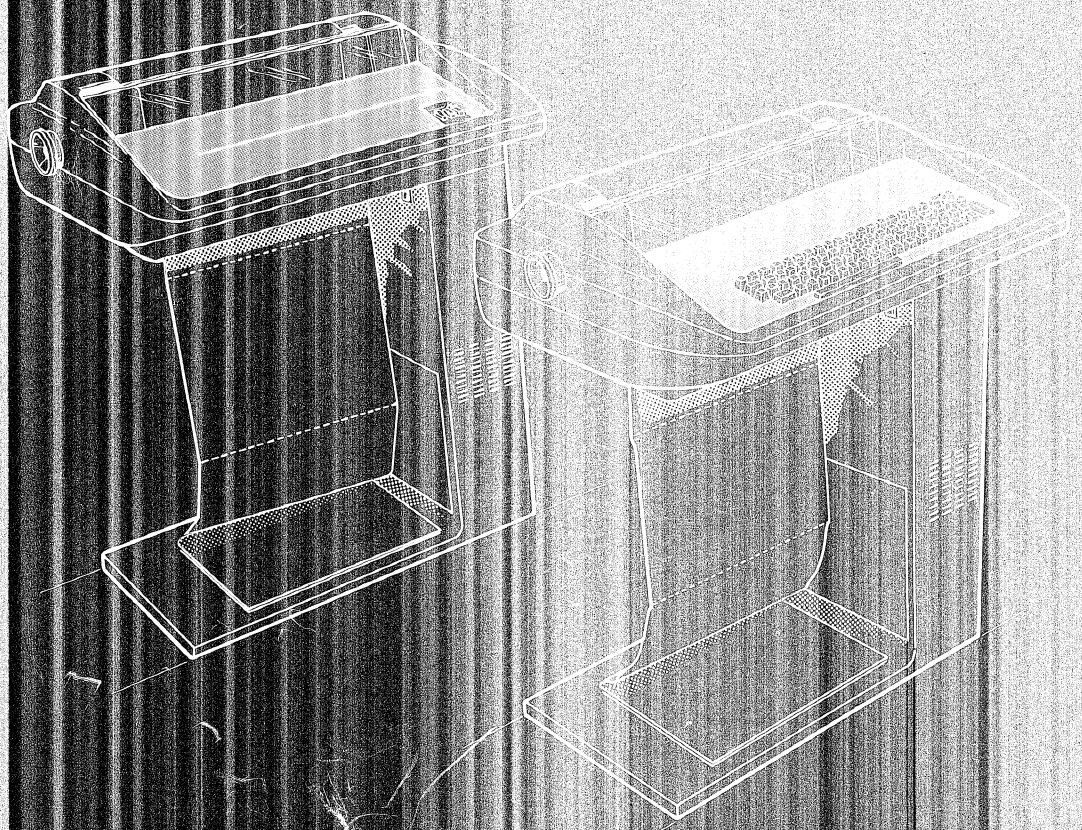
# ENHANCED DASHER® LP2 AND TP2 PRINTERS

## USER'S MANUAL

## MODELS 6190-6194, 9610-9613



Data General

Ordering No. 014-000675-03

# TECHNICAL SPECIFICATIONS

## GENERAL:

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

## ELECTRICAL:

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

## MECHANICAL:

| | |
|---|---|
| **Dimensions** | Height: 85.7cm (33.75″)<br>Depth: 53.3cm (21″)<br>Width: 67.3cm (26.5″) |
| **Weight** | 27kg (60 lbs.) |

## ELECTRO-MECHANICAL:

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

## ENVIRONMENTAL:

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

# ENHANCED DASHER® LP2 AND TP2 PRINTERS

## USER'S MANUAL

## MODELS 6190-6194, 9610-9613

# Warning:

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

Data General

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# 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. 014-000678.

The illustrations in this manual are for reference only and may not be an exact visual replica of the product.

> **NOTE:** *Similar information for the LP2/TP2 Printer, Models 6073 through 6077, may be found in the DASHER® LP2 and TP2 Printers User's Manual, Part No. 014-000094 and in the Operator's Manual, Part No. 014-000093.*

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# CHAPTER 1
# INTRODUCTION

## PRODUCT OVERVIEW

The DASHER® LP2 and TP2 family of printers are impact, dot-matrix printers developed for use as computer consoles, data entry terminals, and hard copy printers.

All DASHER® printers are capable of printing at speeds of up to 180 characters per second (cps). 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 9-wire printhead which forms 7 × 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-232-C or 20 mA current loop connections are provided on serial interface models. In addition, these models may be used in conjunction with Bell 103 and 212A compatible MODEMs. Table 1-1 lists and describes all LP and TP models.

**Table 1-1. DASHER Model Configurations**

| MODEL | TYPE | DESCRIPTION |
|---|---|---|
| 6190 | LP | Receive-only line printer with parallel interface |
| 6191 | LP | Receive-only line printer subsystem, parallel interface, Nova/Eclipse programmed I/O controller, paper holder. |
| 6192 | LP | Receive-only line printer subsystem parallel interface, Nova/Eclipse data channel controller, paper holder |
| 6193 | TP | Receive-only terminal printer with serial interface |
| 6194 | TP | Keyboard send/receive terminal printer with serial interface |
| 9610 | LP | Receive-only line printer subsystem with parallel interface for CS/10 C1 systems |
| 9611 | LP | Receive-only line printer subsystem with parallel interface for use with CS/10 C3 systems |
| 9612 | LP | 6190 receive-only printer with parallel interface configured for CS/30 systems |
| 9613 | LP | 6190 receive-only line printer with parallel interface configured for CS/40+ systems |
| 1285A | — | Box of 12 ribbon cartridges for all models |
| 1285B | — | Box of 60 ribbon cartridges for all models |
| 1285C | — | Box of 600 ribbon cartridges for all models |
| 1127A | — | Paper holder for all models |

# STANDARD PRINTER FEATURES

All members of the printer family include the following features:

- International Character Fonts—All members of the printer family may be configured to use two of the following seven international character fonts:

  — American
  — British
  — French
  — German
  — Swedish
  — Danish
  — Spanish

  Any two of these fonts may be configured as standard and alternate character sets.

  **NOTE:** *All models are equipped with all international character sets; however only two sets may be used at any given time (primary and secondary sets) as selected by SW1 on the Control Logic PWB. The primary set is configured according to the beta suffix to the model number and the secondary set is always configured as the U.S. character set (can be reconfigured to any desired set during installation).*

- Horizontal Tabbing—Permits you to set or clear tabs anywhere in the 132 character line (220 character line is compressed print mode). All tabs may be set with a single escape sequence as described in the Programming Chapter.

- 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.

- 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 7 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 Per Inch (lpi)—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.

- Alternate Character Set—Permits you to print characters from a second character set. This second character set may be one of the seven international character fonts or an optional character set depending on the setting of the Control Logic PCB configuration switches (see Installation chapter for additional detail).

- Automatic Form Feed—Allows you to advance the paper to the top of the next form in one operation. Included is the automatic perforation skip-over feature which allows you to skip the perforation between forms.

- Compressed Print—Allows you to print 132/220 characters/line on 8½/14-inch wide paper.

| | CHARACTERS PER INCH | |
|---|---|---|
| | REGULAR | ELONGATED |
| Normal | 10 | 5 |
| Compressed | 16.5 | 8.25 |

# OPTIONAL FEATURES

The following optional features are also available:

- Parallel Interface—Allows you to connect your printer to systems equipped with a parallel ASCII line-printer interface. The parallel interface transfers 7 or 8 bits of information at a time. In addition, it sends signals which inform the system when the printer is powered-up and on-line as well as wehn 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 switch 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 chasses.

- 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.

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

- Paper Holder—Collects and stacks fanfold 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 compressed 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 compressed elongated width characters at 8 lines per inch vertical spacing.

Compressed print underscored

Regular print underscored

Compressed elongated print underscored

Elongated print underscored

## 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!@#$%^&*()-_=+`~[]\|;:'"{},<.>/?

The U. K. character set is:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890!@£$%↑&*()-_=+`¯[]\|;:'"{},<.>/?

The FRENCH character set is:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890!à£$%^&*()-_=+`~°§çù;:'"éè,<.>/?

The GERMAN character set is:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890!§#$%^&*()-_=+`ßÄÜöö;:'"äü,<.>/?

The SPANISH character set is:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890!@#$%^&*()-_=+`~[]ÑñÑ;:'"{},<.>/?

The SWEDISH character set is:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890!é#¤%ü&*()-_=+éüÄÄöö;:'"ää,<.>/?

The DANISH character set is:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890!ä#¤%ü&*()-_=+äüÆÄØø;:'"ææ,<.>/?

DATA GENERAL CORP.
Austin, TX

# CHAPTER 2
# PROGRAMMING

## INTRODUCTION

Your DASHER 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 lowercase 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 2528 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 two 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). Chapter 3 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 the 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—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 printer responds to them.

### Printing Character Codes

The printing characters include all the upper- and lowercase alphanumeric characters as well as graphic, punctuation, and space characters. Up to 132 characters

may be printed on each line (220 characters in compressed mode). If more than 132 characters (220 in compressed mode) are received without a line terminator, they are not printed. New lines ⟨012⟩, vertical tabs ⟨013⟩, form feed ⟨014⟩, and carriage returns ⟨015⟩ are all considered line terminators.

NOTE: *In this manual, octal codes are shown in angle brackets.*

# 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 | 007 | Sounds audible tone immediately after code is received. |
| Back Space | BS | 010 | Printhead moves back one character position. |
| Horizontal Tab | HT | 011 | Printhead moves to next horizontal tab stop. If no tab is set, the command is ignored. |
| Newline (Line Feed) | NL | 012 | Terminates the present line, advances the paper one line, and either:<br>a. determines the fastest way to print the next line (if it is complete), or<br>b. performs a carriage return and prints any characters from left to right. |
| Vertical Tab | VT | 013 | Paper advances to next tab stop. If no tab is set, a carriage return is performed. |
| Form Feed | FF | 014 | Paper advances to the top of the next form. |
| Carriage Return | CR | 015 | Carriage returns to the left-hand margin. |
| Shift Out | SO | 016 | Selects alternate character set. |
| Shift In | SI | 017 | Selects standard character set. |
| Escape | ESC | 033 | Denotes the beginning of a command sequence. |
| | | | (Codes transmitted)* |
| Device Code 1 | DC1 | 021 | **Indicates that the character buffer has room for more characters. |
| Device Code 3 | DC3 | 023 | **Indicates that the character buffer is full. |

*On DASHER TP2 printers only.
**When Software Busy in enabled (See Installation Chapter).

