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LG01 600 LPM Text Printer

User's Guide

Order Number: EK-OLG01-UG-003

Prepared by
Computer Special Systems

Digital Equipment Corporation • Merrimack, NH 03054

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PREFACE

This manual provides both DIGITAL™ Field Service personnel and DIGITAL customers with procedures for operating, debugging, and troubleshooting the LG01 600 LPM Text Printer.

This manual consists of five chapters and two appendices, as follows.

CHAPTER 1 -- Introduction of the LG01 600 LPM Text Printer User's Guide.

CHAPTER 2 -- Operation of the LG01 printer, including a discussion of its controls and adjustments, and control panel operation.

CHAPTER 3 -- Programming, including a discussion on printing, and the paper motion control coder.

CHAPTER 4 -- Debugging, including a discussion on the debugging tools and printer configurations.

CHAPTER 5 -- Fault Correction and Troubleshooting explains proper fault correction procedures along with an explanation of error messages.

Appendices A and B provide additional information on the LG01 printer specifications, and summary of control sequences.

For detailed information on the LG01 600 LPM Text Printer, refer to the following documents:

<u>LG01 600 LPM Text Printer Installation/Operator's</u>	
<u>Manual</u>	EK-0LG01-IN
<u>LG01 600 LPM Text Printer Technical Manual</u>	EK-0LG01-TM
<u>LG01 600 LPM Text Printer Mini-Reference Manual</u>	EK-0LG01-RM

Throughout this manual, Notes, Cautions, and Warnings have the following meanings:

NOTE Calls attention to information in text that may be of special importance.

CAUTION Calls attention to information in text essential to avoiding system, or equipment damage.

WARNING Calls attention to information in text essential to the safety of personnel.

Other conventions used in this manual include:

... Horizontal or vertical ellipses in text means that information not directly related to the description has been omitted.

Word An initial capital word in a procedure indicates a panel marking.



The icon represents a key in the control panel.

FCC USER STATEMENT

NOTICE

This equipment generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such radio frequency interference. Operation of this equipment in a residential area may cause interference in which case the user at this own expense will be required to take whatever measures may be required to correct the interference.

CHAPTER 1 INTRODUCTION

1.1 INTRODUCTION

The LG01 600 LPM Text Printer is a versatile, high resolution line printer. It prints correspondence quality text, and high-speed data processing quality text.

The designation "LGxx" is used in this manual to represent a series or family of line printers. The term applies to any DIGITAL printer with an LGxx number, such as LG01 or LG02 printers.

The LG01 printer is available with a parallel or serial interface for interfacing with the host computer. This manual covers the operation and use of the printer with both interfaces. The manual describes the operating modes and functions of the printer, and the commands used to control it from a host computer, fault codes and debugging.

1.2 OPTIONS LIST

Table 1-1 lists the LG01 printer options.

Table 1-1 LG01 Printer Options

Option	Used With	Description
LG01-AA	PDP-11 (UNIBUS), VAX-11	LG01 printer, 600 LPM, 120/240 Vac, 50/60 Hz, LP11 interconnect (P/N 70-18953-01)
LG01-BA	PDP-11 (Q-bus), MicroVAX II	LG01 printer, 600 LPM, 120/240 Vac, 50/60 Hz, BC27A-30 cable, LPV11 (M8027 module)
LG01-CA	VAX-11	LG01 printer, 600 LPM, 120/240 Vac, 50/60 Hz, BC27A-30 cable
LG01-DA	PDP-11, VAX-11 MicroVAX II	LG01 printer, Serial Interface, 600 LPM, 120/240 Vac, 50/60 Hz, BC22D-25 cable

CHAPTER 2 OPERATION

2.1 INTRODUCTION

The state-of-the-art LG01 600 LPM Text Printer (refer to Figure 2-1) has a variety of capabilities and functions. The printer boasts a user-friendly control panel that allows the operator to select a variety of optional fonts, type sizes, form lengths, and ribbon colors.

This chapter discusses access to and maintenance of the LG01 printer, familiarizes the operator with control panel keys and functions, instructs the operator on installing paper, adjusting paper controls, installing and changing ribbon cartridges, and using the control panel.

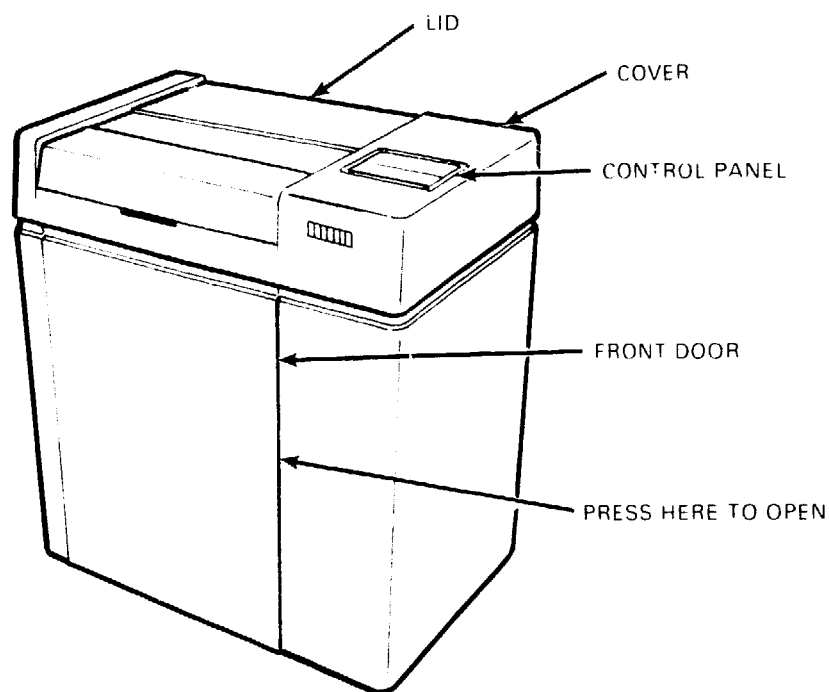


Figure 2-1 LG01 600 LPM Text Printer

2.1.1 Access to the LG01 Printer

2.1.1.1 Opening/Closing Front Door -- To open the front door, press the middle right edge of the door. The door will swing open. To close, push on the middle right edge until the door is closed.

2.1.1.2 Opening/Closing Lid -- Open the lid by raising the front edge. The lid will stay open in any raised position.

Close the lid by lowering the front edge. The lid is secure when the two metal pins inside the lid touch the two magnets on the cover (refer to Figure 2-2).

WARNING

Be careful when working behind the LG01 with the cover open. When the cover is open, the lid can pop open if it is jarred.

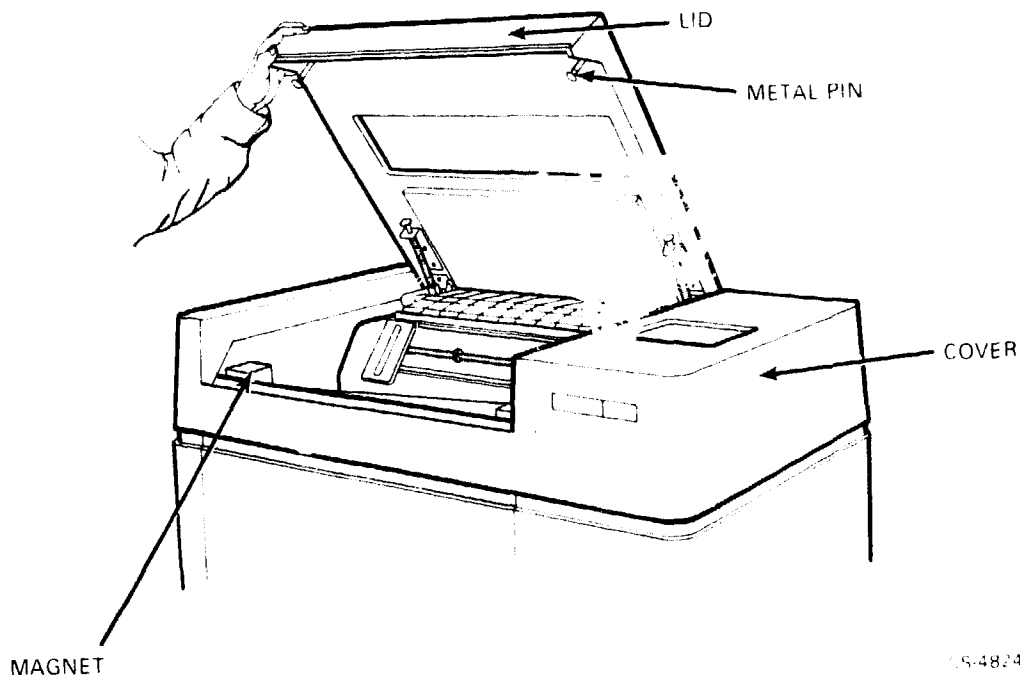


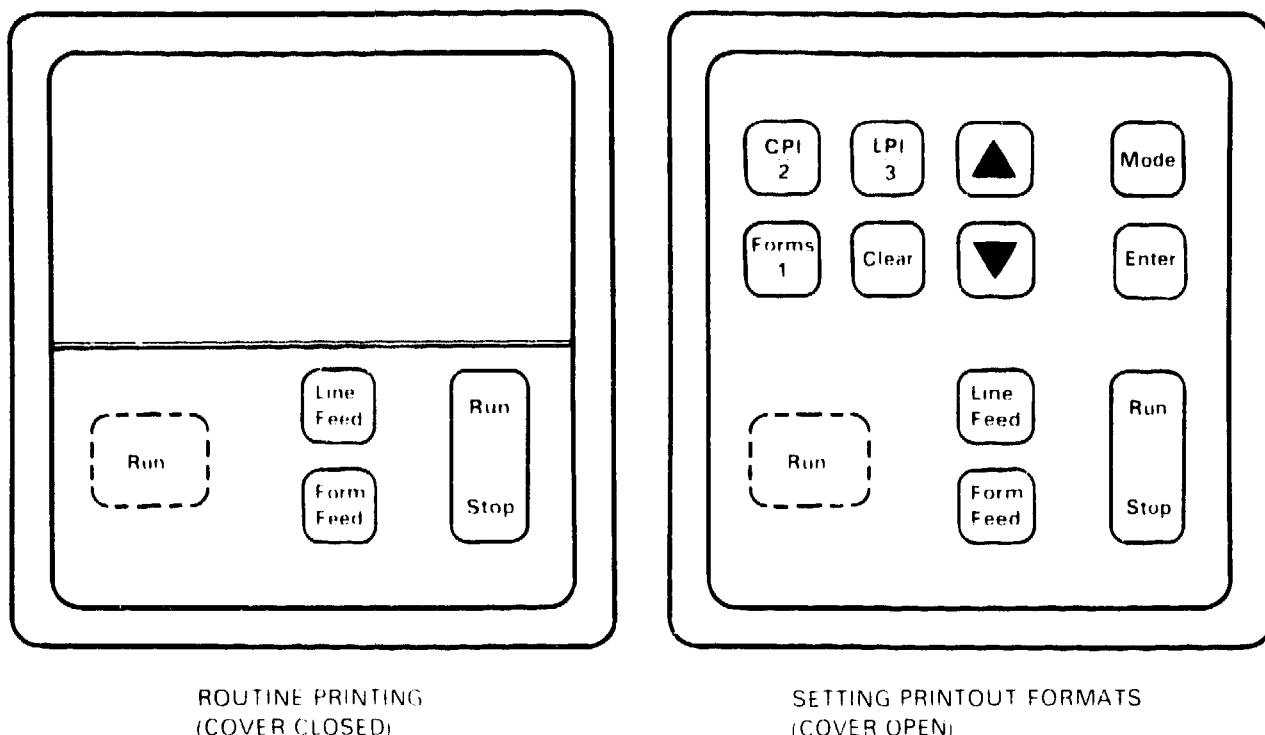
Figure 2-2 LG01 Printer Lid

2.1.2 Control Panel Cover

The LG01 printer control panel cover is shown in Figure 2-3. Keep the upper control panel covered for routine printing. To avoid accidental clearing or formatting, open the cover only to set new printing formats.

2.1.3 Routine Cleaning

Remove paper bits and dust with a soft brush or vacuum cleaner after approximately every 24 hours of use. Also, wipe the ribbon shield to remove ribbon dust.



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Figure 2-3 LG01 Printer Control Panel

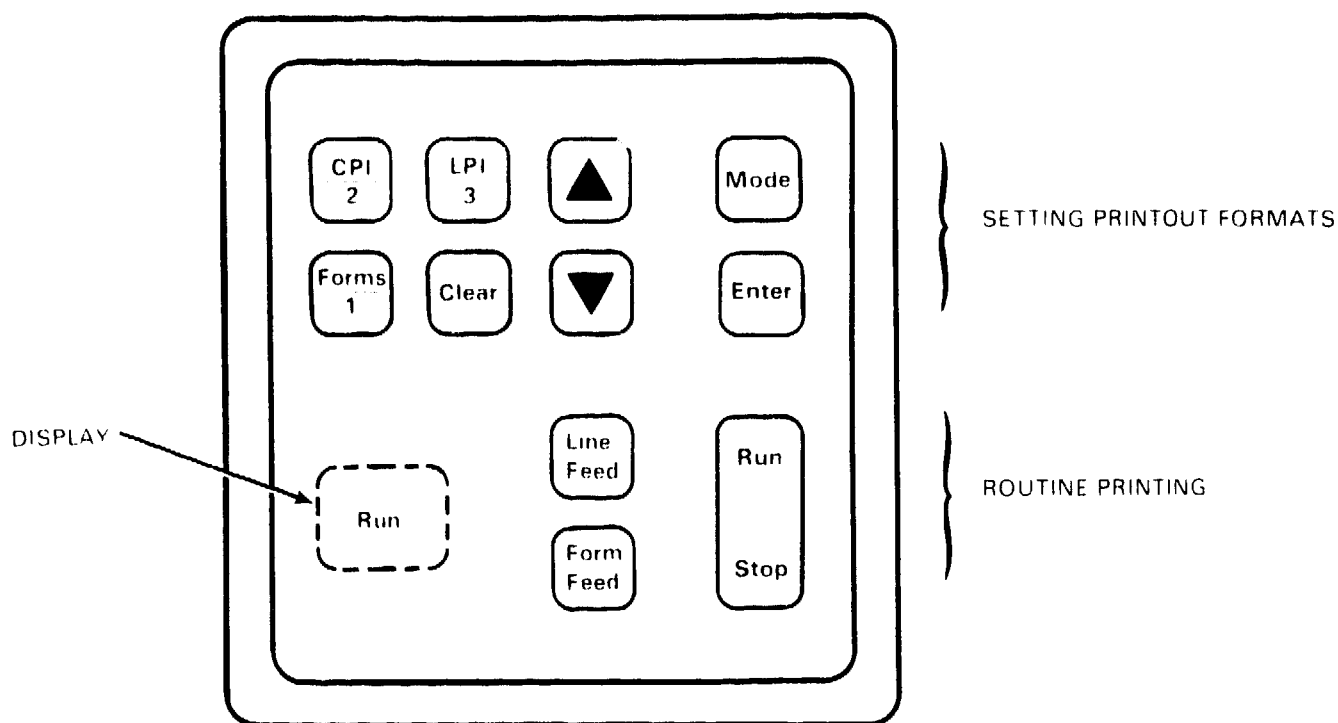
2.2 LG01 PRINTER CONTROLS AND DISPLAYS

2.2.1 Power Switch

The power switch is located on the back of the LG01 printer. Reach over the left side of the LG01 printer to locate it.

2.2.2 Printer Control Panel

The lower half of the control panel contains the keys used for daily, routine printing (placing printer online/offline and advancing forms). The upper half contains the keys used to set printing formats and to run tests. For routine printing, keep the control panel cover pulled down, covering the format keys. Refer to Figure 2-4 for the LG01 control panel. Table 2-1 lists the functions of the various keys.



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Figure 2-4 LG01 Printer Control Panel, Cover Opened

Table 2-1 Control Panel Keys

Control Key/ Display		Function
Display		Shows operator entries and fault codes.
LINE FEED		Advances paper one line.
FORM FEED		Advances paper to top of next form.
RUN/STOP		Alternately places the printer ON LINE/OFF LINE.
MODE		Chooses mode: NORMAL, OPERATOR, or TEST.
FORMS/1		Use to select printout formats. See NORMAL MODE and OPERATOR MODE in Chapter 5 for the various functions.

Table 2-1 Control Panel Keys (Cont)

Control Key/ Display	Function
CPI/2	Use to select printout formats. See NORMAL MODE and OPERATOR MODE in Chapter 5 for the various functions.
LPI/3	Use to select printout formats. See NORMAL MODE and OPERATOR MODE in Chapter 5 for the various functions.
ENTER	Enters the printout format chosen with MODE , FORMS/1 , CPI/2 , and LPI/3 keys.
and (arrow keys)	- Used for fine vertical adjustment of paper. moves paper forward and moves paper backward in small increments. - Used with MODE, FORMS/1, CPI/2 and LPI/3 to select printout formats.
CLEAR	The clear key performs a variety of functions depending on the panel keys pressed after pressing CLEAR. Resets printer; clears fault conditions. Result of pressing CLEAR depends on which CLEAR mode is selected next. (See FAULT CORRECTION PROCEDURE in Chapter 5 for more details.)

Table 2-2 Clear Key Functions

Current Mode or Condition	Result of Pressing Clear
OPER, TEST, PROG, or NORM	1. Printer returns to Normal mode with STOP displayed (pressing the ENTER key is not required).
STOP	1. CLEAR is displayed. 2. The arrow keys may be used to select the desired clearing function. 3. When one of the following clearing functions is selected, pressing the ENTER key performs the function.

Display	Description
CLER	Resets to Data Processing font for both ANSI 60 and 61 character sets, resets to 10 CPI (characters per inch), resets to 6 LPI (lines per inch), resets vertical character size to times 1, clears printer from hex dump mode if enabled.
LBUF	Clears the character line buffer.
MASK	Clears all error masks.
ALL	Does all of the above CLEAR functions.

NOTES

1. If the printer is in the STOP condition, and the CLEAR key is repeatedly pressed, the display will alternately show CLER or STOP each time the CLEAR key is pressed. This will continue to occur without performing any clearing function unless the ENTER key is pressed when CLER is showing in the display.
2. If a fault exists, the printer configuration cannot be cleared.

Table 2-2 Clear Key Functions (Cont)

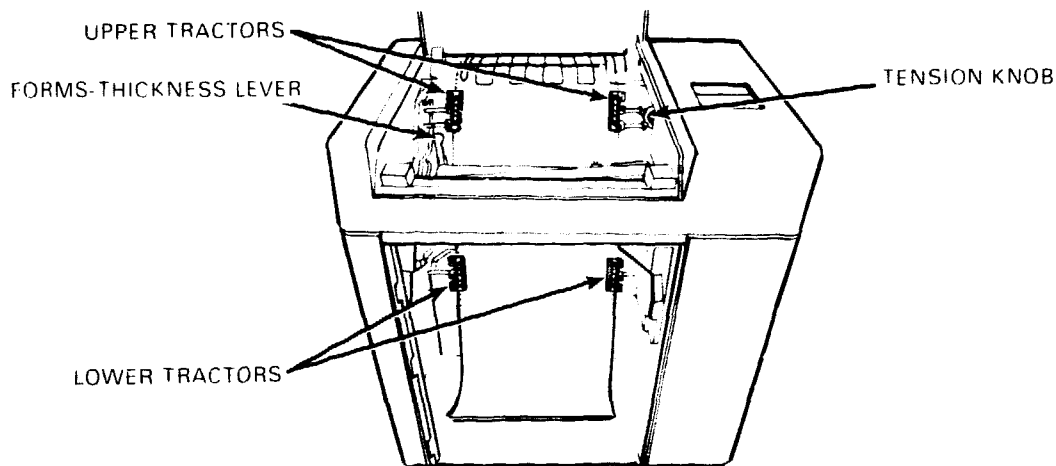
Current Mode or Condition	Result of Pressing Clear
Fault Conditions	1. Automatic clearing faults: The following faults are automatically cleared when the error has been corrected. ● Platen Open (PLTN OPEN) ● Paper Out (PAPER OUT) ● Ribbon Out (RIBN OUT) When these faults have been resolved, STOP is displayed. If not in a TEST mode, normal printing may continue when the RUN key is pressed. 2. Clearing other faults using the the CLEAR key: Other faults not listed above may be cleared by pressing the CLEAR key. If the fault is not cleared, it is a non-clearable fault, which must be referred to your supervisor or service representative.

2.2.3 Forms Control

The LG01 printer uses three means of controlling the operator-installed forms. These controls help maintain paper tension and help feed the forms through the printer in the desired manner. These forms controls are listed in Table 2-3 and shown in Figure 2-5.

Table 2-3 Forms Control

Control	Function
Tractors	The tractors hold the forms and move them through the printer. There are two upper and two lower tractors. To move the tractors, unlock the tractor locking levers and slide along the tractor bar to the desired location. When loading forms, open the tractor doors and place the form holes over the tractor pins.
Forms-Thickness Lever	Adjust the blue forms-thickness lever to get the maximum print quality.
Tension Knob	The orange tension knob adjusts the vertical tension of the forms.



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Figure 2-5 Forms Control

2.3 LOADING FORMS

CAUTION

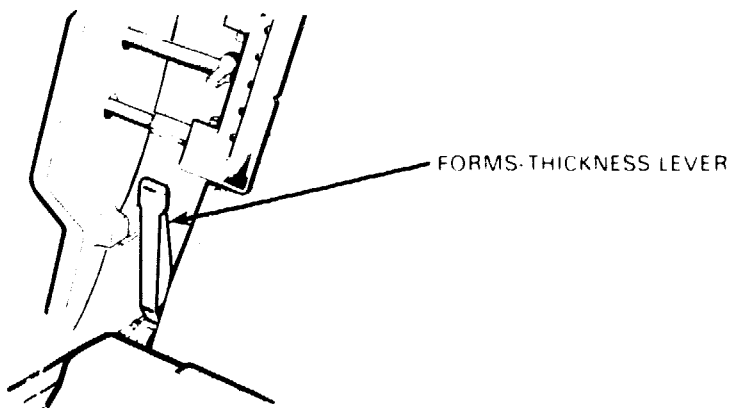
Never print directly on the platen; permanent damage may occur.

When the printer runs out of paper, the PAPER OUT message displays and printing stops. If printing stops in the middle of a form, you may complete that form by pressing and holding down the RUN key.

If the printer is set up to accept forms of the same width as the forms you are loading, follow the directions in Section 2.3.1, **Reloading Forms**. If the new forms require width adjustment, follow the directions in Section 2.3.2, **Adjusting Tractors/Loading Forms**.

2.3.1 Reloading Forms

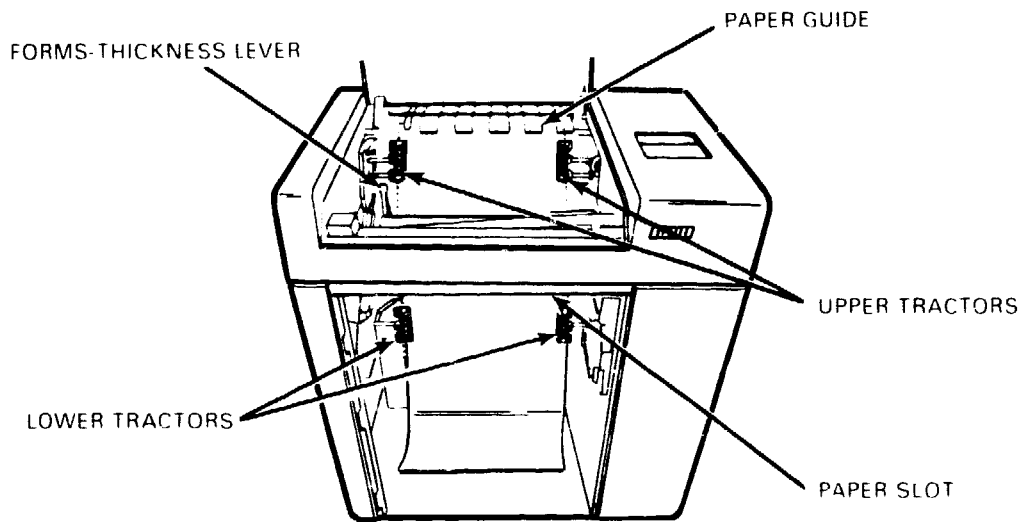
1. Press  and raise lid until it latches into place.
2. Raise forms-thickness lever (refer to Figure 2-6).



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Figure 2-6 Forms-Thickness Lever Location

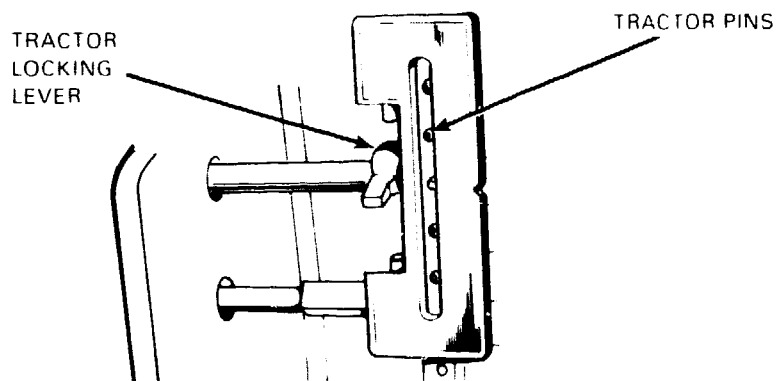
3. Open front panel and place the new forms supply directly beneath lower tractors, with left edge lined up with left tractor (refer to Figure 2-7).
4. Open all four tractor doors, two upper and two lower.
5. Feed paper up through the paper path and put through the wire guide.



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Figure 2-7 Location of Forms-Control Loading Tractors

6. Place the paper holes over the tractor pins and close the tractor doors (refer to Figure 2-8).
7. Lower forms-thickness lever and press Clear once. Adjust forms-thickness lever (refer to Section 2.3.6, **Adjusting Forms-Thickness Lever**).
8. Align top of form (refer to Section 2.4.2.2, **Top of Form**).
9. Press Form Feed several times. Make sure paper is feeding correctly and stacking properly behind the machine.



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Figure 2-8 Paper Tractor Locking Lever

2.3.2 Adjusting Tractors/Loading Forms

If the tractors need to be readjusted to fit a new form size, follow the steps in the following sections.

2.3.2.1 Preparing the Printer --

1. Press  if printer is online.
2. Raise lid and open front door.
3. Raise forms-thickness lever.
4. Open all four tractor doors and remove old forms.
5. Unlock right tractor locking levers. Push upper tractor levers down and lower tractor levers up to unlock them (refer to Figure 2-8).

2.3.2.2 Inserting Forms --

1. Place the left edge of the forms with the left tractor.
2. Feed forms up through the paper path and out through the paper guide.

