⌐	
170	AA	10101010	¬	¬	
171	AB	10101011	½	½	
172	AC	10101100	¼	¼	
173	AD	10101101	¡	¡	
174	AE	10101110	«	«	
175	AF	10101111	»	»	
176	B0	10110000			N/A
177	B1	10110001			
178	B2	10110010			
179	B3	10110011	─	─	
180	B4	10110100	┤	┤	
181	B5	10110101	╡	╡	
182	B6	10110110	╢	╢	
183	B7	10110111	╖	╖	
184	B8	10111000	╕	╕	
185	B9	10111001	╣	╣	
186	BA	10111010	═	═	
187	BB	10111011	╗	╗	
188	BC	10111100	╝	╝	
189	BD	10111101	╜	╜	
190	BE	10111110	╛	╛	
191	BF	10111111	┐	┐	

CODE CONVERSION TABLE (Continued)

Numeric			ASCII character		
Deci-	Hexa-		DotMax 24I/C		DotMax
mal	decimal	Binary	Set1	Set2	24D
192	C0	11000000			
193	C1	11000001			
194	C2	11000010			
195	C3	11000011			
196	C4	11000100			
197	C5	11000101			
198	C6	11000110			
199	C7	11000111			
200	C8	11001000			
201	C9	11001001			
202	CA	11001010			
203	CB	11001011			
204	CC	11001100			
205	CD	11001101			
206	CE	11001110			
207	CF	11001111			
208	D0	11010000			N/A
209	D1	11010001			
210	D2	11010010			
211	D3	11010011			
212	D4	11010100			
213	D5	11010101			
214	D6	11010110			
215	D7	11010111			
216	D8	11011000			
217	D9	11011001			
218	DA	11011010			
219	DB	11011011			
220	DC	11011100			
221	DD	11011101			
222	DE	11011110			
223	DF	11011111			

CODE CONVERSION TABLE (Continued)

Numeric			ASCII character		
Deci-	Hexa-		DotMax 24I/C		DotMax
mal	decimal	Binary	Set 1	Set 2	24D
224	E0	11100000	α	α	
225	E1	11100001	β	β	
226	E2	11100010	Γ	Γ	
227	E3	11100011	π	π	
228	E4	11100100	Σ	Σ	
229	E5	11100101	σ	σ	
230	E6	11100110	μ	μ	
231	E7	11100111	τ	τ	
232	E8	11101000	Φ	Φ	
233	E9	11101001	Θ	Θ	
234	EA	11101010	Ω	Ω	
235	EB	11101011	δ	δ	
236	EC	11101100	∞	∞	
237	ED	11101101	ø	ø	
238	EE	11101110	∈	∈	
239	EF	11101111	∩	∩	N/A
240	F0	11110000	≡	≡	
241	F1	11110001	±	±	
242	F2	11110010	≥	≥	
243	F3	11110011	≤	≤	
244	F4	11110100	⌠	⌠	
245	F5	11110101	⌡	⌡	
246	F6	11110110	÷	÷	
247	F7	11110111	≈	≈	
248	F8	11111000	°	°	
249	F9	11111001	•	•	
250	FA	11111010	·	·	
251	FB	11111011	√	√	
252	FC	11111100	n	n	
253	FD	11111101	²	²	
254	FE	11111110	■	■	
255	FF	11111111			

APPENDIX F - PAGE FORMAT

Page format is based on three factors:

Horizontal character spacing,
Vertical line spacing,
Number of lines per page.

Each of these factors can be independently controlled.

An "Index" is used to define specific movement for both horizontal character spacing and vertical line spacing. Any point on a page can be defined by a "horizontal position" and a "vertical position". Refer to Figure F-1 for the following definition of page format terms.