# Escape Sequences

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

- Horizontal tabs
- Vertical tabs
- Elongated printing
- Underscoring
- Resetting the printer
- Compressed printing
- Plotting
- Down line loading a character set

An Escape Code ⟨033⟩, 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, 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 (220th) character position. The printhead advances to the next horizontal tab stop following the reception of a Horizontal Tab (CTRL-I) control code ⟨011⟩ 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<br>⟨033⟩⟨061⟩ | Sets a horizontal tab at the current printhead position. |
| ESC 2<br>⟨033⟩⟨062⟩ | Clears a horizontal tab from the current printhead position. |
| ESC E # # ... NULL<br>⟨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 (# = $334_8$ = $220_{10}$)*. All previously set horizontal tabs are cleared. |
| ESC E NULL<br>⟨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 EXC E sequence will only be able to set tabs to the 127th column position.*

## Vertical Tabs

You may set a vertical tab anywhere from top of a form to the line preceding the top of the next form. The printer keeps track of the number of lines per form and the user's current line position. However if you have perforation skip-over enabled (see Operator's Manual), you must remember that you have, in effect, fewer lines per form.

When a printer receives a Vertical Tab (CTRL-K) control code ⟨013⟩, it advances the paper to the beginning of the next line on which a vertical tab is set. If no vertical tab is set, Vertical Tab code acts like a Carriage Return. The following escape sequences are used to set and clear vertical tabs:

NOTE: *Tabs may be set or cleared only after a line terminator has been received.*

| Escape Sequence (Octal Code) | Effect On Printer |
|---|---|
| ESC 5<br>⟨033⟩⟨065⟩ | Sets a vertical tab at the current line position. |
| ESC 6<br>⟨033⟩⟨066⟩ | Clears a vertical tab from the current line position. |
| ESC F # # ... NULL<br>⟨033⟩⟨106⟩ # # ...<br>⟨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<br>⟨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. You should note that only 66 elongated characters wiill 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 <<br>⟨033⟩⟨074⟩ | Selects elongated printing for subsequent characters. |
| ESC =<br>⟨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 enable 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. |

## Resetting the Printer (Master Reset)

A software Master Reset (ESC c NULL; ⟨033⟩⟨143⟩⟨000⟩⟨000⟩) 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

Your printer allows you to print either normal or compressed width characters. While in the normal mode,, you can print 132 normal width characters on regular 132-column paper. In compressed mode, you can print 220 compressed characters on 132-column paper. However, you may issue the escape sequences to change the print mode only after a line terminator, i.e., Newline ⟨012⟩, Vertical Tab ⟨013⟩, Form Feed ⟨014⟩, or Carriage Return ⟨015⟩. 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. |

## 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 900 columns per second. You may plot up to 1320 columns per line (2200 columns in compressed mode).

To plot, you enter plot mode and send a 7-bit code (from 0 to 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 7-bit code and the printhead wires which are fired is shown in the accompanying illustration. A "1" in a bit position fires the corresponding printwire.

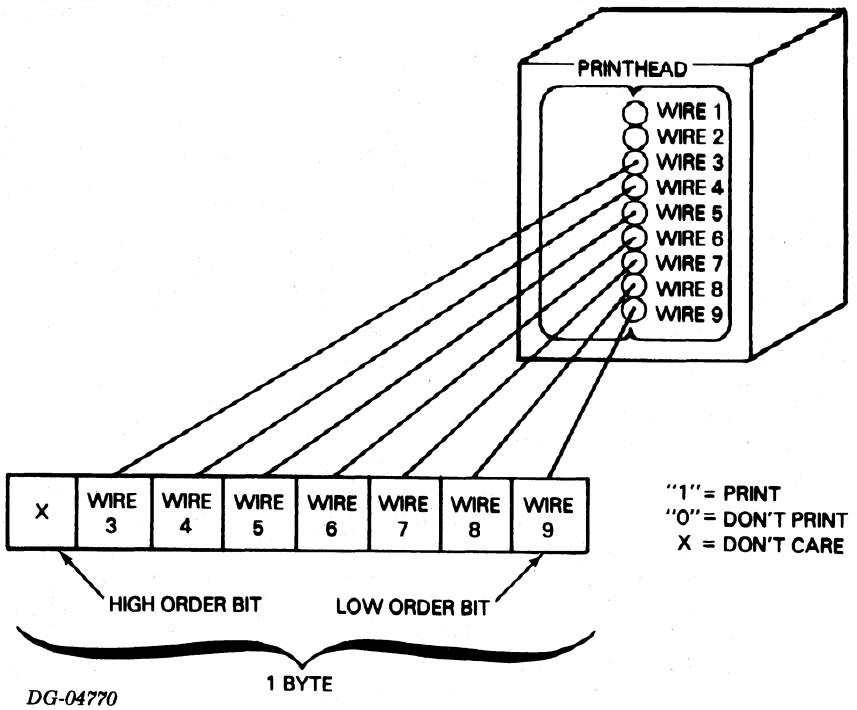
You enter plot mode by issuing a line terminator, i.e., Newline ⟨012⟩, Vertical Tab ⟨013⟩, Form Feed ⟨014⟩, or Carriage Return ⟨015⟩, followed by ESCape d ⟨033⟩ ⟨144⟩. This escape sequence must be issued after a line terminator; otherwise it will be ignored. After entering plot mode, you issue the series 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⟩⟨145⟩) and issue a line terminator. If the next line is to be plotted, issue a Newline ⟨012⟩ after deselecting plot mode. The printer will produce a line feed with NO interline spacing. However, inserting any terminator 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.

| Escape Sequence (Octal Code) | Effect On Printer |
|---|---|
| ESC d ⟨033⟩⟨144⟩ | Selects plot mode. |
| ESC e ⟨033⟩⟨145⟩ | Deselects plot mode. |

To plot ESCape ⟨033⟩, you must transmit it twice in a row (since it could signal the beginning of the deselect sequence). 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.

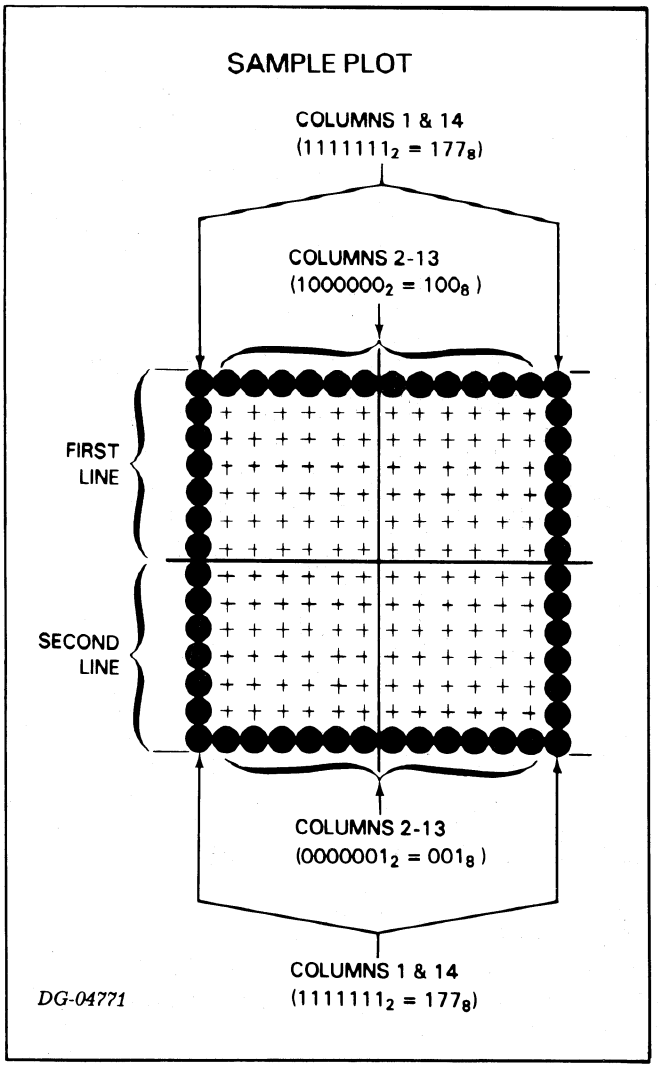
## PLOT MODE CODING




*DG-04770*

## Example:

Suppose you wanted to plot a 14 × 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⟩<br>⟨144⟩ | Enter plot<br>mode |
| ⟨177⟩ | Prints column 1, first line |
| ⟨100⟩ (12 times) | Prints columns 2-13, first line |
| ⟨177⟩ | Prints column 14, first line |
| ⟨033⟩<br>⟨145⟩ | Exit<br>Plot Mode |
| ⟨012⟩ | Newline |
| ⟨033⟩<br>⟨144⟩ | Enter<br>Plot Mode |
| ⟨177⟩ | Prints column 1, second line |
| ⟨001⟩ (12 times) | Prints columns 2-13, second line |
| ⟨177⟩ | Prints column 14, second line |
| ⟨033⟩<br>⟨145⟩ | Exit Plot<br>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

DASHER printers allow you to define your own character set. You can define a character set which prints up to 118, 7 × 9 dot matrix characters. Once you have defined each character in your character set, you load the set into the 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 are control codes which do not print any characters. The remaining 95 characters (⟨040⟩ - ⟨176⟩) are printing characters.