2.3.3 Adjusting Upper Tractors

1. Place left forms holes over upper left tractor pins and close tractor doors.
2. Move right tractors until tractor pins align with forms holes.
3. Place right forms holes over upper right tractor pins and close tractor doors.
4. If necessary, align the form's first print column position with the desired print position on the forms scale (refer to Figure 2-9). Make the necessary adjustments by unlocking the tractor locking levers (refer to Figure 2-8) and positioning the forms. When the first character position is located below the right edge of the left tractor, lock it into place. (The numbers on the forms scale represent a width of 132 characters at 10 CPI.)
5. Push upper right tractor gently to the right until paper is taut, but not too tight. Lock upper right tractor.
6. Lower the forms-thickness lever.

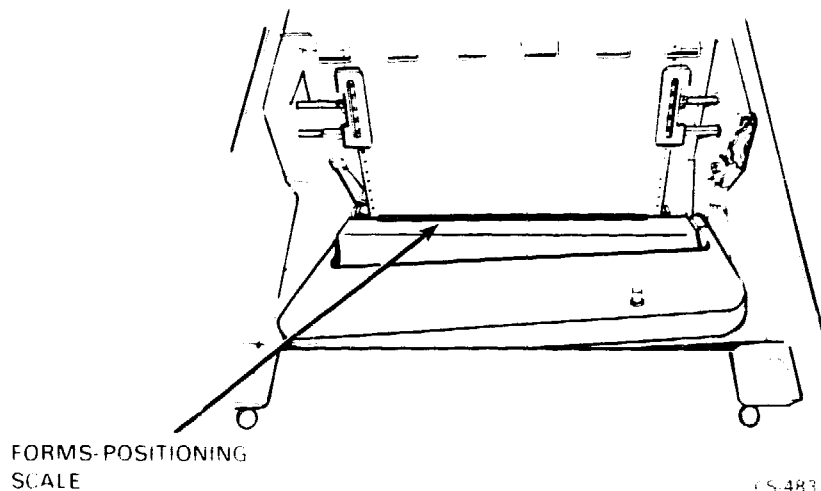


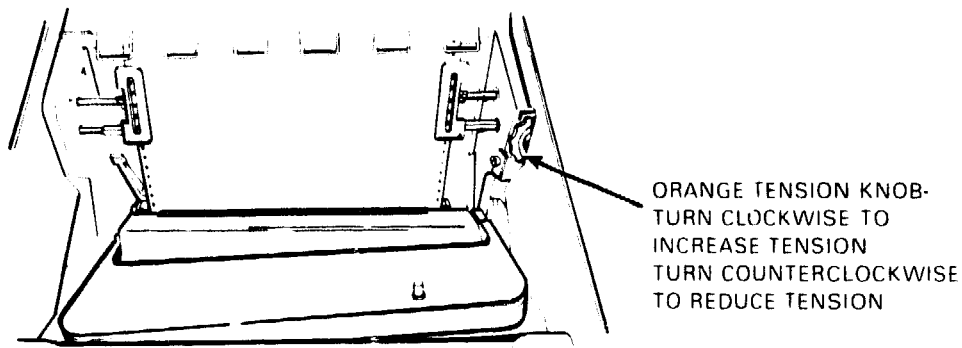
Figure 2-9 Forms-Positioning Scale

2.3.4 Adjusting Lower Tractors

NOTE

Position the lower tractors directly below the upper tractors so that the forms will feed through properly. Follow these steps to adjust the lower tractors correctly.

1. Pull down gently on forms near the lower tractors. Pull forms so the surface is taut and smooth, but not too tight.
2. If lower left tractor is not aligned with forms, unlock locking lever (refer to Figure 2-8) and move tractor to the right or left. Then lock the tractor-locking lever.
3. While holding paper, check to see if tractor pins are vertically aligned with forms holes. Align pins with holes by turning tension knob (refer to Figure 2-10).
 - a. Turn orange tension knob clockwise to lower the pins, or
 - b. Turn orange tension knob counterclockwise to raise the pins.
4. Unlock right tractors and move to right or left, locating the tractor pins under the paper holes. Close tractor door (refer to Figure 2-13).
5. Push right tractor gently to the right until forms are taut, but not too tight. Lock right tractor into place.
6. Press Clear.



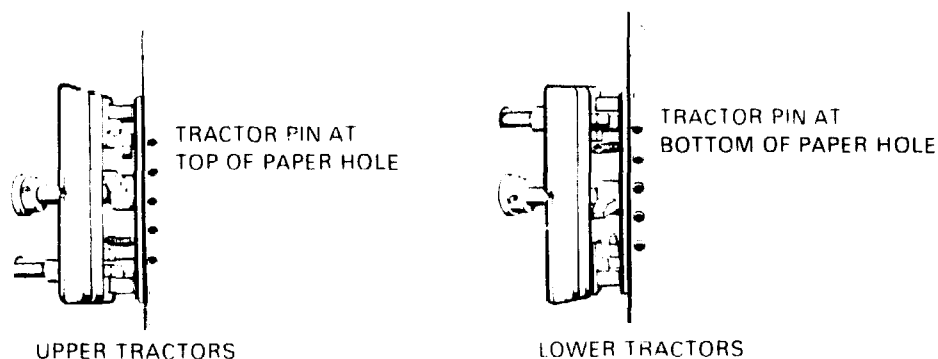
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Figure 2-10 Tension Knob Location

2.3.5 Adjusting Tension Knob

The vertical tension between the upper and lower tractors must be set correctly for the paper to feed properly through the paper path. To make tension adjustments:

1. Check paper surface above lower tractors. It should be taut and smooth. If the vertical tension is correct, you will see the upper tractor pins at the top of forms holes and lower tractor pins at the bottom of forms holes (refer to Figure 2-11).
2. If necessary, adjust the vertical tension knob until pins are positioned in forms holes, as shown in Figures 2-10 and 2-11.
 - a. Turn tension knob counterclockwise to raise pins, or
 - b. Turn tension knob clockwise to lower pins.
3. Press Form
Feed several times, and check forms that have gone through the printer.
 - a. If the forms holes are vertically elongated or torn, there is too much tension. Decrease tension by turning orange tension knob counterclockwise.
 - b. If some printed lines have shorter characters than others, there is too little tension. Increase tension by turning orange tension knob clockwise.



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Figure 2-11 Paper Hole and Tractor Pin Position

2.3.6 Adjusting Forms-Thickness Lever

The forms-thickness adjusts the spacing between the hammerbank and the platen. When the lever is all the way down, the space is minimum. When normal (20# to 60#) single-part forms are used, the forms-thickness lever should be set all the way down.

CAUTION

If the forms-thickness lever is set to low, the paper can tear out of the upper tractors.

1. Start printing by placing the printer online or by running a test (refer to **Control Panel Test Mode**, Section 2.4.2).
2. Open lid.
3. Move the forms-thickness lever to the point where the print quality is best (refer to Figure 2-6).
4. Close lid.

2.3.7 Placing Printer Online

1. Press  several times to make sure paper is feeding properly and stacking correctly behind printer.
2. Press  .

2.3.8 Changing the Ribbon

A cartridge ribbon is supplied with the printer. You should replace the cartridge when printing becomes faint.

2.3.8.1 Removing Ribbon Cartridge --

1. Press **Stop** and raise lid.
2. Raise forms-thickness lever.
3. Remove ribbon cartridge by pulling straight up (refer to Figure 2-12).

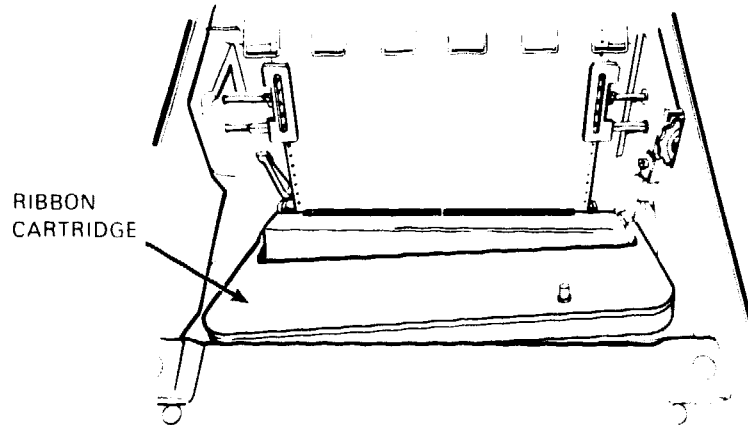


Figure 2-12 Ribbon Cartridge Location

2.3.8.2 Installing Ribbon Cartridge --

1. Turn ribbon knob clockwise until there is no slack in ribbon.
2. Slip ribbon between the two plastic guides and the ribbon shield. Make sure ribbon is not twisted.
3. Turn ribbon knob clockwise until cartridge is seated over ribbon cartridge post. Press down on cartridge until it snaps into place.
4. Lower forms-thickness lever. Press **Clear** once.
5. Check print quality and adjust forms-thickness lever if necessary (refer to **Adjusting Forms-Thickness Lever**, Section 2.3.6).
6. Close lid and press **Run**.

2.4 OPERATING THE PRINTER

2.4.1 Starting the Printer

1. Switch the power on. The power switch is located on the rear panel of the printer.
2. STOP or NORM must be displayed on the control panel before the printer can be placed online. (If a fault message appears, refer to **Fault Correction Procedure**, Section 5.2).
3. Press  to place the printer online.

2.4.2 Control Panel - Normal Mode

Use normal (NORM) mode to make most of the common format settings. The types of NORM mode selections are listed in Table 2-4, along with the default format settings, which are in effect when the printer is turned on. Make all selections in this mode while the printer is offline.

Table 2-4 Normal (NORM) Mode Selections

Format Selection	Setting at Power Up
Top of Form	Wherever it was last set
Vertical Format Control	FLS (format set from control panel)
Characters Per Inch (CPI)	CP10 (10 CPI)
Lines Per Inch (LPI)	LP06 (6 LPI)

2.4.2.1 Entering Normal Mode (NORM) -- When NORM or STOP is displayed, the printer is offline and in NORM mode.

To enter NORM offline mode for changing format settings:

1. If printer is online, press 

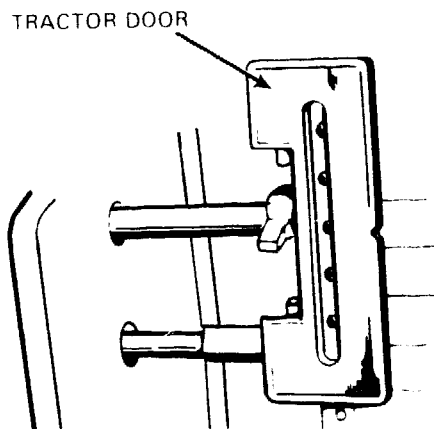
or

If the printer is offline but NORM is not displayed, press . Then press  or  until NORM is displayed.

2. Make format changes as described in Section 2.4.2.2.

2.4.2.2 Top of Form (TOF) -- The Top of Form is the first line printed on a page, not the top edge of a piece of paper or form.

1. Using  and  or , align the first line to be printed with the notch in the upper paper tractors (refer to Figure 2-13). (The up arrow moves the paper forward and the down arrow moves the paper backward in small increments.)
2. Enter NORM mode (see **Entering NORM Mode** in Section 2.4.2.1).
3. Press . TOF is displayed.
4. Press . Paper will move (aligning paper at the platen, not at the notch in the upper tractor) to the new Top of Form.
5. Start printing by placing the printer online, or by running a test (refer to **Control Panel - Test Mode**, Section 2.4.4). Check for proper placement of lines.
6. If necessary, use  or  for fine adjustments. The arrow keys may be used while the printer is either printing or stopped.



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Figure 2-13 Top of Form (TOF) Alignment

2.4.2.3 Vertical Format Control* -- Follow these steps to select the type of Vertical Format Control desired:

1. Enter NORM mode (refer to Entering Normal Mode (NORM), Section 2.4.2.1).
2. Press . TOF is displayed.
3. Press  or  until desired setting appears on the display.

* FLS - Vertical format set from the Control Panel

* VFU - Form length set from Vertical Format Unit

4. Press .

2.4.2.4 Characters Per Inch (CPI) -- Follow these steps to change the number of Characters Per Inch:

1. Enter NORM mode.
2. Press . The current CPI displays.
3. Press  or  until the desired CPI appears:

CP5 - 5 CPI
CP10 - 10 CPI
CP12 - 12 CPI
CP15 - 15 CPI

4. Press .

2.4.2.5 Lines Per Inch (LPI) -- Follow these steps to change the number of Lines Per Inch:

1. Enter NORM mode.
2. Press . The current LPI displays.
3. Press  or  until the desired LPI appears on the display.

LP06 - 6 LPI
LP08 - 8 LPI
LP10 - 10 LPI

4. Press .

2.4.3 Control Panel - Operator Mode

Use the operator (OPER) mode to set additional printout formats and modes of printer operation. The types of OPER mode selections are listed in Table 2-5 along with the default format settings in effect when the printer is turned on. All of these settings are made while the printer is offline.

Table 2-5 Operator (OPER) Mode

Format Selection	Setting at Power-Up
Form Length	Either FO66 (66 lines for 11-inch forms), depending on the printer's configuration.
Bottom-of-Form Skip	B000 (0 lines skipped)
Data Processing Font	On
Character Width	X1.0 (100%)
Character Height	X1.0 (100%)
Paper Motion Sensor	ON
Accept Host Escape Sequences	ON

2.4.3.1 Entering Operator Mode (OPER) -- Follow these steps to enter OPER mode:

1. Press  if RUN is currently displayed.
2. Press . Then press  or  until OPER displays.

2.4.3.2 Form Length (FL) -- Follow these steps to set form length (the total number of lines on a page).

1. Move to Top of Form:
 - a. If Top of Form is already set correctly, press .
 - b. If Top of Form needs adjustment, refer to Top of Form, Section 2.4.2.2.
2. Enter OPER mode (refer to Entering OPER Mode, Section 2.4.3.1).
3. Press . Then press  or  until FORM displays.
4. Press . Then press  or  until FL displays.

5. Press  . The current Form Length appears.
6. To change Form Length, press an arrow until desired length is displayed.

F001 - F250 Forms may contain from 0 - 250 lines.

7. Press  .

2.4.3.3 Bottom-of-Form Skip (BOF) -- The Bottom-of-Form Skip indicates the number of blank lines between the last line printed on one form and the first line printed on the next form.

Follow these steps to set BOF:

1. Enter OPER mode (see **Entering OPER Mode**, Section 2.4.3.1).
2. Press  . Then press  or  until FORM displays.
3. Press  . Then press  or  until BOF displays.
4. Press  . Current BOF appears on display.
5. To change BOF, press  or  until the desired setting displays.

B000 - B015 Forms may contain from 0 - 15 skipped lines.

6. Press  .

2.4.3.4 Data Processing Font (DP) -- Standard data processing printing uses the DP font. To choose the data processing font.

1. Enter OPER mode.
2. Press  . Then press  or  until FONT displays.
3. Press  . Current font displays.
4. To change data processing font (listed in Table 2-6), press  or  until DP appears on the display.
5. Press  .

Table 2-6 Font Selection Codes

Display Code
DP
CORR
OCR A
OCR B

2.4.3.5 Correspondence Quality Font (CORR) -- The CORR font may be used for letters and other high-quality printing. To choose the CORR font:

1. Enter OPER mode.
2. Press  . Then press  or  until FONT displays.
3. Press  . Current font displays.
4. To change the correspondent font (listed in Table 2-6), press  or  until CORR appears on the display.
5. Press  .

2.4.3.6 Optical Character Recognition Font A (OCR A) -- To select OCR A, choose one as follows:

1. Enter OPER mode.
2. Press  . Then press  or  until FONT displays.
3. Press  . Current font displays.
4. To change to the OCR A font, press  or  until OCR A appears on the display.
5. Press  .

2.4.3.7 Optical Character Recognition Font B (OCR B) -- To select OCR B, choose as follows:

1. Enter OPER mode.
2. Press  . Then press  or  until FONT displays.
3. Press  . The last font selection displays.
4. To change fonts (listed in Table 2-6), press  or  until desired font appears on the display.
5. Press  .

2.4.3.8 Character Width (HORZ) -- The printer can expand characters to twice their normal width.

NOTE

Correspondence-quality and OCR A and OCR B characters cannot be expanded.

To choose width:

1. Enter OPER mode.
2. Press  . Press  or  until SIZE is displayed.
3. Press  . Press  or  until HORZ is displayed.
4. Press  . The current character width is displayed.
X1.0 Normal width
X2.0 200% normal width
5. Press  .

2.4.3.9 Character Height (VERT) -- The printer can expand characters to three times their normal height.

NOTE

Correspondence-quality and OCR A and OCR B characters cannot be expanded.

To choose character height:

1. Enter OPER mode.
2. Press  . Press  or  until SIZE is displayed.
3. Press  . Press  or  until VERT is displayed.
4. Press  . The current character height is displayed.
5. To change character height, press  or  until desired height is displayed.
X1.0 Normal height
X2.0 200% normal height
X3.0 300% normal height
6. Press  .

2.4.3.10 Press Motion Sensor (MOTN) -- If frequent MOTN messages are received, turn the paper motion sensor OFF. Then, if a paper motion error occurs, the printer will not stop. Use this only as a temporary measure; contact the system programmer for further corrective action.

1. Enter OPER mode.
2. Press  . Then press  or  until CNTL displays.
3. Press  . Then press  or  until MOTN displays.
4. Press  . The current status is displayed.
5. Press  or  to turn MOTN ON or OFF.
6. Press  .

2.4.3.11 Host Escape Sequences (ESCF) -- The printer may be set to accept or ignore escape sequences from the host computer. To change this setting:

1. Enter OPER mode.
2. Press  . Then press  or  until CNTL displays.
3. Press  . Then press  or  until ESCF displays.
4. Press  . The current setting is displayed.
5. Press  or  to change the setting.
ON Accepts host escape sequences
OFF Ignores host escape sequences
6. Press  .

To check any printing operation or parameters, use TEST mode. To run a test:

- ```
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]
&.'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]\
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^!
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^! "
*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^! "#
```

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While the test is running, operate arrow keys to make fine vertical adjustments. Also adjust Forms-Thickness Lever for best print quality (refer to Adjusting Forms-Thickness Lever, Section 2.3.6).

4. Press  to stop the test.

Other self-tests are used only for printer maintenance and are run by the service representative.

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[illegible][illegible]

## CHAPTER 3 PROGRAMMING

### 3.1 PRINTING

The LG01 600 LPM Text Printer is controlled by commands from the host computer. These commands include:

- Single ASCII control codes.
- ASCII escape sequences.
- Paper instructions.

For quick reference, all single ASCII control codes and escape sequences are summarized in Appendix B.

This chapter explains:

- Controls codes (and also discusses actual printing).
- Paper motion.
- Paper instructions.

#### 3.1.1 Control Codes

The LG01 printer accepts control codes and 7/8-bit ASCII printable characters. Table 3-1 shows the DEC™ Multinational Character Set. Table 3-2 lists, in numerical order, all control codes and their functions.

DEC™ is a registered trademark of Digital Equipment Corporation.

**Table 3-1 DEC Multinational Character Set**

|    |    |    |    |                   |    |    |    |                             |    |     |     |                   |    |    |    |                              |    |     |     |                                                                                    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|----|----|----|----|-------------------|----|----|----|-----------------------------|----|-----|-----|-------------------|----|----|----|------------------------------|----|-----|-----|------------------------------------------------------------------------------------|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
|    |    |    |    | b8                | 0  | 0  | 0  | 0                           | 0  | 0   | 0   | 0                 | 1  | 1  | 1  | 1                            | 1  | 1   | 1   | 1                                                                                  |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|    |    |    |    | b7                | 0  | 0  | 0  | 0                           | 0  | 1   | 1   | 1                 | 1  | 0  | 0  | 0                            | 0  | 1   | 1   | 1                                                                                  |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|    |    |    |    | b6                | 0  | 0  | 1  | 1                           | 0  | 0   | 1   | 1                 | 0  | 0  | 1  | 1                            | 0  | 0   | 1   | 1                                                                                  |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|    |    |    |    | b5                | 0  | 1  | 0  | 1                           | 0  | 1   | 0   | 1                 | 0  | 1  | 0  | 1                            | 0  | 1   | 0   | 1                                                                                  |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|    |    |    |    |                   | 00 | 01 | 02 | 03                          | 04 | 05  | 06  | 07                | 08 | 09 | 10 | 11                           | 12 | 13  | 14  | 15                                                                                 |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| b4 | b3 | b2 | b1 |                   | 0  | 0  | 0  | 0                           | 0  | NUL | DLE | SP                | 0  | @  | P  |                              | p  |     | DCS |  | ° | À |   | à |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0  | 0  | 0  | 1  | 1                 | 0  | 0  | 0  | 1                           | 1  | SOH | DC1 | 1                 | 1  | A  | Q  | a                            | q  |     | PU1 | ı                                                                                  | ± | Á | Ñ | â | ñ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0  | 0  | 1  | 0  | 2                 | 0  | 0  | 1  | 0                           | 2  | STX | DC2 |                   | 2  | B  | R  | b                            | r  |     | PU2 | ç                                                                                  | 2 | Â | Ò | â | ó |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0  | 0  | 1  | 1  | 3                 | 0  | 0  | 1  | 1                           | 3  | ETX | DC3 | #                 | 3  | C  | S  | c                            | s  |     | STS | £                                                                                  | 3 | Ä | Ö | ä | ö |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0  | 1  | 0  | 0  | 4                 | 0  | 1  | 0  | 0                           | 4  | EOT | DC4 | \$                | 4  | D  | T  | d                            | t  | IND | CCH |                                                                                    |   | Ä | Ö | ä | ö |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0  | 1  | 0  | 1  | 5                 | 0  | 1  | 0  | 1                           | 5  | ENO | NAK | ¥                 | 5  | E  | U  | e                            | u  | NEL | MW  | ¥                                                                                  | μ | Å | Ö | ä | ö |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0  | 1  | 1  | 0  | 6                 | 0  | 1  | 1  | 0                           | 6  | ACK | SYN | &                 | 6  | F  | V  | f                            | v  | SSA | SPA |                                                                                    | ¶ | Æ | Ö | æ | ö |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0  | 1  | 1  | 1  | 7                 | 0  | 1  | 1  | 1                           | 7  | BEL | ETB | '                 | 7  | G  | W  | g                            | w  | ESA | EPA | §                                                                                  | • | Ç | È | ç | œ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1  | 0  | 0  | 0  | 8                 | 1  | 0  | 0  | 0                           | 8  | BS  | CAN | ı                 | 8  | H  | X  | h                            | x  | HTS |     | Ø                                                                                  |   | È | Ø | ı | • |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1  | 0  | 0  | 1  | 9                 | 1  | 0  | 0  | 1                           | 9  | HT  | EM  | ı                 | 9  | I  | Y  | i                            | y  | HTJ |     | ©                                                                                  | ı | É | Ù | ı | ù |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1  | 0  | 1  | 0  | 10                | 1  | 0  | 1  | 0                           | 10 | LF  | SUB | *                 |    | J  | Z  | j                            | z  | VTS |     | ª                                                                                  | º | Ê | U | ª | ú |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1  | 0  | 1  | 1  | 11                | 1  | 0  | 1  | 1                           | 11 | VT  | ESC | +                 |    | K  |    | k                            |    | PLD | CSI | "                                                                                  | " | Ë | Û | ä | û |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1  | 1  | 0  | 0  | 12                | 1  | 1  | 0  | 0                           | 12 | FF  | FS  |                   | <  | L  |    | l                            | l  | PLU | ST  |                                                                                    | ¼ | Ï | Ü | ı | ü |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1  | 1  | 0  | 1  | 13                | 1  | 1  | 0  | 1                           | 13 | CR  | GS  | -                 | =  | M  |    | m                            |    | RI  | OSC |                                                                                    | ½ | Î | Ý | ı | ý |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1  | 1  | 1  | 0  | 14                | 1  | 1  | 1  | 0                           | 14 | SO  | RS  |                   | >  | N  | ^  | n                            | ~  | SS2 | PM  |                                                                                    |   | Ï |   | ı |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1  | 1  | 1  | 1  | 15                | 1  | 1  | 1  | 1                           | 15 | SI  | US  | /                 | ?  | O  | _  | o                            | '  | DEL | SS3 | APC                                                                                |   | ¿ | ÿ | ß | ı |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|    |    |    |    | ASCII CONTROL SET |    |    |    | ASCII GRAPHIC CHARACTER SET |    |     |     | ADD L CONTROL SET |    |    |    | DEC SUPPLEMENTAL GRAPHIC SET |    |     |     |                                                                                    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|    |    |    |    |                   |    |    |    |                             |    |     |     |                   |    |    |    |                              |    |     |     | DEC MULTINATIONAL CHARACTER SET                                                    |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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**Table 3-2 LG01 Printer Control Code Summary**

| Control Code            |                  | Function                                                                                                                   |
|-------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------|
| BEL<br>07               | (ASCII)<br>(hex) | Bell - Sounds alarm for one-half second.                                                                                   |
| HT<br>09                | (ASCII)<br>(hex) | Horizontal Tabs - Spaces to next preset tab stop. (See Section 3.1.4 on Horizontal Tab.)                                   |
| LF<br>0A                | (ASCII)<br>(hex) | Line Feed - Advances paper one line (for character printing) or one row (for plotting). Prints a line if preceded by data. |
| FF<br>0C                | (ASCII)<br>(hex) | Form Feed - Advances paper to top of next form. Prints a line if preceded by data.                                         |
| CR<br>OD                | (ASCII)<br>(hex) | Carriage Return - Returns cursor to beginning of line.                                                                     |
| SO<br>OE                | (ASCII)<br>(hex) | Shift Out - Shifts to alternate character set.                                                                             |
| SI<br>OF                | (ASCII)<br>(hex) | Shift In - Shifts to standard character set.                                                                               |
| ESC<br>1B               | (ASCII)<br>(hex) | Escape - Interprets code, which follows it as a control function.                                                          |
| Any other<br>ASCII code |                  | Any ASCII control code not listed above is replaced by a space.                                                            |

### 3.1.2 Alternatives for the Escape Sequence

The two alternate code sequences for entering <ESC>[ as a control code are:

|        |         |     |         |
|--------|---------|-----|---------|
| <ESC>[ | (ASCII) | CSI | (ASCII) |
| 1B 5B  | (hex)   | 9B  | (Hex)   |

### 3.1.3 Character Mode

When printing characters, escape sequences are used to specify the following:

- Character sets.
- Character height and width.
- Characters per inch and lines per inch.
- Horizontal tab positions.

**3.1.3.1 Character Sets --** Data processing character sets, correspondence quality character sets, OCR A character sets, and OCR B character sets are installed in all LG01 line printers.

#### **Data Processing Character Sets**

These character sets are usually used for data processing printouts, and for drafts of letters and reports. Examples of data processing characters are shown in Figure 3-1.

```
'"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
'"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
'"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
```

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**Figure 3-1 Data Processing Character Set**

#### **Correspondence Quality Character Sets**

Correspondence quality character sets are used for high-quality letter and document printing. Examples of correspondence-quality characters are shown in Figure 3-2.

```
'"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
'"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
'"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
```

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**Figure 3-2 Correspondence-Quality Character Set**

**3.1.3.2 Selecting Character Sets --** Different character sets are selected by sending an escape sequence. These escape sequences are shown in Table 3-3.