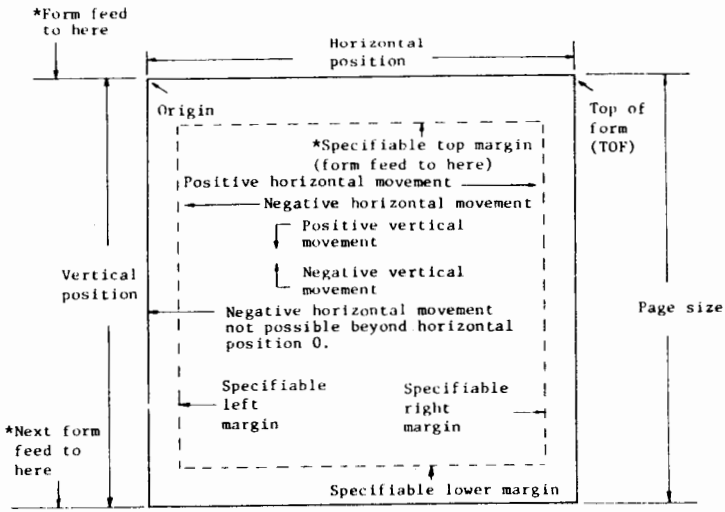


Figure F-1 Page Layout print format

Width of Print Position* = Horizontal Motion Index (HMI)

Print Position Number = $\frac{\text{Horizontal Position}}{\text{HMI}} + 1$

Print Position Tab = Horizontal Tab Positions are limited to the first 160 print positions.

Height of Line* = Vertical Motion Index (VMI)

Line Number = $\frac{\text{Vertical Position}}{\text{VMI}} + 1$

Vertical Tab = Vertical Tab Positions

Page Size = Number of lines x VMI

* Horizontal and vertical position is measured in inches.

Origin: This is the position where the carriage stops after a printer initialization (when power is turned on or after a reset). It is defined as follows:

Horizontal position 0 = Print position 1

Vertical position 0 = Top of form or print line 1.

Horizontal Motion Index (HMI): HMI specifies carriage pitch for printing of characters. You can specify character pitch in multiples of 1/120 or 1/180 inch.

When HMI is specified in multiples of 1/120 inch:

$$\text{HMI} = \frac{(n-1)}{120} \text{ inch}$$

where (n) is a value of 1 to 126

Horizontal Motion Index (HMI) (Continued)

When HMI is specified in multiples of 1/180 inch:

$$HMI = \frac{(n)}{180} \text{ inch}$$

where (n) is a value of 0 to 255.

The carriage does not move when HMI = 0.

Vertical Motion Index (VMI): VMI defines paper movement for a line feed, a negative line feed, and other paper operations. Specify line feed in multiples of 1/48 inch or 1/180 inch.

When VMI is specified as a multiple of 1/48 inch:

$$VMI = \frac{(n-1)}{48} \text{ inch}$$

where (n) is a value from 1 to 126

When VMI is specified as a multiple of 1/180 inch:

$$VMI = \frac{(n)}{180} \text{ inch}$$

where (n) is a value from 0 to 255.

The paper does not move when VMI = 0.

Absolute Horizontal Position: The horizontal distance between the present print position and the origin.

Absolute Vertical Position: The vertical distance between the current print line and the first line on the page (origin).

Print Position: The horizontal space which can contain a single printed character. The number of print positions per line is based on the HMI.

Print Position (Continued)

The leftmost print position is position 1. The print position is calculated as follows:

$$\text{Print position} = \frac{\text{Horizontal Position}}{\text{HMI}} + 1$$

Line: The vertical space which can contain a row of printed characters. The height of the line is equal to the VMI.

The line is calculated as follows:

$$\text{Line number} = \frac{\text{Vertical Position}}{\text{VMI}} + 1$$

Appendix G

Glossary of Terms

aaa text: a printer speed test text, consisting of one line of groups of 3 letter a's, each group separated by one space.

AC Line Fuse: protects the printer's power supply in case of a power overload and short circuit.

AC Power Cord: provides electricity to the printer (two prongs for power and one plug for ground).

Application Software: program that provides a solution to a particular problem such as maintaining an inventory or creating a report.

ASCII: an acronym for American Standard Code for Information Interchange, or the code sent to the printer with a unique binary number for each character.

Auto/LF: generates a line feed for each carriage return.