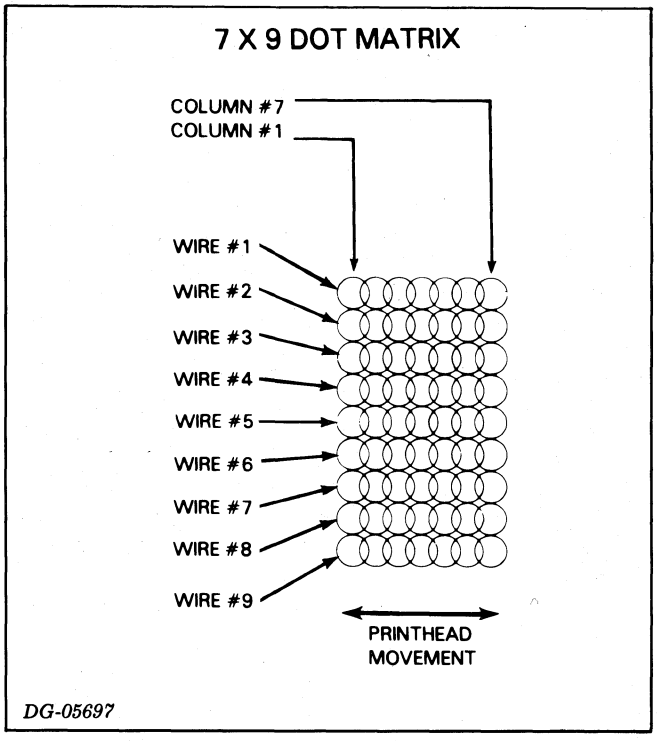
When you down line load a character set, you may define any printing character except for control codes which perform specific functions on LP2 and TP2 printers. These codes include ⟨007⟩, ⟨017⟩, and ⟨033⟩. The functions of these codes are summarized in the table entitled DASHER LP2 and TP2 Printer Control Codes. Therefore, a down line loaded character set can define 118 individual characters. The codes for which characters may be defined include ⟨000⟩-⟨006⟩, ⟨020⟩-⟨032⟩, and ⟨034⟩-⟨177⟩.

## Defining A Character Set

Each dot pattern in a character set is defined using a 7 × 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 5.

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 8 memory locations to store one character. The first memory location MUST contain all zeros. The following 7 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 7th column 7 locations above the first. For example, the



firing codes for the character "B" would be organized as shown in the following diagram:

## Loading A Character Set

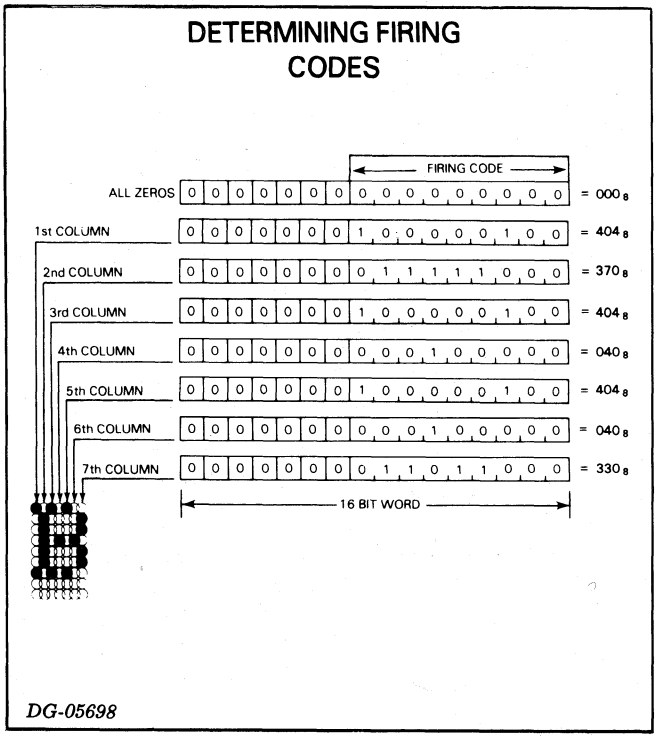
In order to understand the format used in downloading a character set it is useful to visualize the printer memory as $4000_8$ 16 bit wide words. The downloaded character set begins at word $2000_8$ and extends to word $3777_8$. This allows a character set storage area of $2000_8$ words ($4000_8$–$2000_8$ = $2000_8$). Each character requires $10_8$ words of storage; so the $2000_8$ words in the character set storage area can store $200_8$ or $128_{10}$ characters. The Starting Character Set Address (SCSA) is always $2000_8$ because the character set storage area begins at word $2000_8$.

The location of the downloaded dot pattern in the character set storage area determines which ASCII code will print that dot pattern. ASCII code ⟨000⟩ prints the first dot pattern in the character set storage area. This pattern occupies the $10_8$ words from $2000_8$ to $2007_8$. Likewise ASCII code ⟨001⟩ will print the dot pattern beginning at word $2010_8$ ending with word $2017_8$. This suggests a formula for determining which locations should contain the dot pattern printed by any ASCII code:

$$\text{Starting Word Address} = 2000_8 + (\text{ASCII code}_8 \times 10_8).$$

The Starting Word Address in the formula is the address containing the first word in the ASCII code's dot pattern. The other 7 words in the dot pattern follow in the next 7 addresses. Using the formula the addresses for the last dot pattern (corresponding to ASCII code ⟨177⟩ can be found.

$$\begin{aligned}\text{Starting Word Address} &= 2000_8 + (177_8 \times 10_8)\\ &= 2000_8 + 1770_8\\ &= 3770_8\end{aligned}$$



So the last dot pattern resides in words $3770_8$ – $3777_8$. This is the very top of the character set storage area.

When downloading a dot pattern into memory, you define which ASCII code prints that pattern by specifying the correct starting address for the load. More detail on this below.

You need not download character sets one dot pattern at a time. With a single ESC Y sequence, any number of dot patterns (up to $128_{10}$) may be loaded into memory. The only restriction is that the printer will load the dot patterns sequentially into memory beginning at the user's specified starting address. You define how many dot patterns are to be loaded during a particular ESC Y sequence by specifying the length of the data block containing the consecutive dot patterns. More detail on this will be given below.

The communication interface receiving the download character set escape sequence receives only 8 bits (one byte) at a time. Therefore dot patterns are loaded sequentially into memory one byte at a time. The dot patterns consist of 9 bit firing codes contained in 16 bit words. These 16 bit words must be broken into two 8 bit bytes before transmitting them to the printer.

16 BIT WORD

/ LEFT BYTE / RIGHT BYTE /

When sending a word to the printer in two bytes, the left byte is always transmitted before the right byte.

In addition to the bytes split from the words in the dot patterns, the ESC Y sequence also transmits the following information.

- Byte Count—Defines how many dot patterns are to be loaded in this ESC Y sequence by specifying the number of BYTES contained in the dot patterns.

  Byte Count =

  | Number of Dot Patterns | × | 8 words per Dot Pattern | × | 2 bytes per word |
  |---|---|---|---|---|

- Starting Byte Address—Defines such ASCII codes print the dot patterns downloaded in this ESC Y sequence by specifying BYTE ADDRESS in the character set storage area where the first of the consecutive dot patterns begins. The STARTING BYTE ADDRESS is simply 2 times the Starting Word Address computed using the formula above or:

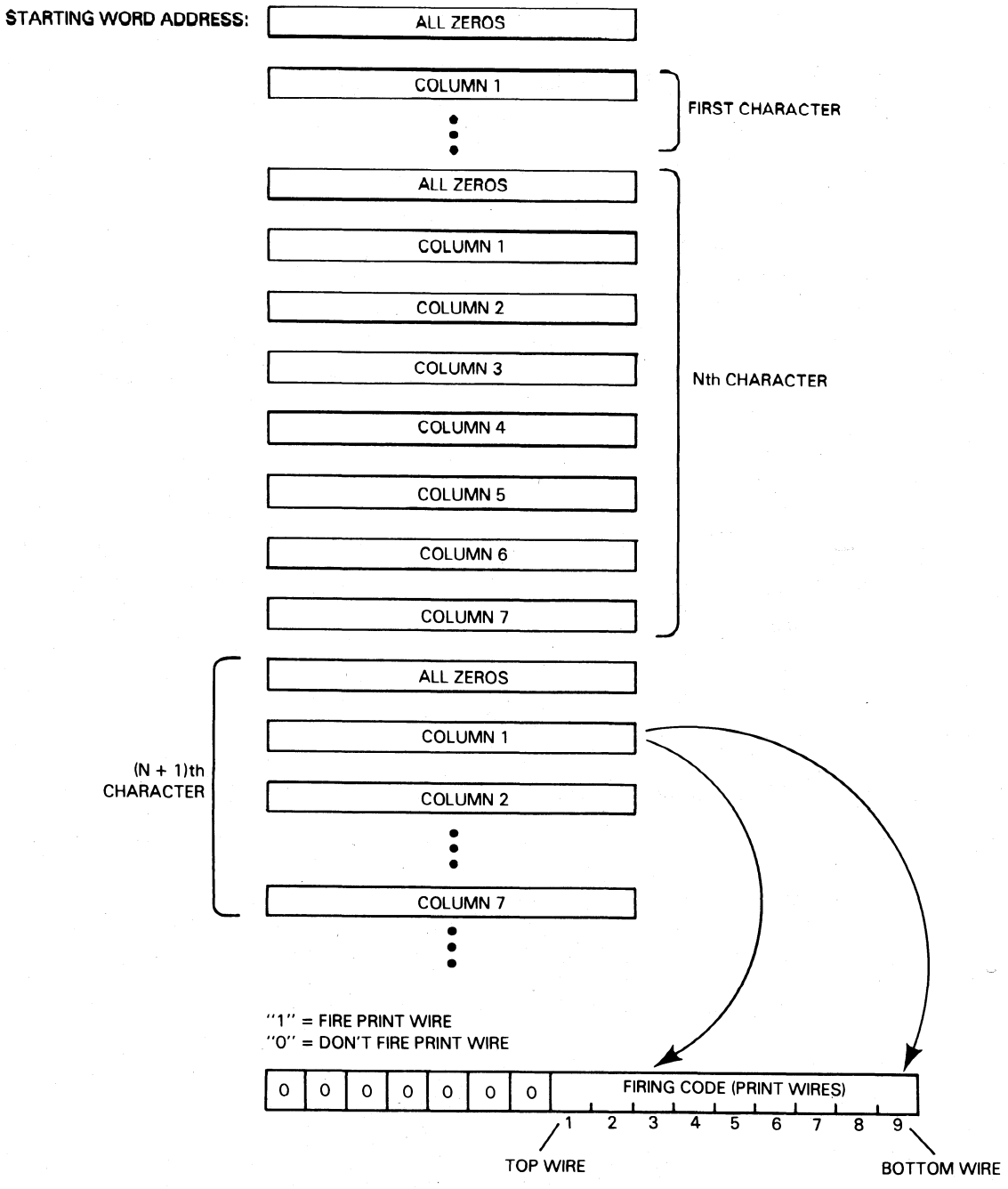
  Starting Byte Address =

  $$2 \times [2000_8 + (\text{ASCII CODE}_8 \times 10_8)]$$

- 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.