**Table 3-3 Escape Sequences for Character Set Selection**

| <b>Escape Sequence</b>      | <b>ASCII</b> | <b>Hex</b>     | <b>Description</b>                                                                        |
|-----------------------------|--------------|----------------|-------------------------------------------------------------------------------------------|
| SEL Graphic Rendition (SGR) | <ESC>[10m    | 1B 5B 31 30 6D | ASCII Graphic Character and DEC Supplemental Character Set.<br><br>● Data Processing Font |
|                             | <ESC>[11m    | 1B 5B 31 31 6D | ASCII Graphic Character and DEC Supplemental Character Set.<br><br>● Correspondence Font  |
|                             | <ESC>[12m    | 1B 5B 31 32 6D | OCR A ANSI Character Set                                                                  |
|                             | <ESC>[13m    | 1B 5B 31 33 6D | OCR B DIN Character Set                                                                   |

**NOTE**

The LG01 printer will only support the DEC Multinational Character set in 7-bit mode by using SI, SO. It will support the DEC Multinational Character set with or without SI, SO in 8-bit mode.

Table 3-4 shows the font default conditions for Characters Per Inch (CPI) settings.

**Table 3-4 Font Defaults**

| Font  | Characters Per Inch (CPI) |                   |        |     |
|-------|---------------------------|-------------------|--------|-----|
|       | 5                         | 10                | 12     | 15  |
| CORR  | #                         | YES \$<br>DEFAULT | YES \$ | #   |
| DATA  | YES                       | YES<br>DEFAULT    | *      | YES |
| OCR A | #                         | YES<br>DEFAULT    | *      | #   |
| OCR B | #                         | YES<br>DEFAULT    | *      | #   |

**NOTES:**

- # Selecting 5 or 15 CPI results in DATA PROCESSING font.
- \$ Selecting 2X changes 5 CPI in DATA PROCESSING font.
- \* Defaults to 12 CPI in CORRESPONDENCE font.

**3.1.3.3 National Replacement Character Sets** -- The printer will replace some characters in the GL character set upon receipt of the following Escape sequences (see Table 3-5).

Table 3-5 lists the character set switch settings and escape sequences for the National replacement character sets.

**Table 3-5 Character Set Escape Sequence and Power-Up Default Switch Settings**

| Control Code | Function              | I/O PCB Module Switch |     |     |     |
|--------------|-----------------------|-----------------------|-----|-----|-----|
|              |                       | SW7                   | SW6 | SW5 | SW4 |
| <ESC>(B      | DEC Multinational     | ON                    | ON  | ON  | ON  |
|              |                       | OFF                   | OFF | OFF | OFF |
| <ESC>(A      | UK                    | ON                    | ON  | ON  | OFF |
| <ESC>(4      | DEC Dutch             | ON                    | ON  | OFF | ON  |
| <ESC>(5      | DEC Finnish           | ON                    | ON  | OFF | OFF |
| <ESC>(R      | French (France)       | ON                    | OFF | ON  | ON  |
| <ESC>(9      | DEC French (Canadian) | ON                    | OFF | ON  | OFF |
| <ESC>(K      | German                | ON                    | OFF | OFF | ON  |
| <ESC>(Y      | Italian               | ON                    | OFF | OFF | OFF |
| <ESC>(J      | JIS Roman             | OFF                   | ON  | ON  | ON  |
| <ESC>(6      | Norwegian/Danish      | OFF                   | ON  | ON  | OFF |
| <ESC>(Z      | Spanish               | OFF                   | ON  | OFF | ON  |
| <ESC>(7      | Swedish               | OFF                   | ON  | OFF | OFF |
| <ESC>(=      | DEC Swiss             | OFF                   | OFF | ON  | ON  |

On error, the printer will default to <ESC>(B above. The power-up default will be determined by the switches on the I/O interface printed circuit board. The controlling switch on the I/O module is SW2 on the parallel board and SW3 on the serial board.

Figures 3-3 through 3-15 show the various National character sets.

| ROW |      |    |    |    | COLUMN         |               | 0             |                | 1           |                | 2           |                | 3           |                 | 4 |                 | 5 |                  | 6   |                  | 7 |  |
|-----|------|----|----|----|----------------|---------------|---------------|----------------|-------------|----------------|-------------|----------------|-------------|-----------------|---|-----------------|---|------------------|-----|------------------|---|--|
|     | BITS |    |    |    | B7<br>B6<br>B5 | 0<br>0<br>0   | 0<br>0<br>1   | 0<br>1<br>0    | 0<br>1<br>1 | 1<br>0<br>0    | 1<br>0<br>1 | 1<br>1<br>0    | 1<br>1<br>1 |                 |   |                 |   |                  |     |                  |   |  |
|     | B4   | B3 | B2 | B1 |                |               |               |                |             |                |             |                |             |                 |   |                 |   |                  |     |                  |   |  |
| 0   | 0    | 0  | 0  | 0  | NUL            | 0<br>0<br>0   |               | 20<br>16<br>10 | SP          | 40<br>32<br>20 | 0           | 60<br>48<br>30 | @           | 100<br>84<br>40 | P | 120<br>80<br>50 | ' | 140<br>96<br>60  | p   | 160<br>112<br>70 |   |  |
| 1   | 0    | 0  | 0  | 1  |                | 1<br>1<br>1   | DC1<br>(XON)  | 21<br>17<br>11 | !           | 41<br>33<br>21 | 1           | 61<br>49<br>31 | A           | 101<br>65<br>41 | Q | 121<br>81<br>51 | a | 141<br>97<br>61  | q   | 161<br>113<br>71 |   |  |
| 2   | 0    | 0  | 1  | 0  |                | 2<br>2<br>2   |               | 22<br>18<br>12 | "           | 42<br>34<br>22 | 2           | 62<br>50<br>32 | B           | 102<br>66<br>42 | R | 122<br>82<br>52 | b | 142<br>98<br>62  | r   | 162<br>114<br>72 |   |  |
| 3   | 0    | 0  | 1  | 1  |                | 3<br>3<br>3   | DC3<br>(XOFF) | 23<br>19<br>13 | #           | 43<br>35<br>23 | 3           | 63<br>51<br>33 | C           | 103<br>67<br>43 | S | 123<br>83<br>53 | c | 143<br>99<br>63  | s   | 163<br>115<br>73 |   |  |
| 4   | 0    | 1  | 0  | 0  |                | 4<br>4<br>4   |               | 24<br>20<br>14 | \$          | 44<br>36<br>24 | 4           | 64<br>52<br>34 | D           | 104<br>68<br>44 | T | 124<br>84<br>54 | d | 144<br>100<br>64 | t   | 164<br>116<br>74 |   |  |
| 5   | 0    | 1  | 0  | 1  |                | 5<br>5<br>5   |               | 25<br>21<br>15 | %           | 45<br>37<br>25 | 5           | 65<br>53<br>35 | E           | 105<br>69<br>45 | U | 125<br>85<br>55 | e | 145<br>101<br>65 | u   | 165<br>117<br>75 |   |  |
| 6   | 0    | 1  | 1  | 0  |                | 6<br>6<br>6   |               | 26<br>22<br>16 | &           | 46<br>38<br>26 | 6           | 66<br>54<br>36 | F           | 106<br>70<br>46 | V | 126<br>86<br>56 | f | 146<br>102<br>66 | v   | 166<br>118<br>76 |   |  |
| 7   | 0    | 1  | 1  | 1  |                | 7<br>7<br>7   |               | 27<br>23<br>17 | '           | 47<br>39<br>27 | 7           | 67<br>55<br>37 | G           | 107<br>71<br>47 | W | 127<br>87<br>57 | g | 147<br>103<br>67 | w   | 167<br>119<br>77 |   |  |
| 8   | 1    | 0  | 0  | 0  | BS             | 10<br>8<br>8  | CAN           | 30<br>24<br>18 | (           | 50<br>40<br>28 | 8           | 70<br>56<br>38 | H           | 110<br>72<br>48 | X | 130<br>88<br>58 | h | 150<br>104<br>68 | x   | 170<br>120<br>78 |   |  |
| 9   | 1    | 0  | 0  | 1  | HT             | 11<br>9<br>9  |               | 31<br>25<br>19 | )           | 51<br>41<br>29 | 9           | 71<br>57<br>39 | I           | 111<br>73<br>49 | Y | 131<br>89<br>59 | i | 151<br>105<br>69 | y   | 171<br>121<br>79 |   |  |
| 10  | 1    | 0  | 1  | 0  | LF             | 12<br>10<br>A | SUB           | 32<br>26<br>1A | *           | 52<br>42<br>2A | :           | 72<br>58<br>3A | J           | 112<br>74<br>4A | Z | 132<br>90<br>5A | j | 152<br>106<br>6A | z   | 172<br>122<br>7A |   |  |
| 11  | 1    | 0  | 1  | 1  | VT             | 13<br>11<br>B | ESC           | 33<br>27<br>1B | +           | 53<br>43<br>2B | ;           | 73<br>59<br>3B | K           | 113<br>75<br>4B | [ | 133<br>91<br>5B | k | 153<br>107<br>6B | {   | 173<br>123<br>7B |   |  |
| 12  | 1    | 1  | 0  | 0  | FF             | 14<br>12<br>C |               | 34<br>28<br>1C | ,           | 54<br>44<br>2C | <           | 74<br>60<br>3C | L           | 114<br>76<br>4C | \ | 134<br>92<br>5C | l | 154<br>108<br>6C |     | 174<br>124<br>7C |   |  |
| 13  | 1    | 1  | 0  | 1  | CR             | 15<br>13<br>D |               | 35<br>29<br>1D | -           | 55<br>45<br>2D | =           | 75<br>61<br>3D | M           | 115<br>77<br>4D | ] | 135<br>93<br>5D | m | 155<br>109<br>6D | }   | 175<br>125<br>7D |   |  |
| 14  | 1    | 1  | 1  | 0  | SO             | 16<br>14<br>E |               | 36<br>30<br>1E | .           | 56<br>46<br>2E | >           | 76<br>62<br>3E | N           | 116<br>78<br>4E | ^ | 136<br>94<br>5E | n | 156<br>110<br>6E | ~   | 176<br>126<br>7E |   |  |
| 15  | 1    | 1  | 1  | 1  | SI             | 17<br>15<br>F |               | 37<br>31<br>1F | /           | 57<br>47<br>2F | ?           | 77<br>63<br>3F | O           | 117<br>79<br>4F | _ | 137<br>95<br>5F | o | 157<br>111<br>6F | DEL | 177<br>127<br>7F |   |  |

## KEY

ASCII CHARACTER

|     |       |         |
|-----|-------|---------|
| ESC | 1 1 1 | COLUMN  |
|     | 3 3   | ROW     |
|     | 2 7   | OCTAL   |
|     | 1 8   | DECIMAL |
|     |       | HEX     |

CS-4983

Figure 3-3 7-Bit ASCII Character Set

| ROW | BITS<br>B4 B3 B2 B1 | COLUMN<br>0          |               | 1              | 2              | 3              | 4              | 5              | 6              | 7               |                 |                 |                 |                 |                  |                  |                  |
|-----|---------------------|----------------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
|     |                     | B7 0<br>B6 0<br>B5 0 | 0 0 1         | 0 1 0          | 0 1 1          | 1 0 0          | 1 0 1          | 1 1 0          | 1 1 1          |                 |                 |                 |                 |                 |                  |                  |                  |
| 0   | 0 0 0 0             | NUL                  | 0<br>0<br>0   | 20<br>16<br>10 | SP             | 40<br>32<br>20 | 0              | 60<br>48<br>30 | @              | 100<br>64<br>40 | P               | 120<br>80<br>50 | `               | 140<br>96<br>60 | p                | 160<br>112<br>70 |                  |
| 1   | 0 0 0 1             |                      | 1<br>1<br>1   | DC1<br>(XON)   | 21<br>17<br>11 | !              | 41<br>33<br>21 | 1              | 61<br>49<br>31 | A               | 101<br>65<br>41 | Q               | 121<br>81<br>51 | a               | 141<br>97<br>61  | q                | 161<br>113<br>71 |
| 2   | 0 0 1 0             |                      | 2<br>2<br>2   |                | 22<br>18<br>12 | "              | 42<br>34<br>22 | 2              | 62<br>50<br>32 | B               | 102<br>66<br>42 | R               | 122<br>82<br>52 | b               | 142<br>98<br>62  | r                | 162<br>114<br>72 |
| 3   | 0 0 1 1             |                      | 3<br>3<br>3   | DC3<br>(XOFF)  | 23<br>19<br>13 | £              | 43<br>35<br>23 | 3              | 63<br>51<br>33 | C               | 103<br>67<br>43 | S               | 123<br>83<br>53 | c               | 143<br>99<br>63  | s                | 163<br>115<br>73 |
| 4   | 0 1 0 0             |                      | 4<br>4<br>4   |                | 24<br>20<br>14 | \$             | 44<br>36<br>24 | 4              | 64<br>52<br>34 | D               | 104<br>68<br>44 | T               | 124<br>84<br>54 | d               | 144<br>100<br>64 | t                | 164<br>116<br>74 |
| 5   | 0 1 0 1             |                      | 5<br>5<br>5   |                | 25<br>21<br>15 | %              | 45<br>37<br>25 | 5              | 65<br>53<br>35 | E               | 105<br>69<br>45 | U               | 125<br>85<br>55 | e               | 145<br>101<br>65 | u                | 165<br>117<br>75 |
| 6   | 0 1 1 0             |                      | 6<br>6<br>6   |                | 26<br>22<br>16 | &              | 46<br>38<br>26 | 6              | 66<br>54<br>36 | F               | 106<br>70<br>46 | V               | 126<br>86<br>56 | f               | 146<br>102<br>66 | v                | 166<br>118<br>76 |
| 7   | 0 1 1 1             |                      | 7<br>7<br>7   |                | 27<br>23<br>17 | '              | 47<br>39<br>27 | 7              | 67<br>55<br>37 | G               | 107<br>71<br>47 | W               | 127<br>87<br>57 | g               | 147<br>103<br>67 | w                | 167<br>119<br>77 |
| 8   | 1 0 0 0             | BS                   | 10<br>8<br>8  | CAN            | 30<br>24<br>18 | (              | 50<br>40<br>28 | 8              | 70<br>56<br>38 | H               | 110<br>72<br>48 | X               | 130<br>88<br>58 | h               | 150<br>104<br>68 | x                | 170<br>120<br>78 |
| 9   | 1 0 0 1             | HT                   | 11<br>9<br>9  |                | 31<br>25<br>19 | )              | 51<br>41<br>29 | 9              | 71<br>57<br>39 | .               | 111<br>73<br>49 | Y               | 131<br>89<br>59 | i               | 151<br>105<br>69 | y                | 171<br>121<br>79 |
| 10  | 1 0 1 0             | LF                   | 12<br>10<br>A | SUB            | 32<br>26<br>1A | *              | 52<br>42<br>2A | :              | 72<br>58<br>3A | ,               | 112<br>74<br>4A | Z               | 132<br>90<br>5A | j               | 152<br>106<br>6A | z                | 172<br>122<br>7A |
| 11  | 1 0 1 1             | VT                   | 13<br>11<br>B | ESC            | 33<br>27<br>1B | +              | 53<br>43<br>2B | ;              | 73<br>59<br>3B | K               | 113<br>75<br>4B | [               | 133<br>91<br>5B | k               | 153<br>107<br>6B | {                | 173<br>123<br>7B |
| 12  | 1 0 0               | FF                   | 14<br>12<br>C |                | 34<br>28<br>1C | ,              | 54<br>44<br>2C | <              | 74<br>60<br>3C | L               | 114<br>76<br>4C | \               | 134<br>92<br>5C | l               | 154<br>108<br>6C |                  | 174<br>124<br>7C |
| 13  | 1 0 1               | CR                   | 15<br>13<br>D |                | 35<br>29<br>1D | -              | 55<br>45<br>2D | =              | 75<br>61<br>3D | M               | 115<br>77<br>4D | ]               | 135<br>93<br>5D | m               | 155<br>109<br>6D | }                | 175<br>125<br>7D |
| 14  | 1 1 1 0             | SO                   | 16<br>14<br>E |                | 36<br>30<br>1E | .              | 56<br>46<br>2E | >              | 76<br>62<br>3E | N               | 116<br>78<br>4E | ^               | 136<br>94<br>5E | n               | 156<br>110<br>6E | ~                | 176<br>126<br>7E |
| 15  | 1 1 1 1             | SI                   | 17<br>15<br>F |                | 37<br>31<br>1F | /              | 57<br>47<br>2F | ?              | 77<br>63<br>3F | O               | 117<br>79<br>4F | _               | 137<br>95<br>5F | o               | 157<br>111<br>6F | DEL              | 177<br>127<br>7F |

## KEY

ASCII CHARACTER

|     |       |
|-----|-------|
| ESC | 1 1 1 |
|     | 33    |
|     | 27    |
|     | 18    |

COLUMN ROW

OCTAL

DECIMAL

HEX



HIGHLIGHTS DIFFERENCES  
FROM ASCII

CS-4984

Figure 3-4 United Kingdom Character Set

| COLUMN |                      | 0   | 1  | 2   | 3  | 4   | 5  | 6   | 7  |
|--------|----------------------|-----|----|-----|----|-----|----|-----|----|
| BITS   |                      | 0 0 |    | 0 1 |    | 1 1 |    | 1 0 |    |
| ROW    | h7 h6 h5 h4 h3 h2 h1 | 0 0 |    | 0 1 |    | 1 1 |    | 1 0 |    |
| 0      | 0 0 0 0              | NUL | 0  | 20  | SP | 40  | 0  | 60  | 80 |
| 1      | 0 0 0 1              |     | 1  | 21  | !  | 41  | 1  | 61  | 81 |
| 2      | 0 0 1 0              |     | 2  | 22  | "  | 42  | 2  | 62  | 82 |
| 3      | 0 0 1 1              |     | 3  | 23  | £  | 43  | 3  | 63  | 83 |
| 4      | 0 1 0 0              |     | 4  | 24  | \$ | 44  | 4  | 64  | 84 |
| 5      | 0 1 0 1              |     | 5  | 25  | %  | 45  | 5  | 65  | 85 |
| 6      | 0 1 1 0              |     | 6  | 26  | &  | 46  | 6  | 66  | 86 |
| 7      | 0 1 1 1              |     | 7  | 27  | '  | 47  | 7  | 67  | 87 |
| 8      | 1 0 0 0              | BS  | 8  | 28  | (  | 48  | 8  | 68  | 88 |
| 9      | 1 0 0 1              | HT  | 9  | 29  | )  | 49  | 9  | 69  | 89 |
| 10     | 1 0 1 0              | LF  | 10 | 30  | *  | 50  | 10 | 70  | 90 |
| 11     | 1 0 1 1              | VT  | 11 | 31  | +  | 51  | 11 | 71  | 91 |
| 12     | 1 1 0 0              | FF  | 12 | 32  | ,  | 52  | 12 | 72  | 92 |
| 13     | 1 1 0 1              | CR  | 13 | 33  | -  | 53  | 13 | 73  | 93 |
| 14     | 1 1 1 0              | SO  | 14 | 34  | .  | 54  | 14 | 74  | 94 |
| 15     | 1 1 1 1              | SI  | 15 | 35  | /  | 55  | 15 | 75  | 95 |

## KEY

ASCII CHARACTER

|     |     |
|-----|-----|
| ESC | 1 1 |
|     | 33  |
|     | 27  |
|     | 1B  |

COLUMN ROW  
OCTAL  
DECIMAL  
HEX

HIGHLIGHTS  
DIFFERENCES  
FROM ASCII

NOTE:  
AT COLUMN/ROW 5/15 LOWERCASE e WITH GRAVE ACCENT  
REPLACES UNDERLINE ( \_ ) WHICH IS USED IN ASCII AND ALL  
OTHER NRC SETS.

CS-4997

Figure 3-5 Dutch Character Set

| ROW | BITS<br>B4 B3 B2 B1 | COLUMN               |               | 0             | 1              | 2  | 3              | 4 | 5               | 6 | 7               |   |                  |     |                  |
|-----|---------------------|----------------------|---------------|---------------|----------------|----|----------------|---|-----------------|---|-----------------|---|------------------|-----|------------------|
|     |                     | B7 0<br>B6 0<br>B5 0 | 0             |               |                |    |                |   |                 |   |                 |   |                  |     |                  |
| 0   | 0 0 0 0             | NUL                  | 0<br>0<br>0   |               | 20<br>16<br>10 | SP | 40<br>32<br>20 | @ | 100<br>64<br>40 | P | 120<br>80<br>50 | é | 140<br>96<br>60  | p   | 160<br>112<br>70 |
| 1   | 0 0 0 1             |                      | 1<br>1<br>1   | DC1<br>(XON)  | 21<br>17<br>11 | !  | 41<br>33<br>21 | 1 | 101<br>65<br>41 | Q | 121<br>81<br>51 | a | 141<br>97<br>61  | q   | 161<br>113<br>71 |
| 2   | 0 0 1 0             |                      | 2<br>2<br>2   |               | 22<br>18<br>12 | "  | 42<br>34<br>22 | 2 | 102<br>66<br>42 | R | 122<br>82<br>52 | b | 142<br>98<br>62  | r   | 162<br>114<br>72 |
| 3   | 0 0 1 1             |                      | 3<br>3<br>3   | DC3<br>(XOFF) | 23<br>19<br>13 | #  | 43<br>35<br>23 | 3 | 103<br>67<br>43 | S | 123<br>83<br>53 | c | 143<br>99<br>63  | s   | 163<br>115<br>73 |
| 4   | 0 1 0 0             |                      | 4<br>4<br>4   |               | 24<br>20<br>14 | \$ | 44<br>36<br>24 | 4 | 104<br>68<br>44 | T | 124<br>84<br>54 | d | 144<br>100<br>64 | t   | 164<br>116<br>74 |
| 5   | 0 1 0 1             |                      | 5<br>5<br>5   |               | 25<br>21<br>15 | %  | 45<br>37<br>25 | 5 | 105<br>69<br>45 | U | 125<br>85<br>55 | e | 145<br>101<br>65 | u   | 165<br>117<br>75 |
| 6   | 0 1 1 0             |                      | 6<br>6<br>6   |               | 26<br>22<br>16 | &  | 46<br>38<br>26 | 6 | 106<br>70<br>46 | V | 126<br>86<br>56 | f | 146<br>102<br>66 | v   | 166<br>118<br>76 |
| 7   | 0 1 1 1             |                      | 7<br>7<br>7   |               | 27<br>23<br>17 | '  | 47<br>39<br>27 | 7 | 107<br>71<br>47 | W | 127<br>87<br>57 | g | 147<br>103<br>67 | w   | 167<br>119<br>77 |
| 8   | 1 0 0 0             | BS                   | 10<br>8<br>8  | CAN           | 30<br>24<br>18 | (  | 50<br>40<br>28 | 8 | 110<br>72<br>48 | H | 130<br>88<br>58 | h | 150<br>104<br>68 | x   | 170<br>120<br>78 |
| 9   | 1 0 0 1             | HT                   | 11<br>9<br>9  |               | 31<br>25<br>19 | )  | 51<br>41<br>29 | 9 | 111<br>73<br>49 | I | 131<br>89<br>59 | i | 151<br>105<br>69 | y   | 171<br>121<br>79 |
| 10  | 1 0 1 0             | LF                   | 12<br>10<br>A | SUB           | 32<br>26<br>1A | *  | 52<br>42<br>2A | : | 112<br>74<br>4A | J | 132<br>90<br>5A | j | 152<br>106<br>6A | z   | 172<br>122<br>7A |
| 11  | 1 0 1 1             | VT                   | 13<br>11<br>B | ESC           | 33<br>27<br>1B | +  | 53<br>43<br>2B | ; | 113<br>75<br>4B | K | 133<br>91<br>5B | k | 153<br>107<br>6B | ä   | 173<br>123<br>7B |
| 12  | 1 1 0 0             | FF                   | 14<br>12<br>C |               | 34<br>28<br>1C | ,  | 54<br>44<br>2C | < | 114<br>76<br>4C | L | 134<br>92<br>5C | l | 154<br>108<br>6C | ö   | 174<br>124<br>7C |
| 13  | 1 1 0 1             | CR                   | 15<br>13<br>D |               | 35<br>29<br>1D | -  | 55<br>45<br>2D | = | 115<br>77<br>4D | M | 135<br>93<br>5D | m | 155<br>109<br>6D | ä   | 175<br>125<br>7D |
| 14  | 1 1 1 0             | SO                   | 16<br>14<br>E |               | 36<br>30<br>1E | .  | 56<br>46<br>2E | > | 116<br>78<br>4E | N | 136<br>94<br>5E | n | 156<br>110<br>6E | ü   | 176<br>126<br>7E |
| 15  | 1 1 1 1             | SI                   | 17<br>15<br>F |               | 37<br>31<br>1F | /  | 57<br>47<br>2F | ? | 117<br>79<br>4F | O | 137<br>95<br>5F | o | 157<br>111<br>6F | DEL | 177<br>127<br>7F |

## KEY

ASCII CHARACTER

|     |       |
|-----|-------|
| ESC | 1 1 1 |
|     | 33    |
|     | 27    |
|     | 1B    |

COLUMN ROW

OCTAL

DECIMAL

HEX



HIGHLIGHTS DIFFERENCES  
FROM ASCII

CS-4985

Figure 3-6 Finnish Character Set

| ROW | COLUMNS |             | 0   | 1             | 2  | 3 | 4  | 5 | 6   | 7 |
|-----|---------|-------------|-----|---------------|----|---|----|---|-----|---|
|     | BITS    |             |     |               |    |   |    |   |     |   |
|     | B4      | B3 B2 B1 B5 |     |               |    |   |    |   |     |   |
| 0   | 0       | 0 0 0 0     | NUL |               | SP | 0 | à  | P | '   | p |
| 1   | 0       | 0 0 0 1     |     | DC1<br>(XON)  | !  | A | Q  | a | q   |   |
| 2   | 0       | 0 0 1 0     |     |               | "  | B | R  | b | r   |   |
| 3   | 0       | 0 0 1       |     | DC3<br>(XOFF) | £  | C | S  | c | s   |   |
| 4   | 0       | 0 1 0 0     |     |               | \$ | D | T  | d | t   |   |
| 5   | 0       | 0 1 0 1     |     |               | %  | E | U  | e | u   |   |
| 6   | 0       | 0 1 1 0     |     |               | &  | F | V  | f | v   |   |
| 7   | 0       | 0 1 1 1     |     |               | '  | G | W  | w | w   |   |
| 8   | 1       | 0 0 0 0     | BS  | CAN           | (  | H | X  | h | x   |   |
| 9   | 1       | 0 0 0 1     | HT  |               | )  | I | Y  | y | y   |   |
| 10  | 1       | 0 0 1 0     | LF  | SUB           | *  | J | Z  | j | z   |   |
| 11  | 1       | 0 0 1 1     | VT  |               | +  | K | .  | k | .   |   |
| 12  | 1       | 1 0 0 0     | FF  |               | ,  | L |    | l | ü   |   |
| 13  | 1       | 1 0 0 1     | CR  |               | -  | M | \$ | m | •   |   |
| 14  | 1       | 1 1 1 0     | SO  |               | .  | N | ^  | n | ••  |   |
| 15  | 1       | 1 1 1 1     | SI  |               | /  | O | _  | o | DEL |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |
|     |         |             |     |               |    |   |    |   |     |   |