Baud Rate: the speed of data transmission to the printer. Applies to serial data only. Baud rate is equal to the number of bits transmitted per second.

Bidirectional Printing: the ability to print from left to right and then right to left to avoid carriage returns and increase printed output.

Bit: A bit is the smallest unit of data and has a value of 0 or 1.

Bold Print: multi-strike printing that darkens the letter without increasing the line thickness.

Buffer: storage area for incoming data.

Byte: eight bits that are considered as one symbol. Used to represent a single character such as a number, a letter, or a special control character.

Card Guide: used to help position paper; center, vertical line indicates position printer will begin to print. Horizontal lines indicate top of paper.

Carriage Return: the return of the print heads to the beginning of the next line.

Command Set: the series of print or format instructions embedded in the printer firmware, and actuated by codes sent from the host computer.

Character: any letter, number, or symbol.

Command: an instruction that tells the computer what to do. A command usually consists of words, parts of words, or codes. The computer will only respond to those commands that are accepted by the program which the computer is currently running.

Continuous Form: paper sheets or forms connected to each other. Continuous Form paper may remain loaded in the form tractors for paper handling ease.

Data: another word for information.

Default: a printer parameter that the printer returns to as "normal".

Dip Switch: "dual in-line package" switch, these switches provide the operator with control of the printing default settings.

Escape Code: a sequence of characters, beginning with ESCAPE (ESC) that make up a command to the printer.

ESD: electrostatic discharge, a condition that can cause false signals or loss of data, generally occurs as static electricity.

Font: a complete set of type in one size and style of characters.

Form Feed: a signal to the printer to advance the printer platen until the next top-of-form position is reached.

Form Length: a printer setting for the spacing between top-of-form positions measured in inches.

Format: the shape and appearance of printer output, including page size, character width and spacing, line spacing, etc.

Friction Feed: feeding of paper through the printer is accomplished by the friction between the platen and platen carriage rollers.

Interface: the connection that transfers electrical signals from one part of a system to another.

Line Spacing: the vertical spacing between lines, measured in lines per inch.

Matrix: an array of elements; in the case of printers the arrangement of the pins that form the letters through closely spaced dots.

Paper Bail Lever: a moveable bar, equipped with rollers, used to hold the paper against the platen.

Paper Edge Guide: a reference guide used to locate the left paper edge at the same place on the platen each time paper is inserted; adjustable.

Platen: the rubber roller in the printer, which provides a backing for the printing action.

Power Switch: the system's ON/OFF switch located on the front of the printer unit. This switch is labeled with the international designations 1 for ON and 0 for OFF.

Printer Port: the parallel or serial connector on the back of your computer used for communication to the printer.

Proportional Spacing: character width differs from one character to another. These characters require variable print head spacing (proportional).

Reset: a function performed by pressing the reset switch or by turning printer Off and then On again.

Shadow Print: a print enhancement created by double striking the letter, and moving the carriage 1/120" before making the second strike resulting in a broader, bolder letter.

Shannon Text: a common printer speed test represents a common relationship of letters and words in the English language. It reads: "The head and in frontal attack on the english writer that the character of this point is therefore another method for the letters that the time of whoever told the problem for an unexpected".

Top-of-Form: the very top of a page of text; the print line where paper stops after operation of the Form Feed (FF) switch (also see page 2-5).

Tractor Feed: a paper handling device for continuous forms. The tractor sprockets engage holes in the edge strip of the form, guiding and registering the paper.

This is a Quick Reference Table for the DotMax 24D Command Set.

RESET AND SENSE		See Paragraph 5-2
Function	**Set**	**Reset**
Initialize Printer	ESC SUB I	None
Reset Error	ESC SUB R	None
Request Status Byte 1	ESC SUB 1	None
Request Status Byte 3	ESC SUB 3	None
Memory Test	ESC SUB SO	None
Remote Reset	ESC CR P	None

PRINT MODE CONTROL		See Paragraph 5-3
Function	**Set**	**Reset**
Enlarged Print Mode	ESC w (SOH)	ESC w (NUL)
Shadow Print Mode	ESC W	CR, ESC & or ESC X
Bold Print Mode	ESC O	CR, ESC & or ESC X
Auto Underscore	ESC E	ESC R or ESC X
Proportional Space (PS)	ESC P	ESC Q or ESC S
Cancel Word Processing modes (except PS)	ESC X	None
Graphic Mode	ESC 3	ESC 4 or CR
Print Suppression	ESC 7	CR
Set space (HMI) to DIP switch setting	ESC S	None

HORIZONTAL MOVEMENT		See Paragraph 5-4
Function	**Set**	**Reset**
Space	SP	None
Backspace	BS	None
Backspace 1/120"	ESC BS	None
Carriage Return (CR)	CR	None
Unidirectional Print	ESC \	ESC /
Backward Print	ESC 6	ESC 5 or CR
Horizontal Motion Index to (n-1)/120 inch	ESC US (n)	By new Horizontal space command
Horizontal Motion Index to (n)/180 inch	ESC b (n)	By new Horizontal space command
Offset Select to (n)/120 inch	ESC DC1 (n)	ESC X or CR

HORIZONTAL TABBING		See Paragraph 5-5
Function	**Set**	**Reset**
Set Horizontal tab stop at current position	ESC 1	ESC 2 (Clears all tab stops)
Clear Horizontal tab stop at current position	ESC 8	ESC 8 (Clears tab individually)
Horizontal tab execution	HT	None
Absolute Horizontal tab to (n) times HMI	ESC HT (n)	None
Absolute print position	ESC $ (n2) (n1)	None

VERTICAL MOVEMENT		See Paragraph 5-6
Function	**Set**	**Reset**
Form feed	FF	None
Line Feed	LF	None
Negative Line Feed	ESC LF	None
Half Line Feed	ESC U	None
Negative Half Line Feed	ESC D	None
Line Feed of (n)/180 inch	ESC J (n)	None
Negative line Feed of (n)/180 inch	ESC j (n)	None
Vertical Motion Index of (n-1)/48 inch	ESC RS (n)	None
Vertical Motion Index of (n)/180 inch	ESC a (n)	None

VERTICAL TAB STOPS		See Paragraph 5-7
Function	**Set**	**Reset**
Vertical Tab	VT	None
Set Vertical Tab at current position	ESC -	None
Absolute Vertical Tab to line (n) times VMI	ESC VT (n)	None
Clear all Tab Stops	ESC 2	None

DotMax 24D Command Table (Continued)

PAGE FORMATTING		See Paragraph 5-8
Function	**Set**	**Reset**
Set Left Margin	ESC 9	None
Set Right Margin	ESC 0	None
Set Top Margin	ESC T	ESC C
Set Bottom Margin	ESC L	ESC C
Set Page Length	ESC FF (n)	None

INTERNATIONAL CHARACTERS		See Paragraph 5-9
Function	**Set**	**Reset**
Select International Language	ESC " (n)	None

PRIMARY/SECONDARY CHARACTER SET		See Paragraph 5-10
Function	**Set**	**Reset**
Select Primary Set	SI	None
Select Secondary Set	SO	None

BIT IMAGE GRAPHICS		See Paragraph 5-11
Function	**Set**	**Reset**
8-bit image printing at density 1/60" X 1/60"	ESC * 0 (n1) (n2)	None
8-bit image printing at density 1/180" X 1/180"	ESC * 1 (n1) (n2)	None
8-bit image printing at density 1/90" X 1/90"	ESC * 2 (n1) (n2)	None
8-bit image printing at density 3/200 X 1/60	ESC * 4 (n1) (n2)	None
24-bit image printing (3 vertical bytes) at density 1/180" X 1/180"	ESC H (n1) (n2)	None
Bit image Line Feed	ESC v	None

DotMax 24D Command Table (Continued)

FONT CONTROL AND DOWN LOAD		See Paragraph 5-12
Function	**Set**	**Reset**
Font Selection	ESC # (n)	None
Font Copy	ESC : NUL (m) (n)	None
Font Down Load (Replace)	ESC 1 (m) (Cs) (Ce) (Wi)	None

SHEET FEEDER CONTROL		See Paragraph 5-13
Function	**Set**	**Reset**
Feed sheet from Bin 1	ESC EM 1	None
Feed sheet from Bin 1	ESC I	None
Feed sheet from Bin 2	ESC EM 2	None
Feed sheet from Bin 2	ESC K	None
Feed sheet (envelope) from Bin 3	ESC EM E	None
Remove (eject) paper	ESC EM R	None
Select Bin 1	//1//	None
Select Bin 2	//2//	None
Select Bin 3	//E//	None
Select Remove (eject)	//R//	None
Select Change Bins	//C//	None

MISCELLANEOUS		See Paragraph 5-14
Function	**Set**	**Reset**
Select Printer	DC1	DC3
Sound Alarm (Bell)	BEL	None
Print "¢" (cent) symbol	ESC Y	None
Print "¬" (logical not)	ESC Z	None
Auto Carriage Return	ESC ?	ESC !
Auto centering of print	ESC =	ESC X, CR or LF
Auto justify of spaces	ESC M	ESC X, ESC R
Unidirectional print mode	ESC \	ESC /
Backward print mode	ESC 6	ESC 5 or CR
Print Suppress	ESC 7	CR
Graphics mode	ESC 3	ESC 4 or CR

This is a Quick Reference Table for the Command Set used in the DotMax 24I and 24C printers.

RESET AND SENSE		See Paragraph 6-2
Function	**Set**	**Reset**
Initialize Printer	ESC SUB I	None
Remote Reset	ESC @	None
Remote Reset	ESC CR P	None

PRINT MODE CONTROL		See Paragraph 6-3
Function	**Set**	**Reset**
Double Width Print Mode	ESC W (SOH)	ESC W (NUL)
Double Width Print Mode	ESC SO or SO	DC4, LF, FF, VT, ESC LF, ESC VT, ESC ! (n), ESC W (0), ESC J (n), ESC j (n),
Condensed Print Mode	ESC SI or SI	DC2 or ESC ! (n)
Double Strike Mode	ESC G	ESC H
Emphasized Print Mode	ESC E	ESC F
Underline	ESC - (SOH)	ESC - (NUL)
Superscript Print Mode	ESC S (NUL)	ESC T
Subscript Print Mode	ESC S (SOH)	ESC T
Italic Print Mode	ESC 4	ESC 5
Proportional Space (PS)	ESC p (SOH)	ESC p (NUL)
Various Print Modes	ESC ! (n)	ESC ! (n)

HORIZONTAL MOVEMENT		See Paragraph 6-4
Function	**Set**	**Reset**
Space	SP	None
Backspace	BS	None
Carriage Return (CR)	CR	None
Unidirectional Print	ESC U (SOH)	ESC U (NUL)
Elite Pitch (12 CPI)	ESC M	By new horizontal
Pica Pitch (10 CPI)	ESC P	space command
Horizontal Spacing to (n-1)/120 inch	ESC US (n)	By new Horizontal space command
Horizontal Spacing to (n)/180 inch	ESC h (n)	By new Horizontal space command
Character Offset	ESC DC1 (n)	ESC X or CR

HORIZONTAL TABBING		See Paragraph 6-5
Function	**Set**	**Reset**
Set Horizontal tab stops	ESC D (n1)...(nk) (NUL)	None
Horizontal tab execution	HT	None
Absolute Horizontal tab execution to (n)	ESC HT (n)	None
Absolute print position	ESC $ (n1) (n2)	None

VERTICAL MOVEMENT		See Paragraph 6-6
Function	**Set**	**Reset**
Form feed	FF	None
Line Feed	LF	None
Negative Line Feed	ESC LF	None
Line Feed of (n)/180 inch	ESC J (n)	None
Negative line Feed of (n)/180 inch	ESC j (n)	None
Line spacing to 1/8"	ESC 0	By new vertical
Line spacing to (n)/180"	ESC 3 (n)	space command
Line spacing to 7/60"	ESC 1	By new vertical
Preset line spacing to (n)/60"	ESC A (n)	space command
Set line spacing to preset	ESC 2	None

VERTICAL TAB STOPS		See Paragraph 6-7
Function	**Set**	**Reset**
Set Vertical tab stops	ESC B (n1)...(nk) (NUL)	None
Vertical tab execution	VT	None
Absolute Vertical tab to execution to line (n)	ESC VT (n)	None

DotMax 24I/24C Command Table (Continued)

PAGE FORMATTING		See Paragraph 6-8
Function	**Set**	**Reset**
Set Left Margin	ESC 1 (n)	None
Set Right Margin	ESC Q (n)	None
Set skip perforations	ESC N (n)	ESC O
Set Page Length in lines	ESC C (n) ESC FF (n)	None
Set Page Length in inches	ESC C (NUL) (n) ESC FF (NUL) (n)	None

INTERNATIONAL CHARACTERS		See Paragraph 6-9
Function	**Set**	**Reset**
Select International Language selected by (n)	ESC R (n)	None

SELECT CHARACTER SET 1 or 2		See Paragraph 6-10
Function	**Set**	**Reset**
Select Character Set 1	ESC 7	ESC 6
Select Character Set 2	ESC 6	ESC 7

BIT IMAGE GRAPHICS		See Paragraph 6-11
Function	**Set**	**Reset**
Set various Image mode	ESC * (m) (n) (n1) (n2) (Data)	None
Single density Image	ESC K (n1) (n2) (Data)	None
Double density Image	ESC L (n1) (n2) (Data)	None
Double density double speed Image	ESC Y (n1) (n2) (Data)	None
Quadruple density Image	ESC Z (n1) (n2) (Data)	None

FONT CONTROL AND DOWN LOAD		See Paragraph 6-12
Function	**Set**	**Reset**
Font Selection	ESC % (m) (n)	None
Font Copy	ESC : (NUL) (m) (n)	None
Font Down Load	ESC & (m) (Cs) (Ce) (Wi)	None

SHEET FEEDER CONTROL		See Paragraph 6-13
Function	**Set**	**Reset**
Feed sheet from Bin 1	ESC EM 1	None
Feed sheet from Bin 2	ESC EM 2	None
Feed sheet (envelope) from Bin 3	ESC EM E	None
Remove (eject) paper	ESC EM R	None
Select Bin 1	//1//	None
Select Bin 2	//2//	None
Select Bin 3	//E//	None
Select Remove (eject)	//R//	None
Select Change Bins	//C//	None

MISCELLANEOUS		See Paragraph 6-14
Function	**Set**	**Reset**
Select Printer	DC1	DC3
Sound Alarm (Bell)	BEL	None
Cancel data on print line	CAN	None
Move Print Head to home	ESC <	None
Auto justify of spaces	ESC m	ESC x
Set MSB to "0"	ESC =	ESC #
Set MSB to "1"	ESC >	ESC #
Enable Paper-End Sensor	ESC 9	ESC 8
Set Typewriter mode	ESC i (SOH)	ESC i (NUL)
DotMax 24C change color to (n) - see page 6-35	ESC r (n)	New color

DotMax 24I/24C Command Table (Continued)

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE STATEMENT

WARNING: This equipment complies with the limits for a Class B Computing Device in accordance with the specifications in Subpart J of Part 15 of the FCC Rules, which are designed to provide reasonable protection against radio and television interference in residential installations. There is, however, no guarantee that interference will not occur in any particular installation.

If equipment certified to meet Class B limits 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:

(a) Reorient the radio or television receiving antenna.
(b) Relocate the printer with respect to the receiver.
(c) Move the equipment away from the receiver.
(d) Plug the printer into a different power outlet, so the printer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. An FCC booklet, "How to Identify and Resolve Radio-TV Interference Problems," Stock No. 004-000-00345-4, is also available from the U.S. Government Printing Office, Washington, D.C. 20402.

In equipment labeled FCC Class B compliant, a shielded and grounded I/O cable is necessary to achieve compliance with the FCC Rules regarding radio emissions from computers. Please consult with your dealer for further details regarding this cable.

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