## CHARACTER SET ORGANIZATION IN MEMORY




*DG-05695*

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 an 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 |

## 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. The ASCII code for "B" is ⟨102⟩. The starting address for the load is computed as follows:

$$\begin{aligned} \text{ADDRESS} &= 2000_8 + (102_8 \times 10_8) \\ &= 2000_8 + 1020_8 \\ &= 3020_8 \end{aligned}$$

2. Calculate the starting byte address as follows:

$$\begin{aligned} \text{Starting Byte Address} &= 2 \times \text{Starting Word Address} \\ &= 2 \times 3020_8 \\ &= 6040_8 \quad \text{right byte} \\ &= 0\ 000\ 110\ 000\ 100\ 000_2 \\ &\quad \text{left byte} \end{aligned}$$

Divide this into two bytes, left hand byte first: $014_8$
$040_8$

3. Calculate the Byte Count

Byte Count = Number of Characters × 8 words per character × 2 bytes per word

$= 1 \times 8 \times 2$
$= 16_{10}$
$= 20_8$ right byte
$= 0\ 000\ 000\ 000\ 010\ 000_2$
left byte

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.

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

| 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:

003 Escape Sequence for Down-Line-Load initiation
131
000 Byte Count
020
014 Starting Byte Address
040
000 Firing Codes for a "B"
000
001
004
000
370
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⟩⟨004⟩⟨000⟩ | Selects a down-line-loaded character set given a starting character set address (SCSA) of $2000_8$. |
| ESC 0 ⟨033⟩⟨117⟩ | Deselects a down-line-loaded character set. |

The value used for the Starting Character Set Address is always $2000_8$.

# Summary of Escape Sequence 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
- Setting and clearing of multiple horizontal tabs
- Vertical tab setting or clearing
- Downline character set load and select

The following escape sequences may be issued only after line terminator (newline, vertical tab, form feed or carriage return):

- Plot mode select
- Compressed print select or deselect

# CHAPTER 3
# INTERFACING AND CABLING

## LP2-TP2 INTERFACING

Your DASHER 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 seven or 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 on-line. The electrical and timing requirements for this interface are given below:

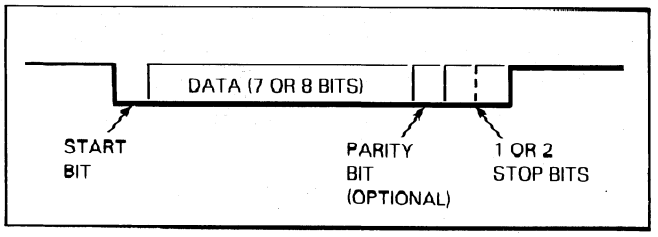
**Parallel Interface Requirements**

| Signal | Characteristics* |
|---|---|
| Data Lines | High = a logical 1.<br>Low = a logical 0. |
| $\overline{\text{STROBE}}$ | Duration: 0.5 - 10$\gamma$s<br>Data lines are sampled on falling edge of $\overline{\text{STROBE}}$. |
| DEMAND | High = Requesting Data<br>Low = Busy |
| READY | High = Printer powered up and ON LINE.<br>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 20 mA current looop or EIA RS-232-C 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 4, Tailoring the Switches on the Control Logic PCB).




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

| | Terminal Transmitting | Terminal Receiving |
|---|---|---|
| MARK SENSE | V max = 40 V<br>1 max = 40 mA | V max = 40 V |
| SPACE SENSE | I = 10 - 60 mA | I < 5 mA |

## Printer 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 on current loop connection J28. The polarity of the hardware-busy signal is switch selectable on the Control Logic PCB. The hardware-busy signal is asserted when the buffer contains more than 2272 bytes. This signal notifies the controller to stop sending data because the buffer is nearly full. After the buffer drops below 512 bytes, the hardware-busy signal is deasserted indicating that the controller can resume transmitting data.

The second method, called XON XOFF, requires your printer to transmit one of two codes to the transmitting device, telling it to start or stop sending data. A DC2 ⟨023⟩ control code is transmitted when the buffer is nearly full while a DC1 control code ⟨021⟩ is transmitted when the buffer is empty. This method requires a full duplex connection with 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 support Bell model 103 and 212A 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. |

You should use a full duplex modem along with the software "busy" control codes mentioned above.

# CABLING

You connect your printer to a computer or communications system using an I/O adapter cable. For specific cabling information, see 010-000683.

# CHAPTER 4
# INSTALLATION

## CHOOSING A SITE

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

## UNPACKING

For packaging information, see 010-000687 or 010-000688.

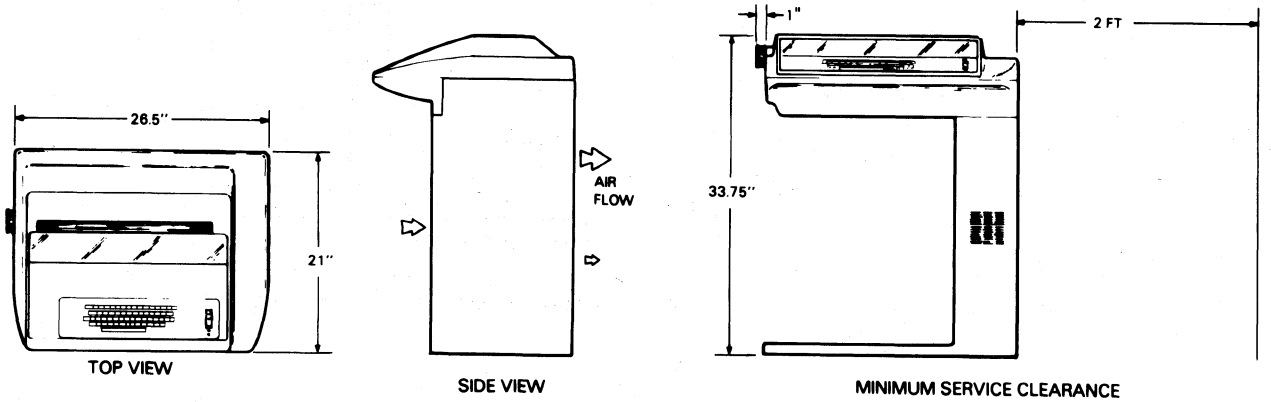
## CONFIGURATION PROCEDURES

The DASHER printers may be installed on a wide range of DGC systems and various features may be either enabled or disabled depending on the setting of various internal switches and the presence or absence of six internal jumper wires.

### SPECIFICATIONS

| Item | Component | Number in Sub-system | Weight lbs / kg | Operating Humidity (Relative) min / max | Maximum Operating Temperature: Component °F / °C | Maximum Operating Temperature: Media °F / °C | Power Dissipation (Watts) | BTUs/hr (3.41 x Watts) | Primary Power: Volts | Hz | Phase | Cond | Amps | Power Cable Length ft / m | Power Cable Connector | Power Drop Mating Power Receptacle | Wall Mating Power Receptacle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N/A | 80 / 36.3 | 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 | 80 / 36.3 | 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

*DG-02866*

The DASHER printers are normally configured at the factory. However, all jumper wires and switch settings should be verified during initial installation.

The printers may also have to be reconfigured if moved to another system.

# TP2 Configuration Options

The jumper wires and DIP switches used for TP2 printer configuration are located on the Main Control printed circuit board (PCB), DGC Part No. 005-016362 as shown below.

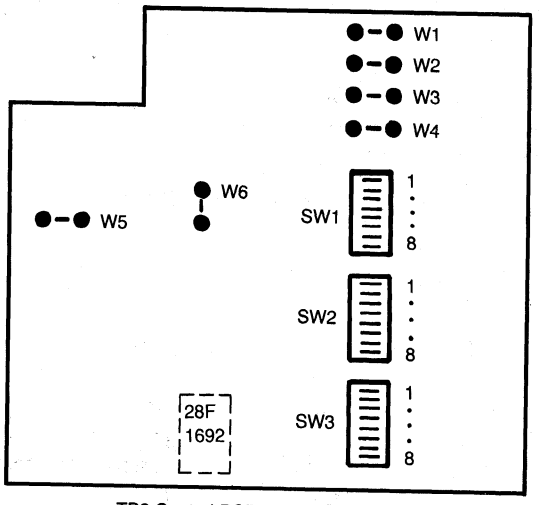
The PCB is equipped with 6 jumper wires (W1 – W6) and 3 Dual-inline-package (DIP) switches (SW1 through SW3).

Each DIP switch contains 8 bit positions labeled 1 through 8.

For TP2 Configuration Summary and tables, see 010-000687.

# LP2 Jumper/Switch Option

For LP2 Configuration Summary tables, see 010-000688.




TP2 Control PCB (p/n 005-016362)

Note: IC 100-1692 installed on TP2 P/N 005-16710 through 005-16713.

LOCATION OF TP2 CONFIGURATION SWITCHES AND JUMPERS

# LP2 Configuration Guidelines

The following jumper wire and DIP switch settings reflect a typical LP2 printer configuration.

**LP2 Jumper Wire Configuration**

| Jumper | In/Out | Description |
|---|---|---|
| W1 | IN | Parallel I/F |
| W2 | IN | Power Failure Recovery Enabled |
| W3 | OUT | SA Disabled |
| W4 | OUT | APL Disabled |
| W5 | IN | Clock Enabled |
| W6 | IN | 8-bit Interface |

For LP2 Switch Bit Settings table, see 010-000688.

# OPERATIONAL CHECK-OUT

We recommend you check out your printer before beginning to use it. This check-out consists of two parts: (1) an off-line check-out after you unpack and tailor your printer, and (2) an on-line check-out after you connect it to your system. Before conducting these check-outs, familiarize yourself with the Operator's Manual (014-000678).

# Off-line Check-out

After you unpack and tailor your printer, do the following:

1. Plug in the detachable power cord at the unit's power socket on the rear base of the pedestal column;
2. Plug the 3-pin end into the ac line supply outlet;
3. Load paper and a ribbon cartridge as described in the Operator's Manual;
4. Activate automatic form feed by following the procedure outlined in the Operator's Manual.

You are now ready to conduct the Off-line Check-out.

**Off-line Check-Out Procedures**

| Procedure | Expected Result |
|---|---|
| Turn the power On, switch the unit OFF LINE, and switch VIEW off. | The fan spins and 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). | The paper is advanced to the top of the next form. |
| *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 feature 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.

NOTE: *View mode operates in ONLINE mode only.*

# On-line Check-out

Before you can conduct the on-line check-out, 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 3, for information about cables) into the appropriate connector on the back side of the pedestal column.
- Connect the other end to the system.

For printer connection figures, see 010-000687 or 010-000688.

If you have an RO model printer, load a program into your system that transmits ASCII characters to the printer. If you have 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.

## On-line Check-Out Procedures

| 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 and RDY indicators light. |
| With the printer online, repeat the steps of the off-line check-out. | The results are identical to the steps in the offline checkout. |
| Check the form feed as follows: | |
| Switch the printer OFF LINE. Activate 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):<br>–a few NEWLINES (012)<br>–ESC-5 (033 065) (sets vertical tab)<br>–a CTRL-L (014) (a form feed)<br>–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. |
| Type in (or transmit) a word or two followed by:<br>–ESC-1 (033 061) (sets horizontal tab)<br>–NEWLINE (015)<br>–CTRL-1 (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):<br>–some text<br>–ESC < (033 074)<br>–more text<br>–ESC = (033 075)<br>–more text | –The text is printed.<br>–Nothing happens.<br>–The text is printed in elongated width characters.<br>–Nothing happens.<br>–The text is printed in normal width characters. |
| Type in (or transmit):<br>–some text<br>–ESC a (033 141)<br>–some text<br>–ESC b (033 142)<br>–some text | –The Text is printed.<br>–Nothing happens.<br>–The text printed is underscored.<br>–Nothing happens.<br>–The text is printed without an underscore. |

**On-line Check-Out Procedures (continued)**

| Procedure | Expected Result |
|---|---|
| Type in (or transmit):<br>ESC c NULL (033 143 000) | 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. |
| *Type in (or transmit):<br>–NEWLINE (012)<br>–ESC > (033 076)<br>–some text<br>–NEWLINE (012)<br>–ESC ? (033 077)<br>–more text | –Printhead returns to the left-hand margin.<br>–Carriage seeks home.<br>–Text is printed in compressed width characters.<br>–Printhead returns to left-hand margin.<br>–Carriage seeks home.<br>–Text is printed in normal width characters. |

*Left if current position ≤ 9 positions from right end.

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 PC board, 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, contact the nearest field service representative for assistance.

# FAULT DETECTORS

## 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.

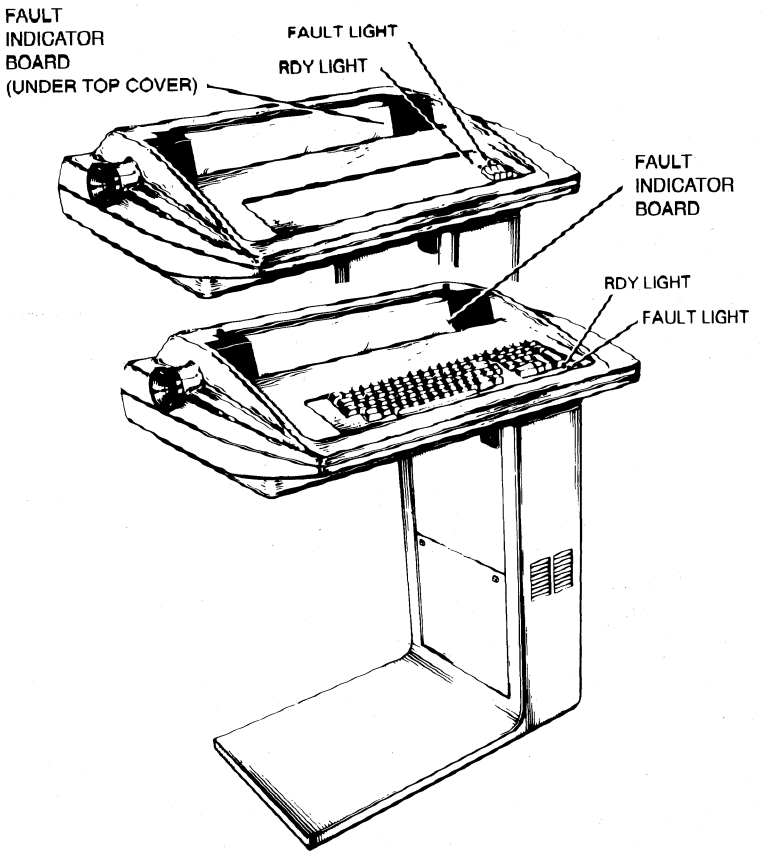
## RDY (Ready) Light

The RDY light on the primary control panel indicates that the printer is on-line and no fault conditions exist.

## Fault Light

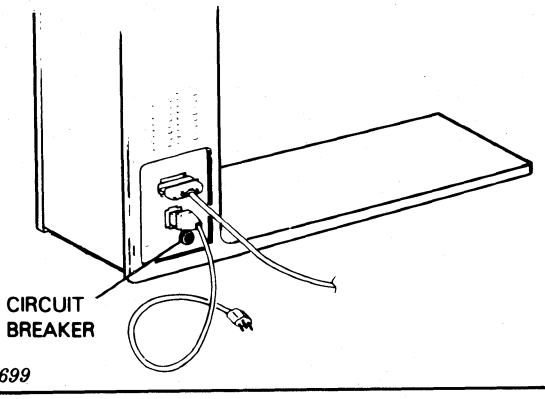
The FAULT LED on the primary control panel lights when a problem exists that requires operator intervention. The nature of the problem can then be determined by evaluating the fault code displayed on the Fault Indicator Board.

FAULT DETECTION LIGHTS




*DG-05706*

POWER LINE CIRCUIT BREAKER




*DG-05699*

# Fault Indicator Board

The seven-segment LED on the Fault Indicator Board displays a numerical fault code anytime an operational or equipment fault is encountered. Each time the dis-

play is updated, a bell is sounded to alert the operator.

# Self Test Failure Faults (Codes 1, 2 and 3)

When the printer is initially powered up or master reset, a self test is performed on the printer's memory circuits (ROM and RAM) and on the serial interface logic (TP printers only). A failure on any of these tests will result in one of the following error codes:

| Error Code | Fault Description |
|---|---|
| 0 | Processor not executing code |
| 1 | Rom Self Test failure |
| 2 | RAM Self Test failure |
| 3 | Serial I/F failure |

After a self test failure occurs, the test is executed continuously and the fault indication remains until the printer successfully passes the test.

An error message display 0 through 3 is an indication of a hardware problem and the user should contact the nearest Data General Field Service Office for assistance.

# Operational Faults (Codes 4-C)

From time to time, printer conditions occur that require operator intervention before normal operations can be resumed. These conditions and their associated fault codes are as follows:

| Fault Code | Condition |
|---|---|
| 4 | Parity error |
| 5 | Carriage motor stall |
| 6 | (Future expansion) |
| 7 | Out of forms |
| 9 | Buffer overflow |
| C | Power failure recovery |

## Parity Error (4)

The parity error fault indication is switch selectable on the control logic PCB (see Installation Chapter).

## Carriage Motor Stall (5)

This fault can be caused by a ribbon cartridge jam, buildup of foreign matter on the leadscrew/guide shafts, or other similar problems.

## Out of Forms (7)

This fault indicates the printer is out of paper or that the paper is no longer feeding into the printer for some reason.

## Buffer Overflow (9)

This fault indicates that the correct busy signal is not configured on the control logic PCB (see Installaion Chapter) or that the host system did not respond to the selected busy signal.

## Power Failure Recovery (c)

This fault indication informs the operator that a power failure has occurred and prevents going directly from a power failure to an ONLINE condition (if desired).

To enable this fault circuit, the Power Fail Recovery feature must be disabled on the control logic PCB (if enabled, the Power Failure Recovery fault will never occur).

# Operational Fault Recovery

To recover from an operational fault, the fault condition must first be cleared and then the FAULT reset switch must be pressed on the Fault Indicator Board.

The forms override function is performed by holding the FAULT RESET switch down to print additional lines after the OUT OF FORMS fault occurs.

# CHAPTER 5
# ARCHITECTURE

## INTRODUCTION

Your printer is controlled by an 8-bit microprocessor. The microprocessor directs communication between a number of a DASHER LP2 and 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 bus.

## 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 print wires.

Your printer has two types of memory: read-only memory and random-access memory. Read-only memory is used exclusively for storing the operating program. 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.

The contents of the random access memory include characters received but not yet printed and downloaded character set dot patterns. These are lost when the printer is powered down and when a Master Reset is generated.