## KEY

| ASCII CHARACTER | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|
| ESC             | 33 | 27 | 1B |    |    |    |    |    |    |    |    |    |

(COLUMN ROW)  
OCTAL  
DECIMAL  
HEX



HIGHLIGHTS DIFFERENCES  
FROM ASCII

NOTE  
QUOTATION MARKS (") ARE USED AS AN APPROXIMATION  
FOR THE DIAERESIS MARK (¨), COLUMN 7/ROW 14

Figure 3-7 French Character Set

| ROW |      |    |    |    | COLUMN               | 0             |               | 1              |    | 2              |   | 3              |   | 4               |   | 5               |   | 6                |     | 7                |   |
|-----|------|----|----|----|----------------------|---------------|---------------|----------------|----|----------------|---|----------------|---|-----------------|---|-----------------|---|------------------|-----|------------------|---|
|     | BITS |    |    |    | B7 0<br>B6 0<br>B5 0 | 0 0           |               | 0 1            |    | 0 1            |   | 1 0            |   | 1 0             |   | 1 1             |   | 1 1              |     |                  |   |
|     | B4   | B3 | B2 | B1 | 0                    | 0             | 1             | 0              | 1  | 0              | 1 | 0              | 1 | 0               | 1 | 0               | 1 | 0                | 1   | 0                | 1 |
| 0   | 0    | 0  | 0  | 0  | NUL                  | 0<br>0<br>0   |               | 20<br>16<br>10 | SP | 40<br>32<br>20 | 0 | 60<br>48<br>30 | à | 100<br>64<br>40 | P | 120<br>80<br>50 | ô | 140<br>96<br>60  | p   | 160<br>112<br>70 |   |
| 1   | 0    | 0  | 0  | 1  |                      | 1<br>1<br>1   | DC1<br>(XON)  | 21<br>17<br>11 | !  | 41<br>33<br>21 | 1 | 61<br>49<br>31 | A | 101<br>65<br>41 | Q | 121<br>81<br>51 | a | 141<br>97<br>61  | q   | 161<br>113<br>71 |   |
| 2   | 0    | 0  | 1  | 0  |                      | 2<br>2<br>2   |               | 22<br>18<br>12 | "  | 42<br>34<br>22 | 2 | 62<br>50<br>32 | B | 102<br>66<br>42 | R | 122<br>82<br>52 | b | 142<br>98<br>62  | r   | 162<br>114<br>72 |   |
| 3   | 0    | 0  | 1  | 1  |                      | 3<br>3<br>3   | DC3<br>(XOFF) | 23<br>19<br>13 | #  | 43<br>35<br>23 | 3 | 63<br>51<br>33 | C | 103<br>67<br>43 | S | 123<br>83<br>53 | c | 143<br>99<br>63  | s   | 163<br>115<br>73 |   |
| 4   | 0    | 1  | 0  | 0  |                      | 4<br>4<br>4   |               | 24<br>20<br>14 | \$ | 44<br>36<br>24 | 4 | 64<br>52<br>34 | D | 104<br>68<br>44 | T | 124<br>84<br>54 | d | 144<br>100<br>64 | t   | 164<br>116<br>74 |   |
| 5   | 0    | 1  | 0  | 1  |                      | 5<br>5<br>5   |               | 25<br>21<br>15 | %  | 45<br>37<br>25 | 5 | 65<br>53<br>35 | E | 105<br>69<br>45 | U | 125<br>85<br>55 | e | 145<br>101<br>65 | u   | 165<br>117<br>75 |   |
| 6   | 0    | 1  | 1  | 0  |                      | 6<br>6<br>6   |               | 26<br>22<br>16 | &  | 46<br>38<br>26 | 6 | 66<br>54<br>36 | F | 106<br>70<br>46 | V | 126<br>86<br>56 | f | 146<br>102<br>66 | v   | 166<br>118<br>76 |   |
| 7   | 0    | 1  | 1  | 1  |                      | 7<br>7<br>7   |               | 27<br>23<br>17 | '  | 47<br>39<br>27 | 7 | 67<br>55<br>37 | G | 107<br>71<br>47 | W | 127<br>87<br>57 | g | 147<br>103<br>67 | w   | 167<br>119<br>77 |   |
| 8   | 1    | 0  | 0  | 0  | BS                   | 10<br>8<br>8  | CAN           | 30<br>24<br>18 | (  | 50<br>40<br>28 | 8 | 70<br>56<br>38 | H | 110<br>72<br>48 | X | 130<br>88<br>58 | h | 150<br>104<br>68 | x   | 170<br>120<br>78 |   |
| 9   | 1    | 0  | 0  | 1  | HT                   | 11<br>9<br>9  |               | 31<br>25<br>19 | )  | 51<br>41<br>29 | 9 | 71<br>57<br>39 | I | 111<br>73<br>49 | Y | 131<br>89<br>59 | i | 151<br>105<br>69 | y   | 171<br>121<br>79 |   |
| 10  | 1    | 0  | 1  | 0  | LF                   | 12<br>10<br>A | SUB           | 32<br>26<br>1A | *  | 52<br>42<br>2A | : | 72<br>58<br>3A | J | 112<br>74<br>4A | Z | 132<br>90<br>5A | j | 152<br>106<br>6A | z   | 172<br>122<br>7A |   |
| 11  | 1    | 0  | 1  | 1  | VT                   | 13<br>11<br>B | ESC           | 33<br>27<br>1B | +  | 53<br>43<br>2B | ; | 73<br>59<br>3B | K | 113<br>75<br>4B | ␣ | 133<br>91<br>5B | k | 153<br>107<br>6B | é   | 173<br>123<br>7B |   |
| 12  | 1    | 1  | 0  | 0  | FF                   | 14<br>12<br>C |               | 34<br>28<br>1C | ,  | 54<br>44<br>2C | < | 74<br>60<br>3C | L | 114<br>76<br>4C | ç | 134<br>92<br>5C | l | 154<br>108<br>6C | ù   | 174<br>124<br>7C |   |
| 13  | 1    | 1  | 0  | 1  | CR                   | 15<br>13<br>D |               | 35<br>29<br>1D | -  | 55<br>45<br>2D | = | 75<br>61<br>3D | M | 115<br>77<br>4D | ␣ | 135<br>93<br>5D | m | 155<br>109<br>6D | ê   | 175<br>125<br>7D |   |
| 14  | 1    | 1  | 1  | 0  | SO                   | 16<br>14<br>E |               | 36<br>30<br>1E | .  | 56<br>46<br>2E | > | 76<br>62<br>3E | N | 116<br>78<br>4E | î | 136<br>94<br>5E | n | 156<br>110<br>6E | û   | 176<br>126<br>7E |   |
| 15  | 1    | 1  | 1  | 1  | SI                   | 17<br>15<br>F |               | 37<br>31<br>1F | /  | 57<br>47<br>2F | ? | 77<br>63<br>3F | O | 117<br>79<br>4F | — | 137<br>95<br>5F | o | 157<br>111<br>6F | DEL | 177<br>127<br>7F |   |

| KEY             |     | COLUMN ROW |         | HIGHLIGHTS DIFFERENCES FROM ASCII |
|-----------------|-----|------------|---------|-----------------------------------|
| ASCII CHARACTER | ESC | 1 1 1      | OCTAL   |                                   |
|                 |     | 3 3        | DECIMAL |                                   |
|                 |     | 2 7        | HEX     |                                   |
|                 |     | 1 B        |         |                                   |

CS-4987

Figure 3-8 French Canadian Character Set

| ROW | BITS<br>B4 B3 B2 B1 | COLUMN               | 1                 | 2                 | 3                 | 4                 | 5                 | 6                 | 7   |
|-----|---------------------|----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-----|
|     |                     | 0                    |                   |                   |                   |                   |                   |                   |     |
|     |                     | B7 0<br>B6 0<br>B5 0 | 0 0<br>0 1<br>0 0 | 0 1<br>0 0<br>0 1 | 0 1<br>0 1<br>0 1 | 1 0<br>1 0<br>1 0 | 1 0<br>1 0<br>1 0 | 1 1<br>1 1<br>1 1 |     |
| 0   | 0 0 0 0             | NUL                  |                   | SP                | 0                 |                   | P                 |                   | p   |
| 1   | 0 0 0 1             |                      | DC1<br>(XON)      | !                 | 1                 | A                 | Q                 | a                 | q   |
| 2   | 0 0 1 0             |                      |                   | "                 | 2                 | B                 | R                 | b                 | r   |
| 3   | 0 0 1 1             |                      | DC3<br>(XOFF)     | #                 | 3                 | C                 | S                 | c                 | s   |
| 4   | 0 1 0 0             |                      |                   | \$                | 4                 | D                 | T                 | d                 | t   |
| 5   | 0 1 0 1             |                      |                   | %                 | 5                 | E                 | U                 | e                 | u   |
| 6   | 0 1 1 0             |                      |                   | &                 | 6                 | F                 | V                 | f                 | v   |
| 7   | 0 1 1 1             |                      |                   | '                 | 7                 | G                 | W                 | g                 | w   |
| 8   | 1 0 0 0             | BS                   | CAN               | (                 | 8                 | H                 | X                 | h                 | x   |
| 9   | 1 0 0 1             | HT                   |                   | )                 | 9                 | I                 | Y                 | i                 | y   |
| 10  | 1 0 1 0             | LF                   | SUB               | *                 | :                 | J                 | Z                 | j                 | z   |
| 11  | 1 0 1 1             | VT                   | ESC               | +                 | ;                 | K                 | Ä                 | k                 | ä   |
| 12  | 1 1 0 0             | FF                   |                   | ,                 | <                 | L                 | Ö                 | l                 | ö   |
| 13  | 1 1 0 1             | CR                   |                   | -                 | =                 | M                 | Ü                 | m                 | ü   |
| 14  | 1 1 1 0             | SO                   |                   | .                 | >                 | N                 | ^                 | n                 | ß   |
| 15  | 1 1 1 1             | SI                   |                   | /                 | ?                 | O                 | _                 | o                 | DEL |

## KEY

ASCII CHARACTER

|     |       |            |
|-----|-------|------------|
| ESC | 1 1 1 | COLUMN ROW |
|     | 33    | OCTAL      |
|     | 27    | DECIMAL    |
|     | 1B    | HEX        |

HIGHLIGHTS DIFFERENCES FROM ASCII

CS-4988

Figure 3-9 German Character Set

| ROW | BITS<br>B4 B3 B2 B1 | COLUMN               |               | 1             | 2              | 3  | 4              | 5 | 6              | 7  |                 |       |                 |       |                  |       |                  |
|-----|---------------------|----------------------|---------------|---------------|----------------|----|----------------|---|----------------|----|-----------------|-------|-----------------|-------|------------------|-------|------------------|
|     |                     | 0                    | 1             |               |                |    |                |   |                |    |                 |       |                 |       |                  |       |                  |
|     |                     | B7 0<br>B6 0<br>B5 0 | 0 0 1         |               |                |    |                |   |                |    | 0 1 0           | 0 1 1 | 1 0 0           | 1 0 1 | 1 1 0            | 1 1 1 |                  |
| 0   | 0 0 0 0             | NUL                  | 0<br>0<br>0   |               | 20<br>16<br>10 | SP | 40<br>32<br>20 | 0 | 60<br>48<br>30 | \$ | 100<br>64<br>40 | P     | 120<br>80<br>50 | ù     | 140<br>96<br>60  | p     | 160<br>112<br>70 |
| 1   | 0 0 0 1             |                      | 1<br>1<br>1   | DC1<br>(XON)  | 21<br>17<br>11 | !  | 41<br>33<br>21 | 1 | 61<br>49<br>31 | A  | 101<br>65<br>41 | Q     | 121<br>81<br>51 | a     | 141<br>97<br>61  | q     | 161<br>113<br>71 |
| 2   | 0 0 1 0             |                      | 2<br>2<br>2   |               | 22<br>18<br>12 | "  | 42<br>34<br>22 | 2 | 62<br>50<br>32 | B  | 102<br>66<br>42 | R     | 122<br>82<br>52 | b     | 142<br>98<br>62  | r     | 162<br>114<br>72 |
| 3   | 0 0 1 1             |                      | 3<br>3<br>3   | DC3<br>(XOFF) | 23<br>19<br>13 | £  | 43<br>35<br>23 | 3 | 63<br>51<br>33 | C  | 103<br>67<br>43 | S     | 123<br>83<br>53 | c     | 143<br>99<br>63  | s     | 163<br>115<br>73 |
| 4   | 0 1 0 0             |                      | 4<br>4<br>4   |               | 24<br>20<br>14 | \$ | 44<br>36<br>24 | 4 | 64<br>52<br>34 | D  | 104<br>68<br>44 | T     | 124<br>84<br>54 | d     | 144<br>100<br>64 | t     | 164<br>116<br>74 |
| 5   | 0 1 0 1             |                      | 5<br>5<br>5   |               | 25<br>21<br>15 | %  | 45<br>37<br>25 | 5 | 65<br>53<br>35 | E  | 105<br>69<br>45 | U     | 125<br>85<br>55 | e     | 145<br>101<br>65 | u     | 165<br>117<br>75 |
| 6   | 0 1 1 0             |                      | 6<br>6<br>6   |               | 26<br>22<br>16 | &  | 46<br>38<br>26 | 6 | 66<br>54<br>36 | F  | 106<br>70<br>46 | V     | 126<br>86<br>56 | f     | 146<br>102<br>66 | v     | 166<br>118<br>76 |
| 7   | 0 1 1 1             |                      | 7<br>7<br>7   |               | 27<br>23<br>17 | '  | 47<br>39<br>27 | 7 | 67<br>55<br>37 | G  | 107<br>71<br>47 | W     | 127<br>87<br>57 | g     | 147<br>103<br>67 | w     | 167<br>119<br>77 |
| 8   | 1 0 0 0             | BS                   | 10<br>8<br>8  | CAN           | 30<br>24<br>18 | (  | 50<br>40<br>28 | 8 | 70<br>56<br>38 | H  | 110<br>72<br>48 | X     | 130<br>88<br>58 | h     | 150<br>104<br>68 | x     | 170<br>120<br>78 |
| 9   | 1 0 0 1             | HT                   | 11<br>9<br>9  |               | 31<br>25<br>19 | )  | 51<br>41<br>29 | 9 | 71<br>57<br>39 | I  | 111<br>73<br>49 | Y     | 131<br>89<br>59 | i     | 151<br>105<br>69 | y     | 171<br>121<br>79 |
| 10  | 1 0 1 0             | LF                   | 12<br>10<br>A | SUB           | 32<br>26<br>1A | *  | 52<br>42<br>2A | : | 72<br>58<br>3A | J  | 112<br>74<br>4A | Z     | 132<br>90<br>5A | j     | 152<br>106<br>6A | z     | 172<br>122<br>7A |
| 11  | 1 0 1 1             | VT                   | 13<br>11<br>B | ESC           | 33<br>27<br>1B | +  | 53<br>43<br>2B | ; | 73<br>59<br>3B | K  | 113<br>75<br>4B | .     | 133<br>91<br>5B | k     | 153<br>107<br>6B | .     | 173<br>123<br>7B |
| 12  | 1 1 0 0             | FF                   | 14<br>12<br>C |               | 34<br>28<br>1C | ,  | 54<br>44<br>2C | < | 74<br>60<br>3C | L  | 114<br>76<br>4C | ç     | 134<br>92<br>5C | l     | 154<br>108<br>6C | ò     | 174<br>124<br>7C |
| 13  | 1 1 0 1             | CR                   | 15<br>13<br>D |               | 35<br>29<br>1D | -  | 55<br>45<br>2D | = | 75<br>61<br>3D | M  | 115<br>77<br>4D | é     | 135<br>93<br>5D | m     | 155<br>109<br>6D | .     | 175<br>125<br>7D |
| 14  | 1 1 1 0             | SO                   | 16<br>14<br>E |               | 36<br>30<br>1E | .  | 56<br>46<br>2E | > | 76<br>62<br>3E | N  | 116<br>78<br>4E | ^     | 136<br>94<br>5E | n     | 156<br>110<br>6E | ì     | 176<br>126<br>7E |
| 15  | 1 1 1 1             | SI                   | 17<br>15<br>F |               | 37<br>31<br>1F | /  | 57<br>47<br>2F | ? | 77<br>63<br>3F | O  | 117<br>79<br>4F | _     | 137<br>95<br>5F | o     | 157<br>111<br>6F | DEL   | 177<br>127<br>7F |

| KEY             |     | COLUMN ROW |         |
|-----------------|-----|------------|---------|
| ASCII CHARACTER | ESC | 1 1 1      | OCTAL   |
|                 |     | 33         | DECIMAL |
|                 |     | 27         | HEX     |
|                 |     | 1B         |         |



HIGHLIGHTS DIFFERENCES FROM ASCII

Figure 3-10 Italian Character Set

| ROW | BITS |    |    |    | COLUMN |     | 0     | 1             | 2 | 3 | 4 | 5 | 6 | 7 |   |
|-----|------|----|----|----|--------|-----|-------|---------------|---|---|---|---|---|---|---|
|     | B4   | B3 | B2 | B1 | B7     | B6  | B5    | 0             | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 0   | 0    | 0  | 0  | 0  | NUL    | 0   | 0     |               |   |   |   |   |   |   |   |
| 1   | 0    | 0  | 0  | 1  |        | 1   | 1     | DC1<br>(XON)  |   |   |   |   |   |   |   |
| 2   | 0    | 0  | 1  | 0  |        | 2   | 2     |               |   |   |   |   |   |   |   |
| 3   | 0    | 0  | 1  | 1  |        | 3   | 3     | DC3<br>(XOFF) |   |   |   |   |   |   |   |
| 4   | 0    | 1  | 0  | 0  |        | 4   | 4     |               |   |   |   |   |   |   |   |
| 5   | 0    | 1  | 0  | 1  |        | 5   | 5     |               |   |   |   |   |   |   |   |
| 6   | 0    | 1  | 1  | 0  |        | 6   | 6     |               |   |   |   |   |   |   |   |
| 7   | 0    | 1  | 1  | 1  |        | 7   | 7     |               |   |   |   |   |   |   |   |
| 8   | 1    | 0  | 0  | 0  | BS     | 8   | 8     | CAN           |   |   |   |   |   |   |   |
| 9   | 1    | 0  | 0  | 1  | HT     | 9   | 9     |               |   |   |   |   |   |   |   |
| 10  | 1    | 0  | 1  | 0  | LF     | 10  | 10    | SUB           |   |   |   |   |   |   |   |
| 11  | 1    | 0  | 1  | 1  | VT     | 11  | 11    | ESC           |   |   |   |   |   |   |   |
| 12  | 1    | 1  | 0  | 0  | FF     | 12  | 12    |               |   |   |   |   |   |   |   |
| 13  | 1    | 1  | 0  | 1  | CR     | 13  | 13    |               |   |   |   |   |   |   |   |
| 14  | 1    | 1  | 1  | 0  | SO     | 14  | 14    |               |   |   |   |   |   |   |   |
| 15  | 1    | 1  | 1  | 1  | SI     | 15  | 15    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 16  | 16    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 17  | 17    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 18  | 18    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 19  | 19    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 20  | 20    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 21  | 21    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 22  | 22    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 23  | 23    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 24  | 24    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 25  | 25    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 26  | 26    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 27  | 27    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 28  | 28    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 29  | 29    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 30  | 30    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 31  | 31    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 32  | 32    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 33  | 33    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 34  | 34    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 35  | 35    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 36  | 36    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 37  | 37    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 38  | 38    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 39  | 39    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 40  | 40    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 41  | 41    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 42  | 42    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 43  | 43    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 44  | 44    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 45  | 45    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 46  | 46    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 47  | 47    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 48  | 48    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 49  | 49    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 50  | 50    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 51  | 51    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 52  | 52    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 53  | 53    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 54  | 54    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 55  | 55    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 56  | 56    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 57  | 57    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 58  | 58    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 59  | 59    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 60  | 60    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 61  | 61    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 62  | 62    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 63  | 63    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 64  | 64    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 65  | 65    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 66  | 66    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 67  | 67    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 68  | 68    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 69  | 69    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 70  | 70    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 71  | 71    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 72  | 72    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 73  | 73    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 74  | 74    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 75  | 75    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 76  | 76    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 77  | 77    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 78  | 78    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 79  | 79    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 80  | 80    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 81  | 81    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 82  | 82    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 83  | 83    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 84  | 84    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 85  | 85    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 86  | 86    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 87  | 87    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 88  | 88    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 89  | 89    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 90  | 90    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 91  | 91    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 92  | 92    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 93  | 93    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 94  | 94    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 95  | 95    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 96  | 96    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 97  | 97    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 98  | 98    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 99  | 99    |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 100 | 100   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 101 | 101   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 102 | 102   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 103 | 103   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 104 | 104   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 105 | 105   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 106 | 106   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 107 | 107   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 108 | 108   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 109 | 109   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 110 | 110   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 111 | 111   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 112 | 112   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 113 | 113   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 114 | 114   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 115 | 115   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 116 | 116   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 117 | 117   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 118 | 118   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 119 | 119   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 120 | 120   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 121 | 121   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 122 | 122   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 123 | 123   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 124 | 124   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 125 | 125   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 126 | 126   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 127 | 127   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 128 | 128   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 129 | 129   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 130 | 130   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 131 | 131   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 132 | 132   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 133 | 133   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 134 | 134   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 135 | 135   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 136 | 136   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 137 | 137   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 138 | 138   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 139 | 139   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 140 | 140   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 141 | 141   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 142 | 142   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 143 | 143   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 144 | 144   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 145 | 145   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 146 | 146   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 147 | 147   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 148 | 148   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 149 | 149   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 150 | 150   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 151 | 151   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 152 | 152   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 153 | 153   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 154 | 154   |               |   |   |   |   |   |   |   |
|     |      |    |    |    |        | 155 | 155</ |               |   |   |   |   |   |   |   |

| ROW | BITS<br>B4 B3 B2 B1 | COLUMN         |               | 0             | 1              | 2  | 3              | 4 | 5              | 6 | 7               |   |                 |   |                  |     |                  |
|-----|---------------------|----------------|---------------|---------------|----------------|----|----------------|---|----------------|---|-----------------|---|-----------------|---|------------------|-----|------------------|
|     |                     | B7<br>B6<br>B5 |               |               |                |    |                |   |                |   |                 |   |                 |   |                  |     |                  |
| 0   | 0 0 0 0             | NUL            | 0<br>0<br>0   |               | 20<br>16<br>10 | SP | 40<br>32<br>20 | 0 | 60<br>48<br>30 | À | 100<br>80<br>60 | P | 120<br>80<br>50 | À | 140<br>96<br>60  | p   | 160<br>112<br>70 |
| 1   | 0 0 0 1             |                | 1<br>1<br>1   | DC1<br>(XON)  | 21<br>17<br>11 | !  | 41<br>33<br>21 | 1 | 61<br>49<br>31 | A | 101<br>81<br>41 | Q | 121<br>81<br>51 | a | 141<br>97<br>61  | q   | 161<br>113<br>71 |
| 2   | 0 0 1 0             |                | 2<br>2<br>2   |               | 22<br>18<br>12 | "  | 42<br>34<br>22 | 2 | 62<br>50<br>32 | B | 102<br>82<br>42 | R | 122<br>82<br>52 | b | 142<br>98<br>62  | r   | 162<br>114<br>72 |
| 3   | 0 0 1 1             |                | 3<br>3<br>3   | DC3<br>(XOFF) | 23<br>19<br>13 | #  | 43<br>35<br>23 | 3 | 63<br>51<br>33 | C | 103<br>83<br>43 | S | 123<br>83<br>53 | c | 143<br>99<br>63  | s   | 163<br>115<br>73 |
| 4   | 0 1 0 0             |                | 4<br>4<br>4   |               | 24<br>20<br>14 | \$ | 44<br>36<br>24 | 4 | 64<br>52<br>34 | D | 104<br>84<br>44 | T | 124<br>84<br>54 | d | 144<br>100<br>64 | t   | 164<br>116<br>74 |
| 5   | 0 1 0 1             |                | 5<br>5<br>5   |               | 25<br>21<br>15 | %  | 45<br>37<br>25 | 5 | 65<br>53<br>35 | E | 105<br>85<br>45 | U | 125<br>85<br>55 | e | 145<br>101<br>65 | u   | 165<br>117<br>75 |
| 6   | 0 1 1 0             |                | 6<br>6<br>6   |               | 26<br>22<br>16 | &  | 46<br>38<br>26 | 6 | 66<br>54<br>36 | F | 106<br>86<br>46 | V | 126<br>86<br>56 | f | 146<br>102<br>66 | v   | 166<br>118<br>76 |
| 7   | 0 1 1 1             |                | 7<br>7<br>7   |               | 27<br>23<br>17 | '  | 47<br>39<br>27 | 7 | 67<br>55<br>37 | G | 107<br>87<br>47 | W | 127<br>87<br>57 | g | 147<br>103<br>67 | w   | 167<br>119<br>77 |
| 8   | 1 0 0 0             | BS             | 10<br>8<br>6  | CAN           | 30<br>24<br>18 | (  | 50<br>40<br>28 | 8 | 70<br>56<br>38 | H | 110<br>92<br>48 | X | 130<br>88<br>58 | h | 150<br>104<br>68 | x   | 170<br>120<br>78 |
| 9   | 1 0 0 1             | HT             | 11<br>9<br>7  |               | 31<br>25<br>19 | )  | 51<br>41<br>29 | 9 | 71<br>57<br>39 | I | 111<br>93<br>49 | Y | 131<br>89<br>59 | i | 151<br>105<br>69 | y   | 171<br>121<br>79 |
| 10  | 1 0 1 0             | LF             | 12<br>10<br>A | SUB           | 32<br>26<br>1A | *  | 52<br>42<br>2A | : | 72<br>58<br>3A | J | 112<br>94<br>4A | Z | 132<br>90<br>5A | j | 152<br>106<br>6A | z   | 172<br>122<br>7A |
| 11  | 1 0 1 1             | VT             | 13<br>11<br>B | ESC           | 33<br>27<br>1B | +  | 53<br>43<br>2B | ; | 73<br>59<br>3B | K | 113<br>95<br>4B | Æ | 133<br>91<br>5B | k | 153<br>107<br>6B | •   | 173<br>123<br>7B |
| 12  | 1 1 0 0             | FF             | 14<br>12<br>C |               | 34<br>28<br>1C | ,  | 54<br>44<br>2C | < | 74<br>60<br>3C | L | 114<br>96<br>4C | Ø | 134<br>92<br>5C | l | 154<br>108<br>6C | •   | 174<br>124<br>7C |
| 13  | 1 1 0 1             | CR             | 15<br>13<br>D |               | 35<br>29<br>1D | -  | 55<br>45<br>2D | = | 75<br>61<br>3D | M | 115<br>97<br>4D | Å | 135<br>93<br>5D | m | 155<br>109<br>6D | •   | 175<br>125<br>7D |
| 14  | 1 1 1 0             | SO             | 16<br>14<br>E |               | 36<br>30<br>1E | .  | 56<br>46<br>2E | > | 76<br>62<br>3E | N | 116<br>98<br>4E | Ü | 136<br>94<br>5E | n | 156<br>110<br>6E | •   | 176<br>126<br>7E |
| 15  | 1 1 1 1             | SI             | 17<br>15<br>F |               | 37<br>31<br>1F | /  | 57<br>47<br>2F | ? | 77<br>63<br>3F | O | 117<br>99<br>4F | — | 137<br>95<br>5F | o | 157<br>111<br>6F | DEL | 177<br>127<br>7F |

| KEY             |     | COLUMN ROW             |                              | HIGHLIGHTS DIFFERENCES<br>FROM ASCII |
|-----------------|-----|------------------------|------------------------------|--------------------------------------|
| ASCII CHARACTER | ESC | 1 11<br>33<br>27<br>1B | 0 01<br>001<br>0001<br>00001 |                                      |
|                 |     |                        |                              |                                      |

