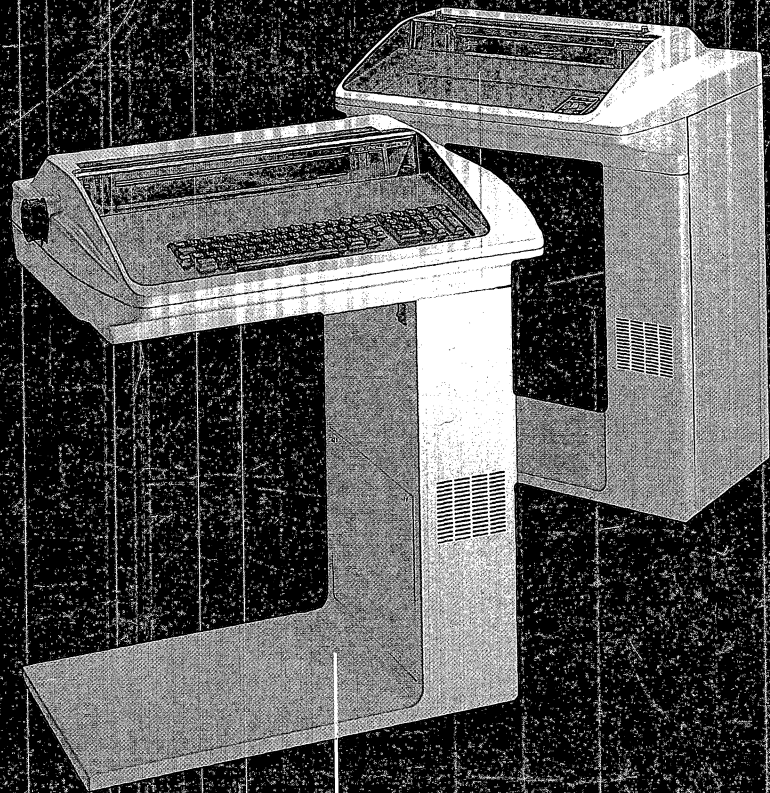


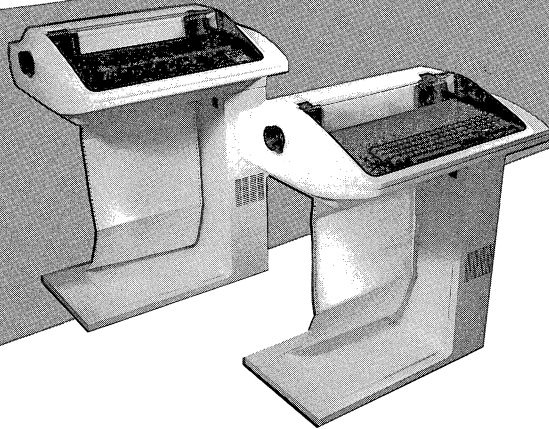
# DASHER™ LP2 AND TP2 PRINTERS

User's Manual



# TECHNICAL

# SPECIFICATIONS



## General

<b>Print Rate</b>	180 characters per second (logic seeking, bidirectional)
<b>Print Method</b>	Serial 9-wire, impact through ribbon
<b>Character Style</b>	7 x 9 dot matrix
<b>Character Size</b>	Height: 2.67mm (0.105") Width: 1.93mm (0.076") (normal width characters)
<b>Character Fonts</b>	American, British, French, German, Spanish and Swedish
<b>Paper Forms</b>	Pin-feed, fan-fold, 1 to 6 parts.  Width: 10.2cm to 38.1cm (4" to 15") Hole spacing: 1.27cm (0.5") centers (nom.) Maximum form thickness: 0.625mm (0.025") Form weight: 5.45Kg (12 lbs.) paper 3.63Kg (8 lbs.) carbon Form crimps: tab type only
<b>Ribbon</b>	Fabric ribbon, cartridge type, continuous loop.

## Mechanical

<b>Dimensions</b>	Height: 85.7cm (33.75") Depth: 53.3cm (21") Width: 67.3cm (26.5")
<b>Weight</b>	27kg (60lbs.)

## Electro-Mechanical

<b>Printhead Drive</b>	Lead screw driven by permanent magnet stepping motor
<b>Print Wire Solenoid Drive</b>	Pulse Width: 400 microseconds Actuating voltage: 48 VDC (primary) 12 VDC (secondary) Solenoid Current: 4 Amps (max.)
<b>Ribbon Drive</b>	Cable drive; bidirectional input, unidirectional output clutch box
<b>Paper Feed Drive</b>	Pin-feed tractors driven by permanent magnet stepping motor and timing belt, eight 7.5deg steps per line at 6 lines per inch spacing.

## Electrical

<b>Parallel Interface (LP2 Printers)</b>	Compatible with 8-bit line printer interfaces which include STROBE, DEMAND, and READY signals.
<b>Serial Interface (TP2 Printers)</b>	Plug compatible with either 20mA current loop or EIA RS-232C voltage interface. Available with MODEM interface.
<b>Power Requirements</b>	120, 220/240 volts ac (nom.), 47 to 63 Hz.
<b>Power Dissipation</b>	Idle: 140 Watts (typical) Running: 300 Watts (typical)
<b>Power Cable</b>	1.8m (6 ft.)
<b>External I/O Cables (max. length)</b>	Parallel interface: 7.4 meters (25 feet) Serial interface: 20mA - 457 meters (1,500 feet) EIA - 7.6 meters (50 feet)

## Environmental

<b>Temperature Ranges</b>	Operating: 10 degC to 40 degC (50 degF to 104 degF) Storage: -40 degC to 60 degC (-40 degF to 140 degF)
<b>Humidity Ranges</b>	Operating: 10% to 90% (non-condensing) Storage: 5% to 95% (non-condensing)
<b>Maximum Altitude</b>	15,250 meters (50,000 ft.)

# DASHER™ LP2 AND TP2 PRINTERS User's Manual

## PREFACE

*This manual is a guide to installing and using your DASHER™ LP2 or TP2 Printer. It covers programming, interfacing and cabling, installation, and architecture. For information about operating your printer, see the DASHER™ LP2 and TP2 Printers Operator's Manual, No. 014-000093.*

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DASHER<sup>TM</sup> LP2 AND TP2 PRINTERS

# CHAPTER I

## INTRODUCTION

### BASIC ELEMENTS

All DASHER™LP2 and TP2 printers are capable of printing at speeds of up to 180 characters per second. Printing is bidirectional and incorporates a "logic seeking" algorithm. This algorithm determines the shortest route to a character, reducing the time that would normally be spent performing unnecessary carriage returns.

The printing mechanism contains a nine-wire printhead which forms 7 x 9 dot-matrix characters. A leadscrew assembly moves the printhead to ensure precise printhead positioning. Movable, pin-feed tractors accommodate 1 to 6 part forms ranging from 4 to 15 inches in width.

The printers are equipped with either a parallel or serial interface. DASHER LP2 printers are equipped with a parallel interface which allows you to attach them to a system in place of a line printer. DASHER TP2 printers are equipped with a serial interface which allows you to attach them to an asynchronous communications line. Both EIA RS-232C or 20mA current loop connections are provided on serial interface models. In addition, these models may be used in conjunction with Bell 103, 202, and 212 compatible MODEMS.

### FEATURES AND OPTIONS

DASHER LP2 and TP2 printers include the following features:

- Horizontal and vertical tabbing
- Plotting
- Underscoring
- Elongated printing
- 6 or 8 lines/inch spacing
- Automatic form feed (option on S models)
- Down line loaded character set
- Compressed printing (option)
- Alternate character set (option)

In addition, the switch selectable view mode allows you to see the last characters printed by moving the printhead out of the way if there is a pause in printing.

You may purchase your printer with one of six international character fonts: American, British, French, German, Spanish and Swedish. The model 1192 option allows TP2 printers to have two such character fonts.

The following table lists the various models of DASHER LP2 and TP2 printers along with the available options.



### DASHER LP2 AND TP2 PRINTERS

PRINTERS		ADDITIONAL FEATURES INCLUDED (NOT COMMON TO ALL MODELS)	ADDITIONAL FEATURES AVAILABLE AS OPTIONS	
MODEL *	DESCRIPTION		MODEL *	DESCRIPTION
6073	Receive-only printer	Automatic form feed Parallel interface	--	
(S)6074	Receive-only printer	Automatic form feed Parallel interface Compressed print	--	
6075	Receive-only printer	Automatic form feed Serial interface	1192-X	Alternate Character Set
(S)6076	Receive-only printer	Automatic form feed Serial interface Compressed print	1192-X	Alternate Character Set
6077	Keyboard send receive terminal	Automatic form feed Serial interface Keyboard Numeric pad	1192-X	Alternate Character Set
(S)6078	Keyboard send receive terminal	Automatic form feed Serial interface Numeric pad Compressed print Keyboard	1192-X	Alternate Character Set
6086	Receive-only printer	Automatic form feed Parallel interface NOVA ECLIPSE programmed I O controller Paper holder	1192-X	Alternate Character Set
6087	Receive-only printer	Automatic form feed Parallel interface Compressed print NOVA ECLIPSE programmed I O controller Paper holder		
6088	Receive-only printer	Automatic form feed Parallel interface NOVA ECLIPSE data channel controller Paper holder		
6089	Receive-only printer	Automatic form feed Parallel interface Compressed print NOVA ECLIPSE data channel controller Paper holder		
S6073	Receive-only printer	Parallel interface	S1146	Quantity 5 of Automatic form feed
S6075	Receive-only printer	Serial interface	S1146	Quantity 5 of Automatic form feed
			S1192-X	Quantity 5 of 1192-x
S6077	Keyboard send/receive terminal	Serial interface Keyboard	S1146	Quantity 5 of Automatic form feed
			S1147	Quantity 5 of Numeric pad
			S1192-X	Quantity 5 of 1192-x
			1149A	Box of 12 ribbon cartridges (for all models)
			1149B	Quantity 5 of 1149A
			1149C	Quantity 50 of 1149A
			S1149A	Quantity 5 of 1149A
			1127A	Paper holder
			S1127A	Quantity 5 of 1127A

\* Model numbers with an S prefix are available to Data General Corporation's independent resellers. Consult your salesman. In ordering alternate character sets use the following designators in place of X:

A = Standard ASCII Font    D = German Character Font  
 B = UK Character Font      F = Swedish Character Font  
 C = French Character Font   G = Spanish Character Font

## Standard Features on All Models

**Horizontal Tabbing** - Allows you to set or clear horizontal tabs anywhere in the 132 character line. Any number of tabs may be set using just one escape sequence.

**Vertical Tabbing** - Allows you to move quickly to any line in your form. You can set all the vertical tabs for a form using just one escape sequence (automatic form feed option must be installed).

**Plotting** - Allows you complete control over 7 of the 9 individual print wires. The 7-bit codes received by your printer directly determine which of these seven printhead wires will fire to form a particular column. While in plot mode, there is no interline spacing so you can print continuous graphs.

**6 or 8 Lines/Inch** - Allows you to select the interline spacing you want on your form. The selection is made by a switch located on the Secondary Control Panel.

**Elongated Printing** - Allows you to print characters at twice the width of normal characters (normal = 10 characters/inch; elongated = 5 characters/inch). You can switch to elongated printing at any time for as long as you like.

**Underscoring** - Allows you to underline characters, strings, or complete lines. The underscore is printed at the same time as the character so your printer doesn't waste time scanning a line twice to fill in the underscores.

**Down Line Loaded Character Set** - Allows your system to load a character set into your printer. You may design your own character set with up to 118 printable characters.

## Optional Features

**Parallel Interface** - Allows you to connect your printer to systems equipped with a parallel ASCII line-printer interface. The parallel interface transfers 8 bits of information at a time. In addition, it sends signals which inform the system when the printer is powered-up and online as well as when the printer's buffer can accept characters.

**Serial Interface** - Allows you to connect your printer to asynchronous communications equipment. This interface transfers a serial data stream in either direction between your printer and a communications system. The interface has eight different transfer rates from 110 to 4800 baud. In addition, there are a number of jumper selectable data formats.

**NOVA/ECLIPSE Programmed I/O Controller** - Allows you to connect your printer to a Data General system previously without a line printer interface. The controller communicates with a NOVA or ECLIPSE CPU via programmed I/O instructions. It resides on a 15-inch square circuit board which plugs into any I/O slot of a NOVA or ECLIPSE computer chassis.

**NOVA/ECLIPSE Data Channel Controller** - Allows you to connect your printer to a Data General system previously without a line printer interface. The controller communicates with a NOVA or ECLIPSE CPU via the data channel. It resides on a 15-inch square circuit board which plugs into any I/O slot of a NOVA or ECLIPSE computer chassis.

**Automatic Form Feed** - Allows you to advance the paper to the top of the next form in one operation. This option must be installed if you want to use vertical tabbing. Included is the automatic perforation skip-over feature which allows you to skip the perforation between forms.

**Compressed Print** - Allows you to print 132 characters/line on 8 1/2-inch wide paper instead of 14-inch paper.

	CHARACTERS PER INCH	
	REGULAR	ELONGATED
Normal	10	5
Compressed	16.5	8.25

**Alternate Character Set** - Allows you to print characters from a second and completely independent character set. This second character set may be any one of the five international character fonts. You may switch from one character set to the other on a character by character basis.

**Ribbon Cartridges** - Replacement fabric-type, continuous-feed ribbon cartridges for use on all model printers.

**Paper Holder** - Collects and stacks fan-fold style forms from your printer.

## EXAMPLES OF PRINT SPACING

This is an example of the DASHER LP2 and TP2 printers' capabilities. The text you are reading is printed using normal width characters at 6 lines per inch vertical spacing.

This is an example of the DASHER LP2 and TP2 printers' capabilities. The text you are reading is printed using normal width characters at 8 lines per inch vertical spacing.

This is an example of the DASHER LP2 and TP2 printers' capabilities. The text you are reading is printed using elongated width characters at 6 lines per inch vertical spacing.

This is an example of the DASHER LP2 and TP2 printers' capabilities. The text you are reading is printed using elongated width characters at 8 lines per inch vertical spacing.

This is an example of the DASHER LP2 and TP2 printers' capabilities. The text you are reading is printed using compressed width characters at 6 lines per inch vertical spacing.

This is an example of the DASHER LP2 and TP2 printers' capabilities. The text you are reading is printed using compressed width characters at 8 lines per inch vertical spacing.

This is an example of the DASHER LP2 and TP2 printers' capabilities. The text you are reading is printed using elongated compressed width characters at 6 lines per inch vertical spacing.

This is an example of the DASHER LP2 and TP2 printers' capabilities. The text you are reading is printed using elongated compressed width characters at 8 lines per inch vertical spacing.

Compressed Print Underscored

Regular Print underscored

Compressed Elongated Print Underscored

Elongated Print Underscored

DG-04833

## INTERNATIONAL CHARACTER SET EXAMPLES

These are the character sets available on DASHER LP2 and TP2 printers.

THE U.S. CHARACTER SET IS:  
ABCDEFGHIJKLMNOPQRSTUVWXYZ  
abcdefghijklmnopqrstuvwxyz  
1234567890!@#%&^\*()\_+=~`^c]x|;:'"O,<.>/?

The FRENCH character set is:  
ABCDEFGHIJKLMNOPQRSTUVWXYZ  
abcdefghijklmnopqrstuvwxyz  
1234567890!a#%&^\*()\_+=~`^c]x|;:'"ee,<.>/?

The GERMAN character set is:  
ABCDEFGHIJKLMNOPQRSTUVWXYZ  
abcdefghijklmnopqrstuvwxyz  
1234567890!y#%&^\*()\_+=~`^c]x|;:'"au,<.>/?

The SWEDISH character set is:  
ABCDEFGHIJKLMNOPQRSTUVWXYZ  
abcdefghijklmnopqrstuvwxyz  
1234567890!e#%&^\*()\_+=~`^c]x|;:'"aa,<.>/?

The U.K. character set is:  
ABCDEFGHIJKLMNOPQRSTUVWXYZ  
abcdefghijklmnopqrstuvwxyz  
1234567890!@#%&^\*()\_+=~`^c]x|;:'"O,<.>/?

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# CHAPTER II

## PROGRAMMING

### INTRODUCTION

Your DASHER LP2 or TP2 printer receives information from a computer or communications line. DASHER TP2 Printers can transmit as well as receive information. This information is represented by 7-bit ASCII codes. The 128 characters in the standard ASCII set consist of 96 upper and lower case alphanumeric, punctuation, and graphic characters as well as 32 control codes. If your printer receives an alphanumeric code, it prints the corresponding character. If it receives a valid control code, it performs the specific function defined by the code. If, however, your printer receives one of the control codes it does not use, it ignores that code.

### CODE RECEPTION

Your printer can store up to 3000 characters in its buffer. Characters enter the buffer from either a parallel interface (DASHER LP2 Printers) or a serial interface (DASHER TP2 Printers). Both types of interfaces are able to signal the computer or communications system that the buffer is full.

The parallel interface controls a special hardware signal which tells the computer system when there is room in the buffer for a character. This is consistent with most line printer interfaces. As a result, the programmer need not worry about overflowing the buffer when programming a DASHER LP2 printer.

The serial interface is equipped with a number of methods of preventing the buffer from overflowing. It can tell the communications system to stop transmitting data via a hardware signal (for local connections), by transmitting special control characters (full duplex), or by transmitting a break code (MODEMs only). Chapter III discusses how these particular methods are used.

While receiving codes, the printer scans those codes already in the buffer to determine the fastest way to print each line. If the buffer becomes filled, the printer uses one of the methods discussed above to stop the system from transmitting codes. As soon as there is room in the buffer, the printer can accept additional codes.

Your printer responds to three types of information:

- Printing Character Codes - which result in a character being printed.
- Control Codes - single codes which control special functions.
- Escape Sequences - sequences of codes (beginning with an escape) which control certain functions.

The table in Appendix A provides a concise summary of the ASCII codes, their octal and decimal values, and how a DASHER LP2 or TP2 printer responds to them.