# 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.

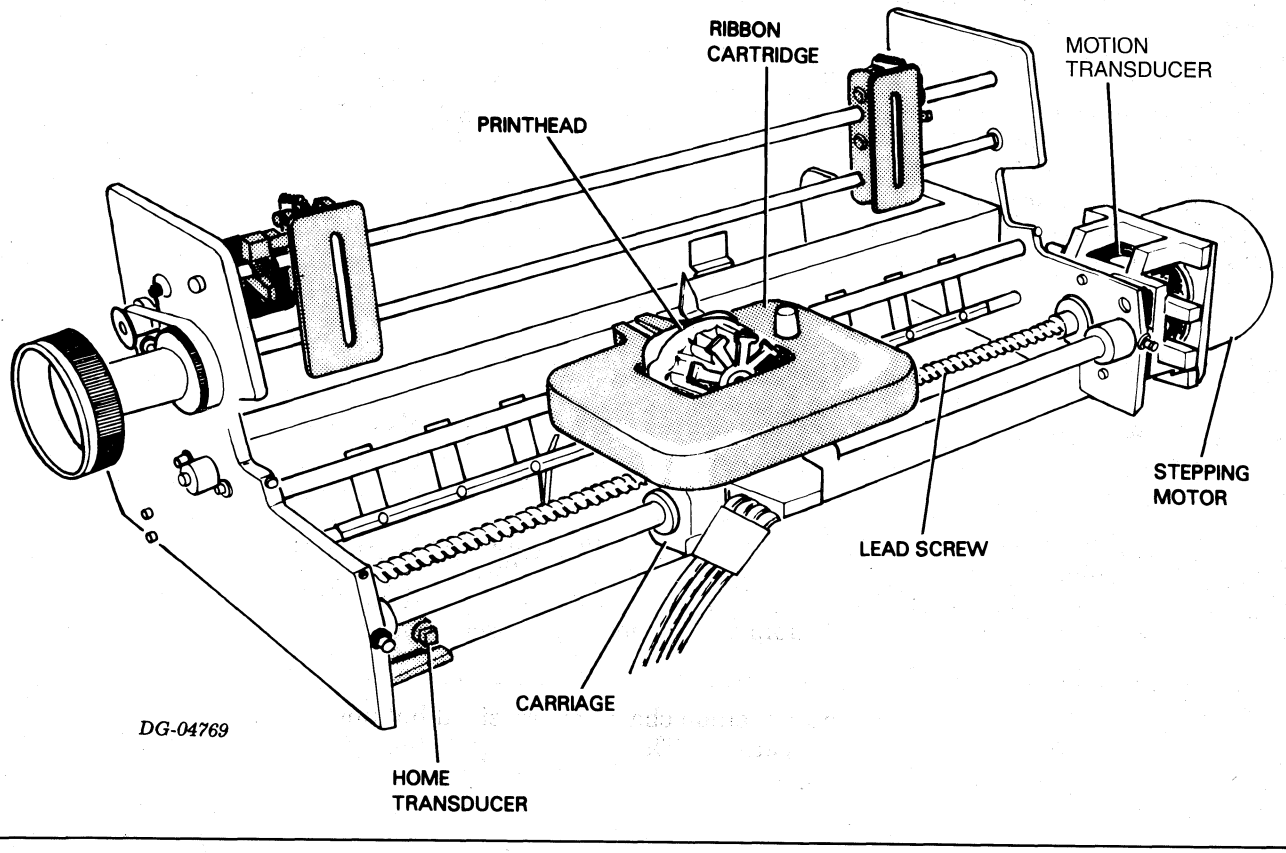
## The Printhead

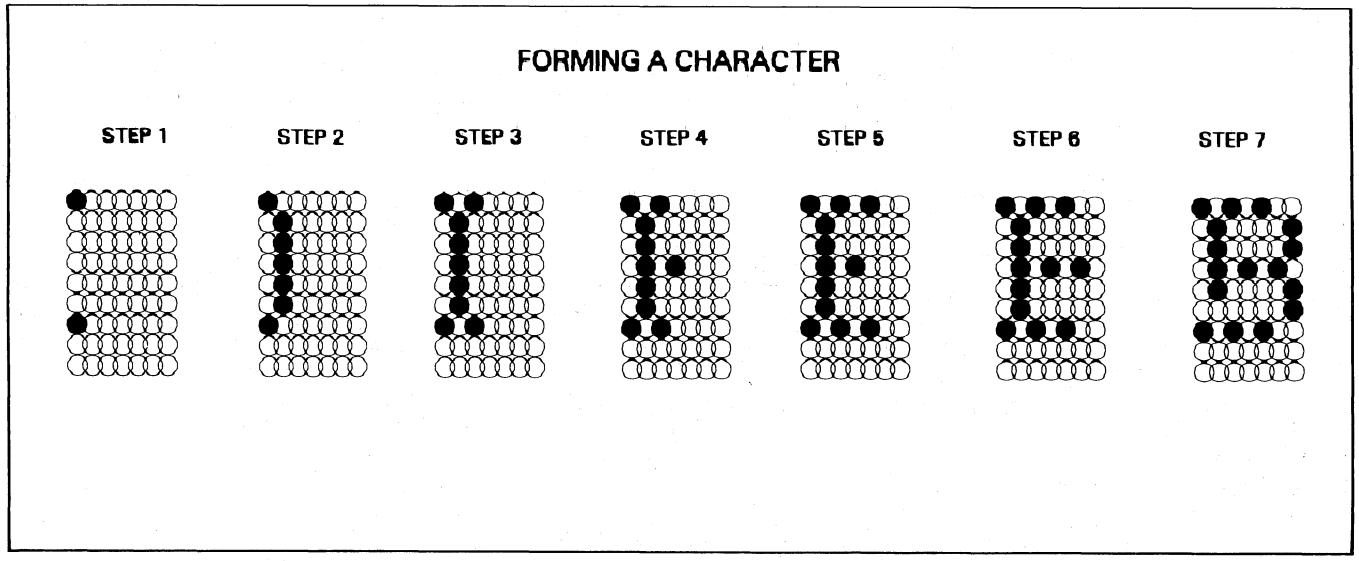
The printhead forms a character in seven segments as it moves across the paper. Each segmenet is formed by firing a subset of the 9 printhead wires. These wires force the ribbon against the paper forming a 7 by 9 dot matrix character. The microprocessor fires these print wires by obtaining a 9-bit code 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.

## 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

PRINTHEAD AND CARRIAGE ASSEMBLY






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.

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.

## Position Transducers

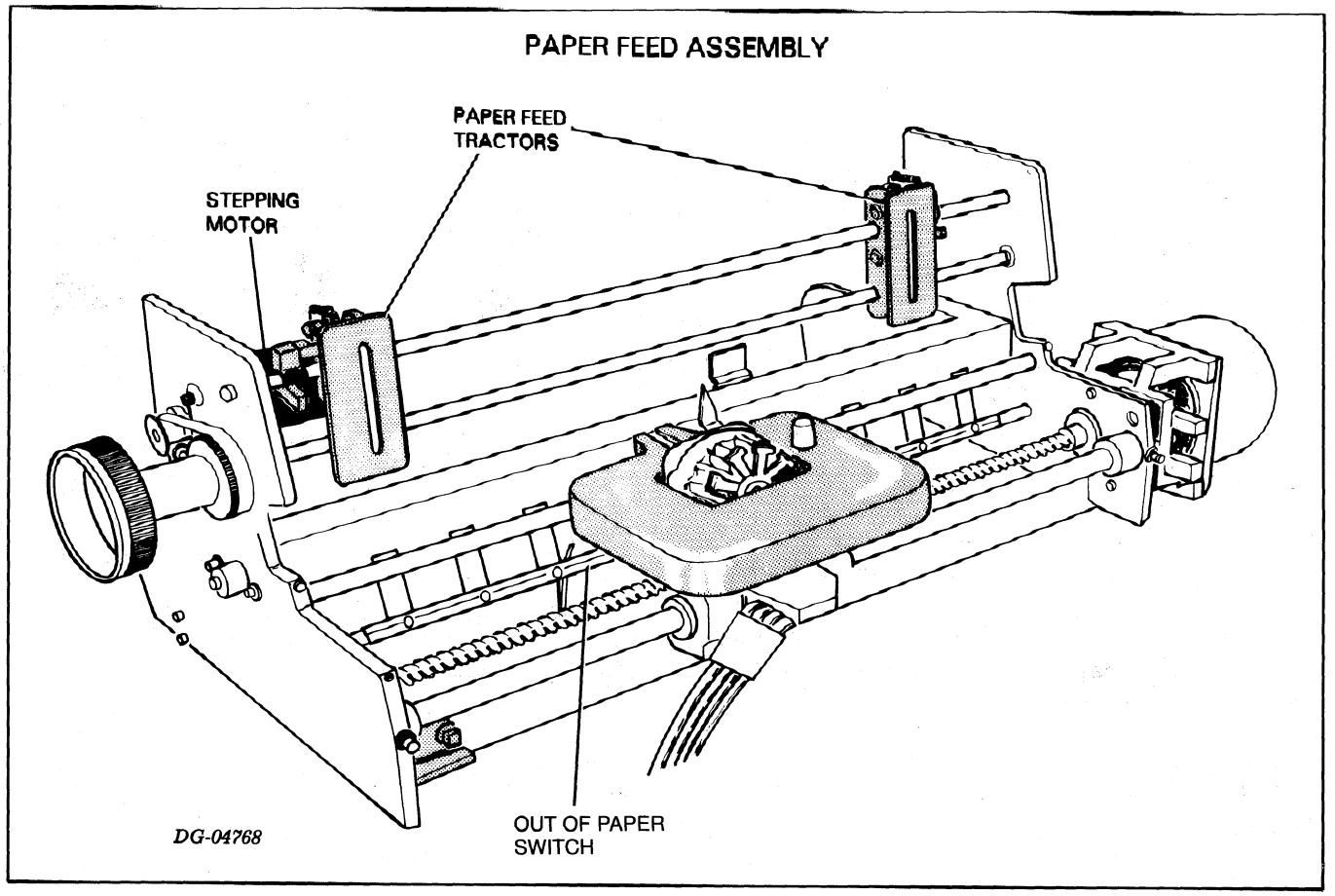
One of the transducers is used to inform the microprocessor when the printhead has reached the left-hand margin (home position). This transducer initializes the printhead's horizontal alignment.

Another transducer rotating with the shaft is used to indicate when the carriage is moving and the motor is not stalled.

# 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.

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




# Control Panels

The printer contains two control panels: a primary control panel located on the top cover and a secondary control panel accessed by raising the top cover.

## Primary Control Panel

The primary control panel contains three switches including:

- ON/OFF LINE
- LINE FEED/FORM FEED
- VIEW MODE

These switches are checked each time the carriage stops. While the carriage remains stopped, the switch states are monitored approximately every 6 milliseconds.

The primary control panel also contains the following LED indicators:

- READY—Unit online and no fault conditions exist.

- ONLINE—Lights when unit is ONLINE, goes out when printer is OFFLINE.
- FAULT—Lights when a fault is detected. If a fault is detected, the unit indicates Busy and Not Ready status, and ceases printing until the fault is corrected and then cleared via the FAULT RESET switch.
- VIEW (TP models only)—Indicates when the view mode is active (active only in ONLINE mode). In the view mode, the carriage moves 9 character positions to permit viewing the most recently typed characters.