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Figure 3-12 Norwegian/Danish Character Set

| ROW | BITS<br>B4 B3 B2 B1 | COLUMN               |               | 0             | 1              | 2     | 3              | 4     | 5              | 6     | 7               |   |                 |   |                  |     |                  |
|-----|---------------------|----------------------|---------------|---------------|----------------|-------|----------------|-------|----------------|-------|-----------------|---|-----------------|---|------------------|-----|------------------|
|     |                     | 87 0<br>86 0<br>85 0 |               | 0 0 0         | 0 0 1          | 0 1 0 | 0 1 1          | 1 0 0 | 1 0 1          | 1 1 0 | 1 1 1           |   |                 |   |                  |     |                  |
| 0   | 0 0 0 0             | NUL                  | 0<br>0<br>0   |               | 20<br>16<br>10 | SP    | 40<br>32<br>20 | 0     | 60<br>48<br>30 | ,     | 100<br>64<br>40 | P | 120<br>80<br>50 | , | 140<br>96<br>60  | p   | 160<br>112<br>70 |
| 1   | 0 0 0 1             |                      | 1<br>1<br>1   | DC1<br>(XON)  | 21<br>17<br>11 | !     | 41<br>33<br>21 | 1     | 61<br>49<br>31 | A     | 101<br>65<br>41 | Q | 121<br>81<br>51 | a | 141<br>97<br>61  | q   | 161<br>113<br>71 |
| 2   | 0 0 1 0             |                      | 2<br>2<br>2   |               | 22<br>18<br>12 | "     | 42<br>34<br>22 | 2     | 62<br>50<br>32 | B     | 102<br>66<br>42 | R | 122<br>82<br>52 | b | 142<br>98<br>62  | r   | 162<br>114<br>72 |
| 3   | 0 0 1 1             |                      | 3<br>3<br>3   | DC3<br>(XOFF) | 23<br>19<br>13 | £     | 43<br>35<br>23 | 3     | 63<br>51<br>33 | C     | 103<br>67<br>43 | S | 123<br>83<br>53 | c | 143<br>99<br>63  | s   | 163<br>115<br>73 |
| 4   | 0 1 0 0             |                      | 4<br>4<br>4   |               | 24<br>20<br>14 | \$    | 44<br>36<br>24 | 4     | 64<br>52<br>34 | D     | 104<br>68<br>44 | T | 124<br>84<br>54 | d | 144<br>100<br>64 | t   | 164<br>116<br>74 |
| 5   | 0 1 0 1             |                      | 5<br>5<br>5   |               | 25<br>21<br>15 | %     | 45<br>37<br>25 | 5     | 65<br>53<br>35 | E     | 105<br>69<br>45 | U | 125<br>85<br>55 | e | 145<br>101<br>65 | u   | 165<br>117<br>75 |
| 6   | 0 1 1 0             |                      | 6<br>6<br>6   |               | 26<br>22<br>16 | &     | 46<br>38<br>26 | 6     | 66<br>54<br>36 | F     | 106<br>70<br>46 | V | 126<br>86<br>56 | f | 146<br>102<br>66 | v   | 166<br>118<br>76 |
| 7   | 0 1 1 1             |                      | 7<br>7<br>7   |               | 27<br>23<br>17 | '     | 47<br>39<br>27 | 7     | 67<br>55<br>37 | G     | 107<br>71<br>47 | W | 127<br>87<br>57 | g | 147<br>103<br>67 | w   | 167<br>119<br>77 |
| 8   | 1 0 0 0             | BS                   | 10<br>8<br>8  | CAN           | 30<br>24<br>18 | (     | 50<br>40<br>28 | 8     | 70<br>56<br>38 | H     | 110<br>72<br>48 | X | 130<br>88<br>58 | h | 150<br>104<br>68 | x   | 170<br>120<br>78 |
| 9   | 1 0 0 1             | HT                   | 11<br>9<br>9  |               | 31<br>25<br>19 | )     | 51<br>41<br>29 | 9     | 71<br>57<br>39 | I     | 111<br>73<br>49 | Y | 131<br>89<br>59 | i | 151<br>105<br>69 | y   | 171<br>121<br>79 |
| 10  | 1 0 1 0             | LF                   | 12<br>10<br>A | SUB           | 32<br>26<br>1A | *     | 52<br>42<br>2A | :     | 72<br>58<br>3A | J     | 112<br>74<br>4A | Z | 132<br>90<br>5A | j | 152<br>106<br>6A | z   | 172<br>122<br>7A |
| 11  | 1 0 1 1             | VT                   | 13<br>11<br>B | ESC           | 33<br>27<br>1B | +     | 53<br>43<br>2B | ;     | 73<br>59<br>3B | K     | 113<br>75<br>4B | ¡ | 133<br>91<br>5B | k | 153<br>107<br>6B | o   | 173<br>123<br>7B |
| 12  | 1 1 0 0             | FF                   | 14<br>12<br>C |               | 34<br>28<br>1C | ,     | 54<br>44<br>2C | <     | 74<br>60<br>3C | L     | 114<br>76<br>4C | ñ | 134<br>92<br>5C | l | 154<br>108<br>6C | ñ   | 174<br>124<br>7C |
| 13  | 1 1 0 1             | CR                   | 15<br>13<br>D |               | 35<br>29<br>1D | -     | 55<br>45<br>2D | =     | 75<br>61<br>3D | M     | 115<br>77<br>4D | ¿ | 135<br>93<br>5D | m | 155<br>109<br>6D | ç   | 175<br>125<br>7D |
| 14  | 1 1 1 0             | SO                   | 16<br>14<br>E |               | 36<br>30<br>1E | .     | 56<br>46<br>2E | >     | 76<br>62<br>3E | N     | 116<br>78<br>4E | ^ | 136<br>94<br>5E | n | 156<br>110<br>6E | ~   | 176<br>126<br>7E |
| 15  | 1 1 1 1             | SI                   | 17<br>15<br>F |               | 37<br>31<br>1F | /     | 57<br>47<br>2F | ?     | 77<br>63<br>3F | O     | 117<br>79<br>4F | _ | 137<br>95<br>5F | o | 157<br>111<br>6F | DEL | 177<br>127<br>7F |

| KEY |    | ASCII CHARACTER |     |
|-----|----|-----------------|-----|
| ESC | 11 | COLUMN          | ROW |
|     | 33 | OCTAL           |     |
|     | 27 | DECIMAL         |     |
|     | 1B | HEX             |     |

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Figure 3-13 Spanish Character Set

| ROW | BITS<br>B4 B3 B2 B1 | COLUMN               |               | 0                 | 1                 | 2              | 3                 | 4                 | 5              | 6               | 7               |                 |                 |                 |                  |                  |                  |
|-----|---------------------|----------------------|---------------|-------------------|-------------------|----------------|-------------------|-------------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
|     |                     | B7 0<br>B6 0<br>B5 0 | 0 0<br>0 1    | 0 0<br>0 1<br>0 0 | 0 1<br>0 1<br>0 1 | 1 0<br>0 0     | 1 0<br>0 1<br>1 0 | 1 1<br>1 0<br>1 1 |                |                 |                 |                 |                 |                 |                  |                  |                  |
| 0   | 0 0 0 0             | NUL                  | 0<br>0<br>0   | 20<br>16<br>10    | SP                | 40<br>32<br>20 | 0                 | 60<br>48<br>30    | É              | 100<br>64<br>40 | P               | 120<br>80<br>50 | é               | 140<br>96<br>60 | p                | 160<br>112<br>70 |                  |
| 1   | 0 0 0 1             |                      | 1<br>1<br>1   | DC1<br>(XON)      | 21<br>17<br>11    | !              | 41<br>33<br>21    | 1                 | 61<br>49<br>31 | A               | 101<br>65<br>41 | Q               | 121<br>81<br>51 | a               | 141<br>97<br>61  | q                | 161<br>113<br>71 |
| 2   | 0 0 1 0             |                      | 2<br>2<br>2   |                   | 22<br>18<br>12    | "              | 42<br>34<br>22    | 2                 | 62<br>50<br>32 | B               | 102<br>66<br>42 | R               | 122<br>82<br>52 | b               | 142<br>98<br>62  | r                | 162<br>114<br>72 |
| 3   | 0 0 1 1             |                      | 3<br>3<br>3   | DC3<br>(XOFF)     | 23<br>19<br>13    | #              | 43<br>35<br>23    | 3                 | 63<br>51<br>33 | C               | 103<br>67<br>43 | S               | 123<br>83<br>53 | c               | 143<br>99<br>63  | s                | 163<br>115<br>73 |
| 4   | 0 1 0 0             |                      | 4<br>4<br>4   |                   | 24<br>20<br>14    | \$             | 44<br>36<br>24    | 4                 | 64<br>52<br>34 | D               | 104<br>68<br>44 | T               | 124<br>84<br>54 | d               | 144<br>100<br>64 | t                | 164<br>116<br>74 |
| 5   | 0 1 0 1             |                      | 5<br>5<br>5   |                   | 25<br>21<br>15    | %              | 45<br>37<br>25    | 5                 | 65<br>53<br>35 | E               | 105<br>69<br>45 | U               | 125<br>85<br>55 | e               | 145<br>101<br>65 | u                | 165<br>117<br>75 |
| 6   | 0 1 1 0             |                      | 6<br>6<br>6   |                   | 26<br>22<br>16    | &              | 46<br>38<br>26    | 6                 | 66<br>54<br>36 | F               | 106<br>70<br>46 | V               | 126<br>86<br>56 | f               | 146<br>102<br>66 | v                | 166<br>118<br>76 |
| 7   | 0 1 1 1             |                      | 7<br>7<br>7   |                   | 27<br>23<br>17    | '              | 47<br>39<br>27    | 7                 | 67<br>55<br>37 | G               | 107<br>71<br>47 | W               | 127<br>87<br>57 | g               | 147<br>103<br>67 | w                | 167<br>119<br>77 |
| 8   | 1 0 0 0             | BS                   | 10<br>8<br>8  | CAN               | 30<br>24<br>18    | (              | 50<br>40<br>28    | 8                 | 70<br>56<br>38 | H               | 110<br>72<br>48 | X               | 130<br>88<br>58 | h               | 150<br>104<br>68 | x                | 170<br>120<br>78 |
| 9   | 1 0 0 1             | HT                   | 11<br>9<br>9  |                   | 31<br>25<br>19    | )              | 51<br>41<br>29    | 9                 | 71<br>57<br>39 | I               | 111<br>73<br>49 | Y               | 131<br>89<br>59 | i               | 151<br>105<br>69 | y                | 171<br>121<br>79 |
| 10  | 1 0 1 0             | LF                   | 12<br>10<br>A | SUB               | 32<br>26<br>1A    | *              | 52<br>42<br>2A    | :                 | 72<br>58<br>3A | J               | 112<br>74<br>4A | Z               | 132<br>90<br>5A | j               | 152<br>6A<br>6A  | z                | 172<br>122<br>7A |
| 11  | 1 0 1 1             | VT                   | 13<br>11<br>B | ESC               | 33<br>27<br>1B    | +              | 53<br>43<br>2B    | ;                 | 73<br>59<br>3B | K               | 113<br>75<br>4B | Ä               | 133<br>91<br>5B | k               | 153<br>6B<br>6B  | ä                | 173<br>123<br>7B |
| 12  | 1 1 0 0             | FF                   | 14<br>12<br>C |                   | 34<br>28<br>1C    | ,              | 54<br>44<br>2C    | <                 | 74<br>60<br>3C | L               | 114<br>76<br>4C | Ö               | 134<br>92<br>5C | l               | 154<br>6C<br>6C  | ö                | 174<br>124<br>7C |
| 13  | 1 1 0 1             | CR                   | 15<br>13<br>D |                   | 35<br>29<br>1D    | -              | 55<br>45<br>2D    | =                 | 75<br>61<br>3D | M               | 115<br>77<br>4D | Å               | 135<br>93<br>5D | m               | 155<br>6D<br>6D  | å                | 175<br>125<br>7D |
| 14  | 1 1 1 0             | SO                   | 16<br>14<br>E |                   | 36<br>30<br>1E    | .              | 56<br>46<br>2E    | >                 | 76<br>62<br>3E | N               | 116<br>78<br>4E | Ü               | 136<br>94<br>5E | n               | 156<br>6E<br>6E  | ü                | 176<br>126<br>7E |
| 15  | 1 1 1 1             | SI                   | 17<br>15<br>F |                   | 37<br>31<br>1F    | /              | 57<br>47<br>2F    | ?                 | 77<br>63<br>3F | O               | 117<br>79<br>4F | -               | 137<br>95<br>5F | o               | 157<br>6F<br>6F  | DEL              | 177<br>127<br>7F |

**KEY**

|                 |     |       |            |  |                                   |
|-----------------|-----|-------|------------|--|-----------------------------------|
| ASCII CHARACTER | ESC | 1 1 1 | COLUMN ROW |  | HIGHLIGHTS DIFFERENCES FROM ASCII |
|                 |     | 23    | ACTUAL     |  |                                   |
|                 |     | 27    | DECIMAL    |  |                                   |
|                 |     | 1B    | HEX        |  |                                   |

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Figure 3-14 Swedish Character Set

| COLUMN |                      | 0     |               | 1             |                | 2     |                | 3     |                | 4     |                 | 5     |                 | 6     |                  | 7     |                  |
|--------|----------------------|-------|---------------|---------------|----------------|-------|----------------|-------|----------------|-------|-----------------|-------|-----------------|-------|------------------|-------|------------------|
| BITS   |                      | 0 0 0 |               | 0 0 1         |                | 0 1 0 |                | 0 1 1 |                | 1 0 0 |                 | 1 0 1 |                 | 1 1 0 |                  | 1 1 1 |                  |
| ROW    | b7 b6 b5 b4 b3 b2 b1 |       |               |               |                |       |                |       |                |       |                 |       |                 |       |                  |       |                  |
| 0      | 0 0 0 0              | NUL   | 0<br>0<br>0   |               | 20<br>16<br>10 | SP    | 40<br>32<br>20 | 0     | 60<br>48<br>30 | %     | 100<br>80<br>40 | P     | 120<br>80<br>50 | ^     | 140<br>96<br>60  | p     | 160<br>112<br>70 |
| 1      | 0 0 0 1              |       | 1<br>1<br>1   | DC1<br>(XON)  | 21<br>17<br>11 | !     | 41<br>33<br>21 | 1     | 61<br>49<br>31 | A     | 101<br>65<br>41 | Q     | 121<br>81<br>51 | a     | 141<br>97<br>61  | q     | 161<br>113<br>71 |
| 2      | 0 0 1 0              |       | 2<br>2<br>2   |               | 22<br>18<br>12 | "     | 42<br>34<br>22 | 2     | 62<br>50<br>32 | B     | 102<br>66<br>42 | R     | 122<br>82<br>52 | b     | 142<br>98<br>62  | r     | 162<br>114<br>72 |
| 3      | 0 0 1 1              |       | 3<br>3<br>3   | DC3<br>(XOFF) | 23<br>19<br>13 | £     | 43<br>35<br>23 | 3     | 63<br>51<br>33 | C     | 103<br>67<br>43 | S     | 123<br>83<br>53 | c     | 143<br>99<br>63  | s     | 163<br>115<br>73 |
| 4      | 0 1 0 0              |       | 4<br>4<br>4   |               | 24<br>20<br>14 | \$    | 44<br>36<br>24 | 4     | 64<br>52<br>34 | D     | 104<br>68<br>44 | T     | 124<br>84<br>54 | d     | 144<br>100<br>64 | t     | 164<br>116<br>74 |
| 5      | 0 1 0 1              |       | 5<br>5<br>5   |               | 25<br>21<br>15 | %     | 45<br>37<br>25 | 5     | 65<br>53<br>35 | E     | 105<br>69<br>45 | U     | 125<br>85<br>55 | e     | 145<br>101<br>65 | u     | 165<br>117<br>75 |
| 6      | 0 1 1 0              |       | 6<br>6<br>6   |               | 26<br>22<br>16 | &     | 46<br>38<br>26 | 6     | 66<br>54<br>36 | F     | 106<br>70<br>46 | V     | 126<br>86<br>56 | f     | 146<br>102<br>66 | v     | 166<br>118<br>76 |
| 7      | 0 1 1 1              |       | 7<br>7<br>7   |               | 27<br>23<br>17 | '     | 47<br>39<br>27 | 7     | 67<br>55<br>37 | G     | 107<br>71<br>47 | W     | 127<br>87<br>57 | g     | 147<br>103<br>67 | w     | 167<br>119<br>77 |
| 8      | 1 0 0 0              | BS    | 10<br>8<br>8  | CAN           | 30<br>24<br>18 | (     | 50<br>40<br>28 | 8     | 70<br>56<br>38 | H     | 110<br>72<br>48 | X     | 130<br>88<br>58 | h     | 150<br>104<br>68 | x     | 170<br>120<br>78 |
| 9      | 1 0 0 1              | HT    | 11<br>9<br>9  |               | 31<br>25<br>19 | )     | 51<br>41<br>29 | 9     | 71<br>57<br>39 | I     | 111<br>73<br>49 | Y     | 131<br>89<br>59 | i     | 151<br>105<br>69 | y     | 171<br>121<br>79 |
| 10     | 1 0 1 0              | LF    | 12<br>10<br>A | SUB           | 32<br>26<br>1A | *     | 52<br>42<br>2A | :     | 72<br>58<br>3A | J     | 112<br>74<br>4A | Z     | 132<br>90<br>5A | j     | 152<br>106<br>6A | z     | 172<br>122<br>7A |
| 11     | 1 0 1 1              | VT    | 13<br>11<br>B | ESC           | 33<br>27<br>1B | +     | 53<br>43<br>2B | ;     | 73<br>59<br>3B | K     | 113<br>75<br>4B | ij    | 133<br>91<br>5B | k     | 153<br>107<br>6B | ˆ     | 173<br>123<br>7B |
| 12     | 1 1 0 0              | FF    | 14<br>12<br>C |               | 34<br>28<br>1C | ,     | 54<br>44<br>2C | <     | 74<br>60<br>3C | L     | 114<br>76<br>4C | ½     | 134<br>92<br>5C | l     | 154<br>108<br>6C | f     | 174<br>124<br>7C |
| 13     | 1 1 0 1              | CR    | 15<br>13<br>D |               | 35<br>29<br>1D | ˆ     | 55<br>45<br>2D | =     | 75<br>61<br>3D | M     | 115<br>77<br>4D | ı     | 135<br>93<br>5D | m     | 155<br>109<br>6D | ¼     | 175<br>125<br>7D |
| 14     | 1 1 1 0              | SO    | 16<br>14<br>E |               | 36<br>30<br>1E | .     | 56<br>46<br>2E | >     | 76<br>62<br>3E | N     | 116<br>78<br>4E | ^     | 136<br>94<br>5E | n     | 156<br>110<br>6E | ˆ     | 176<br>126<br>7E |
| 15     | 1 1 1 1              | SI    | 17<br>15<br>F |               | 37<br>31<br>1F | /     | 57<br>47<br>2F | ?     | 77<br>63<br>3F | O     | 117<br>79<br>4F | _     | 137<br>95<br>5F | o     | 157<br>111<br>6F | DEL   | 177<br>127<br>7F |

## KEY

ASCII CHARACTER

|     |       |            |
|-----|-------|------------|
| ESC | 1 1 1 | COLUMN ROW |
|     | 3 3   | OCTAL      |
|     | 2 7   | DECIMAL    |
|     | 1 B   | HEX        |

HIGHLIGHTS  
DIFFERENCES  
FROM ASCII

## NOTE:

THE FOLLOWING TABLE INDICATES THE APPROXIMATIONS THAT ARE USED TO REPRESENT THE DUTCH CHARACTERS THAT ARE NOT AVAILABLE IN THE DECMCS SET. (THESE APPROXIMATIONS ARE TO BE COMPATIBLE WITH THE VT220 AND VT240.) THE CHARACTER POSITION IN THE CHART IS LISTED BY COLUMN/ROW.

| COLUMN/ROW | CHARACTER SET NAME (SYMBOL) | APPROXIMATION NAME (SYMBOL)                               |
|------------|-----------------------------|-----------------------------------------------------------|
| 4/0        | THREE QUARTERS (3/4)        | SUPERSCRIPT (³)                                           |
| 5/11       | LOWERCASE ij LIGATURE (ij)  | LOWERCASE y WITH DIAERESIS (ÿ)                            |
| 7/11       | DIAERESIS (¨)               | QUOTATION MARKS (")                                       |
| 7/12       | FLORIN SIGN (ƒ)             | LOWERCASE f (f)                                           |
| 7/14       | ACUTE ACCENT (´)            | APOSTROPHE, SINGLE QUOTATION MARK, ASCII ACUTE ACCENT (´) |

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Figure 3-15 Swiss Character Set

**3.1.3.4 Character Size Select** -- Characters can be doubled or tripled in height, and in the case of the data processing font, doubled in width by use of the size command. To change character size, use the following escape sequence (refer to Figure 3-16).

ESC[n1;n2 B (ASCII)

1B 5B n1 3B n2 20 42 (hex)

where:

n1 is the height multiplier:

100 = 100% (normal size)  
200 = 200% of normal size  
300 = 300% of normal size

n2 is the width multiplier:

100 = 100% (normal size)  
200 = 200% of normal size

B = a designator

See Figure 3-16.

Input:

```
<ESC>[100;100 BPRINT THIS LINE NORMAL SIZE . CRLF
<ESC>[100;200 BPRINT THIS LINE 2X HORIZONTAL. CRLF
<ESC>[200;200 BPRINT THIS LINE 2X AND 2X. CRLF
<ESC>[300;200 BPRINT THIS LINE 3X AND 2X. CRLF
```

```
PRINT THIS LINE NORMAL SIZE.
PRINT THIS LINE 2X HORIZONTAL.
PRINT THIS LINE 2X AND 2X.
PRINT THIS LINE 3X AND 2X.
```

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Figure 3-16 Character Size Change Output

Changing the height doubles or triples the distance the paper moves in response to a Line Feed (control code) or Line Slew (paper instruction) command.

The size selection remains in effect even if SO or SI codes are issued, or if a new character set is selected. A new CPI selection will cancel the horizontal expansion; it will not affect the vertical expansion. Similarly, setting horizontal size cancels a previous CPI selection.

**3.1.3.5 Characters Per Inch --** The escape sequence below selects characters per inch (CPI). (DECSHORP)

<ESC>[nw (ASCII)

1B 5B n 77 (hex)

where:

n = CPI  
0 = 10  
1 = 10 (default)  
2 = 12  
5 = 5  
9 = 15  
w = sequence terminator

CPI may be changed anywhere on a form. Setting the CPI cancels a previous horizontal size selection, and vice-versa.

Sample output of changes to CPI are shown in Figure 3-17.

Input:

<ESC>[1w THIS IS DRAFT AT 10 CPI. CRLF  
<ESC>[9w THIS IS DRAFT AT 15 CPI. CRLF

THIS IS DRAFT AT 10 CPI.  
THIS IS DRAFT AT 15 CPI.

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Figure 3-17 Examples of CPI Changes

**3.1.3.6 Lines Per Inch --** The following escape sequence selects lines per inch (LPI). (DECVERP)

<ESC>[nz (ASCII)

1B 5B n 7A (hex)

where:

n = CPI  
0 = 6  
2 = 8  
7 = 10  
z = sequence terminator

LPI may be changed anywhere on a form. The current LPI setting is used to compute form physical length when a VFU load or form length selection occurs.

Sample outputs of changes to LPI are shown in Figures 3-18 and 3-19.

Input:

```
<ESC>[0 z THIS LINE IS PRINTED AT 6 LPI. CRLF
THIS LINE IS PRINTED AT 6 LPI. CRLF
THIS LINE IS PRINTED AT 6 LPI. CRLF
THIS LINE IS PRINTED AT 6 LPI. CRLF
THIS LINE IS PRINTED AT 6 LPI. CRLF
THIS LINE IS PRINTED AT 6 LPI. CRLF
```

Output:

```
THIS LINE IS PRINTED AT 6 LPI.
THIS LINE IS PRINTED AT 6 LPI.
THIS LINE IS PRINTED AT 6 LPI.
THIS LINE IS PRINTED AT 6 LPI.
THIS LINE IS PRINTED AT 6 LPI.
THIS LINE IS PRINTED AT 6 LPI.
```

(S 479)

Figure 3-18 Sample of 6 LPI

Input:

```
<ESC>[2z THIS LINE IS PRINTED AT 8 LPI. CRLF
THIS LINE IS PRINTED AT 8 LPI. CRLF
THIS LINE IS PRINTED AT 8 LPI. CRLF
THIS LINE IS PRINTED AT 8 LPI. CRLF
THIS LINE IS PRINTED AT 8 LPI. CRLF
THIS LINE IS PRINTED AT 8 LPI. CRLF
```

Output:

```
THIS LINE IS PRINTED AT 8 LPI.
THIS LINE IS PRINTED AT 8 LPI.
THIS LINE IS PRINTED AT 8 LPI.
THIS LINE IS PRINTED AT 8 LPI.
THIS LINE IS PRINTED AT 8 LPI.
THIS LINE IS PRINTED AT 8 LPI.
THIS LINE IS PRINTED AT 8 LPI.
THIS LINE IS PRINTED AT 8 LPI.
```

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Figure 3-19 Sample of 8 LPI

### 3.1.4 Horizontal Tabs

A horizontal tab (HT) is a preset stop used when printing a line. Set a tab stop at each column where printing will begin.

On initialization, tab stops are cleared. However, these can be set by the Set Tab command. As many as 198 tabs can be set in a line, but only 16 tabs can be set in any one horizontal tab escape sequence.