### Printing Character Codes

The printing characters include all the upper and lower case alphanumeric characters as well as graphic, punctuation, and space characters. Up to 132 characters may be printed on each line. If more than 132 characters are received without a line terminator, they are not printed. Newlines (012<sub>8</sub>), Vertical Tabs (013<sub>8</sub>), Form Feeds (014<sub>8</sub>), and Carriage Returns (015<sub>8</sub>) are all considered line terminators.

## Control Codes

Your printer recognizes a number of control codes it receives as commands to perform specific operations. In addition to recognizing control codes, DASHER TP2 printers can transmit a number of control codes. The control codes and their effects are listed in the accompanying table.

### DASHER LP2 AND TP2 PRINTER CONTROL CODES

NAME	MNEMONIC	CONTROL CODE (OCTAL)	EFFECT
(Codes received)			
Bell	BEL	0 0 7	Sounds audible tone.
Back Space	BS	0 1 0	Print head moves back one character position. <b>(Only when online)</b>
Horizontal Tab	HT	0 1 1	Print head moves to next horizontal tab stop. If no tab is set, the command is ignored.
Newline (Line Feed)	NL	0 1 2	Terminates the present line, advances the paper one line, and either: <ul style="list-style-type: none"> <li>a) determines the fastest way to print the next line (if it is complete), or</li> <li>b) performs a carriage return and prints any characters from left to right.</li> </ul>
Vertical Tab	VT	0 1 3	Paper advances to next tab stop. If no tab is set, the command is ignored.
Form Feed	FF	0 1 4	Paper advances to the top of the next form. If the automatic form feed option is not installed, the command is ignored.
Carriage Return	CR	0 1 5	Carriage returns to the left-hand margin.
Shift Out	SO	0 1 6	<b>Selects alternate character set. (Model 1192 Option)</b>
Shift In	SI	0 1 7	<b>Selects standard character set.</b>
Escape	ESC	0 3 3	Denotes the beginning of a command sequence.
(Codes transmitted)*			
Device Code 1	DC1	0 2 1	** Indicates that the character buffer has room for more characters.
Device Code 3	DC3	0 2 3	** Indicates that the character buffer is full.

\* On DASHER TP2 printers only.

\*\* When jumpered (see Chapter IV, Installation).

## Escape Sequences

A number of functions on your printer may be controlled by special sequences of codes called escape sequences.

- Horizontal and vertical tabbing
- Elongated characters
- Underscoring
- Plotting
- Resetting the printer
- Compressed printing (option)
- Down line loading a character set

An Escape code ( $033_8$ ), if enabled, defines the beginning of these sequences while subsequent codes define the particular function to be performed. If no valid code follows the Escape code (or an option is not installed), the Escape code is ignored and subsequent codes produce the standard effect. If the Escape disable switch on the secondary control panel is in the disable position, all escape codes are ignored and subsequent codes are printed.

### Horizontal Tabs

You may set a horizontal tab anywhere from the second to the last (132nd) character position. The printhead advances to the next horizontal tab stop following the reception of a Horizontal Tab (CTRL-I) control code ( $011_8$ ) and at least one printing character code. If you haven't set any horizontal tabs and CTRL-I is received, the command has no effect. The following escape sequences set and clear horizontal tabs:

ESCAPE SEQUENCE (OCTAL CODES)	EFFECT ON PRINTER
ESC 1 (033 061)	Sets a horizontal tab at the current printhead position.
ESC 2 (033 062)	Clears a horizontal tab from the current printhead position.
ESC E # # ... NULL (033 105 # ... 000)	Sets horizontal tabs at each character position specified by an octal number (#). A tab may be set anywhere from the second character position ( $\# = 002_8$ ) to the last character position ( $\# = 204_8 = 132_{10}$ )*. All previously set horizontal tabs are cleared.
ESC E NULL (033 105 000)	Clears all horizontal tabs.

\* See Appendix A for decimal/octal equivalents.

Note: If your computer or communications system only supplies 7 data bits to the printer, you should use the ESC 1 sequence to set horizontal tabs. The ESC E sequence will only be able to set tabs to the 128th column position.

### Vertical Tabs (Option on S Models)

The automatic form feed option (if installed in your printer) provides vertical tabbing. You may set a vertical tab anywhere from one line after the top of a form to the line preceding the top of the next form. The automatic form feed option keeps track of the number of lines per form and your present line position. However, if you have Perforation Skip-over enabled (see the "Operator's Manual"), you must remember that you have, in effect, fewer lines per form.

When a printer equipped with the automatic form feed option receives a Vertical Tab (CTRL-K) control code ( $013_8$ ), it advances the paper to the beginning of the next line on which a vertical tab is set. If no vertical tab is set between the current line position and the top of the next form, the Vertical Tab code acts like a Carriage Return. The escape sequences described below set and clear vertical tabs. Vertical tabs may only be set or cleared immediately after a line terminator - i.e., Newline ( $012_8$ ), Vertical Tab ( $013_8$ ), Form Feed ( $014_8$ ), or Carriage Return ( $015_8$ ).

ESCAPE SEQUENCE (OCTAL CODE)	EFFECT ON PRINTER
ESC 5 (033 065)	Sets a vertical tab at the current line position.
ESC 6 (033 066)	Clears a vertical tab from the current line position.
ESC F # # ... NULL (033 106 # # ... 000)	Sets a vertical tab at the positions specified by the octal numbers (#). These numbers may be anywhere from 1 to the maximum line length of the form you are using (no form can be more than 99 lines long). All previously set vertical tabs are cleared.
ESC F NULL (033 106 000)	Clears all vertical tabs.

## Elongated Printing

You can print elongated (double width) characters in either the normal mode or the compressed mode. Elongated characters may be selected anywhere within a line. However, they are printed at a slower speed (24 cps). You should note that only 66 elongated characters will fit on a regular 132-character line. You can mix normal and elongated characters in a single line, but you must keep in mind that elongated characters are twice the width of normal characters. The escape sequences which control this feature are given below:

ESCAPE SEQUENCE (OCTAL CODE)	EFFECT ON PRINTER
ESC < (033 074)	Selects elongated printing for subsequent characters.
ESC = (033 075)	Deselects elongated printing.

## Underscoring

You may underscore characters, words, or complete lines by turning the underscore feature on and off. The underscore is printed at the same time as the character. Normal width and elongated characters may be underscored in both the Normal and the Compressed printing modes. You select and disable underscoring as follows:

ESCAPE SEQUENCE (OCTAL CODE)	EFFECT ON PRINTER
ESC a (033 141)	Starts underscoring. Subsequent print positions are underscored until the command sequence turning off the feature is received.
ESC b (033 142)	Stops underscoring. Subsequent print positions are not underscored.

## Plotting

See Plotting Page II-5.

## Resetting the Printer (Master Reset)

A software Master Reset (ESC c; 033<sub>g</sub> 143<sub>g</sub>) allows you to reset and reinitialize your printer according to the settings of the secondary control panel. In addition, it clears the character buffer, clears any horizontal or vertical tabs, turns off underscoring and turns off elongated printing.

## Compressed Printing (Option)

If your printer is equipped with the compressed printing option, you can print either normal or compressed width characters. While in normal mode, you can print 132 normal width characters on regular 132-column paper. In compressed mode, you can print 132 compressed characters on 80-column paper. However, you may issue the escape sequences to change the print mode only after a line terminator, i.e., Newline (012<sub>g</sub>), Vertical Tab (013<sub>g</sub>), Form Feed (014<sub>g</sub>), or Carriage Return (015<sub>g</sub>). Both escape sequences are ignored unless they are issued at the proper time. These escape sequences are given below:

ESCAPE SEQUENCE (OCTAL CODE)	EFFECT ON PRINTER
ESC > (033 076)	Switches the printer from normal printing to the compressed printing mode.
ESC ? (033 077)	Switches the printer back from the compressed printing mode to normal mode.

## Down Line Loaded Character Set

See Down Line Loading A Character Set Page II-7.

## PLOTTING

Plotting is a standard feature on all model printers. In plot mode, 7 of the printhead's 9 firing wires, (the bottom 7 wires) are under the user's direct control. The seven wires print in vertical columns. Each column is printed separately. Your printer plots from left to right at 172 columns per second. You may plot up to 1320 columns per line.

To plot, you enter plot mode and send a 7-bit code (from 0 - 177) to your printer. Instead of interpreting these 7-bits as an ASCII code and printing the corresponding 7-column character, the printer interprets the code as a command to print one column. Each bit of the code determines if a particular wire will be fired. The relationship between a seven bit code and the printhead wires which are fired is shown in the accompanying illustration. A "1" in a bit position fires the corresponding print-wire.

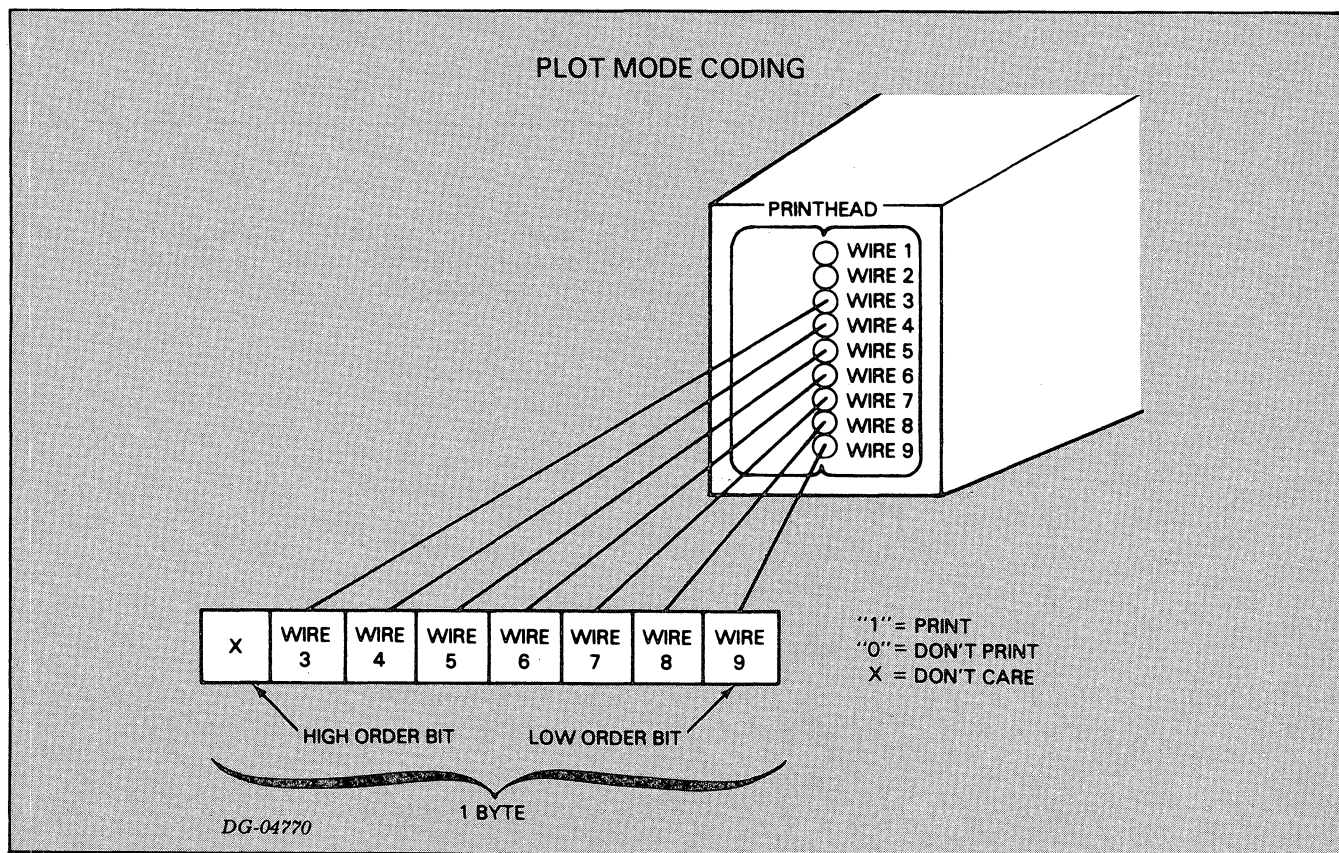
You enter plot mode by issuing a line terminator, i.e., Newline (012<sub>g</sub>), Vertical Tab (013<sub>g</sub>), Form Feed (014<sub>g</sub>), or Carriage Return (015<sub>g</sub>), followed by ESCape d (033<sub>g</sub> 144<sub>g</sub>). This escape sequence must be issued after a line terminator; otherwise it will be ignored. After entering plot mode, you

issue the series of 7-bit codes which define the columns you wish to plot. These columns WILL NOT be plotted until after you terminate the current line. To terminate a line, you must deselect plot mode (issue an ESC e: 033<sub>8</sub>, 145<sub>8</sub>) and issue a line terminator. If the next line is to be plotted, issue a Newline (012<sub>8</sub>) immediately after deselecting plot mode. The printer will produce a line feed with NO interline spacing. However, inserting any code between the plot deselect sequence and the Newline code causes the printer to produce normal (6 or 8 lpi) interline spacing. To plot another line, enter plot mode, issue the codes to be plotted, exit plot mode, and issue a line terminator.

You may plot any code except the ASCII code for ESCape (033<sub>8</sub>). This code can only be used in the sequence which deselects plot mode. Do not issue any other escape sequences while the printer is in plot mode.

If you are in normal mode when you enter plot mode, the printer plots with the same spacing between columns as normal width characters. However, if you are in compressed mode, the printer plots with the same spacing as compressed characters.

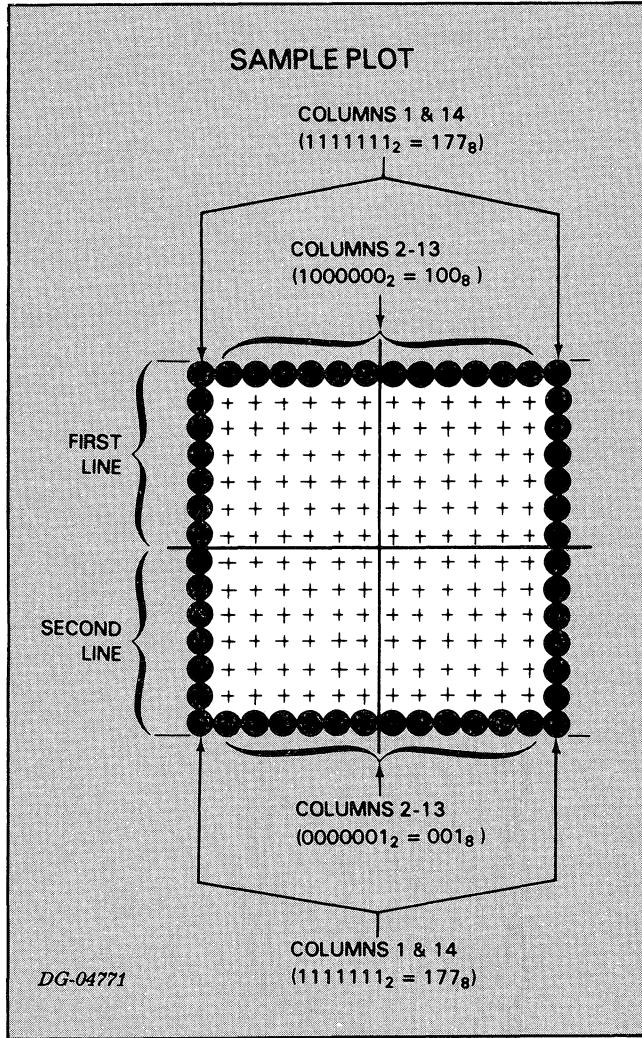
ESCAPE SEQUENCE (Octal Code)	EFFECT ON PRINTER
ESC d 033 144	Selects plot mode.
ESC e (033 145)	Deselects plot mode.





## An Example

Suppose you wanted to plot a 14 by 14 dot matrix square at the left hand margin. You must determine the codes you need and the order in which to send them. The codes for the square we want to make are shown below.



The sequence you would use to plot this square is:

OCTAL CODE	EFFECT
012	Newline
033	Enter plot
144	mode
177	Prints column 1, first line
100 (12 times)	Prints columns 2-13, first line
177	Prints column 14, first line
033	Exit
145	Plot Mode
012	Newline
033	Enter
144	Plot Mode
177	Prints column 1, second line
001 (12 times)	Prints columns 2-13, second line
177	Prints column 14, second line
033	Exit Plot
145	Mode
012	Newline

The image which results from this plot sequence is more of a rectangle than a square because successive horizontal print positions overlap.

## DOWN-LINE-LOADING A CHARACTER SET

Your DASHER LP2 and TP2 printers allow you to define your own character set. You can define a character set which prints up to 118 7 x 9 dot matrix characters. Once you have defined each character in your character set, you load the set into a printer's memory via an escape sequence. Two additional escape sequences allow you to select and deselect the character set.

The Down-Line-Load Character Set feature is very handy if you want to design your own character set or if you must be able to print in a number of different character fonts. When the printer is powered down or a Master Reset is performed, a down-line-loaded character set must be reloaded.

**NOTE** *Your computer or communications system must be set up to transmit 8 data bits at a time in order to down line load and select a character set.*

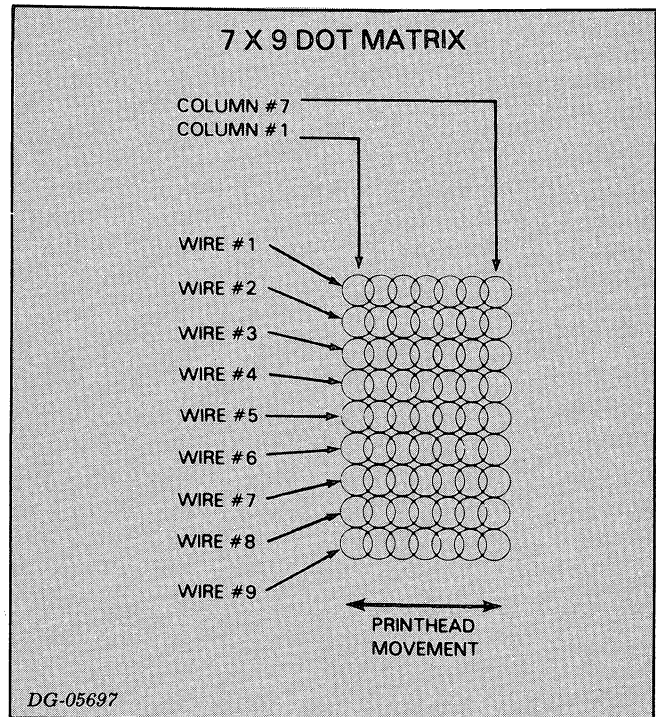
### Character Sets

Your printer accepts up to 127 different 7 bit character codes. By convention, the first 32 codes (0-40<sub>8</sub>) are control codes which do not print any characters. The remaining 95 characters (40<sub>8</sub> - 176<sub>8</sub>) are printing characters.

When you down line load a character set, you may define any printing character except for control codes which perform specific functions on LP2 and TP2 printers. These codes include 7<sub>8</sub> - 17<sub>8</sub>, and 33<sub>8</sub>. The functions of these codes are summarized in the table entitled DASHER LP2 and TP2 Printer Control Codes (page II-2). Therefore, a down line loaded character set can define 118 individual characters. The codes for which characters may be defined include 0 - 7<sub>8</sub>, 20<sub>8</sub> - 32<sub>8</sub>, and 34<sub>8</sub> - 176<sub>8</sub>.

## Defining A Character Set

Each character in a character set is defined using a 7 x 9 dot matrix. The following diagram shows the relative print-wire locations and column positions available to form one character. Information on how characters are actually printed may be found in Chapter V.



You select the dots to be printed via the seven 9-bit firing codes. A "1" in the firing code indicates that the corresponding wire will be fired when that column is printed. A "0" in the firing code indicates that the corresponding wire will not be fired. The one restriction in selecting firing codes is that print wires may not be consecutively fired (i.e., the same bit may not be a "1" in two successive firing codes).

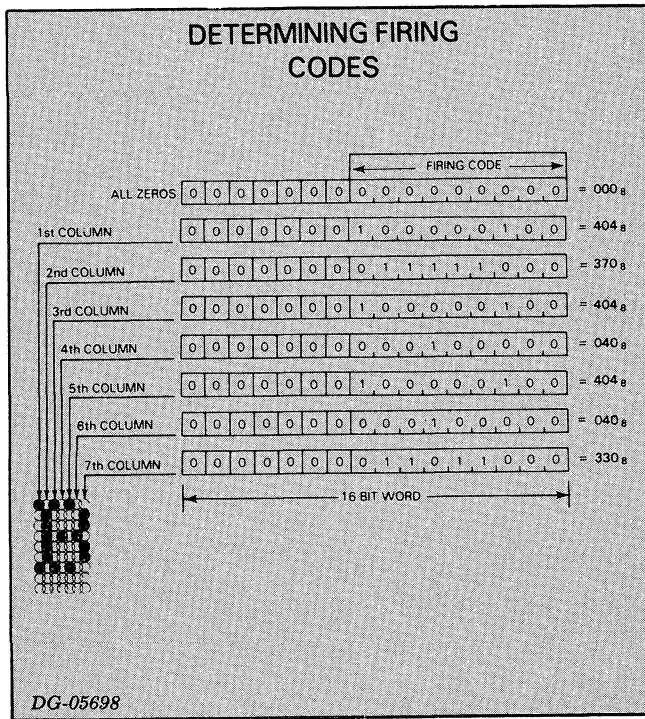
Once the firing codes for a character are determined, they must be put into a format which allows them to be loaded into the printer. The printer uses eight memory locations to store one character. The first memory location MUST contain all zeros. The following seven memory locations each contain one 9-bit firing code that determines which of the 9 wires in the printhead will fire to form one column of a character. A character's firing codes are ordered in memory with the first column in the lowest memory location and the seventh column seven locations above the first. For example, the firing codes for the character "B" would be organized as shown in the following diagram:

Since each character requires eight memory locations, the total amount of memory space used in the printer is equal to eight times the number of characters in your character set. A character set can be anywhere from one character to 128 characters long. However, remember that 9 of these codes cannot be printed.

### Loading A Character Set

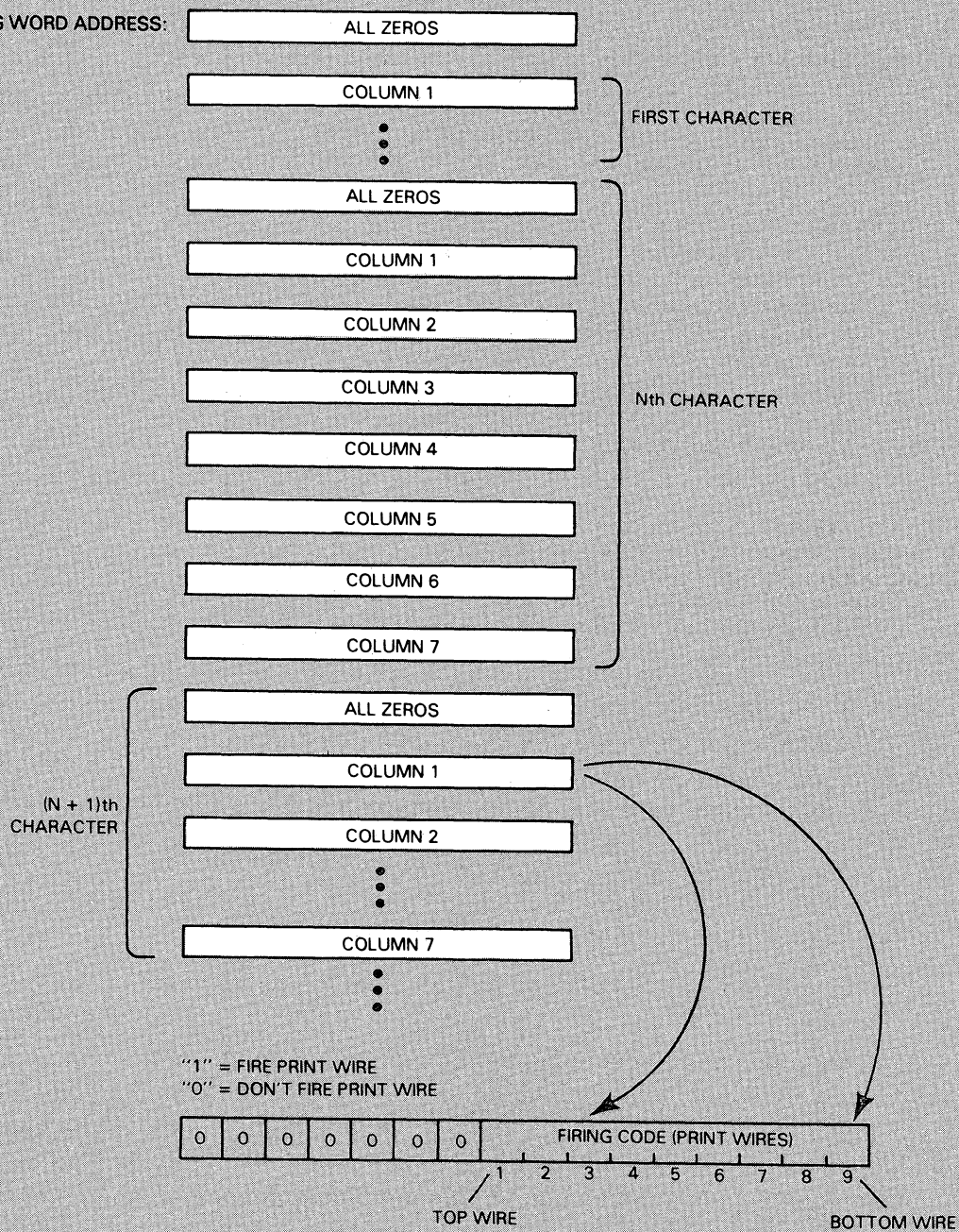
Your printer contains a 2,000 16-bit word memory. The memory locations in which a character set may be loaded range from  $2000_8$  -  $3770_8$ . The locations specified by this range can store exactly 127 characters.

The fifteen bit address of the location in the printer's memory where a character set will begin loading is called the Starting Word Address. (This address must be between  $2000_8$  and  $3770_8$ .) A character set is loaded into a printer's memory, sequentially, from the Starting Word Address as shown in the following diagram:



### CHARACTER SET ORGANIZATION IN MEMORY

STARTING WORD ADDRESS:



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You load a character set into a DASHER LP2 or TP2 printer via an escape sequence. In addition to the data containing the character set's firing codes, the escape sequence transfers the following information:

- **Byte Count** - specifying the number of bytes that are being transferred. The Byte Count is twice the number of words needed to store the character set.  

$$\text{Byte Count} = \text{Number of Characters} \times 8 \text{ words per character} \times 2 \text{ bytes per word}$$
- **Starting Byte Address** - specifying the location in the printer's memory where the first character in the character set will start loading. The Starting Byte Address is twice the Starting Word Address (16-bit address) where loading begins.
- **Negated Checksum** - a number used by the printer at the end of the load sequence to determine if any data errors occurred during the load.

The one byte Negated Checksum is obtained by summing all the data bytes, ignoring any carry, and taking the 2's complement of that sum. This sum does not include the Byte Count or the Starting Byte Address, just the bytes containing the firing codes.

You must transmit data to a printer one byte (8-bits) at a time. You cannot load a character set if you have a DASHER TP2 printer with a serial interface set up to receive only 7 data bits at a time. The following table gives the escape sequence for loading a character set into an LP2 or TP2 printer.

### CHARACTER SET LOADING ESCAPE SEQUENCE

ESCAPE SEQUENCE	OCTAL VALUE	NUMBER OF BYTES
ESCape	033	1 BYTE
Y	131	1 BYTE
BYTE COUNT	---	2 BYTES
STARTING BYTE ADDRESS	---	2 BYTES
DATA	---	2 BYTES
DATA	---	2 BYTES
DATA	---	2 BYTES
NEGATED CHECKSUM	---	1 BYTE

Since the printer can only receive 8-bits at a time, the firing codes, the byte count, and the starting byte address (which are in a 16-bit format) must be divided into bytes before they are transmitted to the printer. A left-hand byte is always transmitted before a right-hand byte.

#### An Example

Suppose you want to load a printer with a character set consisting of one character, the character "B". Proceed as follows:

- 1) Determine a starting address for the load. We will use 2000<sub>8</sub>.

$$\text{Starting Word Address} = 2000_8$$

- 2) Calculate the Starting Byte Address.

$$\begin{aligned} \text{Starting Byte Address} &= 2 \times \text{Starting Word Address} \\ &= 2 \times 2000_8 \\ &= 4000_8 \quad \text{right byte} \\ &= \underline{0\ 000\ 100\ 000\ 000\ 000}_2 \\ &\quad \text{left byte} \end{aligned}$$

Divide this into two bytes, left hand byte first: 010<sub>8</sub>  
000<sub>8</sub>



3) Calculate the Byte Count.

$$\begin{aligned}
 \text{Byte Count} &= \text{Number of Characters} \times 8 \text{ words per character} \times 2 \text{ bytes per word} \\
 &= 1 \times 8 \times 2 \\
 &= 16_{10} \\
 &= 20_8 \quad \text{right byte} \\
 &= \underbrace{0000000}_{\text{left byte}} \underbrace{000010000}_2
 \end{aligned}$$

Divide this into two bytes, left-hand byte first:  $000_8$   
 $020_8$

4) Determine the data bytes and the Negated Checksum.

From the illustration "Firing Codes for the Character B" we know the 16-bit firing codes. These are broken into bytes, left-hand byte first. The 2's complement of the sum of these bytes forms the checksum byte.

16-bit code (octal)	8-bit code (octal)	byte sum
00000	000	000
	000	+001
00404	001	001
	004	+004
00370	000	005
	370	+370
00404	001	375
	004	+001
00040	000	376
	040	+004
00404	001	402
	004	+040
00040	000	442
	040	+001
00330	000	443
	330	+004
		447
		+040
		507
		+330
		sum = 1037
		sum (8-bits) = 037
		Negated Checksum (2's complement) = 341

Therefore, the Down-Line-Load sequence for the character set is:

- 033 Escape Sequence for Down-Line-Load initiation 131
- 000 Byte Count 020
- 010 Starting Byte Address 000
- 000 Firing Codes for a "B"
  - 000
  - 001
  - 004
  - 000
  - 370
  - 001
  - 004
  - 000
  - 040
  - 001
  - 004
  - 000
  - 040
  - 001
  - 004
  - 000
  - 040
  - 000
  - 330
- 341 Negated Checksum

Selecting Your Character Set

A down-line-loaded character set is selected and deselected via escape sequences. These escape sequences are given below:

DOWN-LINE-LOAD CHARACTER SET SELECT /DESELECT

ESCAPE SEQUENCE (OCTAL)	FUNCTION
ESC N SCSA (033 116 --- ---)	SELECTS A DOWN-LINE-LOADED CHARACTER SET GIVEN A STARTING CHARACTER SET ADDRESS (SCSA). THE SCSA IS A 15-BIT OR TWO BYTE ADDRESS.
ESC 0 (033 117)	DESELECTS A DOWN-LINE-LOADED CHARACTER SET.

The value used for the Starting Character Set Address (SCSA) depends on how you have defined your character set. If you have defined a character set which begins with a character for  $0_8$ , then the Starting Character Set Address is equal to the Starting Word Address previously described. However, if you have loaded a subset of a possible 128 characters (118 printing characters) where the first character is not  $0_8$ , then the SCSA must be adjusted. In this case, the SCSA may be calculated in decimal as follows:

$$\text{Starting Character Set Address} = \text{Starting Word Address} - \text{First Character Code Loaded} \times 10_8$$

### Example Continued

In order to select the character set containing the character "B" (previously described), you must determine which character code should cause the printer to respond with a "B". If  $000_8$  should generate a "B", then the Starting Character Set Address would be calculated as follows:

$$\begin{aligned}
 \text{Starting Character Set Address} &= \text{Starting Word Address} - \text{First Character Code Loaded} \times 8 \\
 &= 2000_8 - (000_8 \times 8) \\
 &= 2000_8 \\
 &= \begin{array}{c} \text{right byte} \\ \underline{0\ 000\ 010\ 000\ 000\ 000}_2 \\ \text{left byte} \end{array}
 \end{aligned}$$

Divide this into two bytes, left-hand byte first:  $002_8$   
 $000_8$

Therefore, you would use the following escape sequence (octal) to select the character set;

033 Down-Line-Load  
116 Character Set Select

002 Starting Character  
000 Set Address

However, if a  $040_8$  code issued to the printer should generate a "b", then you calculate the Starting Character Set Address as follows:

$$\begin{aligned}
 \text{Starting Character Set Address} &= \text{Starting Word Address} - \text{First Character Code Loaded} \times 10_8 \\
 &= 2000_8 - (40_8 \times 10_8) \\
 &= 2000_8 - 400_8 \\
 &= 1400_8 \\
 &= \begin{array}{c} \text{right byte} \\ \underline{0\ 000\ 001\ 100\ 000\ 000} \\ \text{left byte} \end{array}
 \end{aligned}$$

Divide this into two bytes, left-hand byte first:  $003_8$   
 $000_8$

In this case, you would use the following escape sequence to select the character set:

033 Down-Line-Load  
116 Character Set Select

003 Starting Character  
000 Set Address

## SUMMARY OF PROGRAMMING RULES

The following escape sequences may be issued anywhere within a line:

- Horizontal tab set or clear at current printhead position
- Underscore on or off
- Elongated character(s) select or deselect
- Alternate character set select or deselect (if installed).

The following escape sequences may only be issued after a line terminator (Newline, Vertical Tab, Form Feed, or Carriage Return):

- Horizontal setting and clearing of multiple tabs.
- Vertical tab set or clear
- Plot mode enter
- Compressed print select or deselect
- Down line character set load and select

The number of normal width characters plus twice the number of elongated characters within a line must not exceed 132.

# CHAPTER III

## INTERFACING AND CABLING

### LP2-TP2 INTERFACING

Your DASHER LP2 or TP2 printer is equipped with either a parallel interface or a serial interface. The parallel interface is available on DASHER LP2 receive-only printers. The serial interface is available on DASHER TP2 receive-only and keyboard-send-receive printers.

#### Parallel Interface

You may connect a DASHER LP2 printer equipped with a parallel interface to any system containing a 7 or 8-bit line printer port. This interface requires eight data lines and a STROBE line from the computer. In addition, a DEMAND line tells the computer when the printer wants another character while a READY line notifies the system when the printer is powered up and online. The electrical and timing requirements for this interface are given below:

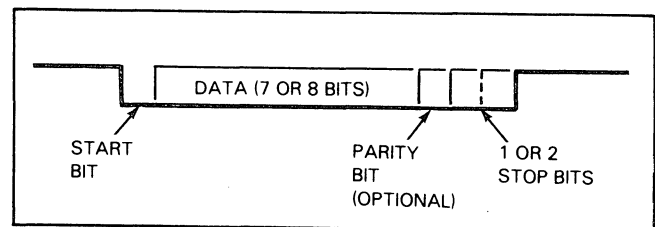
#### PARALLEL INTERFACE REQUIREMENTS

SIGNAL	CHARACTERISTICS *
Data Lines	High = a logical 1. Low = a logical 0.
STROBE	Duration: 0.5 - 10 $\mu$ s Data lines are sampled on falling edge of STROBE.
DEMAND	High = Requesting Data Low = Busy
READY	High = Printer powered up and ON LINE. Low = Printer NOT READY.

\* High = 2.4 - 5.0 Volts  
Low = 0.0 - 0.4 Volts

#### Serial Interface

You may connect a DASHER TP2 printer equipped with a serial interface to a communications system via either 20mA current loop or EIA RS-232C connections. The interface receives and transmits data in serial data bursts which consist of a start bit, 7 or 8 data bits, an optional parity bit, and 1 or 2 stop bits. You select the particular data format via jumpers (see Chapter IV, Tailoring the Options PC Board).



The electrical requirements for current loop connections are given in the following table:

	TERMINAL TRANSMITTING	TERMINAL RECEIVING
MARK SENSE	V max = 40V I max = 40mA	V max = 40V
SPACE SENSE	I = 10 - 60mA	I < 5mA

## Local Copy

You can configure your DASHER TP2 terminal for local copy communication. Normally, your terminal prints characters only when received from the communications line. In local copy mode, it prints characters received from the communications line as well as characters generated by the keyboard (a character is transmitted to the communication system at the same time it is printed). This feature allows the system designer to cut down on communication overhead since the software does not have to "echo" each character to the printer.

## Printer Busy Signal

Under normal circumstances, you can operate a DASHER TP2 printer at 1200 baud without the use of a busy signal. However, if your printer receives a large number of mechanical operations (e.g., Newlines) or escape sequences at 1200 baud, or it is set up to receive data at a higher baud rate, you should use a busy signal.

The function of a busy signal is to tell the transmitting device to stop sending data so that the printer's character buffer does not overflow (i.e., lose data). The DASHER TP2 printer's serial interface has two different methods for telling the transmitting device to stop sending information.

The first method uses a hardware busy signal provided in both EIA and current loop configurations. This method is designed for use with local connections to a processor (i.e., not through a MODEM). The signal is labeled RTS on the EIA connector (J29) and BUSY and -BUSY on the Current Loop connector (J28).

If the hardware busy signal is asserted, the BUSY signal is driven low. This notifies the controller that it should stop sending data because the buffer is nearly full. After the printer's buffer reaches half empty, the BUSY signal is driven high. This notifies the controller that it can resume transmitting data.

The second method, called X/ON X/OFF, requires your printer to transmit one of two codes to the transmitting device, telling it to start or stop sending data. A DC3 (023<sub>g</sub>) control code is transmitted when the buffer is nearly full while a DC1 control code (021<sub>g</sub>) is transmitted when the buffer is empty. This method requires a full duplex connection with the proper software handler at the processor end of the communications line. Communication may or may not be through a MODEM.

## MODEM Control Signals

The serial interface supports Bell model 103, 202, and 212 compatible asynchronous MODEMs. The signals used by DASHER TP2 printers and their functions are given below:

SIGNAL	TYPE	FUNCTION
Transmit data	EIA or Current Loop	Carries data transmitted by the DASHER TP2 printer.
Receive data	EIA or Current Loop	Carries data received by the DASHER TP2 printer.
Data Set Ready	EIA	Input to printer. When high, indicates that the MODEM is powered-up, ready, and that a call has been received.
Data Terminal Ready	EIA	Output from printer. When high, indicates that the printer is powered up, ready, and aware that the MODEM is ready.
Request To Send	EIA	Output from printer. When low, indicates to the MODEM that the printer would like to transmit some data.
Clear To Send	EIA	Input to printer. When high, indicates that the MODEM is ready to transmit data it receives from the printer.

If you are operating at a rate above 1200 baud, you should use a full duplex MODEM along with the software "busy" control codes mentioned above. The auto-answer/auto-disconnect feature may be enabled or disabled at your discretion. When disabled, Data Terminal Ready remains high at all times.

## Auto-answer/Auto-disconnect Feature

Your printer's serial interface supports MODEMs capable of automatically answering incoming calls. However, if the printer does not receive any data for 30 seconds, it automatically directs the MODEM to go on-hook (i.e., hang-up). This protects you against wrong numbers and bad connections. During normal communication, the auto-disconnect feature protects against bad or lost data by placing the MODEM on-hook if no data is received for 30 seconds or more.

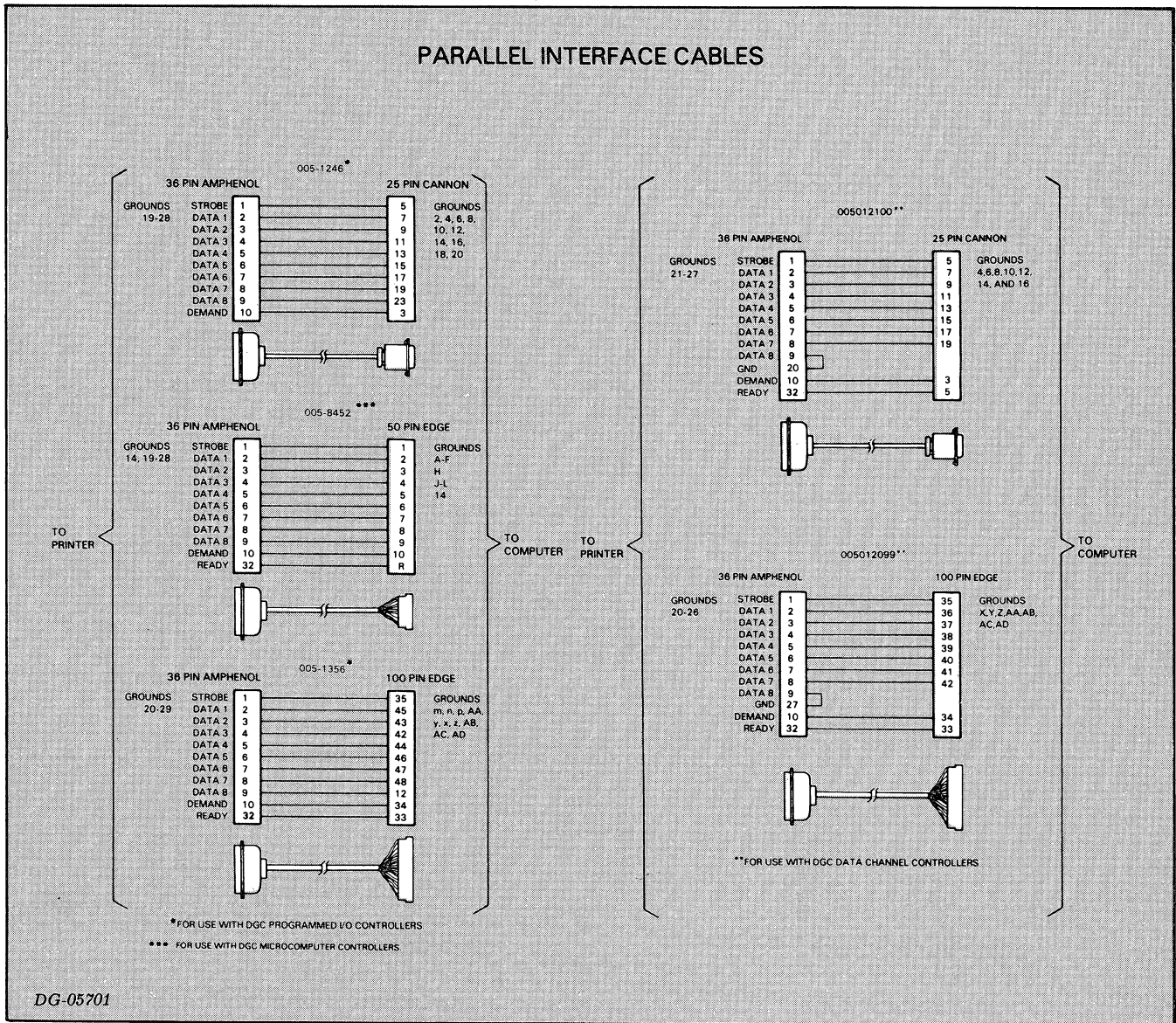
The MODEM alerts the terminal to a call by placing Data Set Ready low. The printer, if ready, responds by placing Data Terminal Ready high. At this point, data received on the Receive data line will be printed. The printer places the MODEM on-hook by allowing Data Terminal Ready to go low.

# CABLING

You connect your printer to a computer or communications system using an I/O adapter cable. The various cables available are described below.

## Parallel Interface I/O Cables

Five I/O adapter cables are available for 6073 and 6074 model printers. Each cable is attached to the printer by a 36-pin Amphenol connector, 25-pin Cannon connector, a 50-pin edge connector, or a 100-pin edge connector.

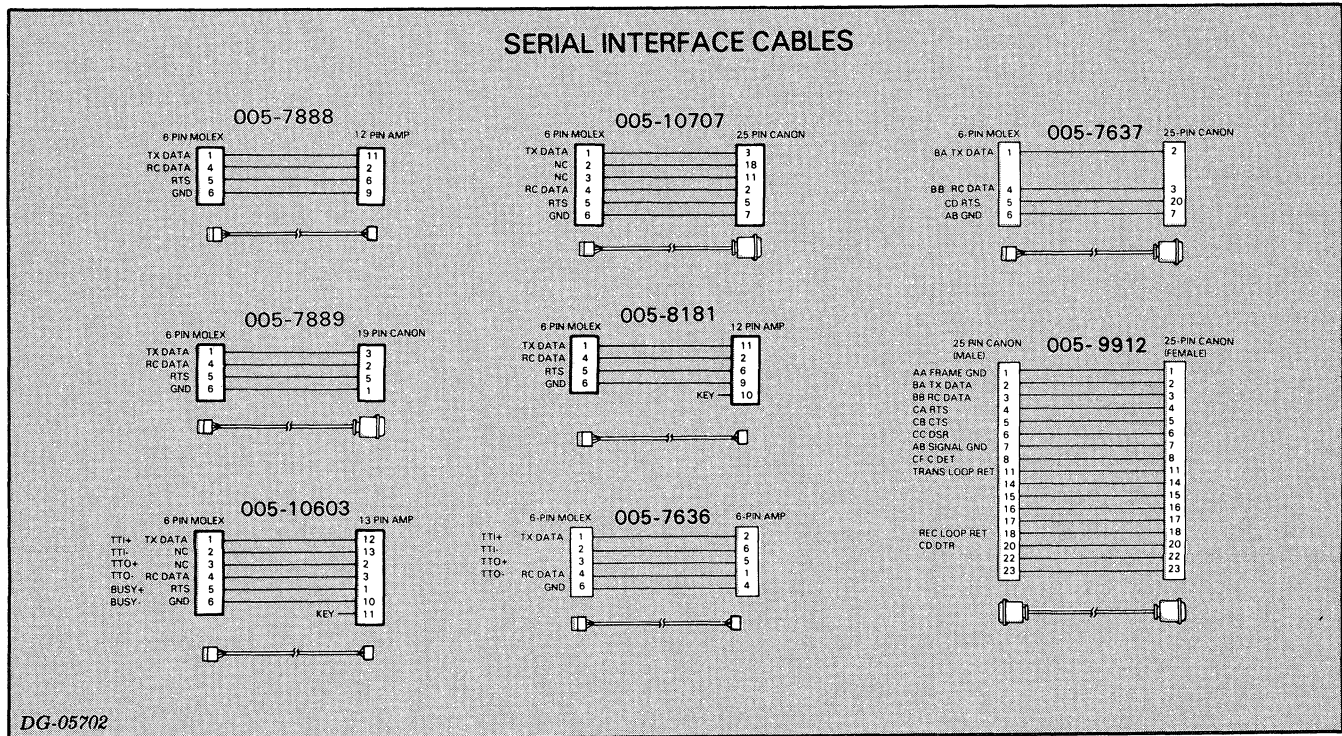


If you are making your own cable, it should not exceed 25 feet (7.4 meters) in length.

## Serial Interface I/O Cables

Serial interface I/O cables come in a number of configurations. You can connect your printer to a system using either DASHER TP1/DASHER TP2 Series compatible cables, a MODEM cable, or a custom cable to which you may attach your own connector.

Cables using the EIA interface may be no longer than 50 feet (15.2 meters) while cables using the current loop interface may be up to 1500 feet (457 meters) long. The various cables which may be used with the serial interface are listed with their pin assignments in the accompanying diagram.



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## DASHER TP2 PRINTER EXTERNAL CABLES

CABLE CONNECTS		REMARKS	CABLE NUMBER	WIRE LIST
TP2 CONNECTOR	DGC COMPUTER/CONTROLLER			
EIA	NOVA 800,830,840, 1200	—	005007889	008002002
EIA	NOVA 2,3,4,820,1210, 1220; ECLIPSE S100, S200, S230, C300, C330, S130, C150, AP130; MICRONOVA	WHEN TP2 PRINTER IS A SECONDARY DEVICE (OR ANY DEVICE ON MICRONOVA)	005007888	008002003
EIA	NOVA 2,3,4,820,1210, 1220; ECLIPSE S100, S200, S230, C300, C330, S130, C150, AP130, ULM	WHEN TP2 PRINTER IS THE PRIMARY CONSOLE. MAY BE SECONDARY CONSOLE WITH ULM.	005010603	008002507
EIA	M/600, S250, C350	—	005010707	008002542
EIA	ALM-8	—	005008181	008002033
CURRENT LOOP /EIA	ALM-16	COMMUNICATION MUST TAKE PLACE AT OR BELOW 1200 BAUD	005007636	008000971
EIA	MODEM	USED WITH SIMPLE MANUAL ANSWER MODEMS	005007637	008000973
MODEM	MODEM	USED WITH AUTO-ANSWER, AUTO-DISCONNECT MODEMS	005009912	008002188

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# CHAPTER IV INSTALLATION

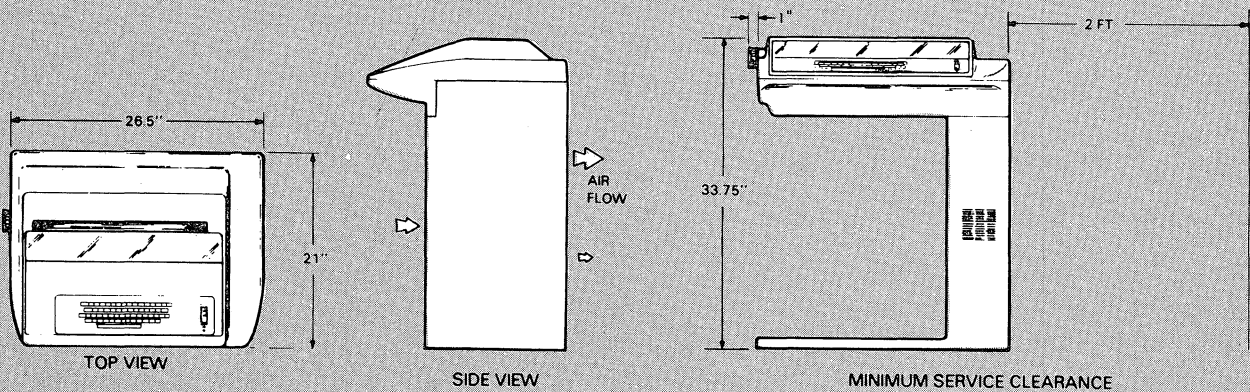
## CHOOSING A SITE

The illustration below gives you the necessary information for choosing a site for your DASHER LP2 or TP2 printer.

### SPECIFICATIONS

Item	Component	Number in Sub-system	Weight		Operating Humidity (Relative)		Maximum Operating Temperature				Power Dissipation (Watts)	BTUs/hr (3.41 x Watts)	Primary Power					Power Cable Length ft / m	Power Cable Connector	Power Drop Mating Power Receptacle	Wall Mating Power Receptacle	
			lbs	kg	min	max	Component		Media				Volts	Hz	Phase	Cond	Amps					
					°F	°C	°F	°C														
		N/A	60	27	10%	90%	104*	40*	N/A		250	853	120	47-63	1	3	2.0	6	1.82	5-15P	5-15R	5-15R
		N/A	60	27	10%	90%	104	40	N/A		250	853	220/240	47-63	1	3	1.2/1.1	6	1.82	5-15P	5-15R	5-15R

\* MINIMUM OPERATING TEMPERATURE: 50°F/10°C



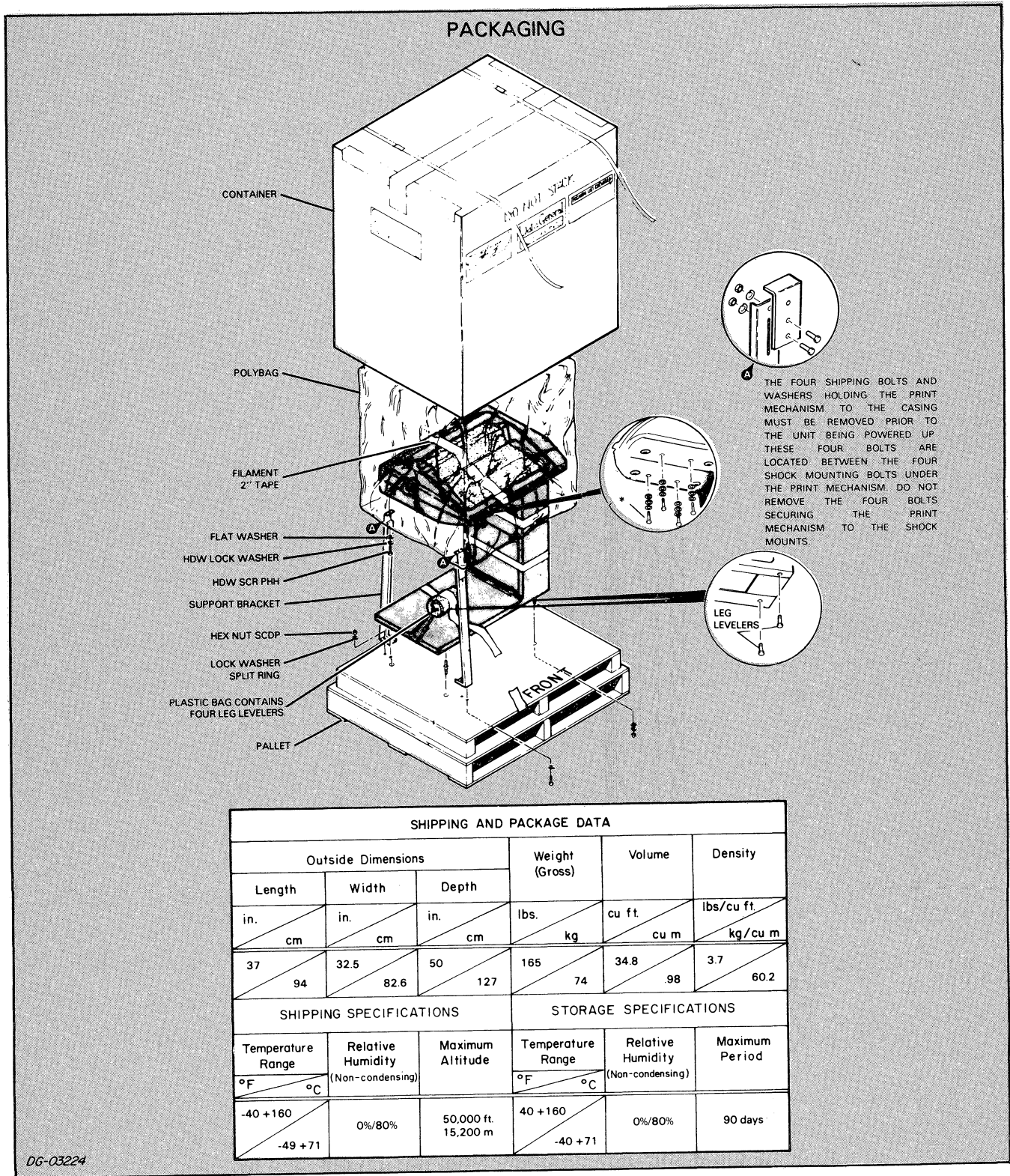
NOTE:  
REAR OF UNIT MUST BE AT LEAST 6"  
FROM WALL OR OTHER OBSTRUCTION TO  
PROVIDE COOLING AIR FLOW.

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# UNPACKING

After you have chosen the site, uncrate the printer and remove the shipping restraints as shown in the diagram.



## TAILORING

How you tailor your printer depends on the model printer you have and the system to which you are connecting it. We tell you below how to jumper the main control PC board and the options PC board (if installed). Though most of these wire jumpers are installed at the factory, you should make sure they are all installed where necessary before proceeding to the operational check-out.

## Jumpering the Main Control PC Board

The main control board has a number of jumpers as shown below. Install jumpers indicated in the table below. The figure below illustrates the approximate location of each jumper (most of them are numbered on the PC board).

**MAIN CONTROL BOARD JUMPERS**

**MAIN PC BOARD REVISION NUMBER LOCATIONS**

JUMPER	MAIN PC BOARD REVISION NUMBER			
	LP2 PRINTERS			TP2 PRINTER
	107000897-01	107000897-02	107001367-00	107001367-00
W1	IN	IN	IN	IN
W3	IN	IN	IN	IN
W5	IN	IN	IN	OUT
W6	IN	IN	IN	OUT
W7	IN	IN	IN	IN
W8	OUT	OUT	---	---
W9	IN	IN	---	---
W10	IN	IN	IN	IN
W11	OUT	OUT	OUT	OUT
W12	---	IN	IN	IN
W13	---	IN	IN	IN
W14	---	IN	IN	IN

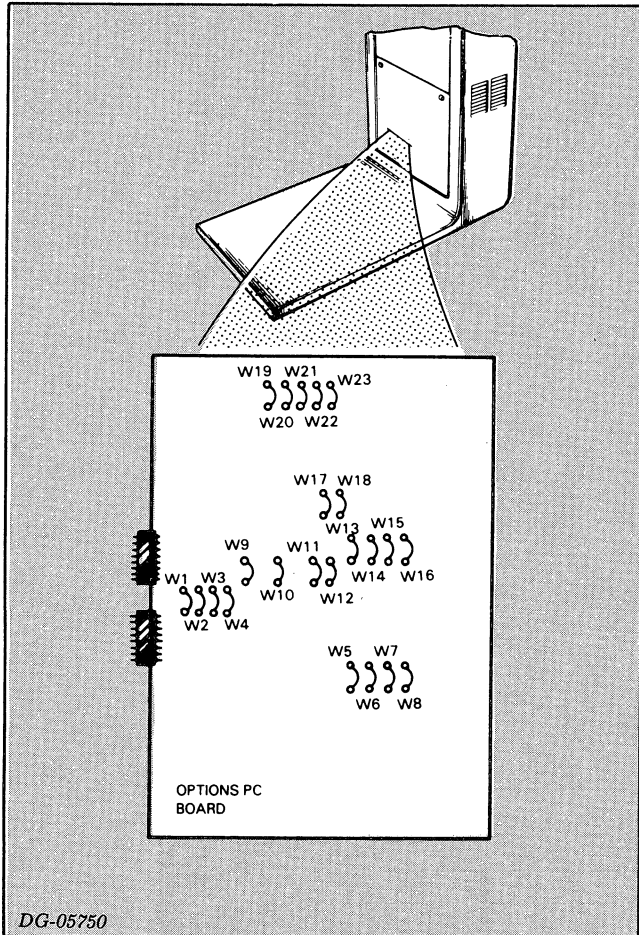
  

JUMPER	POSITION	COMMENT
W2	IN	PRINTERS EQUIPPED WITH COMPRESSED PRINT OPTION
	OUT	PRINTERS NOT EQUIPPED WITH COMPRESSED PRINT OPTION
W4	IN	PRINTERS EQUIPPED WITH AN ALTERNATE CHARACTER GENERATOR
	OUT	PRINTERS NOT EQUIPPED WITH AN ALTERNATE CHARACTER GENERATOR (ALL LP2 PRINTERS)

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## Jumpering the Options PC Board

The options PC board is installed on all DASHER TP2 printers. You insert the various jumpers on this board as described below. Their relative positions are shown in the accompanying illustration.



## Serial Interface Configuration Jumpers

Jumpers W19 - W23 select the parity, number of data bits, and number of stop bits for the serial interface.

SELECTS:	JUMPER	POSITION		
PARITY	W19 W23	IN } OUT } EVEN	IN } IN } ODD	OUT } - } NO PARITY
STOP BITS	W20	IN = 1		OUT = 2
DATA BITS	W21 W22	OUT } IN } 7 DATA BITS	OUT } OUT } 8 DATA BITS	

For non-modem full-duplex connections insert W7-W10 as follows:

Jumper	Position
W7	IN
W8	IN
W9	OUT
W10	OUT

## Local Copy Select Jumpers

Jumpers W15 and W16 enable local copy mode. When enabled, a character generated by the keyboard is printed locally at the same time it is transmitted to the communications line (for more detail see Chapter III, Interfacing).

JUMPER	LOCAL COPY ENABLE	LOCAL COPY DISABLE
W15 W16	OUT IN	IN OUT

Jumpers W5, W6, W13, W14, W17, and W18 should be installed as indicated by the following table:

JUMPER	JUMPER POSITION	DASHER LP2
W5	OUT	IN
W6	IN	OUT
W13	IN	OUT
W14	OUT	IN
W17	IN	OUT
W18	OUT	IN

## Software Busy Jumpers

Jumpers W11 and W12 enable and disable the automatic transmission of a software BUSY code. If enabled, DC3 (023g) is transmitted when the print buffer is nearly filled. A DC1 (021g) is transmitted when the buffer becomes half empty.

Jumper	Software Busy Enable	Software Busy Disable
W11 W12	OUT IN	IN OUT

## MODEM Configuration Jumpers

Jumpers W1 - W4 and W8 - W9 determine what signals are used when your printer is connected to a MODEM. Jumpers W1 - W4 select either EIA or 20mA current loop connections for the receive data and transmit data pins supplied on the 25-pin MODEM connector cable. Jumpers W8 - W9 enable or disable your printer's auto-answer and auto-disconnect feature.

JUMPER	AUTO-ANSWER AUTO-DISCONNECT DISABLE	AUTO-ANSWER AUTO-DISCONNECT ENABLE
W8 W9	IN OUT	OUT IN

JUMPER	EIA	20 mA CURRENT LOOP
W1	IN	OUT
W2	OUT	IN
W3	OUT	IN
W4	IN	OUT

If interfaced to a modem, jumpers W7 and W10 select a full- or half-duplex connection.

When a half-duplex connection is selected, the printer drives RTS (Request To Send) to the high state. This requests a line turn-around from the modem so that the printer can transmit data. The modem should respond by placing CTS (Clear To Send) in the high state; thus allowing the printer to transmit its data.

When a full-duplex connection is selected, the RTS signal remains at the high state; thus ensuring that the CTS signal is asserted by the modem. This allows the terminal to transmit data at any time.

JUMPER	FULL DUPLEX CONNECTION	HALF DUPLEX CONNECTION
W7	OUT	IN
W10	IN	OUT

## OPERATIONAL CHECK-OUT

We recommend you check out your printer before beginning to use it. This check-out consists of two parts: (1) an offline check-out after you unpack and tailor your printer, and (2) an online check-out after you connect it to your system. Before conducting these check-outs, familiarize yourself with the Operator's Manual (014-000093).

### Offline Check-out

After you unpack and tailor your printer:

- Plug the 12-pin end of the power cord into the unit's power socket just above the circuit breakers on the back of the pedestal column;
- Plug the 3-pin end into the ac line supply outlet;
- Load paper and a ribbon cartridge as described in the Operator's Manual;
- If your printer has automatic form feed which you will be using, activate it by following the procedure outlined in the Operator's Manual.

You are now ready to conduct the Offline Check-out.

### Offline Check-Out

PROCEDURE	EXPECTED RESULT
Turn the power ON, switch the unit OFF LINE, and switch VIEW off.	The fan spins and the RDY (READY) glows. The printhead returns to column one.
* Type a line of text without a NEWLINE.	The text is printed as you type.
* Press the CARRIAGE RETURN key.	The printhead moves to the left-hand margin of the same line.
* Press the NEWLINE key.	The paper advances one line.
* Type more text followed by a NEWLINE.	The text is printed as you type and the printhead moves to the left-hand column of the next line.
Press the FEED switch to the single line feed position several times (on KSR models press the LF FF key several times).	The paper advances one line each time you press the switch.
Hold the FEED switch in the continuous line feed position (on KSR models hold down the LF/FF key).	- If the automatic form feed option is installed, the paper is advanced to the top of the next form. - If the automatic form feed option is not installed, continuous line feeds are generated until you release the key.

\* Applies to testing KSR terminals only.

CONTINUED



## Offline Check-Out CONTINUED

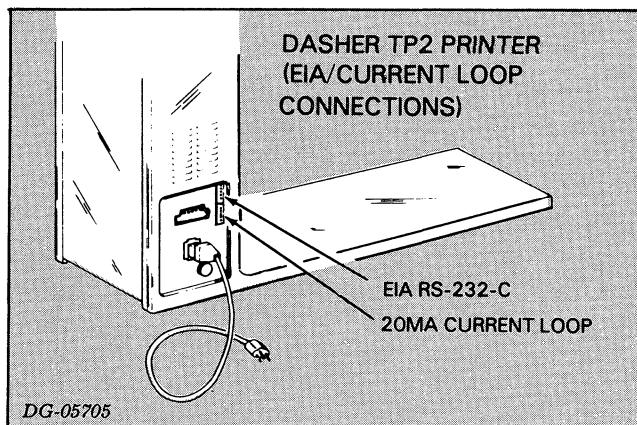
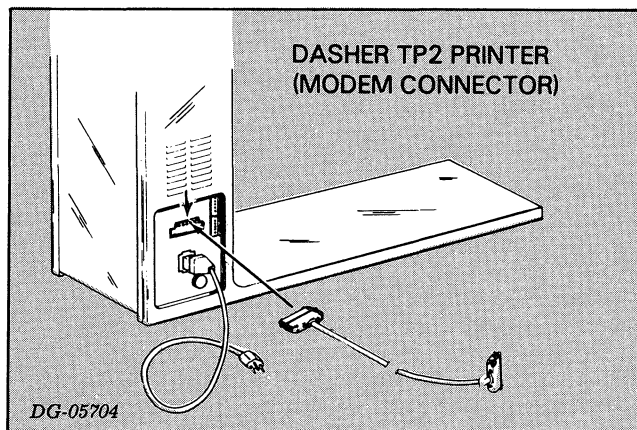
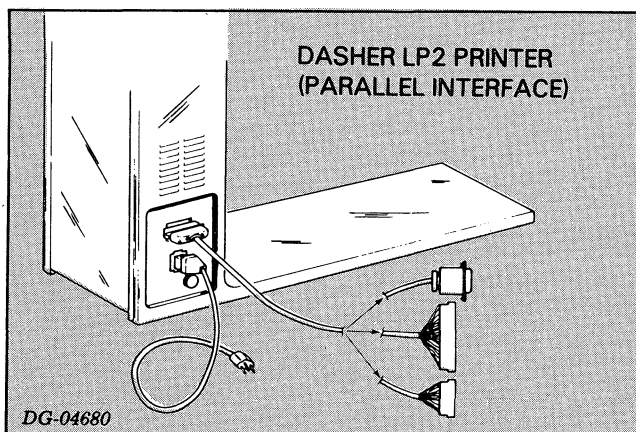
PROCEDURE	EXPECTED RESULT
* Move the VIEW switch to the ON position and type a line of text, pausing several places to the left of column 126 for at least 1.2 seconds.	The text is printed as you type. At each pause, the printhead moves 6 columns to the right of the last character printed.
*Type a full line of text, pausing to the right of column 126 for at least 1.2 seconds.	The text is printed as you type. At the pause, the printhead moves 6 columns to the left of the last character printed.
*Move the VIEW switch to the OFF position and repeat the two preceding steps.	The text is printed as you type. The printhead does not move clear of the text during pauses in typing.
*Press an alphanumeric key and the RPT key simultaneously.	The alphanumeric character is printed repeatedly until you release one of the keys.
Check the form feed option as follows:  Advance the paper to the top of the next form. Set the line count thumbwheels to the line count corresponding to the length of the form you are using. Press and release the TOF INIT pushbutton and press the FEED switch to the continuous line feed position (hold the LF/FF switch down on KSR models).	The paper advances to the top of the next form.

\* Applies to testing KSR terminals only.

## Online Check-out

Before you can conduct the online checkout, you need to connect your printer to a computer or communications system as follows:

- Plug the printer end of the I/O adapter cable or custom cable (see Cabling, Chapter III, for information about cables) into the appropriate connector on the back side of the pedestal column as shown below.
- Connect the other end to the system.



If you have an RO model printer, load a program into your system that transmits ASCII characters to the printer. If you have a KSR terminal, load a program into your system that transmits codes received from your keyboard back to the printer. Now you are ready to conduct the online check-out.

## Online Check-Out

PROCEDURE	EXPECTED RESULT
Switch the power ON and switch your printer ON LINE.	The fan spins and the printhead returns to the left-hand margin. The ON LINE light glows.
With the printer online, repeat the steps of the offline check-out.	The results are identical to the steps in the offline checkout.
Check the form feed option as follows:	
Switch the printer OFF LINE. Activate the the automatic perforation skip-over feature, set the line count thumbwheels to the number of lines corresponding to length of the form you are using, adjust the paper so that the printhead is about 1/2 inch below the top of the form, and press and release the TOF INIT pushbutton. Switch the printer ON LINE.	No visible result.
Type several lines of text and press the CTRL and the L keys simultaneously. (For an RO terminal, transmit an appropriate number of ASCII printing characters followed by a Form Feed character.)	The text is printed as you type and the paper advances to 1/2 inch below the top of the next form.
Type in (or transmit) the same number of lines as set by the line count thumbwheels.	The text is printed until you reach the sixth line from the bottom. The paper advances to 1/2 inch below the top of the next form, and the rest of the text is printed.
* Type in (or transmit): - a few NEWLINES (012) - ESC CTRL-5 (033 065) (sets vertical tab) - a CTRL-L (014), (a form feed) - CTRL-K (013) (a vertical tab)	Paper advances a few lines, proceeds to the top of the next form, and advances to the line in which the vertical tab is set.

PROCEDURE	EXPECTED RESULT
Type in (or transmit) a word or two followed by: - ESC CTRL-1 (033 061) (sets horizontal tab) - NEWLINE (015) - CTRL-I (011)	The text is printed as you type (or transmit), a horizontal tab is set at the end of the text, the printhead returns to the beginning of the next line and tabs out to the position where the tab was set (after the last character typed on the line above).
Type in (or transmit): - some text - ESC < (033 074) - more text  - ESC = (033 075) - more text	- The text is printed. - Nothing happens. - The text is printed in elongated width characters. - Nothing happens. - The text is printed in normal width characters.
Type in (or transmit): - some text - ESC a (033 141) - some text - ESC b (033 142) - some text	- The text is printed. - Nothing happens. - The text printed is underscored. - Nothing happens. - The text is printed without an underscore.
Type in (or transmit): ESC c (033 143)	The printer reinitializes itself according to the settings of the Secondary Control Panel (see Operator's Manual). The printhead returns to the left-hand margin. *The present line becomes the top of form.
**Type in (or transmit): - NEWLINE (012) - ESC > (033 076) - some text  - NEWLINE (012) - ESC ? (033 077) - more text	- Printhead returns to left-hand margin. - Nothing happens. - Text is printed in compressed width characters. - Printhead returns to left-hand margin. - Nothing happens. - Text is printed in normal width characters.

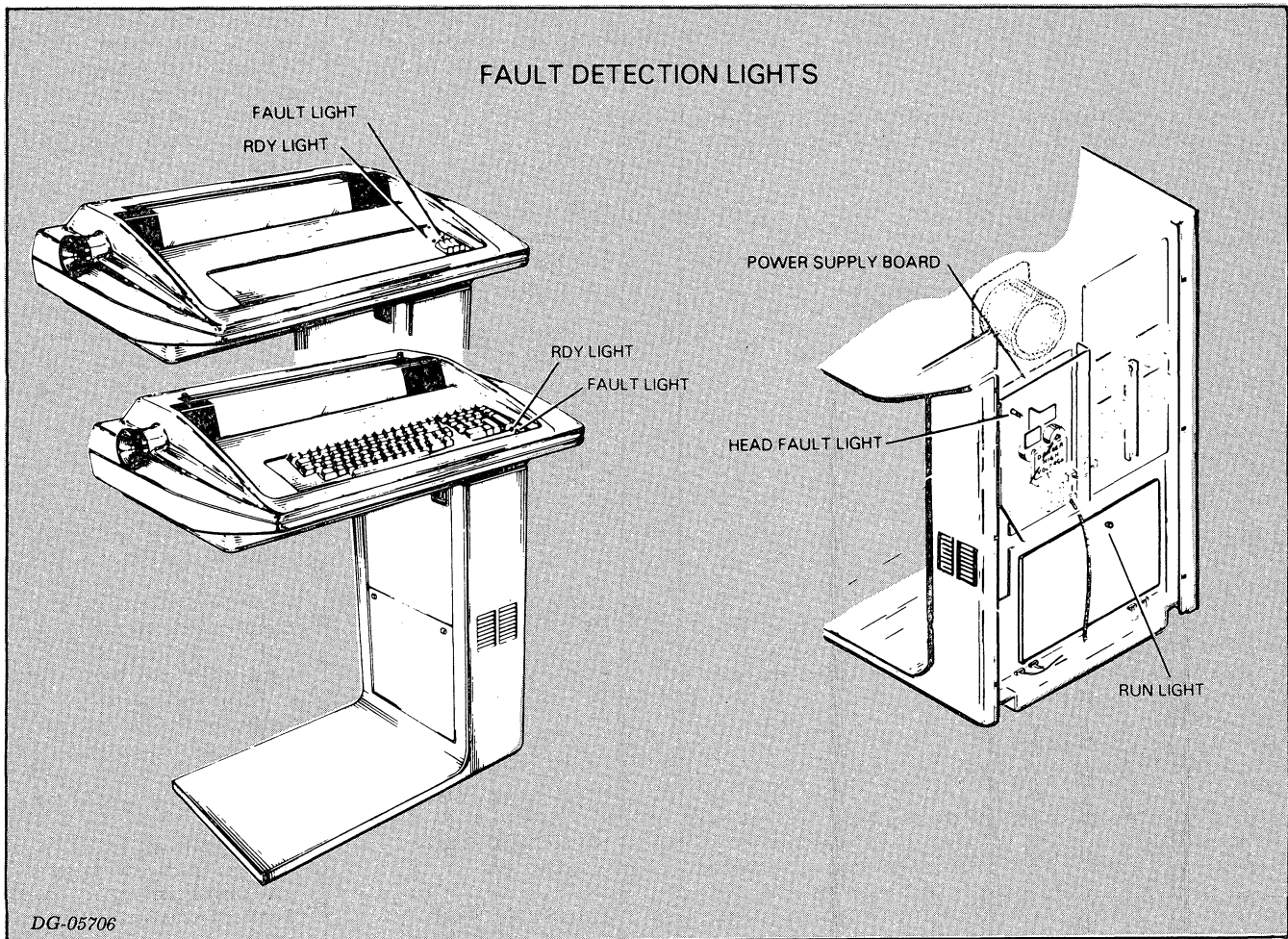
\* If the Automatic Form Feed is installed.

\*\* If the Compressed Printing option is installed.

This completes the check-out of your printer. If you did not get the expected result, check the input power, the cabling connections, the jumpers on the main and options PC boards, and the coding of the program transmitting or echoing characters to your printer. (It may also be helpful at this time to check the Troubleshooting Guide in the Operator's Manual.) Repeat the appropriate checkout procedures. If your printer still does not function correctly, you may be able to isolate, and even correct, the problem using the built-in fault detectors described below. If these detectors are no help, contact the nearest field service representative for assistance.

## FAULT DETECTORS

A circuit breaker and a system of fault interlocks protect your printer. They disable the operation of your printer in the event of a component malfunction or an unsafe condition. Several of the faults incorporate indicator lights to facilitate troubleshooting. There are four such indicator lights: two are on the primary control panel - the RDY and the FAULT light; one is on the power supply board - the Head Fault light; and one is on the main control PC board - the RUN light.

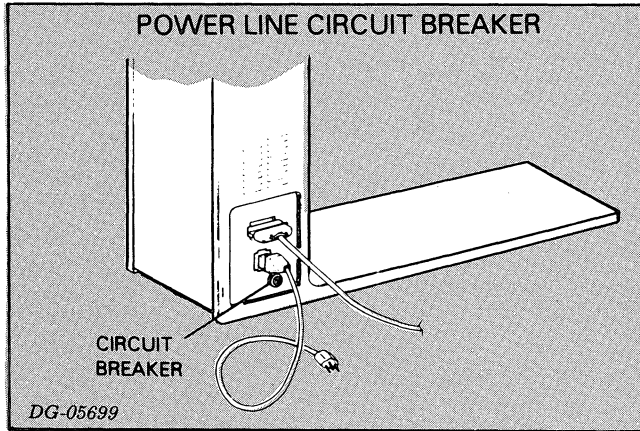




## Power Line Circuit Breaker

A circuit breaker protects your unit from overcurrent situations. There is usually a good reason for a circuit breaker tripping; therefore, we recommend that you call a qualified service representative in the event of a problem.

A portion of the circuit breaker pops out in the event of a short. You reset a breaker (with the power switch Off) by pressing in the cylinder. If this breaker will not reset, wait 5 minutes and try again. DO NOT FORCE breaker reset or damage may result.



## RDY (Ready) Light

The RDY light indicates the status of the printer's character buffer as well as the existence of any fault conditions. The light operates only when the printer is online. Normally, the light goes off when the character buffer is filled. The light comes on again when the buffer becomes half empty. The RDY light also goes off if a fault exists, warning you that you can no longer operate your printer. Sometimes you can correct the problem by simply depressing the MST RST switch located on the Secondary Control Panel.

## FAULT Light

A fault occurs as a result of one of a number of conditions: your printer is out of paper, the paper has not advanced the appropriate number of lines, the ribbon cartridge has jammed, or there is a checksum error on a Down-Line-Loaded character set.

A switch in the paper path senses the absence of paper. If the printer is out of paper, it goes offline after the next NEWLINE and the Fault light glows. The light also glows if the paper does not advance the expected number of lines. The usual cause of this is a paper jam (see the Operator's Manual on "Loading Paper"). If the ribbon cartridge has jammed, stalling the carriage assembly, a new ribbon cartridge must be installed. In all cases, the MST RST button must be pressed *following* the correction of a fault condition.

## Head Fault Light

When off, this light indicates that the print head is operating normally. If on, the printer's power supply has been shut down due to excessive current in the printhead. The power should be shut off and you should call a service representative.

## RUN Light

When lit, this light indicates that your printer has executed its power-up and initialization sequence properly. If you are experiencing trouble with your printer and this light is not lit after powering-up the unit and/or pressing the MST RST button on the secondary control panel, you should turn it off and call a service representative.

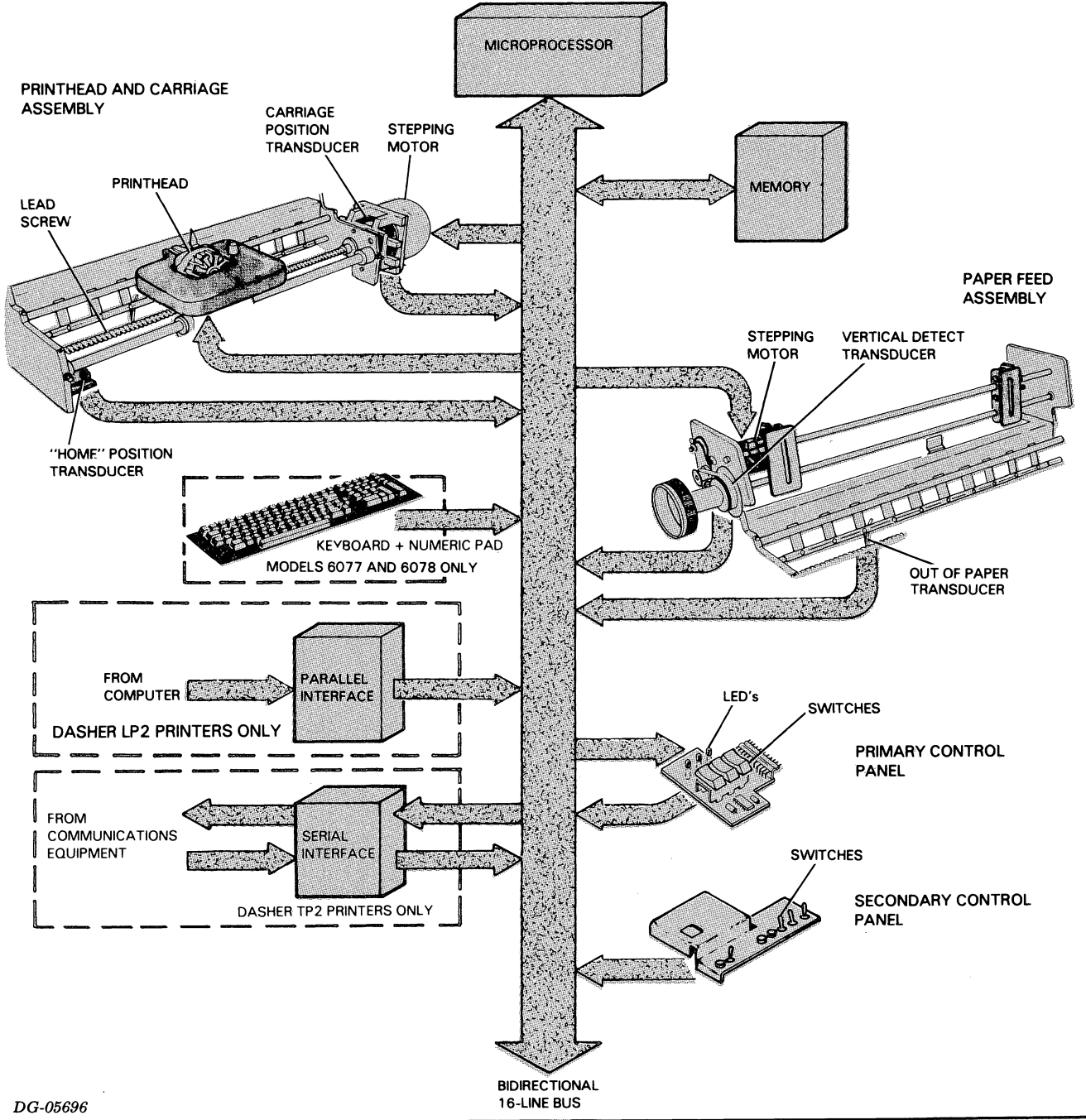
## Overvoltage Fault

An overvoltage fault occurs when the +16vdc regulated output from the power supply increases above +20vdc. All positive voltages drop to zero causing the printer to shut down completely (all indicator lights go off). Following shut-down, the unit attempts to power up and reinitialize.

## Undervoltage Fault

If the +5vdc regulated output from the power supply drops to less than 4 volts, all the printer's control functions stop and all the indicator lights go off. Following shut-down, the unit attempts to power up and reinitialize.

# BI-DIRECTIONAL 16-LINE BUS AND SUBSYSTEMS



DG-05696

# CHAPTER V

## ARCHITECTURE

### INTRODUCTION

Your printer is controlled by Data General's 16-bit microNOVA microprocessor. The microprocessor directs communication between a number of a DASHER LP2 or TP2 printer's basic subsystems. These subsystems include:

- Memory
- Printhead and carriage assembly
- Paper feed assembly
- Control panels
- Keyboard and numeric pad
- Parallel interface or serial interface

Information is transferred between these subsystems and the microprocessor along a bidirectional 16-line bus. The diagram on the opposite page illustrates how this bus connects the different portions of the printer.

### THE MICROPROCESSOR

The microprocessor-based design eliminates costly hard-wired logic and provides the printer with greater power and flexibility. Its programmable nature makes possible many of the printer's special features such as horizontal tabbing, vertical tabbing, and elongated characters.

The microprocessor's main function is to control the printer's various subsystems. The manner in which these subsystems are controlled is determined by the microprocessor's program.

### MEMORY

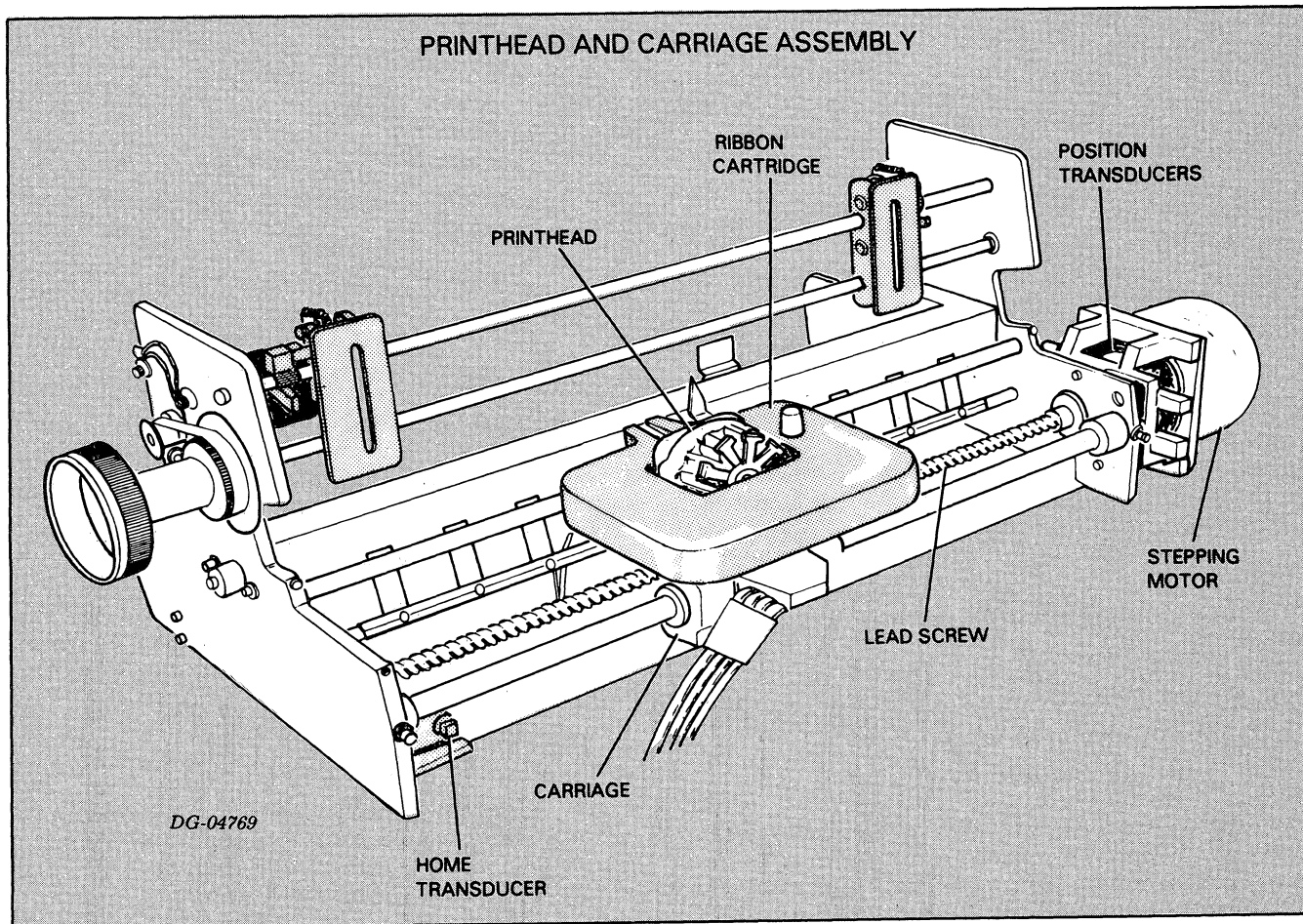
The memory subsystem stores the microprocessor's program and variables, characters received from the computer, and special codes used by the microprocessor to fire the printhead.

Your printer has two types of memory: read-only memory and random-access memory. Read-only memory is used exclusively for storing programs. This type of memory cannot be altered by the microprocessor. Its contents are not lost when you power-down your printer. Random-access memory is used to store program data and incoming characters.

A third storage device, the character generator, is really a read-only memory which contains special codes used by the microprocessor to fire the printhead. These codes, called firing codes, are nine bits long. The character generator contains all the firing codes necessary to print all the characters in a particular character set. (The various character sets are described in Appendix B.)

## PRINthead AND CARRIAGE ASSEMBLY

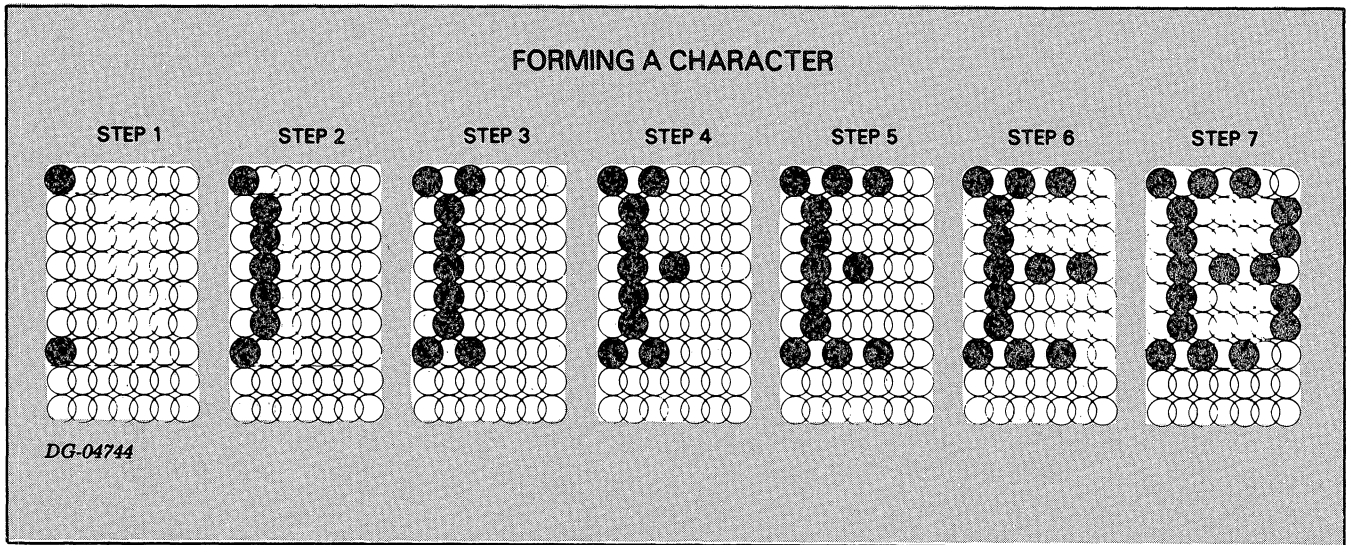
The printhead and carriage assembly is the mechanism which prints characters. The following diagram illustrates the various components of this subsystem.



## The Printhead

The printhead forms a character in seven segments as it moves across the paper. Each segment is formed by firing a subset of the 9 printhead wires. These wires force the ribbon against the paper forming a 7 by 9 dot matrix character. The microprocessor fires these print wires by obtaining a 9-bit code from the character generator and transmitting that code to the printhead. The illustration below shows how a character is formed during a left to right print sequence.

Since printing is bidirectional, a character may also be formed by starting with its right column. In this case, the microprocessor issues the firing codes in reverse order.



## The Carriage

The microprocessor controls the horizontal motion of the printhead by issuing commands to the drive circuitry of the carriage mechanism. This mechanism consists of a stepping motor and lead screw assembly (to which the printhead carriage is attached). When the microprocessor steps this motor (tells it to rotate a fixed amount), the lead screw turns, moving the printhead a fixed distance. Since the stepping motor may be stepped clockwise or counter-clockwise, the printhead may be moved either right or left.

## Position Transducers

The microprocessor determines when the print-wires should be fired by monitoring the printhead position transducers. These transducers locate the exact printhead firing position for each of the seven columns which form a character.

Another transducer informs the microprocessor when the printhead has reached the left-hand margin (home position). This transducer is used to initialize the printhead's horizontal alignment.

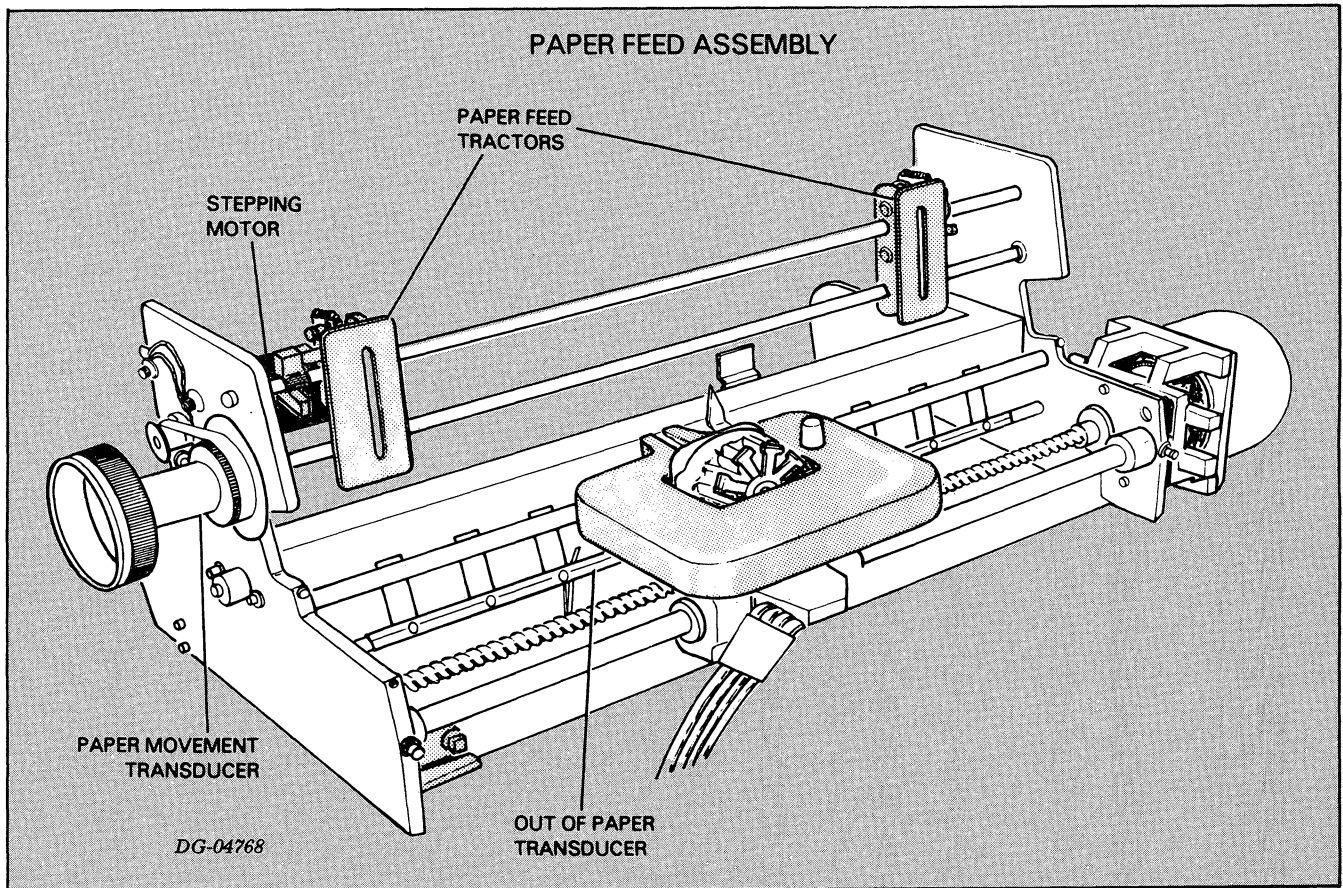
## PAPER FEED ASSEMBLY

The paper feed assembly controls the vertical movement of paper past the printhead. Like the carriage mechanism, the paper feed assembly uses a stepping motor. This motor turns the tractors which move the paper by the printhead. The microprocessor directly controls how much paper is fed through the printer by stepping this motor a selected number of times. In fact, the difference between selecting 6 lines/inch or 8 lines/inch spacing is reflected in the number of steps the microprocessor issues to the stepping motor for a line feed.

## Sensing Paper Movement

A transducer, like the head position transducer, notifies the microprocessor each time it senses paper movement. If the transducer detects that the paper feed motor has taken a different number of steps than were issued by the microprocessor, a fault is generated, indicating a problem in the paper feed assembly.

A switch informs the microprocessor when paper runs out. If this occurs, the microprocessor generates a fault.





## THE CONTROL PANELS

There are two control panels which you may use to control your printer. The primary control panel contains a number of lights and switches used to display status information and control commonly used functions. The secondary control panel contains switches which configure the printer and select its various options. The microprocessor monitors the primary control panel and the MST RST switch on the secondary control panel constantly. However, it only monitors the other switches on the secondary control panel when the printer is offline. When the microprocessor detects a change in a switch position on either control panel, it proceeds accordingly, displaying the change in the indicator lights if applicable.

## THE KEYBOARD AND NUMERIC PAD

The keyboard and numeric pad are input devices which allow you to communicate with your communications system. Like other subsystems, the microprocessor monitors the keyboard and numeric pad. When the operator presses a key, the microprocessor retrieves the keyed character's 7-bit ASCII code. If the printer is offline, the microprocessor immediately processes the character (either printing it or performing the associated control function). If the printer is online, the microprocessor transmits the 7-bit code to the communications line via the serial interface.

## THE PARALLEL INTERFACE

A parallel interface transfers data from a computer to the microprocessor. Eight data lines transfer data from the computer to the interface 8 bits at a time. A *demand* line informs the computer when your interface is able to accept data. A second status line, *Ready*, informs the computer whether your printer is powered up and online.

The microprocessor continually checks the interface to see if any data is present. If it finds that a byte has arrived, the microprocessor retrieves this byte from the interface and stores it in memory for processing. The parallel interface can accept data at a rate up to 5,000 characters/second until the allotted storage area in memory is filled. At this point, the microprocessor processes half of the stored characters before it accepts any additional characters.

## SERIAL INTERFACE

The serial interface transfers data in either direction between the printer and a communications system. This interface, available on both RO Printer and KSR terminals in a number of jumper selectable serial formats. In addition, you may select one of eight different information transfer rates (110, 150, 300, 600, 1200, 1800, 2400, and 4800 baud).

### Reception

The serial interface assembles data in an 8-bit buffer as it is received, notifying the microprocessor when the complete byte is present. The microprocessor then retrieves the byte and stores it in memory for processing.

### Transmission

When the microprocessor wishes to transmit a character, it first checks the serial interface to see if it is busy transmitting a character. When the interface is idle, the microprocessor transfers the byte (character) to the interface.

### Control

In addition to transmitting and receiving data, the microprocessor controls and reads the status of a MODEM through the serial interface. The interface includes signals which allow you to use MODEMs with auto-answer and auto-disconnect features.

## POWER SUPPLY

The printer's power supply provides six different dc supply voltages from either 120 volt or 220/240 volt ac power sources (47-63 Hz). The design uses pulse-width modulation to regulate the output voltages. In addition, overvoltage and overcurrent detection protect the supply against fluctuations in line voltage.



# APPENDIX A

## ASCII - 128 CHARACTER CODES

NAME OR MNEMONIC	ACTION TAKEN BY PRINTER	ASCII CODE (OCTAL)	DECIMAL EQUIVALENT	KEYS ** PRESSED TO GENERATE CODE
NUL	None	000	000	CTRL O
SOH	None	001	001	CTRL A
STX	None	002	002	CTRL B
ETX	Reserved	003	003	CTRL C
EOT	Reserved	004	004	CTRL D
ENQ	None	005	005	CTRL E
ACK	Reserved	006	006	CTRL F
BEL	Sounds audible tone	007	007	CTRL G
BS	Back Space (online only)	010	008	CTRL H • BS • SHIFT BS • CTRL BS
HT	Horizontal Tab	011	009	CTRL I • TAB • SHIFT TAB • CTRL TAB
NL	Newline (Line Feed)	012	010	CTRL J • LF • SHIFT LF • CTRL LF
VT	Vertical Tab *	013	011	CTRL K
FF	Form Feed *	014	012	CTRL L
CR	Carriage Return	015	013	CTRL M • CR • SHIFT CR • CTRL CR • (NP)
SO	Selects Alternate Character Set	016	014	CTRL N
SI	Selects Standard Character Set	017	015	CTRL O
DLE	None	020	016	CTRL P
DC1	None	021	017	CTRL Q
DC2	None	022	018	CTRL R
DC3	None	023	019	CTRL S
DC4	None	024	020	CTRL T
NAK	None	025	021	CTRL U
SYN	None	026	022	CTRL V
ETB	None	027	023	CTRL W
CAN	None	030	024	CTRL X
EM	None	031	025	CTRL Y
SUB	None	032	026	CTRL Z
ESC	Begins Command Seq.	033	027	CTRL [ • ESC • SHIFT ESC • CTRL ESC
FS	None	034	028	CTRL
GS	None	035	029	CTRL _
RS	None	036	030	CTRL
US	None	037	031	CTRL _
SP	Space	040	032	SPACE BAR

\* MODELS EQUIPPED WITH THE AUTOMATIC FORM FEED OPTION

\*\*CTRL denotes control key.

NP denotes keys appearing on numeric pad as well as keyboard.

NAME OR MNEMONIC	ACTION TAKEN BY PRINTER	ASCII CODE (OCTAL)	DECIMAL EQUIVALENT	KEY(S) PRESSED TO GENERATE
Exclamation	Prints !	041	033	SHIFT! OR CTRL SHIFT!
Quotation Mark	Prints "	042	034	SHIFT" OR CTRL SHIFT"
Number Sign	Prints #	043	035	SHIFT# OR CTRL SHIFT#
Dollar Sign	Prints \$	044	036	SHIFT\$ OR CTRL SHIFT\$
Percent Sign	Prints %	045	037	SHIFT% OR CTRL SHIFT%
Ampersand	Prints &	046	038	SHIFT& OR CTRL SHIFT&
Apostrophe	Prints '	047	039	SHIFT' OR CTRL SHIFT'
Open Parenthesis	Prints (	050	040	SHIFT( OR CTRL SHIFT(
Close Parenthesis	Prints )	051	041	SHIFT) OR CTRL SHIFT)
Asterisk	Prints *	052	042	SHIFT* OR CTRL SHIFT*
Plus Sign	Prints +	053	043	SHIFT+ OR CTRL SHIFT+
Comma	Prints ,	054	044	, OR CTRL,
Hyphen (Minus Sign)	Prints -	055	045	- OR CTRL-
Period (Decimal Point)	Prints .	056	046	. OR CTRL.(NP)
Slash	Prints /	057	047	/ OR CTRL/
Zero	Prints 0	060	048	0 OR CTRL 0(NP)
One	Prints 1	061	049	1 OR CTRL 1(NP)
Two	Prints 2	062	050	2 OR CTRL 2(NP)
Three	Prints 3	063	051	3 OR CTRL 3(NP)
Four	Prints 4	064	052	4 OR CTRL 4(NP)
Five	Prints 5	065	053	5 OR CTRL 5(NP)
Six	Prints 6	066	054	6 OR CTRL 6(NP)
Seven	Prints 7	067	055	7 OR CTRL 7(NP)
Eight	Prints 8	070	056	8 OR CTRL 8(NP)
Nine	Prints 9	071	057	9 OR CTRL 9(NP)
Colon	Prints :	072	058	SHIFT : OR CTRL SHIFT:
Semicolon	Prints ;	073	059	; OR CTRL;
Less Than	Prints <	074	060	SHIFT < OR CTRL SHIFT<
Equal Sign	Prints =	075	061	= OR CTRL=
Greater Than	Prints >	076	062	SHIFT > OR SHIFT>
Question Mark	Prints ?	077	063	SHIFT? OR CTRL SHIFT?
Commercial At	Prints @	100	064	SHIFT@ OR CTRL SHIFT@
A	Prints A	101	065	SHIFT A
B	Prints B	102	066	SHIFT B
C	Prints C	103	067	SHIFT C
D	Prints D	104	068	SHIFT D
E	Prints E	105	069	SHIFT E
F	Prints F	106	070	SHIFT F
G	Prints G	107	071	SHIFT G
H	Prints H	110	072	SHIFT H
I	Prints I	111	073	SHIFT I
J	Prints J	112	074	SHIFT J
K	Prints K	113	075	SHIFT K
L	Prints L	114	076	SHIFT L
M	Prints M	115	077	SHIFT M
N	Prints N	116	078	SHIFT N
O	Prints O	117	079	SHIFT O
P	Prints P	120	080	

NAME OR MNEMONIC	ACTION TAKEN BY PRINTER	ASCII CODE (OCTAL)	DECIMAL EQUIVALENT	KEY(S) PRESSED TO GENERATE
Q	Prints Q	121	081	SHIFT Q
R	Prints R	122	082	SHIFT R
S	Prints S	123	083	SHIFT S
T	Prints T	124	084	SHIFT T
U	Prints U	125	085	SHIFT U
V	Prints V	126	086	SHIFT V
W	Prints W	127	087	SHIFT W
X	Prints X	130	088	SHIFT X
Y	Prints Y	131	089	SHIFT Y
Z	Prints Z	132	090	SHIFT Z
Opening Bracket	Prints [	133	091	[
Back Slash	Prints \	134	092	\
Close Bracket	Prints ]	135	093	]
Circumflex	Prints ^	136	094	^
Underline	Prints _	137	095	SHIFT _
Accent Grave	Prints `	140	096	`
a	Prints a	141	097	A
b	Prints b	142	098	B
c	Prints c	143	099	C
d	Prints d	144	100	D
e	Prints e	145	101	E
f	Prints f	146	102	F
g	Prints g	147	103	G
h	Prints h	150	104	H
i	Prints i	151	105	I
j	Prints j	152	106	J
k	Prints k	153	107	K
l	Prints l	154	108	L
m	Prints m	155	109	M
n	Prints n	156	110	N
o	Prints o	157	111	O
p	Prints p	160	112	P
q	Prints q	161	113	Q
r	Prints r	162	114	R
s	Prints s	163	115	S
t	Prints t	164	116	T
u	Prints u	165	117	U
v	Prints v	166	118	V
w	Prints w	167	119	W
x	Prints x	170	120	X
y	Prints y	171	121	Y
z	Prints z	172	122	Z
Open Baroque Parenthesis	Prints {	173	123	{
Vertical Mark Parenthesis	Prints	174	124	SHIFT
Close Baroque Parenthesis	Prints }	175	125	SHIFT }
TILDE	Prints ~	176	126	SHIFT ~
DELETE	None	177	127	DEL•SHIFT DEL•CTRL DEL•CTRL SHIFT DEL





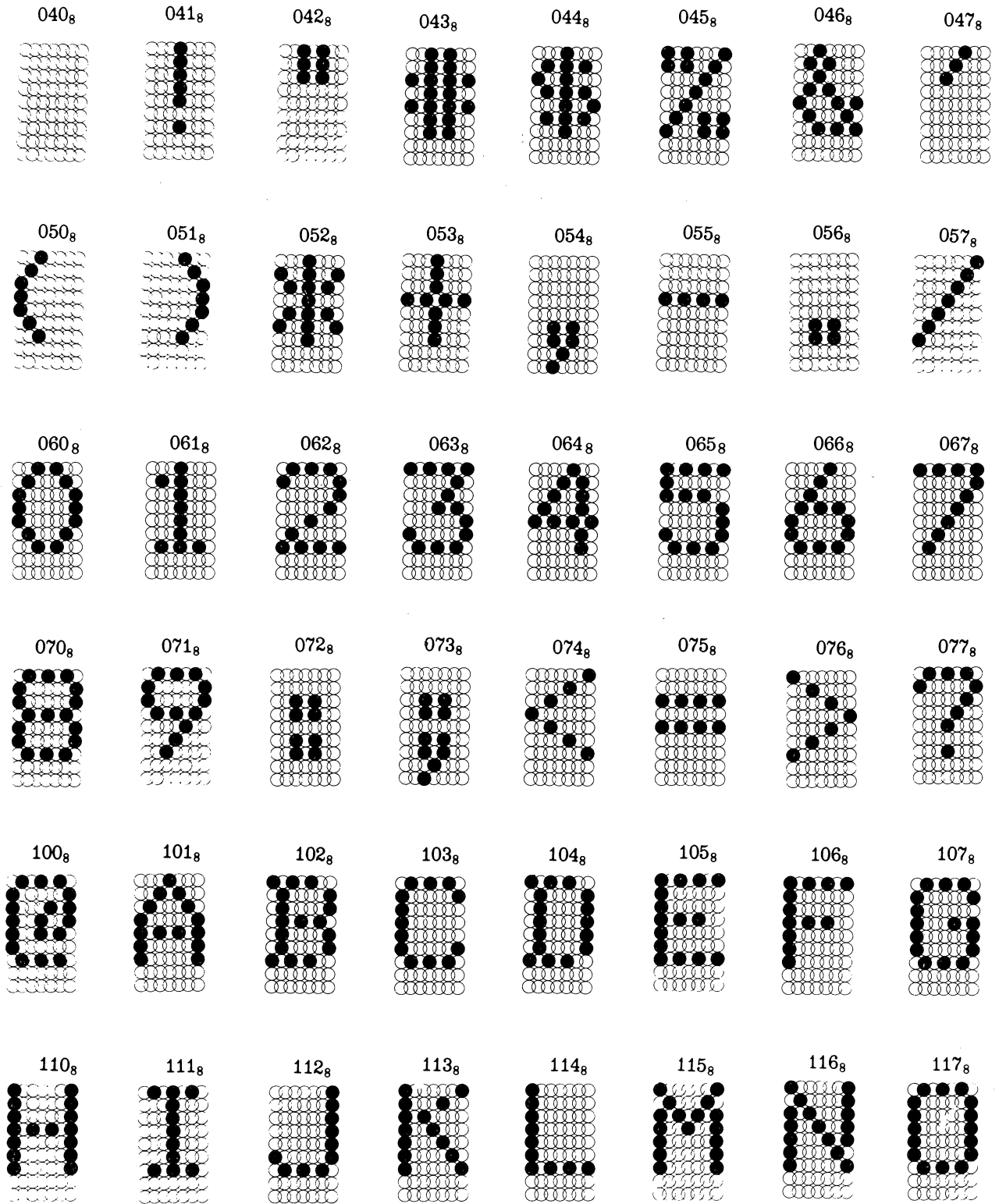
## **APPENDIX B**

# **INTERNATIONAL CHARACTER SETS**

There are six 96-symbol character sets available with your DASHER LP2 or TP2 printer. They correspond to standard ASCII code specifications in the following six countries: France, Germany, Spain, Sweden, the United Kingdom, and the United States.

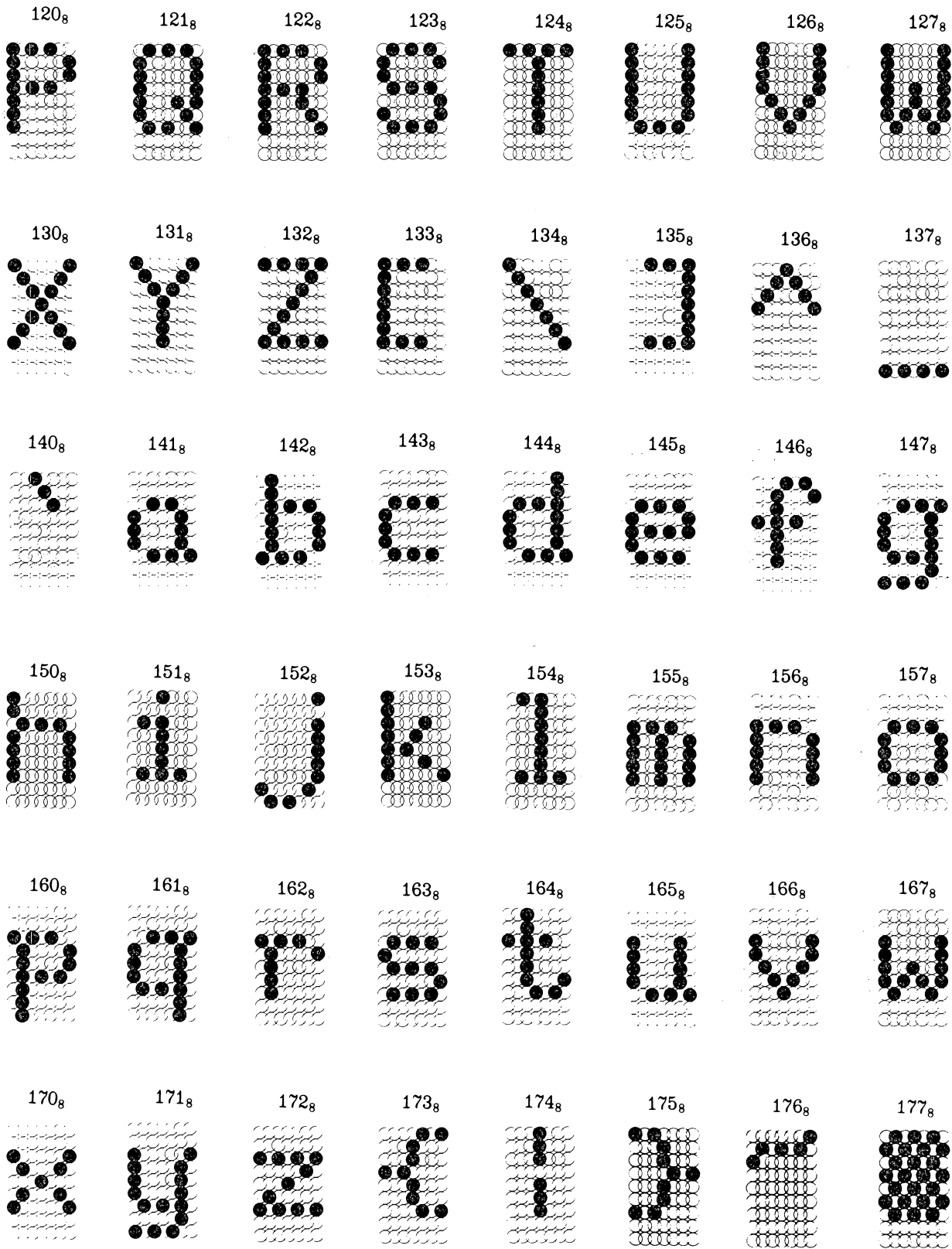
Each character is defined by a 7-bit ASCII code. Control codes, 000-037 octal are not printed. The codes from 040-177 octal define the 96-symbol character set. The dot-matrix patterns your printer produces for each code are shown on the following pages. We illustrate the American font in its entirety. However, of the remaining five fonts, we provide only those patterns which differ from the American font.

# AMERICAN USAGE



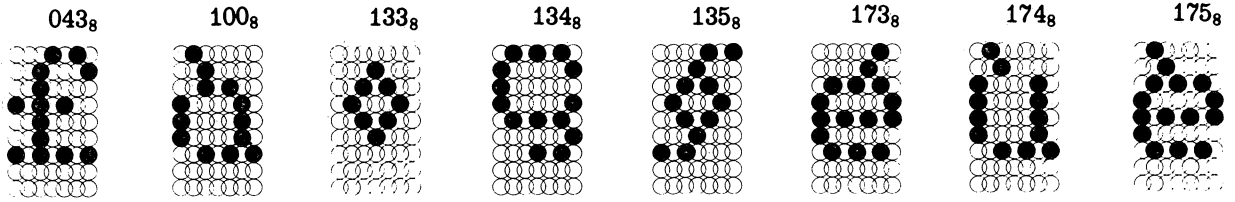
DG-04807

# AMERICAN USAGE

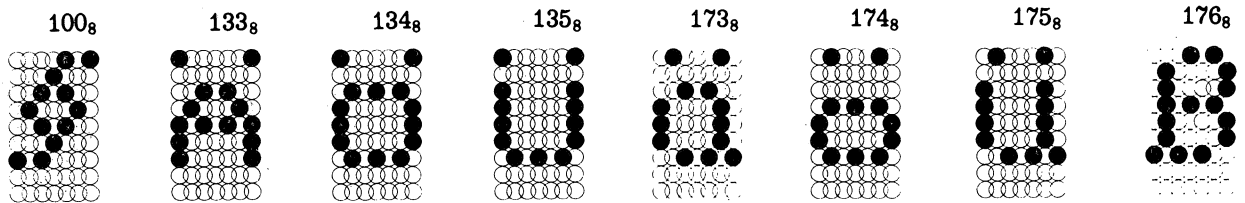


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## FRENCH USAGE

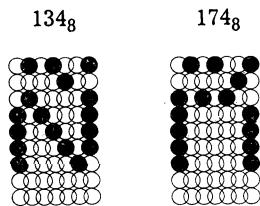


## GERMAN USAGE



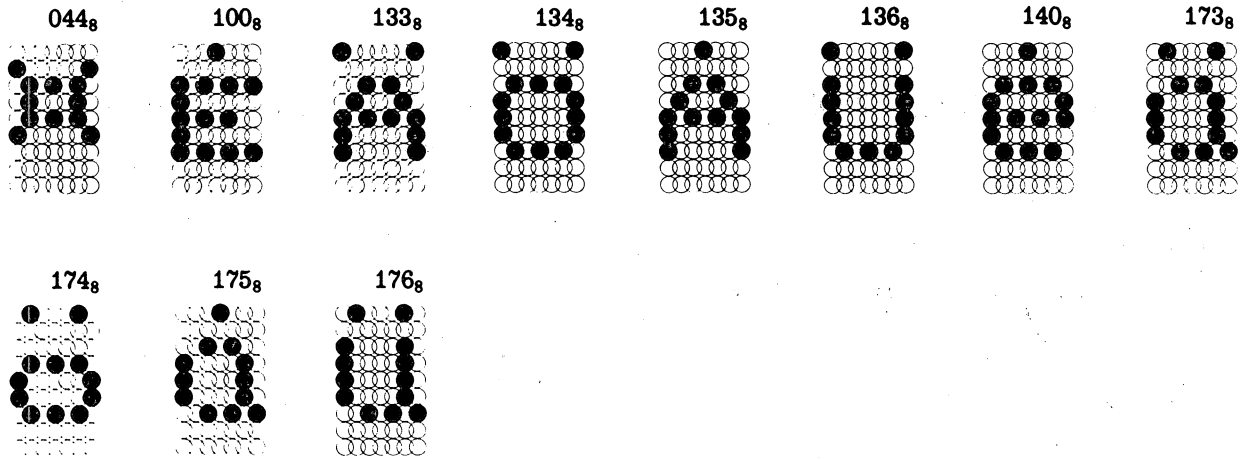
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## SPANISH USAGE

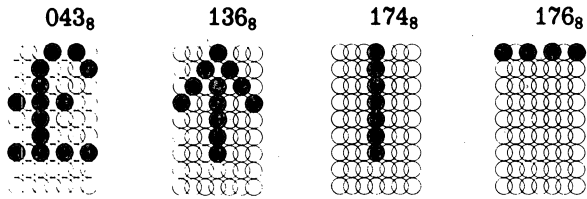


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## SWEDISH USAGE



## BRITISH USAGE



DG-04810

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**New Hampshire:** Nashua  
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**New Mexico:** Albuquerque  
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**Ohio:** Columbus, Dayton, Brooklyn Heights  
**Oklahoma:** Oklahoma City, Tulsa  
**Oregon:** Portland  
**Pennsylvania:** Blue Bell, Carnegie  
**Rhode Island:** Rumford  
**South Carolina:** Columbia  
**Tennessee:** Knoxville, Memphis  
**Texas:** Austin, Dallas, El Paso, Ft. Worth, Houston  
**Utah:** Salt Lake City  
**Virginia:** McLean, Norfolk, Richmond, Salem  
**Washington:** Kirkland  
**West Virginia:** Charleston  
**Wisconsin:** West Allis

**Australia:** Melbourne, Victoria  
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**Italy:** Milan, Padua, Rome  
**The Netherlands:** Rijswijk  
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# Data General

# USERS

# group

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<b>2. Hardware</b>  M/600 C/350, C/330, C/300 S/250, S/230, S/200 S/130 AP/130 CS Series N3/D Other NOVA microNOVA Other _____ (Specify) _____	<table border="1"> <thead> <tr> <th>Qty. Installed</th> <th>Qty. On Order</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	Qty. Installed	Qty. On Order																					<b>6. Communications</b>	<input type="checkbox"/> RSTCP <input type="checkbox"/> CAM <input type="checkbox"/> HASP <input type="checkbox"/> 4025 <input type="checkbox"/> RJE80 <input type="checkbox"/> Other <input type="checkbox"/> SAM Specify _____ _____
Qty. Installed	Qty. On Order																								
<b>3. Software</b>	<input type="checkbox"/> AOS <input type="checkbox"/> RDOS <input type="checkbox"/> DOS <input type="checkbox"/> RTOS <input type="checkbox"/> SOS <input type="checkbox"/> Other Specify _____ _____	<b>7. Application Description</b>	<input type="radio"/> _____ _____ _____ _____ _____																						
<b>4. Languages</b>	<input type="checkbox"/> Algol <input type="checkbox"/> Assembler <input type="checkbox"/> DG/L <input type="checkbox"/> Interactive <input type="checkbox"/> Cobol <input type="checkbox"/> Fortran <input type="checkbox"/> ECLIPSE Cobol <input type="checkbox"/> RPG II <input type="checkbox"/> Business BASIC <input type="checkbox"/> PL/1 <input type="checkbox"/> BASIC <input type="checkbox"/> Other Specify _____ _____	<b>8. Purchase</b>	From whom was your machine(s) purchased? <input type="checkbox"/> Data General Corp. <input type="checkbox"/> Other Specify _____ _____																						
		<b>9. Users Group</b>	Are you interested in joining a special interest or regional Data General Users Group? <input type="radio"/> _____ _____																						

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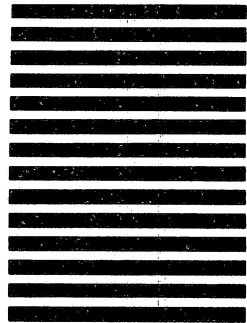
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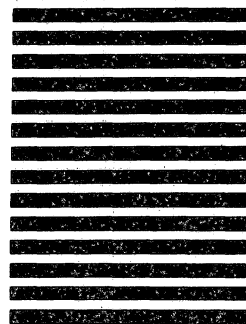
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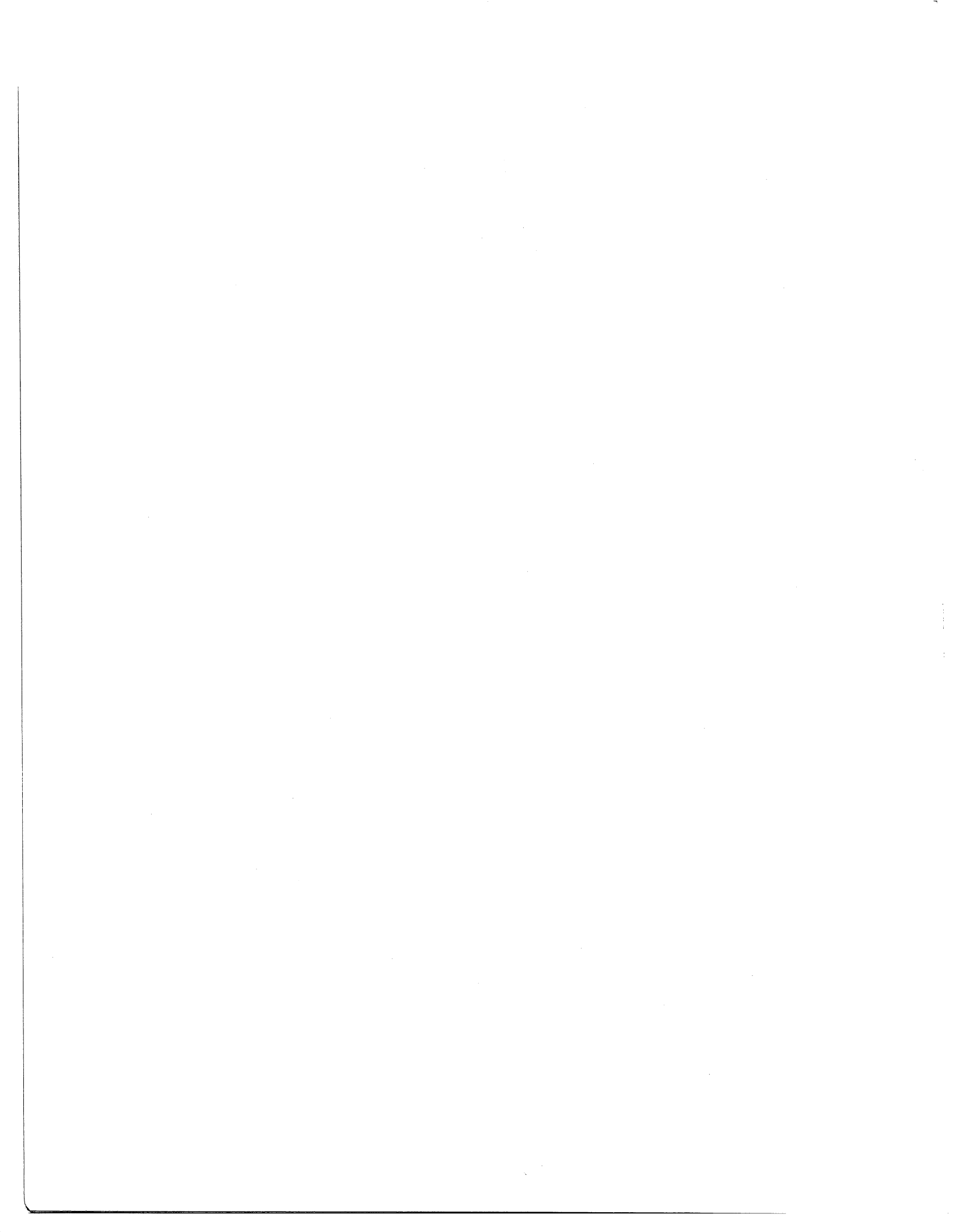
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