## Secondary Control Panel

The secondary control panel contains the control switches that are least often accessed by the operator. These switches include:

- Compressed/Normal Mode switch
- 6/8 line per inch switch
- 0-99 lines per form (thumbwheel switch)
- Top of Form Initialize switch
- Perforation Skipover Disable
- Master Reset switch
- Self Test/ESC Disable switch
- Baud Rate switch
- Primary/Alternate Character Set Select switch

# Keyboard and Numeric Pad

Some TP model printers are equipped with an ASCII keyboard. While this unit is online, codes of depressed keys are transmitted to the host system over the serial interface. Since only full duplex protocol is supported, the character is not printed until echoed back by the host.

When the keyboard equipped unit is offline, it functions as a typewriter with a limited set of control codes including:

| Octal Code | Function |
|---|---|
| 007 | Bell |
| 010 | Backspace |
| 012 | Newline |
| 015 | Carriage Return |

# The Parallel Interface

A parallel interface transfers data from a computer to the microprocessor. Seven or eight data lines transfer data from the computer to the interface. 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 with no fault conditions.

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 most 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.

# Power Supply

The printer's power supply provides six different dc supply voltages from either 120 V or 220/240 Vac 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 0 |
| 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 |
| 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) |

| Name or Mnemonic | Action Taken By Printer | ASCII Code (Octal) | Decimal Equivalent | Keys **Pressed To Generate Code |
|---|---|---|---|---|
| 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 | SHIFT P |
| 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 ô | 136 | 094 | ^ |
| Underline | Prints _ | 137 | 095 | SHIFT _ |
| Accent Grave | Prints ò | 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 |

| Name or Mnemonic | Action Taken By Printer | ASCII Code (Octal) | Decimal Equivalent | Keys **Pressed To Generate Code |
|---|---|---|---|---|
| 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<br>DEL•SHIFT DEL•CTRL DEL•CTRL |
| DELETE | None | 177 | 127 | SHIFT DEL |

**CTRL denotes control key.
NP denotes keys appearing on numeric pad as well as keyboard.

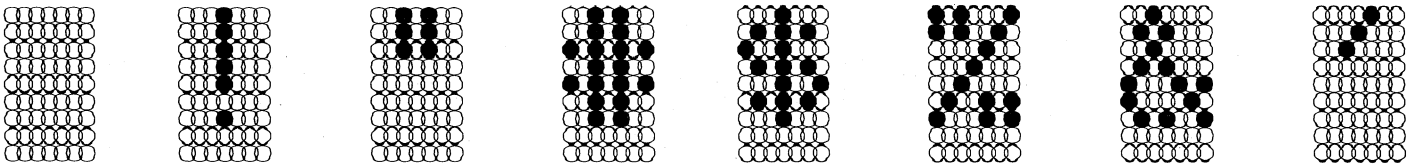
# APPENDIX B
# INTERNATIONAL CHARACTER SETS

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

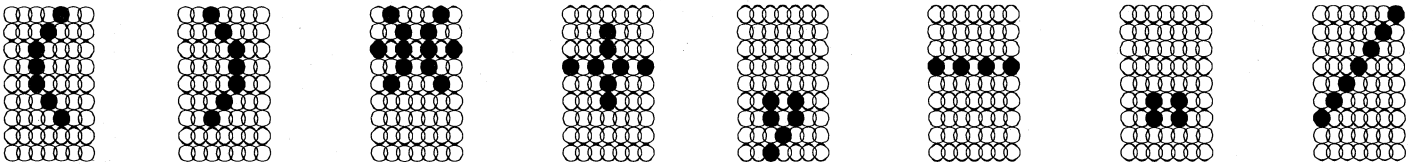
Each character is defined by a 7-bit ASCII code. Control codes, 000-037 octal are not printed. The codes from 040-177 octal define the 96-symbol character set. The dot-matrix patterns your printer produces for each code are shown on the following pages. We illustrate the American font in its entirety.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

# AMERICAN USAGE

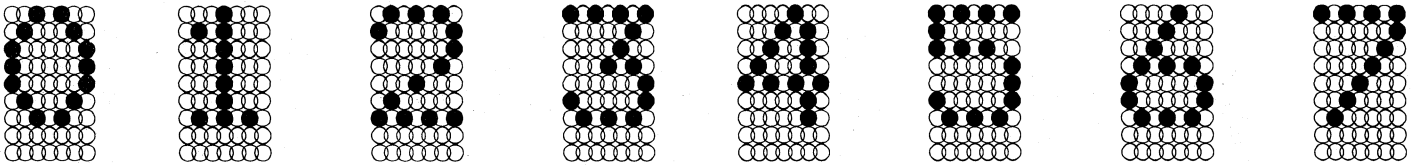
040 041 042 043 044 045 046 047



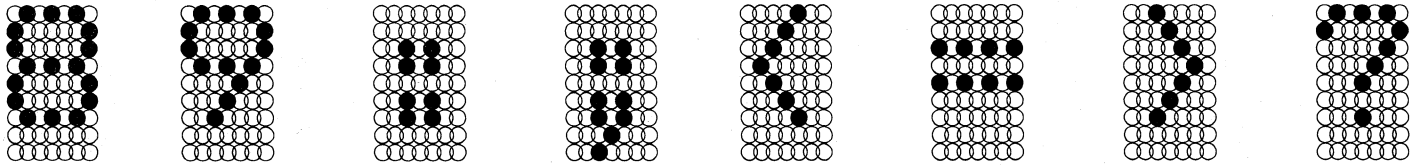
050 051 052 053 054 055 056 057



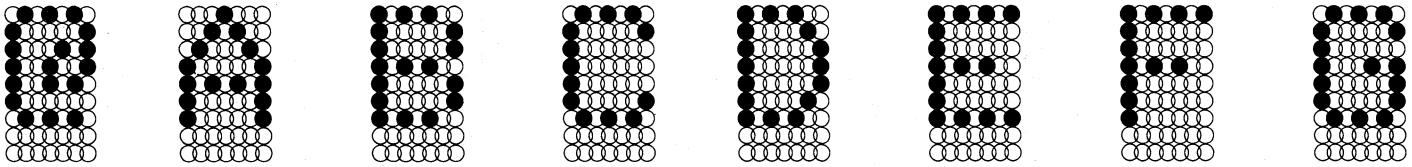
060 061 062 063 064 065 066 067



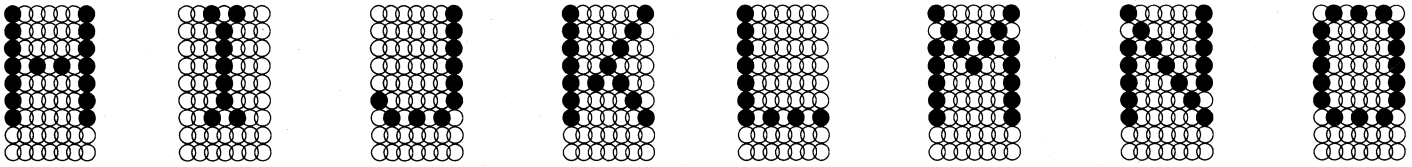
070 071 072 073 074 075 076 077



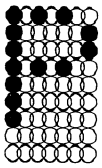
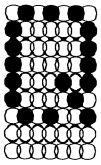
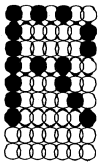
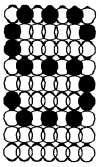
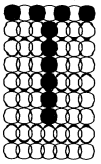
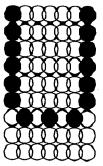
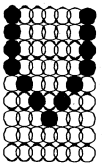
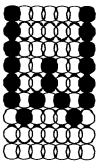
100 101 102 103 104 105 106 107

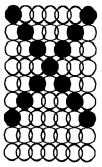
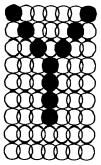
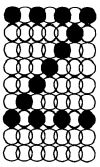
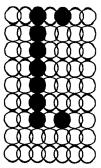
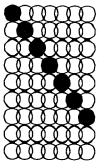
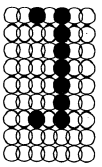
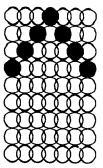
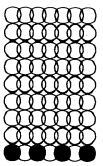


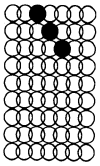
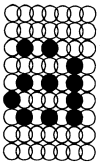
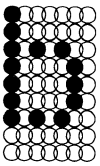
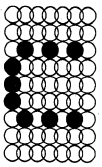
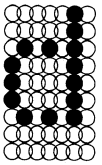
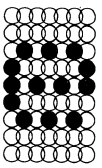
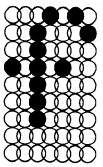
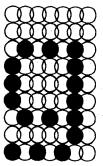
110 111 112 113 114 115 116 117

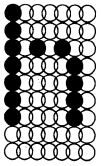
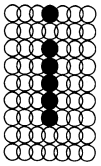
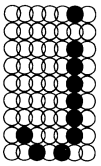
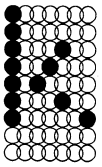
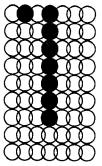
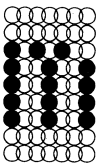
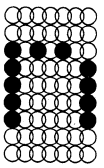
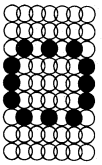


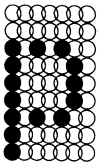
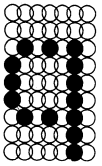
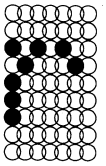
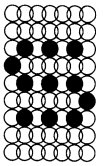
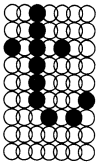
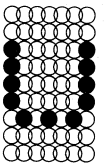
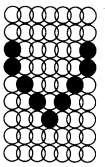
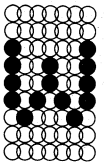
# AMERICAN USAGE

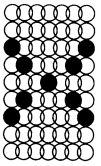
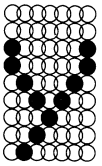
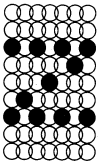
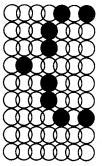
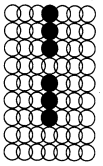
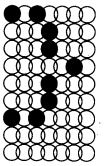
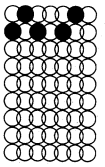
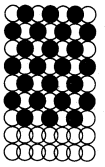
120 
121 
122 
123 
124 
125 
126 
127 