**3.1.4.1 Setting Horizontal Tabs** -- The sequence to set horizontal tabs is shown below.

<ESC>[n1;n2;n3 ...n16u (ASCII)

1B 5B n1 3B n2 3B n3 75 (hex)

where:

n1;n2;n3...n16 = columns specified as tab stops

u = sequence terminator

The example below shows the escape sequence and sample data columns for horizontal tabs set at columns 15, 30, and 45.

<ESC>[15;30;45u (ASCII)

1B 5B 31 35 3B 33 30 3B 34 35 75 (hex)

| COLOR  | SIZE   | SHAPE  |
|--------|--------|--------|
| ORANGE | MEDIUM | CIRCLE |
| GREEN  | LARGE  | SQUARE |
| YELLOW | SMALL  | SPHERE |

Horizontal tabs may be set while sending a line of print data. The escape sequence to set a horizontal tab at current position is shown below.

<ESC>H (ASCII)

1B 48 (hex)

**3.1.4.2 Tabbing** -- Once the horizontal tabs have been set, use the horizontal tab code to actually cause movement to a tab stop.

The code that executes the tab function is shown below.

HT (ASCII)

09 (hex)

**3.1.4.3 Clearing Horizontal Tabs** -- The escape sequence to clear all horizontal tabs (including default tab settings) is shown below.

<ESC>[3g            (ASCII)

1B 5B 33 67        (hex)

Note that the sequence above disables the tab function and converts it to a space. That is, if you send this command and then send the HT code (09 hex), the print mechanism will move one space.

The escape sequence to clear a horizontal tab at the current position is shown below.

<ESC>[0g            (ASCII)

1B 5B 30 67        (hex)

Tabbing to tab stops set beyond the right margin should be avoided. This action has the same effect on the printer as sending more characters than will fit on a line. (For details on this condition, see Section 3.1.5, "Autoprint".)

The right margin limit is determined by the current character density, as shown in the examples below.

| Density | Right Margin |
|---------|--------------|
| 10 CPI  | Column 132   |
| 15 CPI  | Column 198   |

### 3.1.5 Autoprint

When the number of characters received for a single line exceeds the number that will fit on that line, the printer simply ignores the excess characters, unless the Autoprint mode is enabled. If Autoprint is enabled (by a switch on the I/O board), the printer automatically inserts a CR code into the data stream immediately after receiving enough characters to fill the line. The effect of the CR code depends on the other printing operation, Newline. (Newline mode is optional. Table 3-6 summarizes the Newline mode.)

### 3.1.6 Newline Mode

In Newline mode, any printable data previously received is printed, and the active writing position (cursor) moves to the first column of the next line. When Newline is enabled, either the carriage return (CR) code or the line feed (LF) code will initiate the Newline function.

The example below shows input and output in Newline mode.

Input:

-Line 1 -CR-Line 2-LF-Line 3-CR LF-Line 5-CR

Output:

-Line 1-  
-Line 2-  
-Line 3-  
-Line 5-

Table 3-6 Summary of Newline Mode

| Input                | Output  |          |
|----------------------|---------|----------|
|                      | Newline | Line No. |
| ABC<CR>              | ABC     | 1        |
|                      | >       | 2        |
| ABC<CR><LF>          | ABC     | 1        |
|                      |         | 2        |
|                      | >       | 3        |
| ABC<LF><CR>          | ABC     | 1        |
|                      | >       | 2        |
| 6050<CR>_/_/<CR><LF> | 6050    | 1        |
|                      | / /     | 2        |
|                      |         | 3        |
|                      | >       | 4        |
| ABC<CR>_DEF<CR><LF>  | ABC     | 1        |
|                      | DEF     | 2        |
|                      |         | 3        |
|                      | >       | 4        |
| ABC<LF>              | ABC     | 1        |
|                      | >       | 2        |

**Legend:**

> Shows the line to which forms advance after <CR> and <LF> are executed.  
\_ Indicates a space.

### 3.1.7 Overstrike

Overstrike allows data from several input lines to be printed on one output line. Overstrike may be chosen to create characters (such as a slashed zero), to overstrike the same character several times for bold print, or to print incompatible character sets or character sizes on the same line.

In Overstrike mode, any of the following sequences causes a line to print.

|          |                                                              |
|----------|--------------------------------------------------------------|
| data<CR> | Print position moves back to beginning of line just printed. |
|----------|--------------------------------------------------------------|

|              |                           |
|--------------|---------------------------|
| data<CR><LF> | Paper moves to next line. |
|--------------|---------------------------|

|          |                           |
|----------|---------------------------|
| data<LF> | Paper moves to next line. |
|----------|---------------------------|

|          |                          |
|----------|--------------------------|
| data<FF> | Paper moves to next TOF. |
|----------|--------------------------|

In Overstrike mode, the <CR> code prints the preceding data and moves the paper to its original position so that a second line can be printed on top of the first line. A SPACE character does not replace another character in memory. See the following example (a \_ represents a space).

Input:

```
250090<CR>
//<CR><LF>
```

Output:

```
250090
```

### 3.1.8 Resetting Printer

To reset the printer to all its default settings, issue the following escape sequence.

```
<ESC>c (ASCII)
```

The affected settings and their default values are listed in Table 3-7. The escape sequence will not cause paper movement.

**Table 3-7 Printer Default Settings**

| <b>Variable</b>     | <b>Default Value</b>                                         |
|---------------------|--------------------------------------------------------------|
| Lines per inch      | 6 lines per inch                                             |
| Characters per inch | 10 characters per inch                                       |
| Character set       | Data processing character set                                |
| Character size      | Normal 100% size (vertical)<br>Normal 100% size (horizontal) |
| Horizontal tabs     | Columns 9, 17, 25, 33,....                                   |

### **3.2 PAPER MOTION**

The following sections describe the various paper motion commands used with the LG01 printer, along with paper instructions.

#### **3.2.1 Line Feed**

The line feed (LF) control code advances the paper one line (in Character mode).

##### **Character Mode:**

When LF is issued in Character mode, the paper moves one line. The actual distance depends on the lines per inch setting.

#### **3.2.2 Form Feed**

The form feed (FF) control code advances the paper to the top of the next form.

#### **3.2.3 Relative Paper Motion**

The relative paper motion command moves the paper a specific number of character lines, forward or backward, from its current position.

Reverse paper motion stops at a top-of-form. Forward motion into a bottom-of-form skip area will move on to the next TOF.

The relative paper motion escape sequence is shown below.

<ESC>[na = n horizontal spaces forward

1B 5B n 61 (hex)

<ESC>[nj = n horizontal spaces reverse

1B 5B n 6A (hex)

<ESC>[ne = n spaces vertical forward

1B 5B n 65 (hex)

As an example, the following escape sequence moves the paper ten lines forward.

```
<ESC>[10e
```

Paper instructions may also be used for relative paper motion. (See Section 3.2.14, Paper Instructions, for details.)

### 3.2.4 VFU Channel Commands

The VFU channel commands move paper forward or backward to a specific VFU channel. (See Section 3.2.10, Vertical Format Unit, for details.)

### 3.2.5 Reverse Form Feed

The reverse form-feed command moves the paper backward to top-of-form of the current form. If the paper is located at a top-of-form when this command is issued, the paper does not move.

The escape sequence for reverse form feed is shown below.

```
<ESC>[nk (ASCII)
```

```
1B 5B n 6B (hex)
```

where:

$n \geq \#$  of lines to

TOF

### 3.2.6 Forward Index

The forward index command moves the paper forward one line (in Character mode) with no change in horizontal position.

The escape sequence for forward index is shown below.

```
<ESC>D (ASCII)
```

The example below shows the use of index forward.

Input:

```
A<ESC>DB<ESC>D<ESC>DD<CR><LF>
```

Output:

```
A
B
C
D
```

### 3.2.7 Reverse Index

The reverse index command moves the paper backward one line (in Character mode) with no change in horizontal position. This command is not allowed in Plot mode.

The escape sequence for reverse index is shown below.

`<ESC>M` (ASCII)

The example below shows the use of reverse index.

Input:

`A<ESC>MB<ESC>MC<ESC>MD<CR><LF>`

Output:

D  
C  
B  
A

### 3.2.8 Setting Vertical Format (All Models)

The typical page printed by computer printers is 11 or 12 inches long, with perforations between pages; pages may be separated into individual sheets or folded as a connected stack. Printing is confined to a certain number of inches on the page, with a margin between the last line of one page and the top line of the next page. The starting point of printing is called top-of-form (TOF); it is the point from which vertical position is measured, and it is the top of line one. The form length is the distance from one TOF to the next. The bottom-of-form (BOF) skip is the distance reserved for margins and includes the space from the bottom of the form to the next top-of-form. Once TOF and form length have been set, paper will automatically advance to the next TOF whenever the active print position falls in the BOF skip area.

Vertical formatting includes the following settings:

- Physical length of the total form.
- Position of the first printed line on a form (TOF).
- Position of bottom-of-form and/or bottom-of-form skip.
- Position of any other vertical stops on a form.

Listed below are three different ways for controlling vertical format. Two of these methods (FLS and VFU) are described in detail in Section 3.2.

Control Panel:

Use the printer control panel to set form length and BOF skip. (See Chapter 2 for details.)

**FLS Command:**

Issue an escape sequence to set form length. This is called Form Length Select or FLS. (The procedure is explained in detail in the FLS section below.)

**VFU:**

Load the Electronic Vertical Format Unit (EVFU) memory from the host computer and then use VFU channel commands to move the paper to specific locations. (The procedure is explained in detail following the FLS section.)

**3.2.9 Form Length Select (FLS)**

The form length distance in the FLS mode is set by operator panel input (as described in Section 2.4.2.3), or by the Form Length Select escape sequence. At initialization, the form length defaults to either 11 or 12 inches (depending on an I/O board switch setting), and the BOF skip defaults to zero.

**NOTE**

While the escape sequence appears to set form length only, Top-of-Form (TOF) is also defined. The actual position of the paper when the FLS command is sent, determines TOF. Therefore, you must first align the paper at the desired top of form before sending the FLS command.

The Form Length Select escape sequence is shown below.

<ESC>[nnnt (ASCII)

1B 5B n n n 74 (hex)

where:

nnn = any number from 2 to 200

2-200 = total number of lines on form

t = sequence terminator

To find nnn, multiply the length of the form (in inches) by the number of lines per inch. The example below shows the computation and escape code for a 17-inch form printed at 6 LPI.

17 x 6 = 102

Form length LPI

nnn (Total lines on form)

<ESC>[102t

### 3.2.10 Electronic Vertical Format Unit (EVFU)

The VFU mode not only sets values for the form length and BOF skip, but also sets up a structure of intermediate positions on the page (vertical tabs) to be accessed by VFU channel commands. The LG01 uses electronic memory for its VFU (EVFU) so that the page format can be defined by commands from the host computer. The memory has 12 bits for each line stored, to a maximum of 200 lines. Lengths and form positions stored in the EVFU are located in memory, according to the lines per inch (LPI) setting in effect at the time the EVFU is loaded. Settings are not affected by changes in LPI or by entering Plot mode.

Using the EVFU as described in Sections 3.2.11 through 3.2.18 allows the user to move quickly through files to vertical tab stops, but it requires mathematical and programming expertise to implement it.

To meet the needs of users requiring the use of the EVFU function on the LG01 printer, Digital Equipment Corporation offers a software layered product that supports the LG01 EVFU Function. The product is a utility called the VAX Vertical Forms Printing for VMS.

#### NOTE

The utility is supported only on the VMS Operating System.

This utility simplifies the interfacing between the user and the printer by enabling the user to create printer independent files. These files contain printer specific page formatting commands that may be downloaded to the printer to program its EVFU memory. The utility may be ordered using order number QA-VZEAA-H\* (\* represents a character that varies depending on the media type). For more information on this product, call 1-800-832-6277.

For information on how to set up the LG01 Printer for VAX Vertical Forms Printing for VMS, refer to the VAX Vertical Forms Printing for VMS Reference Guide.

### 3.2.11 EVFU Load

To load the EVFU, two escape sequences are used, one to begin and one to end the load.

#### NOTE

While the main purpose of these commands is to load the EVFU, top-of-form is also defined. The actual position of the paper when the load VFU command is sent, determines TOF. Therefore, you must first align the paper at the desired top-of-form before sending the begin load VFU command.

The load VFU escape sequences are shown as follows.

Begin load -

<ESC>[<1h (ASCII)

1B 5B 3C 31 68 (hex)

End load -

<ESC>[<1l (ASCII)

(lower case "L")  
(numeral one)

1B 5B 3C 31 6C (hex)

With the exception of ASCII control codes, all data following the begin load sequence is placed in EVFU memory. All commands are ignored except the end load sequence.

All data must be in the EVFU load format. If an error occurs during the load, the load is canceled. If a load overruns memory length, the load is canceled and any remaining EVFU data is printed. Canceled loads default to the current FLS setting (as set from the control panel or with the FLS escape sequence).

During the EVFU load, the VLOD is displayed on the control panel.

### 3.2.12 EVFU Data Format

The EVFU data includes two bytes of data for each line of the form, starting with line one, which is the top-of-form line. The two bytes of data indicate channel number(s). Channel 1 is used for top-of-form, and Channel 12 is used for bottom-of-form. The format for the byte pair is shown in Table 3-8.

**Table 3-8 EVFU Load - Data Format**

|        |          |     |                                            |                 |    |    |    |                          |
|--------|----------|-----|--------------------------------------------|-----------------|----|----|----|--------------------------|
| Bit:   | 7        | 6   | 5                                          | 4               | 3  | 2  | 1  | 0                        |
| Value: | x 1      | C6  | C5                                         | C4              | C3 | C2 | C1 | First character of pair  |
|        | x 1      | C12 | C11                                        | C10             | C9 | C8 | C7 | Second character of pair |
| where: | x        | =   | not used                                   |                 |    |    |    |                          |
|        | Bit 6    | =   | always 1                                   |                 |    |    |    |                          |
|        | Bits 0-5 | =   | represent channels with binary 1's and 0's |                 |    |    |    |                          |
|        |          | 1   | =                                          | channel present |    |    |    |                          |
|        |          | 0   | =                                          | no channel      |    |    |    |                          |
|        | C1-C12   | =   | Channels 1 through 12                      |                 |    |    |    |                          |
|        |          | C1  | identifies TOF                             |                 |    |    |    |                          |
|        |          | C2  | is the vertical tab channel                |                 |    |    |    |                          |
|        |          | C12 | identifies BOF                             |                 |    |    |    |                          |

In the following example, the byte pair sets the bits for Channels 4 and 8.

| Binary   | Hex | ASCII |
|----------|-----|-------|
| x1001000 | 48  | H     |
| x1000010 | 42  | B     |

The byte pairs for a sample EVFU load are shown in Table 3-9. The form is 33 lines long; therefore the table shows 33 byte pairs.

Table 3-9 Sample KVPU Load

| Byte No. | Binary Code Data Bits | Hex Code |                  | Byte No. | Binary Code Data Bits | Hex Code |
|----------|-----------------------|----------|------------------|----------|-----------------------|----------|
|          |                       | 1B       |                  |          |                       |          |
|          |                       | 5B       | Begin Load       | 35       | x1000000              | 40       |
|          |                       | 3C       | Escape Sequence  | 36       | x1000000              | 40       |
|          |                       | 31       |                  | 37       | x1000000              | 48       |
|          |                       | 68       |                  | 38       | x1000010              | 42       |
| 1        | x1000001              | 41       | Line 1 (Top,     | 39       | x1000000              | 40       |
| 2        | x1000000              | 40       | Channel 1)       | 40       | x1000000              | 40       |
| 3        | x1000000              | 40       | Line 2           | 41       | x1000000              | 40       |
| 4        | x1000000              | 40       |                  | 42       | x1000000              | 40       |
| 5        | x1000000              | 40       | Line 3           | 43       | x1000000              | 40       |
| 6        | x1000000              | 40       |                  | 44       | x1000000              | 40       |
| 7        | x1000000              | 40       | Line 4           | 45       | x1000000              | 40       |
| 8        | x1000000              | 40       |                  | 46       | x1000000              | 40       |
| 9        | x1000000              | 40       | Line 5           | 47       | x1000000              | 40       |
| 10       | x1000000              | 40       |                  | 48       | x1000000              | 40       |
| 11       | x1000000              | 40       | Line 6           | 49       | x1000000              | 40       |
| 12       | x1000000              | 40       |                  | 50       | x1000000              | 40       |
| 13       | x1000010              | 42       | Line 7 (Vertical | 51       | x1000000              | 40       |
| 14       | x1000000              | 40       | Tab, Channel 2)  | 52       | x1000000              | 40       |
| 15       | x1000000              | 40       | Line 8           | 53       | x1000000              | 40       |
| 16       | x1000000              | 40       |                  | 54       | x1000000              | 40       |
| 17       | x1000000              | 40       | Line 9           | 55       | x1000000              | 40       |
| 18       | x1000000              | 40       |                  | 56       | x1100000              | 60       |
| 19       | x1000000              | 40       | Line 10          | 57       | x1000000              | 40       |
| 20       | x1000000              | 40       |                  | 58       | x1000000              | 40       |
| 21       | x1000000              | 40       | Line 11          | 59       | x1000000              | 40       |
| 22       | x1000000              | 40       |                  | 60       | x1000000              | 40       |
| 23       | x1000000              | 40       | Line 12          | 61       | x1000000              | 40       |
| 24       | x1000000              | 40       |                  | 62       | x1000000              | 40       |
| 25       | x1100100              | 64       | Line 13 (Chan-   | 63       | x1000000              | 40       |
| 26       | x1000000              | 40       | nels 3 and 6)    | 64       | x1000000              | 40       |
| 27       | x1000000              | 40       | Line 14          | 65       | x1000000              | 40       |
| 28       | x1000000              | 40       |                  | 66       | x1000000              | 40       |
| 29       | x1000000              | 40       | Line 15          |          |                       | 1B       |
| 30       | x1000000              |          |                  |          |                       | 5B       |
| 31       | x1000000              | 40       | Line 16          |          |                       | 3C       |
|          |                       |          |                  |          |                       | End Load |
|          |                       |          |                  |          |                       | Escape   |
|          |                       |          |                  |          |                       | Sequence |
| 32       | x1000000              | 40       |                  |          |                       | 31       |
| 33       | x1000000              | 40       | Line 17          |          |                       | 6C       |
| 34       | x1000000              | 40       |                  |          |                       |          |

### 3.2.13 VFU Channel Commands

After the EVFU memory is loaded and VFU mode is selected, format is set but no paper movement occurs. The next step is the issuing of VFU channel commands, using an escape sequence, to move the paper forward or backward to specified channels.

#### NOTE

The channel selection escape sequence is shown below.

<ESC>[nnn&y (ASCII)

1B 5B nnn 26 79 (hex)

where:

nnn = channel to which paper will move

When 1st n = 0, movement is forward.

When 1st n = 9, movement is backward.

The value of n for each channel is shown in Table 3-10.

Table 3-10 Value n for Each VFU Channel

| nnn | Move Forward<br>to Channel | nnn | Move Backward<br>to Channel |
|-----|----------------------------|-----|-----------------------------|
| 000 | 1                          | 900 | 1                           |
| 001 | 2                          | 901 | 2                           |
| 002 | 3                          | 902 | 3                           |
| 003 | 4                          | 903 | 4                           |
| 004 | 5                          | 904 | 5                           |
| 005 | 6                          | 905 | 6                           |
| 006 | 7                          | 906 | 7                           |
| 007 | 8                          | 907 | 8                           |
| 008 | 9                          | 908 | 9                           |
| 009 | 10                         | 909 | 10                          |
| 010 | 11                         | 910 | 11                          |
| 011 | 12                         | 911 | 12                          |

In the example below, the escape sequence moves the paper forward to Channel 4.

<ESC>[003&y

To move the paper backward to Channel 1, the following escape sequence is issued.

<ESC>[900&y

All backward commands stop at TOF if the channel is not found. If a command is issued to go to a VFU channel for which no bits have been set, the printer will display an FX error.

### 3.2.14 Paper Instructions (LG01-AA, BA, and CA Only)

To use the paper instructions command, both the host CPU and the printer must be set for 7-bit data mode (refer to Appendix C, LG01 600 LPM Text Printer Installation/Operator's Manual, EK-0LG01-IN).

Paper instructions are sent to the printer by holding the PAPER INSTRUCTION signal active while sending data characters.

Listed below are three types of paper instructions. Following the list is a detailed explanation of each type.

- Relative Paper Motion
- Direct Access VFU (DAVFU)
- VFU Channel Commands

**3.2.14.1 Relative Paper Motion** -- This paper instruction moves the paper forward from the current paper position. Paper is moved forward the specified number of lines.

Relative line/row advance paper instructions are issued by holding the PAPER INSTRUCTION signal active while sending a 7-bit data code. See Sample data code below.

|        |      |   |   |   |   |   |   |   |
|--------|------|---|---|---|---|---|---|---|
| Bit:   | PI/7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Value: | 1    | n | n | 1 | n | n | n | n |

where: PI = PAPER INSTRUCTION signal

n = binary 1 or 0  
 Bit 4 = always 1  
 nnnnnn = line count  
 Bits 6, 5, 3, 2, 1, 0 are read as  
 one value of 0 through 63  
 (binary 000000 to 111111).

As an example, the signals shown below would move the paper forward 50 lines or 50 rows (50 = binary 110010).

|        |      |   |   |   |   |   |   |   |
|--------|------|---|---|---|---|---|---|---|
| Bit:   | PI/7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Value: | 1    | 1 | 1 | 1 | 0 | 0 | 1 | 0 |

Motion continues across page boundaries, and bottom-of-form areas are automatically skipped when relative paper motion instructions are executed. If motion ends in a bottom-of-form area, the paper automatically moves to the next top-of-form.

**3.2.14.2 DAVFU** -- Form length, top-of-form, bottom-of-form skip, and vertical tabs can all be loaded into EVFU memory by paper instructions.

### 3.2.15 DAVFU Load

While the main purpose of the DAVFU load command is to load the EVFU memory, top-of-form is also defined. The actual position of the paper when the VFU command is sent, determines TOF. Therefore, first align the paper at the desired top-of-form before sending the DAVFU load command.

To load the EVFU memory, hold the PAPER INSTRUCTION signal active while sending a start code. Then send DAVFU data, and a stop code.

The start and stop codes are shown below.

|        |      |   |   |   |   |   |   |   |            |
|--------|------|---|---|---|---|---|---|---|------------|
| Bit:   | PI/7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |            |
| Value: |      | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0          |
|        |      |   |   |   |   |   |   |   | Start code |
|        | 1    | 1 | 1 | 0 | 1 | 1 | 1 | 1 | Stop code  |

where: PI = PAPER INSTRUCTION signal  
 0 = binary 0  
 1 = binary 1

### 3.2.16 DAVFU Data Format

The DAVFU data includes two bytes of information for each line of the form, starting with line one. The two bytes of data indicate channel number(s). Channel 1 is always used for top-of-form, and Channel 12 is always used for bottom-of-form.

Each bit is used for a specific channel, as shown below. (A bit showing a 1 represents a selected channel.)

|        |      |   |     |     |     |    |    |    |                          |
|--------|------|---|-----|-----|-----|----|----|----|--------------------------|
| Bit:   | PI/7 | 6 | 5   | 4   | 3   | 2  | 1  | 0  |                          |
| Value: | 1    | 0 | C6  | C5  | C4  | C3 | C2 | C1 | First character of pair  |
|        |      |   |     |     |     |    |    |    |                          |
|        | 1    | 0 | C12 | C11 | C10 | C9 | C8 | C7 | Second character of pair |

where: PI = PAPER INSTRUCTIONS Signal

Bits 1 - 6 represent channels with binary 1's and 0's  
 0 = no channel  
 1 = channel present

C1 - C12 = Channels 1 through 12

The byte pairs for a sample load are shown in Table 3-11. The form is 20 lines long; therefore, 20 byte pairs are needed.

**Table 3-11 Sample Paper Instruction Load Format**

| Byte No. | Binary Data Bits | Hex Code |                  | Byte No. | Binary Data Bits | Hex Code |                  |
|----------|------------------|----------|------------------|----------|------------------|----------|------------------|
|          | x1101110         | 6E       | Start Code       | 21       | x0000000         | 00       | Line 11          |
| 1        | x0000001         | 01       | Line 1 (TOF,     | 22       | x0000000         | 00       |                  |
| 2        | x0000000         | 00       | Channel 1)       | 23       | x0000000         | 00       | Line 12          |
| 3        | x0000000         | 00       | Line 2           | 24       | x0000000         | 00       |                  |
| 4        | x0000000         | 00       |                  | 25       | x0100100         | 24       | Line 13          |
| 5        | x0000000         | 00       | Line 3           | 26       | x0000000         |          | (Channels 3 & 6) |
| 6        | x0000000         | 00       |                  | 27       | x0000000         |          | Line 14          |
| 7        | x0000000         | 00       | Line 4           | 28       | x0000000         |          |                  |
| 8        | x0000000         | 00       |                  | 29       | x0000000         |          | Line 15          |
| 9        | x0000000         | 00       | Line 5           | 30       | x0000000         |          |                  |
| 10       | x0000000         | 00       |                  | 31       | x0000000         |          | Line 16          |
| 11       | x0000000         | 00       | Line 6           | 32       | x0000000         |          |                  |
| 12       | x0000000         | 00       |                  | 33       | x0000000         |          | Line 17          |
| 13       | x0000010         | 02       | Line 7 (Vertical | 34       | x0000000         |          |                  |
| 14       | x0000000         | 00       | Tab, Channel 2)  | 35       | x0000000         |          | Line 18 (BOF,    |
| 15       | x0000000         | 00       | Line 8           | 36       | x0100000         | 20       | Channel 12)      |
| 16       | x0000000         | 00       |                  | 37       | x0000000         | 00       | Line 19          |
| 17       | x0000000         | 00       | Line 9           | 38       | x0000000         | 00       |                  |
| 18       | x0000000         | 00       |                  | 39       | x0000000         | 00       |                  |
| 19       | x0000000         | 00       | Line 10          | 40       | x0000000         | 00       | Line 20          |
| 20       | x0000000         | 00       |                  |          | x1101111         | 6F       | Stop Code        |

### 3.2.17 VFU Channel Commands

After the EVFU memory is loaded and VFU mode is selected, VFU channel commands are now issued to cause actual paper movement. To send VFU channel commands, send a PAPER INSTRUCTION signal together with a 7-bit data character, which indicates the desired channel.

|        |      |   |   |   |   |   |   |   |
|--------|------|---|---|---|---|---|---|---|
| Bit:   | PI/7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Value: | 1    | x | x | 0 | v | v | v | v |

where: PI = PAPER INSTRUCTION signal  
 Bit 4 = always 0  
 vvvv = Channel select code (see Table 3-12)

**Table 3-12 Channel Select Code**

| <b>VFU Channel</b> | <b>Hex Value</b> | <b>vvvv Value</b>     |
|--------------------|------------------|-----------------------|
| 1                  | 0                | 0000 (top-of-form)    |
| 2                  | 1                | 0001                  |
| 3                  | 2                | 0010                  |
| 4                  | 3                | 0011                  |
| 5                  | 4                | 0100                  |
| 6                  | 5                | 0101                  |
| 7                  | 6                | 0110                  |
| 8                  | 7                | 0111                  |
| 9                  | 8                | 1000                  |
| 10                 | 9                | 1001                  |
| 11                 | A                | 1010                  |
| 12                 | B                | 1011 (bottom-of-form) |
| Illegal            | C                | 1100 (format error)   |
| Illegal            | D                | 1101 (format error)   |
| Illegal            | E                | 1110 (format error)   |
| Illegal            | F                | 1111 (format error)   |

The command shown below sends the paper forward to Channel 5.

|        |      |   |   |   |   |   |   |   |
|--------|------|---|---|---|---|---|---|---|
| Bit:   | PI/7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Value: | 1    | x | x | 0 | 0 | 1 | 0 | 0 |

### 3.2.18 Start and Stop Underline Commands

To underline text, issue a Start Underline command before the text to be underlined, and a Stop Underline command after it. See the escape sequences below.