130 
131 
132 
133 
134 
135 
136 
137 

140 
141 
142 
143 
144 
145 
146 
147 

150 
151 
152 
153 
154 
155 
156 
157 

160 
161 
162 
163 
164 
165 
166 
167 

170 
171 
172 
173 
174 
175 
176 
177 

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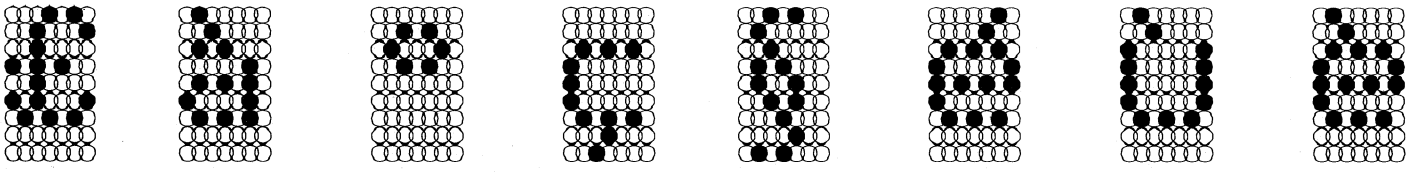

## GERMAN USAGE

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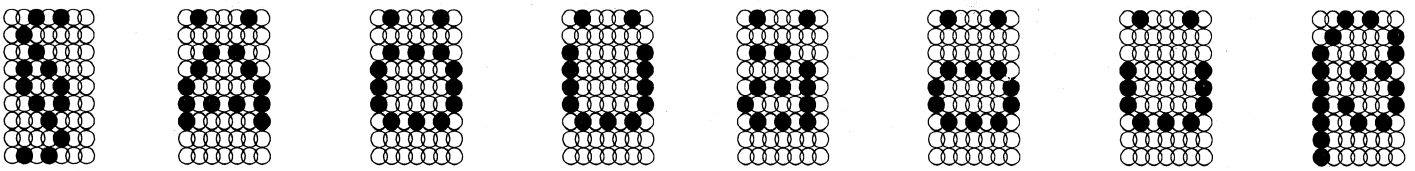
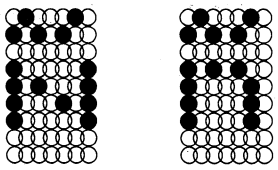


## SPANISH USAGE

134 174



## BRITISH USAGE

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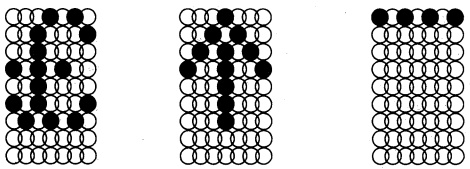

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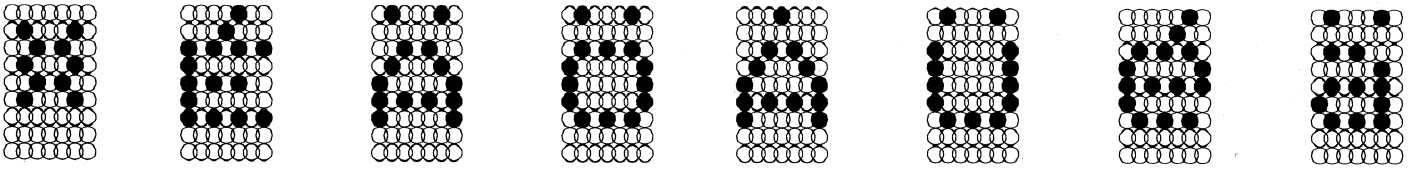

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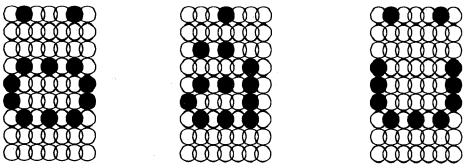

## DANISH/NORWEGIAN USAGE

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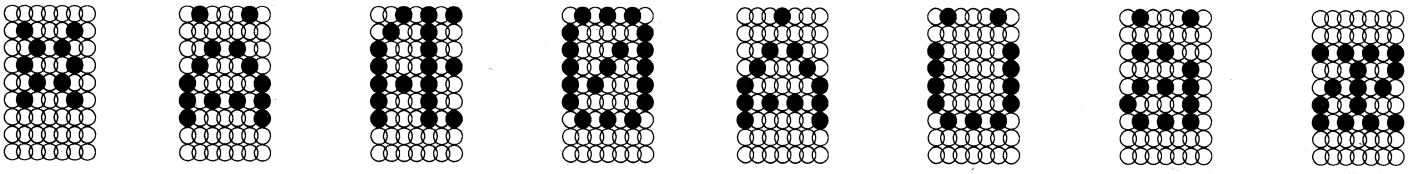

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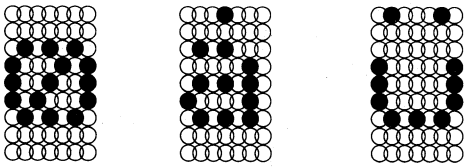

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## Installation Membership Form

Name _____ Position _____ Date _____

Company, Organization or School _____

Address _____ City _____ State _____ Zip _____

Telephone: Area Code _____ No. _____ Ext. _____

**1. Account Category**

- ☐ OEM
- ☐ End User
- ☐ System House
- ☐ Government

**2. Hardware**

| | Qty. Installed | Qty. On Order |
|---|---|---|
| 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) _____ | | |
| _____ | | |

**3. Software**

- ☐ AOS
- ☐ DOS
- ☐ SOS
- ☐ RDOS
- ☐ RTOS
- ☐ Other

Specify _____

**4. Languages**

- ☐ Algol
- ☐ DG/L
- ☐ Cobol
- ☐ ECLIPSE Cobol
- ☐ Business BASIC
- ☐ BASIC
- ☐ Assembler
- ☐ Interactive
- ☐ Fortran
- ☐ RPG II
- ☐ PL/1
- ☐ Other

Specify _____

**5. Mode of Operation**

- ☐ Batch (Central)
- ☐ Batch (Via RJE)
- ☐ On-Line Interactive

**6. Communications**

- ☐ RSTCP
- ☐ HASP
- ☐ RJE80
- ☐ SAM
- ☐ CAM
- ☐ 4025
- ☐ Other

Specify _____

**7. Application Description**

○ _____

**8. Purchase**

From whom was your machine(s) purchased?

- ☐ **Data General Corp.**
- ☐ Other

Specify _____

**9. Users Group**

Are you interested in joining a special interest or regional Data General Users Group?

○ _____

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Data General Corporation, Westboro, Massachusetts 01581, (617) 366-8911

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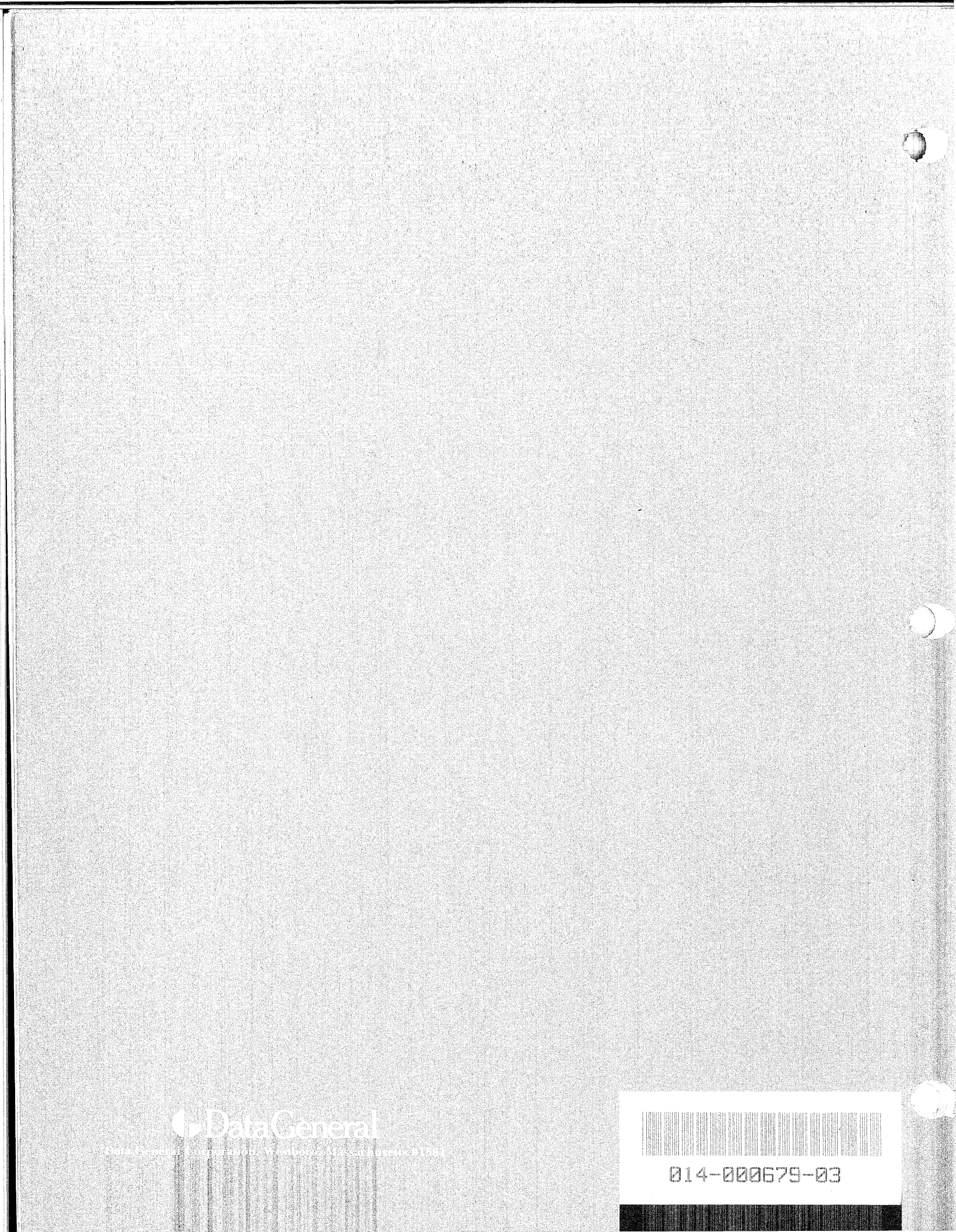
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