Start Underline      <ESC>[4m      (ASCII)

1B 5B 34 6D      (hex)

Stop Underline      <ESC>[24m      (ASCII)

1B 5B 32 34 6D (hex)

The underscore character, 5F hex, can still be used.



#### 4.1 DEBUGGING

As an aid in debugging the host programs that drive the LG01 600 LPM Text Printer, the LG01 printer can be put into Dump mode. In this mode, the LG01 printer does not execute control codes and other commands it receives. Instead, the commands are printed out in the hexadecimal format along with the normal character data. Each command is printed as its hex value, bracketed by < and >. Some examples follow:

| Input<br>Command | No Parity |
|------------------|-----------|
| <CR>             | <0D>      |
| <LF>             | <0A>      |
| <ESC>            | <1B>      |

Paper Instruction commands are printed in hex format, bracketed by <PI and >. See the example below.

| Input<br>Command | No Parity |
|------------------|-----------|
| Slew 1 line      | <PI11>    |

Buffer Clear and Prime commands both print out as <CLR>. In the example below, the printout is shown for online mode as well as for Dump mode.

Input:

<FF><ESC>c top of form - reset. <CR><LF> line 2. <CR>< LF>

Online Mode Output:                      Dump Mode Output: (No Parity)

|                      |            |                      |
|----------------------|------------|----------------------|
| top of form - reset. | <0C> <1B>c | top of form - reset. |
| line 2.              | <0D> <0A>  | line 2.              |
|                      | <0D> <0A>  |                      |

To enter Dump mode, start from the offline condition and perform the following steps.

1. Press MODE. Then press  or  until TEST displays.
2. Press FORMS/1. Then press  or  until DIAG displays.
3. Press CPI/2. Then press  or  until ONLN displays.
4. Press LPI/3. Then press  or  until DUMP displays.

5. Press ENTER.
6. Press RUN/STOP. RUN displays.
7. The LG01 printer is now in Dump mode. Send data from the host computer to the LG01 printer.
8. Press RUN/STOP to end the Dump test. STOP displays.
9. Press LINE FEED or FORM FEED to advance paper and view printout. Return to Step 6 to continue in Dump mode.
10. Press CLEAR to exit to CLEAR mode.
11. Press  or  until CLER is displayed.
12. Press ENTER to exit to Normal mode.

Dump mode is only one of the LG01 printer's diagnostic tests. Additional diagnostic and self-test information can be found in the LG01 600 LPM Text Printer Technical Manual (EK-0LG01-TM).

#### 4.2 PRINTER CONFIGURATION

The LG01 printer can generate a report in Offline mode, to show the configurations of the printer, including all switch settings. Figure 4-1 shows a sample of such a report, and includes a guide to its interpretation.

To print a configuration report, start from Normal mode (offline) and follow the steps below.

1. Press MODE. Then press  or  until TEST displays.
2. Press FORMS/1. Then press  or  until PRNT displays.
3. Press CPI/2. Then press  or  until OPTN displays.
4. Press LPI/3. Then press  or  until CNFG displays.
5. Press ENTER.
6. Press RUN/STOP. RUN displays.
7. To stop the printout, press RUN/STOP to display STOP.
8. Press LINE FEED or FORM FEED to advance paper and view printout.
9. Press CLEAR to return to Normal mode (offline).

PRINTER WITH  
PARALLEL INTERFACE

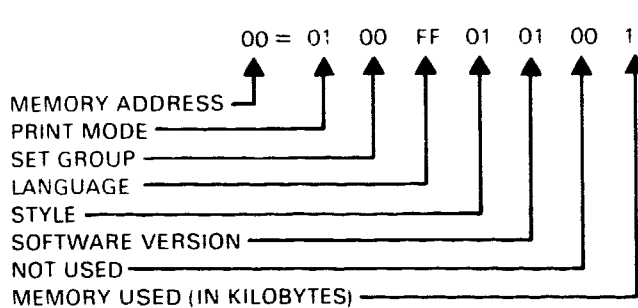
- (A) I/O VER nn  
(B) FP VER nn  
(C) CNTL VER nn  
(D) MODEL LG01  
(E) CHAR SETS:  
00 = 01 12 00 10 01 00 11  
10 = 08 12 00 20 01 00 31  
40 = 01 12 00 10 01 00 11  
50 = 08 12 00 20 01 00 31  
80 = 21 00 42 01 01 00 11  
90 = 07 00 42 04 01 00 31  
(F) CASE = UP/LOW  
(G) MODE = OP  
(H) LANG = xx  
(I) AUTOP = IN  
(J) PARITY = OFF  
(K) 11 INCH FORM  
(L) STROBE IS 1  
(M) I/O = DP

NOTES:

- (A) I/O SOFTWARE \*  
(B) FRONT PANEL SOFTWARE VERSION \*  
(C) CONTROL CPU SOFTWARE VERSION \*  
(D) MODEL NUMBER  
(E) CHARACTER SETS INSTALLED

PRINTER WITH  
SERIAL INTERFACE

- (A) I/O VER nn  
(B) FP VER nn  
(C) CNTL VER nn  
(D) MODEL LG01  
(E) CHAR SETS:  
00 = 01 12 00 10 01 00 11  
10 = 08 12 00 20 01 00 31  
40 = 01 12 00 10 01 00 11  
50 = 08 12 00 20 01 00 31  
80 = 21 00 42 01 01 00 11  
90 = 07 00 42 04 01 00 31  
(F) CASE = UP/LOW  
(G) MODE = OP  
(H) LANG = xx  
(I) AUTOP = IN  
(J) PARITY = OFF  
(K) 11 INCH FORM  
(L) BUSY = 0 1  
(M) US ART MODE 4E  
(N) PROTOCOL = E4  
(O) BUFF K=2



ARBITRARY NUMBERS. UNIQUE TO  
EACH CHARACTER MEMORY.

WHERE xx = USACII  
UK  
DEC DUTCH  
DEC FINNISH  
FRENCH  
DEC FRENCH/CANADIAN  
GERMAN  
ITALIAN  
JIS ROMAN  
DEC NOR/DAN  
SPANISH  
SWEDISH  
SWISS

- (F) UP/LOW = UPPER/LOWER CASE, UP = UPPER CASE ONLY  
(G) OP = OVERPRINT MODE, NL = NEWLINE MODE  
(H) DEFAULT LANGUAGE:  
01 = DEC MULTINATIONAL  
(I) IN = AUTOPRINT ON, OUT = AUTOPRINT OFF  
(J) EVEN = EVEN PARITY, ODD = ODD PARITY, OFF = PARITY OFF  
(K) DEFAULT FORM LENGTH: 11 INCHES or 12 INCHES  
(L) ACTIVE EDGE OF STROBE SIGNAL: 0= RISING, 1= FALLING  
(ASSUMES THE CABLE IS DISCONNECTED).  
(M) DP = DATA PRODUCTS INTERFACE  
4E = RS-232  
(N) PROTOCOL = E4  
(O) BUFFK = 2

\* WHERE nn = SOFTWARE VERSION NUMBER

Figure 4-1 LG01 Printer Configuration



## CHAPTER 5 FAULT CORRECTIONS AND TROUBLESHOOTING

This chapter helps solve most problems that arise during normal printer use, and includes a troubleshooting chart.

### 5.1 FAULT CODES

Fault codes are displayed on the control panel when an error occurs. There are two types of faults:

1. Faults that must be corrected before the LG01 printer can resume operation. For example, if the LG01 printer runs out of paper, new paper must be installed before printing can continue.
2. Faults that do not require correction before the LG01 printer can resume operation. If this type of fault is not corrected, the LG01 printer assumes a default mode of operation. However, errors in the printout may result if the original fault is not corrected.

### 5.2 FAULT CORRECTION PROCEDURE

Whenever a fault occurs, the LG01 printer stops, the bell sounds, and a fault message scrolls slowly across the display on the control panel. When the message stops, a fault code appears. The code is the first four character positions of the message (see Table 5-1, Normal Operation Display Messages).

To correct a fault, use the procedure described below.

1. (Optional) If the LG01 printer stops in the middle of a form, complete printing the form before correcting the fault. To do this, press and hold the STOP/RUN switch until the whole form is printed.
2. Look up the fault message in Table 5-2, Common Fault Messages.
3. Perform corrective action, call qualified service personnel, or run printer in default mode.
4. Press Clear. (While CLEAR is being pressed, any other uncorrected fault messages display.) If a message still remains, it can be cleared by switching the printer off. However, be aware that switching off the LG01 printer causes loss of all data stored in the buffer.

**CAUTION**

Press  once for each fault code displayed. Pressing  after all fault codes have been cleared will result in lost data from the buffer.

5. Press  to place the LG01 printer online. RUN displays.

#### 5.2.1 Normal Operation Messages

Table 5-1 defines the display messages used by the LG01 printer during normal operations when there are no faults present. The term "code" in the table heading refers to the first four character positions of the display message.

**Table 5-1 Normal Operation Display Messages**

| Code/Message  | Meaning                                            |
|---------------|----------------------------------------------------|
| CLER          | CLEAR key is being pressed.                        |
| STOP          | Normal ready. Not online. Press RUN to go on-line. |
| VLOD          | VFU loading. Please wait.                          |
| WAIT CNTL CPU | Control CPU not ready. Please wait.                |

#### 5.2.2 Common Fault Messages

Table 5-2 defines the display messages used by the LG01 printer to indicate the presence of an operational problem or fault. The table also provides suggestions for corrective action with each fault listed. The term "code" in the table heading refers to the first four character positions of the display message.

**Table 5-2 Common Fault Messages**

| <b>Code/Message</b> | <b>Meaning</b>                                            | <b>Action</b>                                                                                    |
|---------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| CNTL CPU STOP       | Control CPU has stopped.                                  | 1. Reseat/replace CPU controller board.<br>2. Reseat/replace paper/status and sequencer boards.* |
| BOF > MAX           | Bottom-of-form skip greater than max.                     | 1. Use smaller BOF skip, or larger forms length.                                                 |
| COxx                | Control checksum error.                                   | 1. Reseat/replace CPU controller software.*<br>2. Reseat/replace CPU controller board.*          |
| DENSITY             | Invalid CPI/LPI.<br>Horizontal/vertical error (Plot mode) | 1. Host data error.                                                                              |
| ERRE HAMMER         | Hammer fuse blown.                                        | 1. Reseat/replace fuse.*<br>2. Reseat/replace hammer driver board.*                              |
| ERRF CPI            | Invalid CPI selected.                                     | 1. Host data error.                                                                              |
| ERRI<br>LPI WRONG   | Invalid LPI selected.                                     | 1. Host data error.                                                                              |
| ERR1<br>POWER UP    | Non-requested branch to power-up routine.                 | 1. Reseat/replace I/O board.*<br>2. Reseat/replace CPU controller board.*                        |
| ERR3<br>SEQ RAM     | Sequencer RAM fault.                                      | 1. Reseat/replace sequencer board.*<br>2. Reseat/replace CPU controller board.*                  |
| ERR4<br>M/B RAM     | Mailbox RAM fault.                                        | 1. Reseat/replace CPU controller board.*                                                         |
| ERR6 ELEC           | Control CPU failure.                                      | 1. Reseat/replace CPU controller board.*                                                         |

\* Only qualified service personnel should perform this repair.

Table 5-2 Common Fault Messages (Cont)

| Code/Message        | Meaning                                                         | Action                                                                                            |
|---------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| ERR8<br>MODE SELECT | Font front-end error;<br>RAM error;<br>Sequence build error.    | 1. Reseat/replace se-<br>quencer board.*<br>2. Reseat/replace CPU<br>controller board.*           |
| ERR9 FONT           | Error attempting to<br>download a font to<br>control board RAM. | 1. Check configuration.<br>2. Reseat/replace font<br>RAM.*                                        |
| ESC<br>FORMAT       | ESC sequencer format<br>error. Sequence will<br>be printed.     | 1. Host data error.                                                                               |
| FAN                 | Cooling system failure.                                         | 1. Reseat/replace fuses.*<br>2. Reseat/replace fan.*                                              |
| FERR                | Invalid download data.                                          | 1. Check download file.                                                                           |
| FLS INCORRECT       | Forms length select<br>error.                                   | 1. Host data error.                                                                               |
| FPnn                | Control panel checksum<br>error.                                | 1. Reseat/replace I/O<br>firmware.*<br>2. Reseat/replace I/O<br>controller board.*                |
| HALT                | I/O CPU failure.                                                | 1. Reseat/replace I/O<br>controller board.*                                                       |
| IERR                | I/O hardware error.                                             | 1. Reseat/replace I/O<br>controller board.*                                                       |
| I/O?                | I/O CPU stopped.                                                | 1. Check installation of<br>I/O controller board.*<br>2. Reseat/replace I/O<br>controller board.* |
| IOxx<br>I/O CK SUM  | I/O checksum error.                                             | 1. Reseat/replace I/O<br>controller board.*<br>2. Reseat/replace I/O<br>software.*                |
| IRAM<br>I/O RAM     | I/O RAM fault.                                                  | 1. Reseat/replace I/O<br>controller board.*                                                       |

\* Only qualified service personnel should perform this repair.

**Table 5-2 Common Fault Messages (Cont)**

| <b>Code/Message</b> | <b>Meaning</b>                                                                                  | <b>Action</b>                                                                                                                                                                                   |
|---------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NOVF NO VFU         | VFU not loaded.                                                                                 | <ol style="list-style-type: none"> <li>1. Use DAVFU.</li> <li>2. Use form length select sequence.</li> </ol>                                                                                    |
| OPTVON VALUE        | Option value incorrect.                                                                         | <ol style="list-style-type: none"> <li>1. Host data error.</li> </ol>                                                                                                                           |
| PAPD DRIVE          | Paper servo fault.                                                                              | <ol style="list-style-type: none"> <li>1. Reseat/replace power amplifier.*</li> <li>2. Reseat/replace power mode/encoder.*</li> <li>3. Reseat/replace paper/status board.*</li> </ol>           |
| PAPM MOTION         | Paper motion fault.<br>For transparent or very thin forms, paper motion detect may be disabled. | <ol style="list-style-type: none"> <li>1. Reload paper if jammed or torn.</li> <li>2. Check tractors and tension.</li> </ol>                                                                    |
| PAPR OUT            | Paper supply out.                                                                               | <ol style="list-style-type: none"> <li>1. Load paper.</li> </ol>                                                                                                                                |
| PRER                | Parity error.                                                                                   | <ol style="list-style-type: none"> <li>1. Check host parity mode.</li> <li>2. Reseat/replace I/O controller board.*</li> <li>3. Disable parity checking.</li> </ol>                             |
| PLTN OPEN           | Platen is open.                                                                                 | <ol style="list-style-type: none"> <li>1. Close platen.</li> </ol>                                                                                                                              |
| REPEAT              | Error in repeat sequence.                                                                       | <ol style="list-style-type: none"> <li>1. Host data error.</li> </ol>                                                                                                                           |
| RIBN OUT            | No ribbon.<br>Ribbon motion error.<br>Motor overcurrent.                                        | <ol style="list-style-type: none"> <li>1. Install ribbon.</li> <li>2. Check ribbon path.</li> <li>3. Reseat/replace ribbon motor.*</li> <li>4. Reseat/replace shuttle/ribbon board.*</li> </ol> |
| SEQ STOP            | Sequencer fault.                                                                                | <ol style="list-style-type: none"> <li>1. Reseat/replace sequencer board.*</li> </ol>                                                                                                           |
| SET NOT LOADED      | Font selection not installed.                                                                   | <ol style="list-style-type: none"> <li>1. Host data error.</li> </ol>                                                                                                                           |

\* Only qualified service personnel should perform this repair.

**Table 5-2 Common Fault Messages (Cont)**

| <b>Code/Message</b>     | <b>Meaning</b>                                  | <b>Action</b>                                                                                                                                                                 |
|-------------------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SHTL STOPPED            | Shuttle sequencer fault.                        | <ol style="list-style-type: none"> <li>1. Check platen (may be too tight).</li> <li>2. Reseat/replace shuttle board.*</li> <li>3. Reseat/replace sequencer board.*</li> </ol> |
| SIZFONT                 | Invalid character size.                         | <ol style="list-style-type: none"> <li>1. Use smaller size.</li> </ol>                                                                                                        |
| STRB<br>WHILE BUSY      | Attempt to input data while printer is busy.    | <ol style="list-style-type: none"> <li>1. Check host interface.</li> <li>2. Correct host I/F sequence. Host must not send data strobe while LG01 printer is busy.</li> </ol>  |
| VDVF FORMAT<br>ERROR    | Error in VFU format loading.                    | <ol style="list-style-type: none"> <li>1. Correct VFU format.</li> </ol>                                                                                                      |
| VERR FORMAT<br>TOO LONG | Form length too long (>200).<br>VFU load error. | <ol style="list-style-type: none"> <li>1. Host data error.</li> </ol>                                                                                                         |
| VMER                    | DAVFU RAM fault.                                | <ol style="list-style-type: none"> <li>1. Reseat/replace CPU controller board.*</li> </ol>                                                                                    |
| +5 VOLT HIGH            | +5 volt high fault.                             | <ol style="list-style-type: none"> <li>1. Reseat/replace power rectifier/regulator board.*</li> </ol>                                                                         |
| +5 VOLT LOW             | +5 volt low fault.                              | <ol style="list-style-type: none"> <li>1. Check fuse.*</li> <li>2. Reseat/replace power rectifier/regulator board.*</li> </ol>                                                |
| +15 VOLTS               | +15 volt fault.                                 | <ol style="list-style-type: none"> <li>1. Check fuse.*</li> <li>2. Reseat/replace power rectifier/regulator board.*</li> </ol>                                                |
| -15 VOLTS               | -15 volt fault.                                 | <ol style="list-style-type: none"> <li>1. Check fuse.*</li> <li>2. Reseat/replace power rectifier/regulator board.*</li> </ol>                                                |
| +70 VOLTS               | +70 volt fault.                                 | <ol style="list-style-type: none"> <li>1. Check fuse.*</li> <li>2. Reseat/replace power rectifier/regulator board.*</li> </ol>                                                |

\* Only qualified service personnel should perform this repair.

### 5.3 TROUBLESHOOTING

Table 5-3 lists basic/routine operating problems and possible solutions that might be accomplished by the user or a technician. Check this list before calling for service.

Table 5-3 Basic Troubleshooting Chart

| Problem                                                        | Cause                                          | Corrective Action                                                                                                                                                                                                                                         |
|----------------------------------------------------------------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Printed characters in one line are shorter than normal         | Vertical paper tension too loose               | Turn tension knob clockwise until paper is taut but not too tight.                                                                                                                                                                                        |
| Paper holes are elongated after going through tractors         | Vertical paper tension too tight               | Turn tension knob counterclockwise until paper is taut but not too tight.                                                                                                                                                                                 |
| Paper holes are wider than normal after going through tractors | Horizontal paper tension too tight             | Unlock and adjust the tractors that are tearing holes.                                                                                                                                                                                                    |
| Paper comes out of tractors                                    | Paper tension                                  | To change vertical tension, turn tension knob; clockwise tightens tension, counterclockwise decreases tension.<br><br>To change horizontal tension, unlock upper and/or lower right tractor. Move tractor(s) right or left to make necessary adjustments. |
|                                                                | Upper tractors not aligned with lower tractors | Realign tractors so that lower tractors are directly below upper tractors.                                                                                                                                                                                |
| Paper tears at right or left edges along holes                 | Forms-Thickness lever lowered too far          | Raise Forms-Thickness lever.                                                                                                                                                                                                                              |
| Printed characters are too light                               | Ribbon worn out                                | Replace ribbon cartridge.                                                                                                                                                                                                                                 |

**Table 5-3 Basic Troubleshooting Chart (Cont)**

| <b>Problem</b>                                                     | <b>Cause</b>                              | <b>Corrective Action</b>                                                                                                                                                                                                                                |
|--------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Printed characters are shaky                                       | Forms-Thickness lever set incorrectly     | Lower Forms-Thickness lever.                                                                                                                                                                                                                            |
| Printed characters on heavy-weight or multi-part paper are smeared | Forms-Thickness lever set incorrectly     | Raise Forms-Thickness lever.                                                                                                                                                                                                                            |
| Right corner of lid comes loose from cover                         | Attempt to close lid while it was latched | <ol style="list-style-type: none"><li>1. Unlock latch.</li><li>2. Place pivot loosely over hinge on top rear of printer.</li><li>3. Hold lid at a 45 degree angle.</li><li>4. Strike front edge of the lid firmly with the palm of your hand.</li></ol> |

#### **5.4 GENERAL**

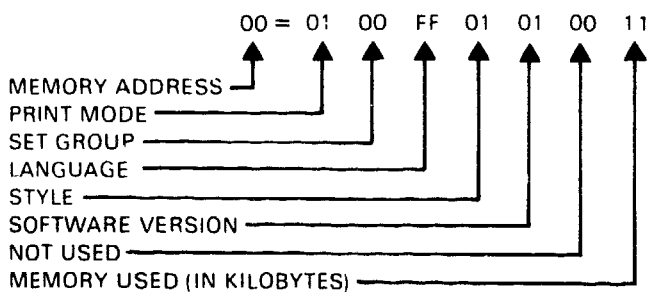
The LG01 printer can generate a report in Offline mode, to show the configurations of the printer, including all switch settings. Figure 5-1 shows a sample of such a report, and includes a guide to its interpretation.

PRINTER WITH  
PARALLEL INTERFACE

(A) I/O VER nn  
(B) FP VER nn  
(C) CNTL VER nn  
(D) MODEL LG01  
(E) CHAR SETS:  
00 = 01 12 00 10 01 00 11  
10 = 08 12 00 20 01 00 31  
40 = 01 12 00 10 01 00 11  
50 = 08 12 00 20 01 00 31  
80 = 21 00 42 01 01 00 11  
90 = 07 00 42 04 01 00 31  
(F) CASE = UP/LOW  
(G) MODE = OP  
(H) LANG = xx  
(I) AUTOP = IN  
(J) PARITY = OFF  
(K) 11 INCH FORM  
(L) STROBE IS 1  
(M) I/O = DP

NOTES:

- (A) I/O SOFTWARE \*  
(B) FRONT PANEL SOFTWARE VERSION \*  
(C) CONTROL CPU SOFTWARE VERSION \*  
(D) MODEL NUMBER  
(E) CHARACTER SETS INSTALLED:



- (F) UP/LOW = UPPER/LOWER CASE, UP = UPPER CASE ONLY  
(G) OP = OVERPRINT MODE, NL = NEWLINE MODE  
(H) DEFAULT LANGUAGE:  
01 = DEC MULTINATIONAL  
(I) IN = AUTOPRINT ON, OUT = AUTOPRINT OFF  
(J) EVEN = EVEN PARITY, ODD = ODD PARITY, OFF = PARITY OFF  
(K) DEFAULT FORM LENGTH: 11 INCHES or 12 INCHES  
(L) ACTIVE EDGE OF STROBE SIGNAL: 0 = RISING, 1 = FALLING  
(ASSUMES THE CABLE IS DISCONNECTED).  
(M) DP = DATA PRODUCTS INTERFACE  
4E = RS-232  
(N) PROTOCOL = E4  
(O) BUFFK = 2

\* WHERE nn = SOFTWARE VERSION NUMBER

PRINTER WITH  
SERIAL INTERFACE

(A) I/O VER nn  
(B) FP VER nn  
(C) CNTL VER nn  
(D) MODEL LG01  
(E) CHAR SETS:  
00 = 01 12 00 10 01 00 11  
10 = 08 12 00 20 01 00 31  
40 = 01 12 00 10 01 00 11  
50 = 08 12 00 20 01 00 31  
80 = 21 00 42 01 01 00 11  
90 = 07 00 42 04 01 00 31  
(F) CASE = UP/LOW  
(G) MODE = OP  
(H) LANG = xx  
(I) AUTOP = IN  
(J) PARITY = OFF  
(K) 11 INCH FORM  
(L) BUSY = 0 1  
(M) US ART MODE 4E  
(N) PROTOCOL = E4  
(O) BUFF K=2

ARBITRARY NUMBERS, UNIQUE TO  
EACH CHARACTER MEMORY.

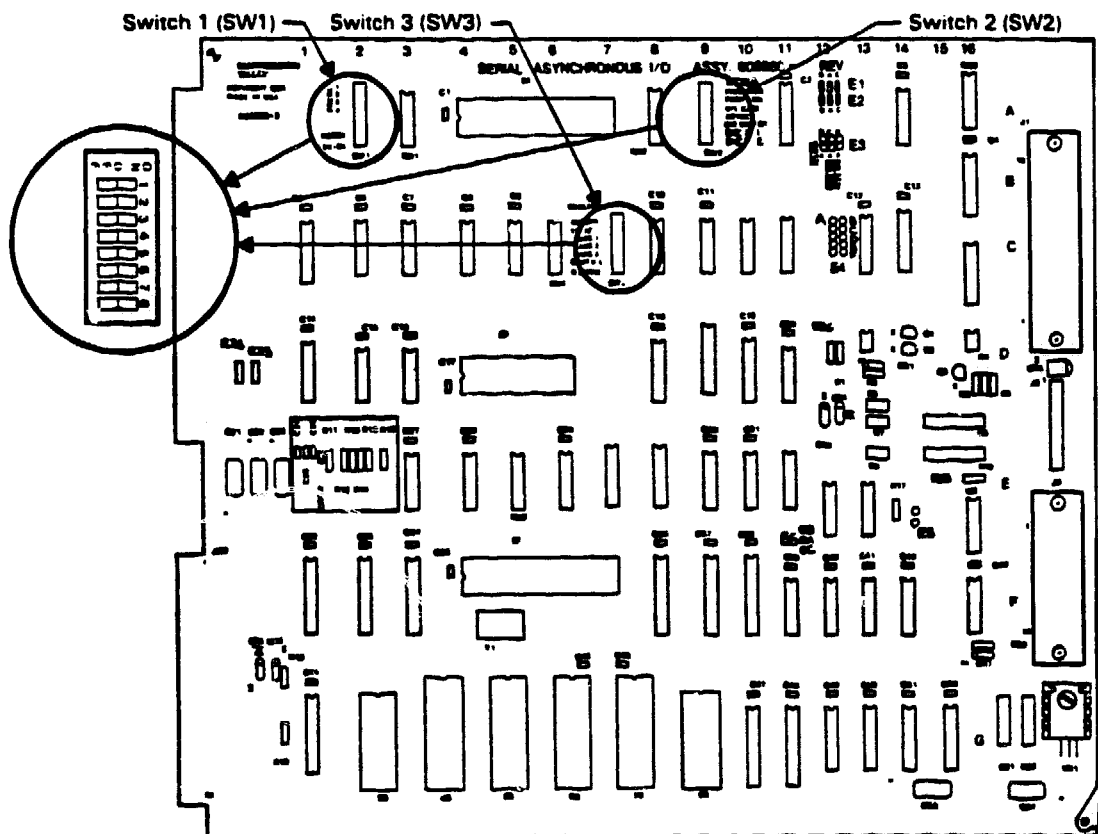
WHERE xx = USACII  
UK  
DEC DUTCH  
DEC FINNISH  
FRENCH  
DEC FRENCH/CANADIAN  
GERMAN  
ITALIAN  
JIS ROMAN  
DEC NOR/DAN  
SPANISH  
SWEDISH  
SWISS

Figure 5-1 LG01 Printer Configuration

### 5.5 SWITCH SETTINGS (LG01 WITH SERIAL RS-232 INTERFACE)

Three banks of switches are located on the basic serial I/O board for configuring the LG01 printer. The first bank is referred to as Switch 1 (SW1), the second is referred to as Switch 2 (SW2), and the third bank is referred to as Switch 3 (SW3). Each bank, or switch, has eight different positions labeled 1 through 8. Each switch has a particular factory setting. Figure 5-2 shows the locations of the three switch banks, and Figures 5-3 through 5-5 show the effects of various switch setting combinations on the LG01 printer.

Switch settings may be changed to any combination to meet the needs of a particular system. However, it is helpful to write down the switch positions you have decided to use and keep this information for reference.



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Figure 5-2 Basic Serial I/O Board Switch Locations

### 5.5.1 Switch 1 Settings

Figure 5-3 shows the factory settings and the effects of ON and OFF for Switch 1 (SW1) using the serial interface.

|                    |                         | Position<br>Number |     |                   |    | Protocol Selector           |  |
|--------------------|-------------------------|--------------------|-----|-------------------|----|-----------------------------|--|
|                    |                         | 4                  | 3   | 2                 | 1  |                             |  |
|                    |                         | ON                 | OFF | ON                | ON | XON/XOFF                    |  |
| Position<br>Number | Function                | ON                 |     | OFF               |    | Factory<br>Setting<br>(SW1) |  |
| 5                  | Not Used                |                    |     |                   |    |                             |  |
| 6                  | Printer<br>Status       | Enabled            |     | Disabled          |    | OFF                         |  |
| 7                  | Modem                   | Modem<br>Selected  |     | Direct<br>Connect |    | OFF                         |  |
| 8                  | Buffer RAM<br>Chip Size | 2K/8K              |     | 4K                |    | ON                          |  |

Figure 5-3 SW1 Settings

### 5.5.2 Switch 2 Settings

Figure 5-4 shows the factory settings and the effects of ON and OFF for Switch 2 (SW2).

| Position Number        | ON                                         | OFF                                         | Factory Setting (SW2) |
|------------------------|--------------------------------------------|---------------------------------------------|-----------------------|
| 1                      | Reverse Channel                            | Inverted Reverse Channel                    | ON                    |
| 2                      | (Bit 8, see setting below)                 |                                             | ON                    |
| 3                      | (Bit 8, see setting below)                 |                                             | OFF                   |
| 4                      | Upper/Lower case                           | Upper Case Only                             | ON                    |
| 5                      | Asynchronous                               | Isochronous                                 | ON                    |
| 6                      | One Stop Bit                               | Two Stop Bit                                | ON                    |
| 7                      | Not Used                                   | Not Used                                    | OFF                   |
| 8                      | <u>ESC</u> and <u>HT</u> Functions Enabled | <u>ESC</u> and <u>HT</u> Functions Disabled | ON                    |
| <b>Position Number</b> |                                            |                                             |                       |
| 2                      | 3                                          | <b>Meaning of 8th Bit</b>                   |                       |
| ON                     | OFF                                        | Print With Alternate Set (With Bit 8 High)  |                       |

Figure 5-4 SW2 Settings

### 5.5.3 Switch 3 Settings

Figure 5-5 shows the factory settings and the effects of ON and OFF for Switch 3 (SW3).

| Position<br>Number | ON                | OFF             | Factory<br>Setting<br>(SW3) |
|--------------------|-------------------|-----------------|-----------------------------|
| 1                  | Newline           | Overprint       | OFF                         |
| 2                  | Autoprint ON      | Autoprint OFF   | ON                          |
| 3                  | 12" Form Length   | 11" Form Length | OFF                         |
| 4                  | Default Languages |                 | ON                          |
| 5                  | Default Languages |                 | ON                          |
| 6                  | Default Languages |                 | ON                          |
| 7                  | Default Languages |                 | ON                          |
| 8                  | Not Used          | Not Used        | OFF                         |

Figure 5-5 SW3 Settings

## 5.6 JUMPER SETTINGS

Figure 5-6 shows the locations of all jumpers on the serial interface board.

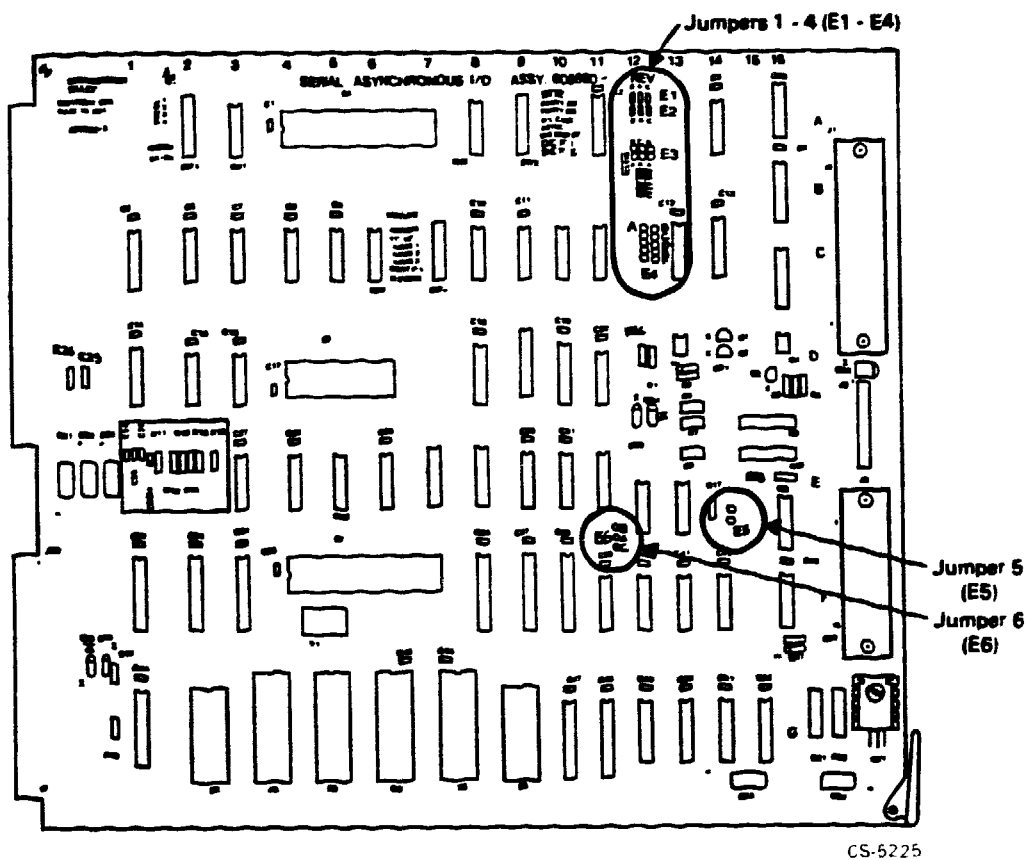


Figure 5-6 Interface Board Jumper Locations

Figure 5-7 illustrates the standard settings for all serial interface printers.

| Jumper | Selection         | Configuration | Meaning     |
|--------|-------------------|---------------|-------------|
| E1     | CV CLOCK          | A-B*          | Internal    |
| E2     | XMIT Clock        | A-B*          | Internal    |
| E3     | I/O Type          | A-C*          | RS-232-C    |
| E4     | Baud Rate         | A-B           | 19200 Async |
|        |                   | A-C*          | 9600 Async  |
|        |                   | A-D           | 4800 Async  |
|        |                   | A-E           | 2400 Async  |
|        |                   | A-F           | 1200 Async  |
| E5     | Internal Clock In | Out           | Inverted    |
|        |                   |               | Standard    |

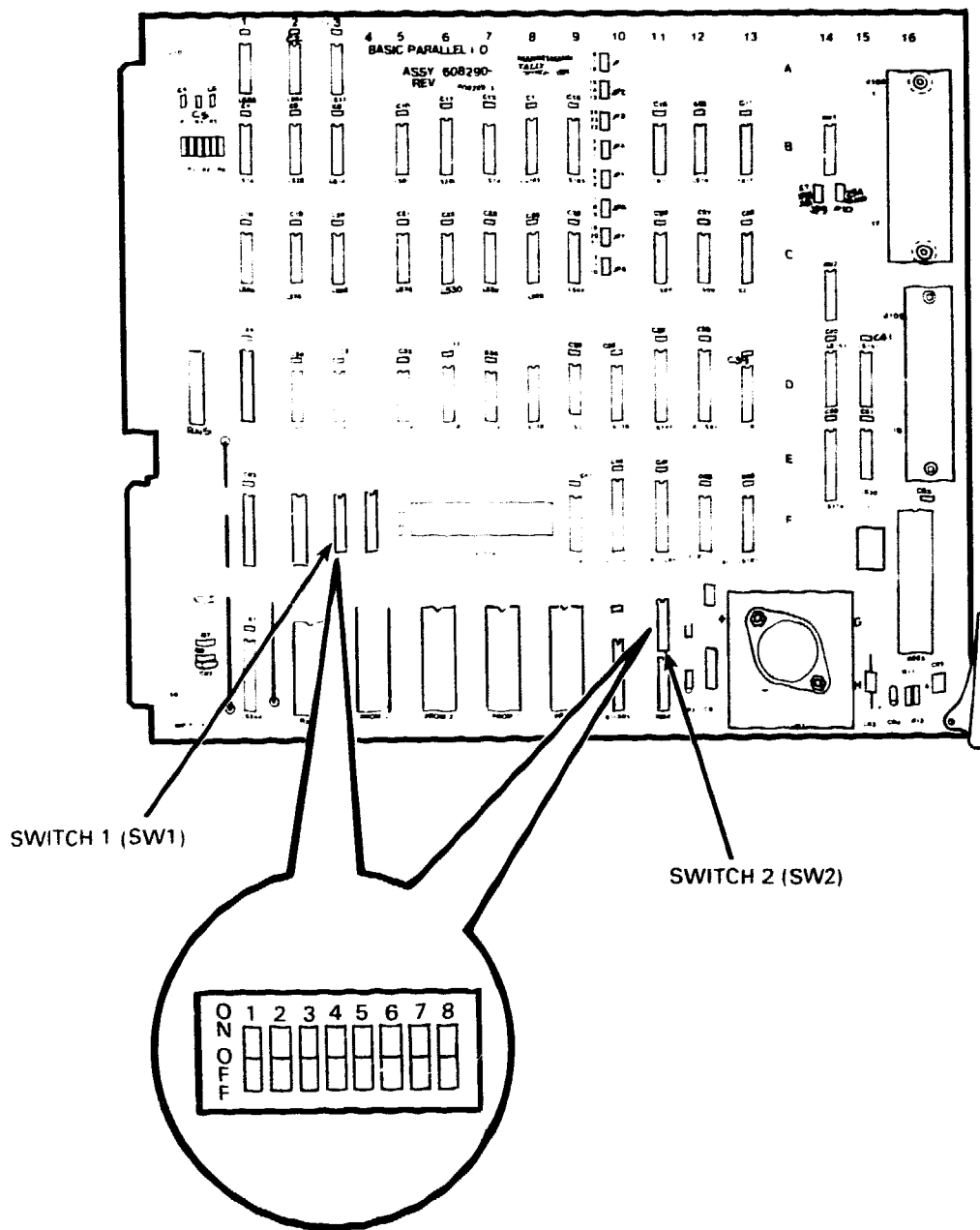
\* Factory Settings

Figure 5-7 Jumper Selection

#### 5.7 SWITCH SETTINGS (LG01 WITH PARALLEL I/O INTERFACE)

Two banks of switches are located on the basic parallel I/O board for configuring the printer. The first bank is referred to as Switch 1 or SW1. The second bank is referred to as Switch 2 or SW2. Each bank, or switch, has eight different positions labeled 1 through 8. The factory settings for these switches are in a particular pattern for the Dataproducts compatible interface. Figure 5-8 shows the board switch locations, and Tables 5-4 and 5-5 show the effects of various switch setting combinations on the printer.

Switch settings may be changed to any combination to meet the needs of your particular system. However, it is helpful to write down the switch positions used and to keep this information for future reference.



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Figure 5-8 Basic Parallel I/O Board Switch Locations

Table 5-4 shows the factory settings and the effects of ON and OFF for Switch 1 (SW1) using the Dataproducts interface.

**Table 5-1 Dataproducts SW1 Settings**

| Position No. | Factory Setting (SW1) | ON                                         | OFF                                         |
|--------------|-----------------------|--------------------------------------------|---------------------------------------------|
| 1            | OFF                   | STROBE on falling edge                     | STROBE on rising edge                       |
| 2            | ON                    | Always ON                                  |                                             |
| 3            | OFF                   | Paper Instruction                          | 8-bit mode                                  |
| 4            | ON                    | Upper/lower case                           | Upper case                                  |
| 5            | OFF                   | Centronics interface                       | Dataproducts interface                      |
| 6            | OFF                   | Invalid                                    | Always OFF                                  |
| 7            | OFF                   | - Not Used -                               |                                             |
| 8            | ON                    | <u>ESC</u> and <u>HT</u> functions enabled | <u>ESC</u> and <u>HT</u> functions disabled |

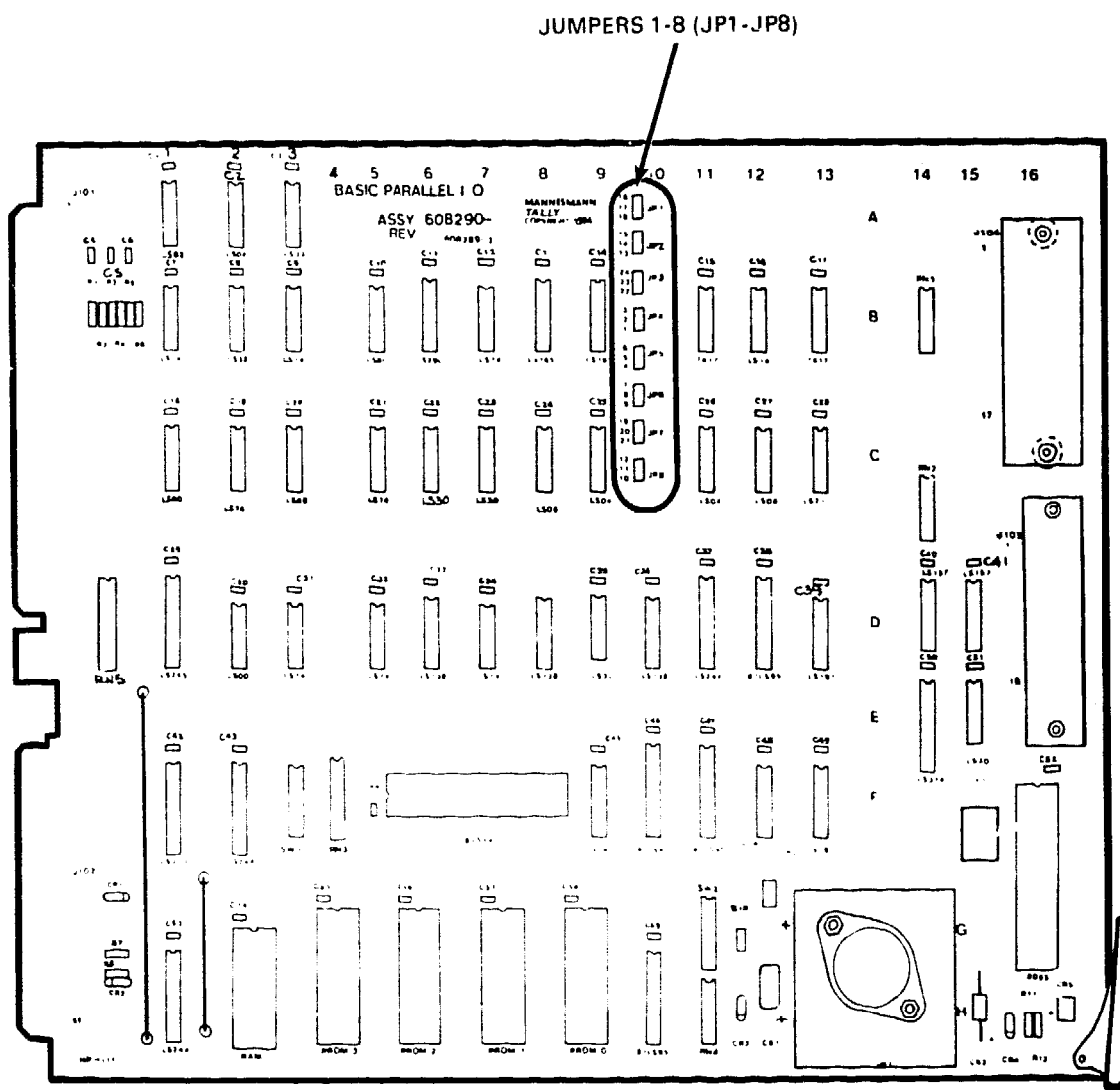
Table 5-5 shows the factory settings and the effects of ON and OFF for Switch 2 (SW2).

**Table 5-5 Switch 2 (SW2) Settings**

| Position No. | Factory Setting (SW1) | ON                | OFF             |
|--------------|-----------------------|-------------------|-----------------|
| 1            | OFF                   | Newline           | Overprint       |
| 2            | ON                    | Autoprint on      | Autoprint off   |
| 3            | OFF                   | 12" form length   | 11" form length |
| 4            | ON                    | Default Languages |                 |
| 5            | ON                    | Default Languages |                 |
| 6            | ON                    | Default Languages |                 |
| 7            | ON                    | Default Languages |                 |
| 8            | OFF                   | NA                |                 |

## 5.8 JUMPER SETTINGS

Figure 5-9 shows the locations of all jumpers on the interface board.



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Figure 5-9 Interface Board Jumper Locations

Table 5-6 lists the standard jumper settings for all printers.

**Table 5-6 Jumper Settings**

| <b>Jumper</b> | <b>Pin No.</b>        | <b>Meaning</b>                                                |
|---------------|-----------------------|---------------------------------------------------------------|
| JP1           |                       | Not Used                                                      |
| JP2           | 14 to 15<br>14 to 13* | DEMAND Active Low<br>DEMAND Active High                       |
| JP3           |                       | Not Used                                                      |
| JP4           |                       | Not Used                                                      |
| JP5           |                       | Not Used                                                      |
| JP6           | 8 to 7*<br>8 to 9     | ONLINE Active High<br>ONLINE Active Low                       |
| JP7           |                       | Not Used                                                      |
| JP8           | 11 to 12<br>10 to 11  | PAPER INSTRUCTION Active Low<br>PAPER INSTRUCTION Active High |

\* Factory setting for Dataproducts interface.



**APPENDIX A**  
**LG01 PRINTER SPECIFICATIONS**

|                                  |                                                                                                                                                                                                                                                |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Characters Per Inch (CPI)</b> | 5, 10, 12, or 15 CPI                                                                                                                                                                                                                           |
| <b>Lines Per Inch (LPI)</b>      | 6, 8, or 10 LPI                                                                                                                                                                                                                                |
| <b>Fonts:</b>                    | Data Processing<br>Correspondence<br>OCR A<br>OCR B                                                                                                                                                                                            |
| <b>Character Sizes</b>           | Vertical size:<br><br>Normal size:<br>200% Normal size<br>300% Normal size<br><br>Horizontal size:<br>Normal size<br>200% Normal size                                                                                                          |
| <b>Printing Speeds</b>           | For all upper case data processing characters:<br>600 Lines Per Minute at 10 CPI<br>420 Lines Per Minute at 15 CPI<br><br>For upper/lower case data processing characters:<br>480 Lines Per Minute at 10 CPI<br>335 Lines Per Minute at 15 CPI |
| <b>Vertical Format Control</b>   | From control panel and from host system                                                                                                                                                                                                        |
| <b>Ribbon types</b>              | Nylon ribbon                                                                                                                                                                                                                                   |
| <b>Forms types</b>               | Continuous fan-fold forms                                                                                                                                                                                                                      |
| <b>Forms size</b>                | 4 inches to 16 inches                                                                                                                                                                                                                          |
| <b>Forms copies</b>              | Single-part up to six-part forms                                                                                                                                                                                                               |

[illegible][illegible]

## APPENDIX B SUMMARY OF CONTROL SEQUENCES

Tables B-1 through B-6 list all the control codes and escape sequences used with the LG01 600 LPM Text Printer. More detailed information may be found in Chapter 3 of this manual.

**Table B-1 Control Codes**

| Control Code    | ASCII | Hex |
|-----------------|-------|-----|
| Bell            | BEL   | 07  |
| Horizontal Tab  | HT    | 09  |
| Carriage Return | CR    | 0D  |
| Escape          | ESC   | 1B  |
| Form Feed       | FF    | 0C  |
| Line Feed       | LF    | 0A  |
| Shift In        | SI    | 0F  |
| Shift Out       | SO    | 0E  |

**Table B-2 Escape Sequences - Paper Motion**

| Escape Sequence             | ASCII        | Hex               |
|-----------------------------|--------------|-------------------|
| Index Forward               | <ESC>D       | 1B 44             |
| Index Reverse               | <ESC>M       | 1B 4D             |
| VFU Channel Command         | <ESC>[nnn&y  | 1B 5B n n n 26 79 |
| Reverse Form Feed           | <ESC>[nk     | 1B 5B 66          |
| Relative Paper Motion       | <u>ESC</u> [ | 1B 5B             |
| n Horizontal Spaces Forward | <ESC>[na     | 1B 5B n 61        |
| n Horizontal Spaces Reverse | <ESC>[nj     | 1B 5B n 6A        |
| n Vertical Spaces Forward   | <ESC>[ne     | 1B 5B n 65        |

**Table B-3 Escape Sequences - Character Printing**

| Escape Sequence       | ASCII         | Hex                  |
|-----------------------|---------------|----------------------|
| Select Character Font | <ESC>[ln m    | 1B 5B 30 n 60        |
| Select Character Size | <ESC>[n1;n2 B | 1B 5B n1 3B n2 20 42 |
| Select LPI            | <ESC>[nz      | 1B 5B n 7A           |
| Select CPI            | <ESC>[nw      | 1B 5B n 77           |

**Table B-4 Escape Sequences - Vertical Format**

| Escape Sequence    | ASCII      | Hex            |
|--------------------|------------|----------------|
| Select Form Length | <ESC>[nnnt | 1B 5B n n n 74 |
| Begin VFU Load     | <ESC>[<1h  | 1B 5B 3C 31 68 |
| End VFU Load       | <ESC>[<1l  | 1B 5B 3C 31 6C |

**Table B-5 Escape Sequences - Horizontal Tabs**

| Escape Sequence                 | ASCII           | Hex                 |
|---------------------------------|-----------------|---------------------|
| Set Horizontal Tabs             | <ESC>[n1;n2...u | 1B 5B n1 3B n2...75 |
| Clear All<br>Horizontal Tabs    | <ESC>[3g        | 1B 5B 33 67         |
| Set Current<br>Horizontal Tab   | <ESC>H          | 1B 48               |
| Clear Current<br>Horizontal Tab | <ESC>[0g        | 1B 5B 30 67         |

**Table B-6 Escape Sequences - Other**

| Escape Sequence | ASCII    | Hex        |
|-----------------|----------|------------|
| Reset Printer   | <ESC>c   | 1B 63      |
| Underline       | <ESC>[nm | 1B 5B n 60 |



## APPENDIX C PRINTER SET-UP CHARACTERISTICS

### C.1 PARALLEL INTERFACE

When using the parallel I/O printer with the VMS operating system, the printer characteristics can be set up as shown below (this is accomplished by the SET PRINTER command).

Printer LCA0:, device type unknown, is on-line, allocated, record-oriented device, carriage control, device is spooled through an intermediate device, error logging is enabled.

|                    |                 |                      |                             |
|--------------------|-----------------|----------------------|-----------------------------|
| Error count        | 0               | Operations completed | 1                           |
| Owner process      | "SYMBIONT_0001" | Owner UIC            | [0,0]                       |
| Owner process ID   | 00000087        | Dev Prot             | S:RWLP,O:RWLP,G:RWLP,W:RWLP |
| Reference count    | 2               | Default buffer size  | 132                         |
| Page width         | 132             | Page length          | 66                          |
| Carriage return    | Formfeed        | Lowercase            |                             |
| No Passall         | No Wrap         | Printall             |                             |
| No Fallback        | Tab             | No Truncate          |                             |
| Intermediate deve: | DUAL:           |                      |                             |
| Associated queue:  | LCA0            |                      |                             |

### C.2 SERIAL INTERFACE

When using the serial I/O printer with the VMS operating system, the terminal characteristics can be set up as shown below (this is accomplished by the SET TERM command).

Terminal: \_TXA3:      Device\_Type: Unknown      Owner: SYMBIONT\_0001  
Username: SYSTEM

|         |      |         |   |        |     |         |      |
|---------|------|---------|---|--------|-----|---------|------|
| Input:  | 9600 | LFfill: | 0 | Width: | 132 | Parity: | None |
| Output: | 9600 | CRfill: | 0 | Page:  | 66  |         |      |

#### Terminal Characteristics:

|                   |                    |                 |                   |
|-------------------|--------------------|-----------------|-------------------|
| Interactive       | Echo               | Type_ahead      | No Escape         |
| No Hostsync       | TTsync             | Lowercase       | Tab               |
| No Wrap           | Scope              | No Remote       | No Eightbit       |
| No Broadcast      | No Readsynchron    | Form            | Fulldup           |
| No Modem          | No Local_echo      | No Autobaud     | No Hangup         |
| No Brdcstambx     | No DMA             | No Altypeahd    | Set speed         |
| Line Editing      | Overstrike editing | No Fallback     | No Dialup         |
| No Secure server  | No Disconnect      | No Pasthru      | No Syspassword    |
| No SIXEL Graphics | No Soft Characters | No Printer Port | Numeric Keypad    |
| No ANSI_CRT       | No Regis           | No Block_mode   | No Advanced_video |
| No Edit_mode      | No DEC_CRT         | No DEC_CRT2     |                   |

Device spooled to \_DUAL: