“S” Applicator
Print Engines

M-8459S, M-8460S, M-8485S, M-8490S
Warning: This equipment complies with the requirements in Part 15 of FCC rules for a Class A computing device. Operation of this equipment in a residential area may cause unacceptable interference to radio and TV reception requiring the operator to take whatever steps are necessary to correct the interference.

All rights reserved. No part of this document may be reproduced or issued to third parties in any form whatsoever without the express permission of SATO America, Inc. The materials in this document is provided for general information and is subject to change without notice. SATO America, Inc. assumes no responsibilities for any errors that may appear.
The Operator’s Manual for the “S” Print Engine Family contains basic information about the printer such as setup, installation, cleaning and maintenance. It also contains complete instructions on how to use the operator panel to configure the printer. The following is a brief description of each section in this manual.

SECTION 1. PRINTER OVERVIEW

This section contains a discussion of the printer specifications and optional features.

SECTION 2. INSTALLATION AND CONFIGURATION

This section contains instructions on how to unpack and set up the printer and load the labels and ribbon.

SECTION 3. CONFIGURATION

This section contains information on using the operator panel and switch panels to configure the printer.

SECTION 4. CLEANING AND MAINTENANCE

This section contains instructions on how to clean and maintain the printer.

SECTION 5. PROGRAMMING

This section introduces the “S” printer programming language. It contains the commands that are used with the printer to produce labels with bar codes, alphanumeric data and graphics.

SECTION 6. INTERFACE SPECIFICATIONS

This section contains the printer’s interface specifications, which include detailed information on how to properly interface your printer to the host system.

SECTION 7. TROUBLESHOOTING

This section contains troubleshooting procedures to follow in the event you have printer problems.
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SECTION 1.
PRINTER OVERVIEW

INTRODUCTION

The SATO “S” Print Engines are designed to be integrated into high-performance on-site labeling systems. All printer parameters are user programmable using the front panel controls and the DIP switches. All popular bar codes and 13 human-readable fonts, including a vector font, are resident in memory providing literally thousands of type styles and sizes.

The Operator’s Manual will help you understand the basic operations of the printer such as setup, installation, configuration, cleaning and maintenance.

The following information is presented in this section:

• General Printer Specifications
• Optional Accessories
# SPECIFICATIONS

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<th>M-8460S</th>
<th>M-8490S</th>
<th>M-8459S</th>
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<tr>
<td><strong>PRINT</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Method</td>
<td>Direct or Thermal Transfer</td>
<td>Direct Only</td>
<td></td>
<td></td>
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<tr>
<td>Speed (User Selectable)</td>
<td>4 to 10 ips 100 to 250 mm/s</td>
<td>4 to 8 ips 100 to 200 mm/s</td>
<td>4 to 8 ips 100 to 200 mm/s</td>
<td>2 to 5 ips 50 to 125 mm/s</td>
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<tr>
<td>Print Module (Dot Size)</td>
<td>.0049 in. .125 mm</td>
<td>.0033 in. .083 mm</td>
<td>.0049 in. .125 mm</td>
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<tr>
<td>Resolution</td>
<td>203 dpi 8 dpmm</td>
<td>305 dpi 12 dpmm</td>
<td>203 dpi 8 dpmm</td>
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<tr>
<td>Maximum Print Width</td>
<td>5.0 in. 128 mm 1024 dots</td>
<td>6.0 in. 152 mm 1216 dots</td>
<td>4.4 in. 112 mm 1344 dots</td>
<td>4.4 in. 112 mm 896 dots</td>
</tr>
<tr>
<td>Maximum Print Length</td>
<td>7 in. (178) mm</td>
<td>14 in. (356 mm)</td>
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<tr>
<td>Expanded Print Length</td>
<td>49.2 in. 1249 mm</td>
<td>32.8 in. 833 mm</td>
<td>49.2 in. 1249 mm</td>
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<td><strong>MEDIA</strong></td>
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<td>Minimum Width</td>
<td>1.0 in. (25 mm)</td>
<td>2.0 in. (53 mm)</td>
<td>1.0 in. (25 mm)</td>
<td>1.0 in. (25 mm)</td>
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<tr>
<td>Minimum Length(1)</td>
<td>.25 in. (6 mm)</td>
<td>.25 in. (6 mm)</td>
<td>.25 in. (6 mm)</td>
<td>.25 in. (6 mm)</td>
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<tr>
<td>Maximum Width</td>
<td>5.25 in. 134 mm</td>
<td>6.5 in. 165 mm</td>
<td>5.25 in. 134 mm</td>
<td>5.25 in. 134 mm</td>
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<tr>
<td>Type</td>
<td>Die Cut Labels, Fan-Fold or Continuous</td>
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<td></td>
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<tr>
<td>Maximum Caliper</td>
<td>.010 in. (.25 mm)</td>
<td></td>
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<tr>
<td>Max Unwind torque</td>
<td>8.8 lbs (4 Kg) with 5 in. wide labels</td>
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<td>Backing Paper Rewind</td>
<td>400 g or less</td>
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<td>Fixed</td>
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<tr>
<td>Maximum Width</td>
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<td>6.5 in. 165 mm</td>
<td>5.25 in. 134 mm</td>
<td>N/A</td>
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<tr>
<td>Length</td>
<td>1968 ft (600 M)</td>
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<tr>
<td>Thickness</td>
<td>4.5 micron, Face-In Wind</td>
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All specifications subject to change without notice.

(1) Minimum label length at print speeds greater than 6 ips is 1.0 in.
## SPECIFICATION

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<td>Power</td>
<td>LED</td>
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<td>Label</td>
<td>LED</td>
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<td>LED</td>
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<td>Error</td>
<td>LED</td>
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<td>Front Panel</td>
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<td>Front Panel</td>
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<td>Pitch</td>
<td>Inside Panel</td>
</tr>
<tr>
<td>Offset</td>
<td>Inside Panel</td>
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<td>Display</td>
<td>Front Panel</td>
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<td>Centronics Compatible Standard</td>
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| Serial     | RS232C (2400 to 19.2K bps) Standard  
|            | RS422/485 (2400 to 19.2K bps) Optional |
| Serial Protocol | Hardware Flow Control (Ready/Busy)  
|                | Software Flow Control (X-On/X-Off)  
|                | Bi-directional (ENQ/Response) |
| Data Transmission | ASCII Format |

### PROCESSING

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<td>ROM</td>
<td>1M byte (4M bit x 2)</td>
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<tr>
<td>DRAM</td>
<td>2 MByte</td>
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All specifications subject to change without notice.
### SPECIFICATION M-8485S/M-8459S/M-8460S M-8490S

<table>
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<td>U Font</td>
<td>(5 dots W x 9 dots H)</td>
<td></td>
</tr>
<tr>
<td>S Font</td>
<td>(8 dots W x 15 dots H)</td>
<td></td>
</tr>
<tr>
<td>M Font</td>
<td>(13 dots W x 20 dots H)</td>
<td></td>
</tr>
<tr>
<td>XU Font</td>
<td>(5 dots W x 9 dots H) Helvetica</td>
<td></td>
</tr>
<tr>
<td>XS Font</td>
<td>(17 dots W x 17 dots H) Univers Condensed Bold</td>
<td></td>
</tr>
<tr>
<td>XM Font</td>
<td>(24 dots W x 24 dots H) Univers Condensed Bold</td>
<td></td>
</tr>
<tr>
<td>OA Font</td>
<td>(15 dots W x 22 dots H) OCR-A</td>
<td>(22 dots W x 33 dots H) OCR A</td>
</tr>
<tr>
<td>OB Font</td>
<td>20 dots W x 24 dots H) OCR-B</td>
<td>(30 dots W x 36 dots H) OCR B</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AUTO SMOOTHING FONTS</th>
<th>WB Font (18 dots W x 30 dots H)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>WB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WL</td>
<td>WL Font (28 dot W x 52 dots H)</td>
<td></td>
</tr>
<tr>
<td>XB</td>
<td>XB Font (48 dots W x 48 dots H) Univers Condensed Bold</td>
<td></td>
</tr>
<tr>
<td>XL</td>
<td>XL Font (48 dot W x 48 dots H) Sans Serif</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VECTOR FONT</th>
<th>Proportional or Fixed Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Font Size 50 x 50 dots to 999 x 999 dots</td>
</tr>
<tr>
<td></td>
<td>Helvetica, 10 Font Variations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DOWNLOADABLE FONTS</th>
<th>TrueType Fonts with Optional Memory Card</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CHARACTER CONTROL</th>
<th>Expansion up to 12X in either the X or Y coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Character Pitch control</td>
</tr>
<tr>
<td></td>
<td>Line Space control</td>
</tr>
<tr>
<td></td>
<td>Journal Print facility</td>
</tr>
<tr>
<td></td>
<td>0°, 90°, 180° and 270° Rotation</td>
</tr>
</tbody>
</table>

All specifications subject to change without notice.
<table>
<thead>
<tr>
<th>SPECIFICATION</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYMBOLOGIES</td>
<td>Bookland (UPC/EAN Supplemental)</td>
</tr>
<tr>
<td></td>
<td>EAN-8, EAN-13</td>
</tr>
<tr>
<td></td>
<td>CODABAR</td>
</tr>
<tr>
<td></td>
<td>Code 39</td>
</tr>
<tr>
<td></td>
<td>Code 93</td>
</tr>
<tr>
<td></td>
<td>Code 128</td>
</tr>
<tr>
<td></td>
<td>Interleaved 2 of 5</td>
</tr>
<tr>
<td></td>
<td>Industrial 2 of 5</td>
</tr>
<tr>
<td></td>
<td>Matrix 2 of 5</td>
</tr>
<tr>
<td></td>
<td>MSI</td>
</tr>
<tr>
<td></td>
<td>POSTNET</td>
</tr>
<tr>
<td></td>
<td>UCC/EAN-128</td>
</tr>
<tr>
<td></td>
<td>UPC-A and UPC-E</td>
</tr>
<tr>
<td></td>
<td>Data Matrix</td>
</tr>
<tr>
<td></td>
<td>Maxicode</td>
</tr>
<tr>
<td></td>
<td>PDF417</td>
</tr>
<tr>
<td>Ratios</td>
<td>1:2, 1:3, 2:5 User definable bar widths</td>
</tr>
<tr>
<td>Bar Height</td>
<td>4 to 600 dots, User programmable</td>
</tr>
<tr>
<td>Rotation</td>
<td>0°, 90°, 180° and 270°</td>
</tr>
<tr>
<td>OTHER FEATURES</td>
<td>Sequential numbering of both numerics and bar codes</td>
</tr>
<tr>
<td>Custom Characters</td>
<td>RAM storage for special characters</td>
</tr>
<tr>
<td>Graphics</td>
<td>Full dot addressable graphics, SATO Hex/Binary or .PCX formats</td>
</tr>
<tr>
<td>Form Overlay</td>
<td>Form overlay for high-speed editing of complex formats.</td>
</tr>
</tbody>
</table>

All specifications subject to change without notice.
<table>
<thead>
<tr>
<th>SPECIFICATION</th>
<th>M-8485S/M-8459S/M-8490S</th>
<th>M-8460S</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIMENSIONS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wide</td>
<td>9.65 in. (245 mm)</td>
<td></td>
</tr>
<tr>
<td>Deep</td>
<td>16.1 in. (408 mm)</td>
<td>17.9 in. 455 mm</td>
</tr>
<tr>
<td>High</td>
<td>11.8 in. (300 mm)</td>
<td></td>
</tr>
<tr>
<td>WEIGHT</td>
<td>25.0 lbs (11.34 Kg)</td>
<td>27.5 lbs 12.5 Kg</td>
</tr>
<tr>
<td>POWER REQUIREMENTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>100 - 115 V (±10 %)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>220V (±10 %)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50/60 Hz (±1%)</td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td>50W Idle</td>
<td>700W Operating</td>
</tr>
<tr>
<td>ENVIRONMENTAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>41° to 104°F (5° to 40°C)</td>
<td></td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-0° to 104°F (-20° to 40°C)</td>
<td></td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>15-85 % RH, non-condensing</td>
<td></td>
</tr>
<tr>
<td>Storage Humidity</td>
<td>Max 90% RH, non-condensing</td>
<td></td>
</tr>
<tr>
<td>Electrostatic Discharge</td>
<td>8KV</td>
<td></td>
</tr>
<tr>
<td>REGULATORY APPROVALS</td>
<td>Ul, CSA, CE (1)</td>
<td></td>
</tr>
<tr>
<td>RFI/EMI</td>
<td>FCC Class A</td>
<td></td>
</tr>
</tbody>
</table>

All specifications subject to change without notice.

(1) CE approval on M-8460S only
### ACCESSORY

<table>
<thead>
<tr>
<th></th>
<th>M-8485S/M-8459S/M-8490S</th>
<th>M-8460S</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMORY EXPANSION</td>
<td>Two slots for PCMCIA Memory Cards (up to 2MB each). Can be used for Graphic File storage, print buffer expansion, format storage and downloaded TrueType fonts.</td>
<td></td>
</tr>
<tr>
<td>CALENDAR</td>
<td>An internally mounted Date/Time clock that can be used to date/time stamp labels at the time of printing.</td>
<td></td>
</tr>
<tr>
<td>FACE-OUT LABEL SENSOR</td>
<td>Top-mounted sensor for reflective Eye-Marks printed on the face of the label.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

All specifications subject to change without notice.
SECTION 2.
INSTALLATION

INTRODUCTION

This section of the manual has been written to help you install the SATO “S” print engine modules and to get started as quickly as possible.

It is recommend to read each chapter in this manual before the installation or the use of the print modules.

INSTALLATION

Careful consideration must be given when selecting the location of the printer, especially to environmental considerations. To obtain optimum results from the SATO “S” print module, always try to avoid operation locations influenced by:

- Direct or bright sunlight, as this will make the label sensor less responsive and may cause the label to be sensed incorrectly.
- Locations which have extremes of temperature, as this can create electrical problems on the circuits within the printer.
- The installed location of the printer should ideally be in areas free from dust, humidity and sudden vibrations.

CONSUMABLES

Always use SATO carbon ribbons or equivalent in the thermal transfer models. The use of incorrect materials may cause malfunctions of the printer and void the warranty.
DIMENSIONS

Note: The exact position of components may vary depending on model.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Model Width</th>
<th>Model Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>10.4 inches</td>
<td>265 mm</td>
</tr>
<tr>
<td>Depth</td>
<td>16.06 inches</td>
<td>417 mm</td>
</tr>
<tr>
<td>M-8460S Only</td>
<td>17.8 inches</td>
<td>452 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Model Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>11.8 inches</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Model M-8460S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>8.9&quot; 227 mm</td>
</tr>
<tr>
<td>Depth</td>
<td>7.08&quot; 180 mm</td>
</tr>
<tr>
<td>Height</td>
<td>9.25&quot; 235 mm</td>
</tr>
</tbody>
</table>

Diagram showing dimensions of the equipment.
REAR PANEL

Power On/Off Switch: To turn power On or Off

Operation Panel To set up the various configurations and to display dispensing quantity and the various alarms. The details of these are described on page 3-5

Adjustment Panel Potentiometers (inside label compartment) to make setup adjustments. The details of these are described on page 3-19.

AC Input Connector To input 115V 50/60 Hz. Use the power cable provided.

AC Fuse To protect the machine from abnormal power input. Type 15A/250V.

Serial I/F Connector Connects to the RS-232C serial port of the host.

Parallel I/F Connector Connects to the Centronics parallel port of the host.

EXT Connector This is an external signal connector for interfacing with the label applicator system.

Memory Card Connectors for Optional PCMCIA Memory Cards.
## SWITCHES AND SENSORS

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover Open Switch:</td>
<td>The print head mechanism cover is fitted with a micro switch. When the cover is opened, this switch is activated and the printer will stop printing.</td>
</tr>
</tbody>
</table>
| Ribbon Motion Sensor: | The sensor will react to the carbon ribbon unwind when approximately 46 feet of ribbon remain. This sensor is a motion detector that signals the printer when the ribbon supply is turning. This sensor is used for both the ribbon end and ribbon near end sensing.  

*Note: The M-8459S Direct Thermal print engine does not use a Ribbon Motion Sensor.*  |
| Head Open Switch:  | When the print head is opened, this switch is activated and the printer will stop printing.                                                |
| Label Sensor:      | This sensor unit contains two sensors for both label gap and Eye-mark sensing.                                                             |
MEDIA LOADING

Ribbon Loading (not applicable for the M-8459S)

1. Open the print head by rotating the Head Latch until the head releases. It is spring-loaded in the open position.

2. Place a new ribbon roll on the Ribbon Unwind Spindle and push it onto the spindle as far as it will go. Make sure the ribbon will unwind from the top of the roll. Note that all SATO ribbons are wound face-in (the ink or dull side faces toward the inside of the roll).

3. Place an empty ribbon core on the Ribbon Wind Spindle and push it onto the spindle as far as it will go.

4. Unwind the clear ribbon leader until about 12 inches of leader/ribbon are off the roll.

5. Route the ribbon as shown in the Ribbon Routing Diagram on the inside of the cover.

6. Tape the end of the ribbon leader to the empty core so that it will underneath the core and over the top (see diagram on inside of cover).

7. Manually wind approximately three turns of ribbon on the core.

8. Inspect the ribbon to make sure it is not folded over or excessively wrinkled as it passes over the print head.

9. If labels are already loaded, close and latch the print head.
Loading the Label Stock

1. Open the print head by rotating the Head Latch until the head releases. It is spring-loaded in the open position.

2. Unlatch the Label Hold Down by lifting up on the latch. It is spring-loaded in the open position.

3. Pull the Label Edge Guide all the way out.

4. Remove approximately 18 inches of labels from the backing liner.

5. Route the label liner under the Label Hold Down and under the print head and out the front of the printer.

6. Pull the liner through the printer until the first label is positioned under the Label Hold Down.

7. Push the labels in until they contact the inside edge of the printer, then position the Label Edge Guide until it lightly contacts the outside edge of the label liner.

8. Close and latch the Label Hold Down and Print Head.

9. Release the Nip Roller Hold Down by rotating the Nip Roller Latch tab clockwise. The Nip Roller Hold Down will swing down.

10. Route the liner over the peel bar and back between the Nip Roller Hold Down and the Nip Roller.

11. Pull the liner tight. Close the Nip Roller Hold Down by pushing upward until it latches in place. Make sure the Nip Roller Latch is securely engaged.

Note: Always check that the backing paper is taut between Platen Roller and Nip Roller.
12. Power the printer on and press the Feed key. It should feed labels until the first label is peeled and ready for application.
ADJUSTING THE LABEL SENSOR

The “S” printers can position labels using either a label gap (transmissive) or an Eye-Mark (reflective) sensor. The sensor used is selected by DSW2-2 (page 3-2). The gap sensor position can be adjusted over a limited range. In addition, the signals from the sensors can be adjusted using the LCD panel (page 3-13) to compensate for different liner opacities and/or Eye-Mark reflectance values.

<table>
<thead>
<tr>
<th></th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Label Width</td>
<td>5.27”</td>
<td>6.5”</td>
<td>5.27”</td>
<td>5.27”</td>
</tr>
<tr>
<td>(includes liner)</td>
<td>(134 mm)</td>
<td>(165 mm)</td>
<td>(134 mm)</td>
<td>(134 mm)</td>
</tr>
<tr>
<td>Max Print Width</td>
<td>4.4”</td>
<td>6.0”</td>
<td>5.0”</td>
<td>4.4”</td>
</tr>
<tr>
<td></td>
<td>(112 mm)</td>
<td>(152 mm)</td>
<td>(128 mm)</td>
<td>(112 mm)</td>
</tr>
<tr>
<td>Gap Sensor</td>
<td>0.5”</td>
<td>0.5”</td>
<td>0.5”</td>
<td>0.5”</td>
</tr>
<tr>
<td>Adjustment Range</td>
<td>to 2.67”</td>
<td>to 3.25”</td>
<td>to 2.67”</td>
<td>to 2.67”</td>
</tr>
<tr>
<td></td>
<td>14 mm to 68 mm</td>
<td>14 mm to 82 mm</td>
<td>14 mm to 68 mm</td>
<td>14 mm to 68 mm</td>
</tr>
<tr>
<td>Non-Print Area</td>
<td>0.12”</td>
<td>0.12”</td>
<td>0.12”</td>
<td>0.12”</td>
</tr>
<tr>
<td></td>
<td>(3 mm)</td>
<td>or 0.25”</td>
<td>(3 mm)</td>
<td>(3 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or 6.5 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ADJUSTING SENSOR POSITION

The label gap (transmissive) sensor can be positioned over a limited (see table on page 2-9). The movable sensor assembly is mounted on the Label Hold Down and is held in position by two screws. To adjust the position of the sensor, both screws must be loosened and the sensor moved to the desired position in the slot, and then the screws retightened. Adjustments to compensate for different liner opacity is done with the LCD panel (see page 3-13).
OPERATION PANEL

LCD Display 2 Line x 16 Character display.
LABEL LED Illuminated when label is out.
RIBBON LED Illuminated when ribbon is out.
Not used on the M-8459S
ERROR LED Illuminated when errors have occurred.
ON-LINE LED Illuminated when printer is On-Line.
LINE Key: Switches the printer On-Line or Off-Line. It can also be used as a Pause function key to stop label during the printing process.
FEED Key To feed one blank label.
DISPLAY Potentiometer for adjusting the contrast of the LCD
The DIP Switch panel is located inside the cover and contains three 8-position DIP switches and three adjustment potentiometers. Adjustment procedures for these are listed in Section 3: Configuration.
DIP Switch Panels

There are three DIP switches (DSW1, DSW2 and DSW3). These are located inside the cover. These switches can be used to set:

- RS232C transmit/receive parameters
- Thermal transfer or direct thermal mode
- Label sensor enable/disable
- Head check mode
- Hex dump mode
- Receive buffer size
- Operation mode

Each switch is an eight section toggle switch. The ON position is always to the top. To set the switches, first power the unit Off, then position the DIP switches. Finally, after placing the switches in the desired positions, power the printer back on. The switch settings are read by the printer electronics during the power up sequence. They will not become effective until the power is cycled.

RS232 Transmit/Receive Setting

Data Bit Selection (DSW1-1). This switch sets the printer to receive either 7 or 8 bit data bits for each byte transmitted.

<table>
<thead>
<tr>
<th>DSW1-1</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>8 data bits</td>
</tr>
<tr>
<td>On</td>
<td>7 data bits</td>
</tr>
</tbody>
</table>

Parity Selection (DSW1-2, DSW1-3). These switches select the type of parity used for error detection.

<table>
<thead>
<tr>
<th>DSW1-2</th>
<th>DSW1-3</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>No Parity</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>Even</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>Odd</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>Not Used</td>
</tr>
</tbody>
</table>
**Stop Bit Selection (DSW1-4).** Selects the number of stop bits to end each byte transmission.

<table>
<thead>
<tr>
<th>DSW1-4</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>1 Stop Bit</td>
</tr>
<tr>
<td>On</td>
<td>2 Stop Bits</td>
</tr>
</tbody>
</table>

**Baud Rate Selection (DSW1-5, DSW1-6).** Selects the data rate (bps) for the RS232 port.

<table>
<thead>
<tr>
<th>DSW1-5</th>
<th>DSW1-6</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>9600</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>19200</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>4800</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>2400</td>
</tr>
</tbody>
</table>

**Protocol Selection (DSW1-7, DSW1-8).** Selects the flow control and status reporting protocols. See Section 5: Interface Specifications for more information.

<table>
<thead>
<tr>
<th>DSW1-7</th>
<th>DSW1-8</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>Rdy/Bsy</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>Xon/Xoff</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>Bi-Com</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>Not Used</td>
</tr>
</tbody>
</table>

**Printer Set Up**

**Print Mode Selection (DSW2-1).** Selects between direct thermal printing on thermally sensitive paper and thermal transfer printing using a ribbon. *Note: This switch is not used on the M-8459S.*

<table>
<thead>
<tr>
<th>DSW2-1</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Therm Xfr</td>
</tr>
<tr>
<td>On</td>
<td>Direct Therm</td>
</tr>
</tbody>
</table>

**Sensor Type Selection (DSW2-2).** Selects between the use of a label gap or a reflective Eye-Mark detector. See page 2-9 for the location of these sensors.

<table>
<thead>
<tr>
<th>DSW2-2</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Gap</td>
</tr>
<tr>
<td>On</td>
<td>Eye-Mark</td>
</tr>
</tbody>
</table>

**Head Check Selection (DSW2-3).** When selected, the printer will check for head elements that are electrically malfunctioning.

<table>
<thead>
<tr>
<th>DSW2-3</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Disabled</td>
</tr>
<tr>
<td>On</td>
<td>Enabled</td>
</tr>
</tbody>
</table>
**Hex Dump Selection (DSW2-4).** Selects Hex Dump mode (see page 3-21).

<table>
<thead>
<tr>
<th>DSW2-4</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Disabled</td>
</tr>
<tr>
<td>On</td>
<td>Enabled</td>
</tr>
</tbody>
</table>

**Receive Buffer Selection (DSW2-5).** Selects the operating mode of the receive buffer. See Section 5: Interface Specifications for more information.

<table>
<thead>
<tr>
<th>DSW2-5</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Single Job</td>
</tr>
<tr>
<td>On</td>
<td>Multi Job</td>
</tr>
</tbody>
</table>

**Protocol Code Selection (DSW2-7).** Selects the command codes used for protocol control. Refer to page E-1 for more information.

<table>
<thead>
<tr>
<th>DSW2-7</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Standard</td>
</tr>
<tr>
<td>On</td>
<td>Non-Std</td>
</tr>
</tbody>
</table>

**M8400S Emulation Mode (DSW2-8).** For emulating special M8400S series software commands. Should be used only if problems are encountered when using existing M8400S software.

<table>
<thead>
<tr>
<th>DSW2-8</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Disabled</td>
</tr>
<tr>
<td>On</td>
<td>Enabled</td>
</tr>
</tbody>
</table>

**Backfeed Selection (DSW3-1).** Backfeed is used to correctly position the label for application and then retract the next label to the proper print position. This operation can be performed immediately after a label is printed and used, or immediately prior to the printing of the next label.

<table>
<thead>
<tr>
<th>DSW3-1</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Before</td>
</tr>
<tr>
<td>On</td>
<td>After</td>
</tr>
</tbody>
</table>

**Label Sensor Selection (DSW3-3).** Enables or disables the Label Sensor. If the Sensor is enabled, it will detect the edge of the label and position it automatically. If it is disabled, the positioning must be under software control using Line Feed commands.

<table>
<thead>
<tr>
<th>DSW3-3</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Sensor Used</td>
</tr>
<tr>
<td>On</td>
<td>Not Used</td>
</tr>
</tbody>
</table>
**Back-Feed Selection (DSW3-4)**. When Back-Feed is enabled, the printer will position the last printed label for dispensing and retract it before printing the next label. The amount of backfeed offset is adjustable. See page 3-19 for information on setting the amount of offset.

<table>
<thead>
<tr>
<th>DSW3-4</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Enabled</td>
</tr>
<tr>
<td>On</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

**External Signal Interface.** See *Section 5: Interface Specifications* for information on the External Signals.

**EXT Print Start Signal Selection (DSW3-5)**. Allows an external device to initiate a label print for synchronization with the applicator. See page 6-11 for a description of the signal level and requirements.

<table>
<thead>
<tr>
<th>DSW3-5</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Enabled</td>
</tr>
<tr>
<td>On</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

**External Signal Type Selection (DSW3-6, DSW3-7)**. Both the polarity and signal type (level or pulse) of the external print synchronizing signal can be selected. See page 6-11 for a definition of signal types.

<table>
<thead>
<tr>
<th>DSW3-6</th>
<th>DSW3-7</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>Type 4</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>Type 3</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>Type 2</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>Type 1</td>
</tr>
</tbody>
</table>

**Repeat Print via External Signal (DSW3-8)**. Allows the applicator to reprint the current label in the print buffer. See page 6-11 for a description of the signal requirements.

<table>
<thead>
<tr>
<th>DSW3-8</th>
<th>SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Disabled</td>
</tr>
<tr>
<td>On</td>
<td>Enabled</td>
</tr>
</tbody>
</table>

**Reserved for Future Use (DSW2-6, DSW3-2)**

*Note: The Centronics (Parallel) communications port are always enabled regardless of the settings for the RS232 port. There are no settings for Centronics! Both the Centronics and RS232 ports are active at all times. Care should be taken to ensure that data is not transmitted to both ports simultaneously as the received message will be corrupted.*
Default Settings

Switch Selections - All switches are placed in the Off position (default) for shipping. This will result in the following operating configuration:

- **Communications**: 8 data bits, no parity, 1 Stop bit, 9600 Baud
- **Protocol**: Ready/Busy
- **Sensor**: Gap Sensor
- **Receive Buffer**: Single Job
- **Mode**: Batch/continuous
- **Label Sensor**: Sensor Used
- **Backfeed**: Disabled
- **External Signals**: Disabled

Software Default Settings - The printer stores the software settings upon receipt and uses them until they are again changed by receipt of a command containing a new setting. These settings are stored in non-volatile RAM and are not affected by powering the printer off. The printer may be reset to use the default software settings by depressing the **LINE** and **FEED** keys simultaneously while powering the printer on. This will result in the following default configuration:

<table>
<thead>
<tr>
<th></th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print Darkness</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Print Speed</td>
<td>4 in. per sec.</td>
<td>6 in. per sec.</td>
<td>6 in. per sec.</td>
<td>6 in. per sec.</td>
</tr>
<tr>
<td>Print Reference</td>
<td>Vertical = 0000, Horizontal = 0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero</td>
<td>Slash</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auto On Line</td>
<td>Enabled</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Once the default operation is completed, a SATO DEFAULT COMPLETED message will be displayed on the LCD panel or a single beep will be heard if the printer does not have an LCD panel. The printer should be powered off while this message is being displayed (or after the beep is heard). This saves the default settings in the EEPROM where they will be automatically loaded the next time the printer is powered on.

---

**PRINTER ADJUSTMENTS**

The LCD Panel is used in conjunction with the **LINE** and **FEED** switches by the operator to manually enter printer configuration settings. Many of the settings can also be controlled via software commands and in the case of conflict between software and control panel settings, the printer will always use the last valid setting. If you load a label job that includes software settings and then enter a new setting via the Operation Panel, the manually set values will be used by the printer. If you set the values manually and then download a job with software settings, the software settings will be used.
Section 3. Configuration

POWER ON

Normal/User Mode

POWER

ON LINE

QTY:000000

Page 3-7

Print Test Labels

POWER + FEED

User Test Print

Large Small

Page 3-16

Advanced Mode Settings and Adjustments

POWER + LINE

Advanced Mode Setup

Page 3-10

Load SATO Default Settings

POWER + FEED + LINE

SATO Default Completed

Page 3-5

Download User Defined Protocol Codes

POWER + LINE + DSW2-7=ON

User Download

Page E-2

Reset to SATO Default Protocol Codes

POWER + LINE + FEED + DSW2-7=ON

Alt Protocol Default Complete

Page E-2

Print Hex Dump Label

POWER, then DSW2-4=ON

Print Buffer

Hex Dump Label

Page 3-21

Page 3-6 9001034 Rev E SATO “S” Print Engines
Normal Mode

When the printer is powered on, the readout should display the following message:

```
ON LINE
QTY:000000
```

The LCD Panel will display the Online status on the top line of the display and the bottom line will contain the label quantity (QTY) status. The ON LINE message will be changed to OFF LINE whenever the printer is switched offline by depressing the LINE key. As soon as a print job is received, the QTY message will indicate the number of labels to be printed. As soon as the label job begins to print, the display will indicate the number of labels remaining in the print job that remain to be printed.

User Mode

To enter the USER mode:

1. The printer is first taken offline by pressing the LINE key once. The display will change to:

```
OFF LINE
000000
```

2. When the display changes to OFF LINE, press the FEED and LINE keys simultaneously for more than one second.

The printer now displays the first USER mode adjustment (Print Darkness).

Print Darkness Setting

There are three (five on the M-8459S) Darkness (or heat range) settings. The higher numbers represent darker settings. The current setting is indicated by an underline under one of the range settings. To change the setting:

1. Use the LINE key to step the underline cursor to the desired setting.

2. Once the correct setting is underlined, press the FEED key to accept the setting and advance to the next adjustment.

   Note: This setting can be overridden by software (see Print Darkness page 5-52).

After setting the heat range with this command, finer adjustments can be made using the PRINT potentiometer adjustment on the Adjustment panel. See Section 4: CLEANING AND MAINTENANCE, for additional information on how to make this adjustment for optimum print quality.
Print Speed Adjustment

There are three SPEED settings on the M-8490S/M-8460S and four on the M-8485S/M-8459S. The setting is listed on the bottom line of the display. The current setting is indicated by an underline under one of the speed settings. To change the setting:

<table>
<thead>
<tr>
<th>Print Speed Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 = 2 ips</td>
</tr>
<tr>
<td>3 = 3 ips</td>
</tr>
<tr>
<td>4 = 4 ips</td>
</tr>
<tr>
<td>5 = 5 ips</td>
</tr>
</tbody>
</table>

1. Use the **LINE** key to step the underline cursor to the desired speed setting.

2. Once the correct setting is underlined, press the **FEED** key to accept the setting and advance to the next adjustment.

*Note: This setting can be overridden by software (see Print Speed, page 5-58).*

See *Section 4: CLEANING AND MAINTENANCE*, for additional information on how to make this adjustment for optimum print quality.

Pitch Offset and Direction

The label Pitch is the distance from the leading edge (the edge that comes out of the printer first) of a label and the leading edge of the next label. The leading edge position of the label can be adjusted relative to the print head +/- 49 mm in increments of 1 mm using the following procedure. Once the position is set, it can be adjusted +/- 3.75 mm using the PITCH potentiometer on the Adjustment panel (see page 3-19).

1. The underline cursor will be positioned underneath the Pitch Direction setting. Pressing the **LINE** key will step the setting to the positive (+)/ negative (-) selection. A positive selection moves the leading edge of the label forward (away from the print mechanism) while a negative selection moves the leading edge of the label back into the mechanism.

2. Once the correct setting is selected, pressing the **FEED** key will accept the setting and advance to the Pitch Offset adjustment.

3. Use the **LINE** key to step the first digit of the counter to the desired position. The display will increment one step for each time the **LINE** key is pressed. The reading will advance to a setting of 4 after which it will automatically wrap and
start at 4 again. The Pitch Direction set in the previous step will be displayed in front of the Offset setting.

4. Once the setting is correct, pressing the **FEED** key will accept the setting and advance to the next Offset digit. Again use the **LINE** key to step to the desired setting (0 thru 9). Once the setting is correct, pressing the **FEED** key will accept the setting and advance to the Cancel Print Job display.

5. You may wish to check your settings by printing a test label after you have completed the adjustments to ensure that they are correct. See page 3-16 for instructions on how to print a test label.

---

**Cancel Print Job**

If the printer has a print job(s) loaded in memory, selecting YES will cause the job(s) to be cleared. The default selection is NO. Make sure that you want to cancel the print job before selecting YES as the job cannot be recovered and will have to be retransmitted to the printer.

1. Use the **LINE** key to step the underline cursor to either the YES or NO selection.

2. Once the correct setting is underlined, pressing the **FEED** key will accept the setting and terminate the User Mode of operation and return you to the Normal Mode OFF LINE display.

If you wish to change any of the settings, you must enter the User Mode again by simultaneously pressing **FEED** and **LINE** keys for more than one second.

---

**Advanced Mode Setup**
An Advanced Setup Mode is provided to make adjustments that require only occasional adjustments. Since they affect the basic operation of the printer, the procedure for entering this mode is designed to prevent someone from accidently changing the settings.

To enter the Advanced Mode, the printer is powered on while pressing the **LINE** key. The printer will beep one time and display Advanced Mode on the LCD panel. *Note: Pressing the LINE key at this time will take you to the Advanced Mode Counters display (see page 3-16).*

Pressing the **FEED** key will advance the display to the first setting selection.

**Zero Slash Setting**

This setting determines if a zero is printed with a slash or without a slash. This setting can also be controlled via software commands. When YES is selected, the U, S, M, WB, WL, XU, XS, XM, XB, XL and vector fonts will have a slash through the center of the zero character.

1. Use the **LINE** key to step the underline cursor to either the YES or NO selection.
2. Once the correct setting is underlined, pressing the **FEED** key will accept the setting and advance the display to the Auto Online display.

![Zero Slash Setting](image)

**Auto Online Setting**

This setting determines the mode in which the printer powers up. If the YES selection is made, the printer powers up in the ON LINE mode and is ready to print. If NO is selected, the printer powers up in the OFF LINE mode and must be manually placed in the ON LINE mode by pressing the **LINE** key before it is ready to print.

1. Use the **LINE** key to step the underline to either the YES or NO selection.
2. Once the correct setting is underlined, pressing the **FEED** key will accept the setting and advance the display to the Vertical Offset display.

![Auto Online Setting](image)
Vertical Offset Setting

Vertical Offset is the distance down from the leading edge (the edge of the label that comes out of the printer first) to the first vertical print position. It is always a positive setting since making it negative would move it up and off the printable label. This setting changes the base reference point for all subsequent label jobs. Its effect is identical to the <ESC>A3 Base Reference point command (see page 5-19). Since the printer moves the label in discrete steps equal to the size of the print dot, the units of measure for Vertical Offset distance is dots. The maximum values that can be set for the different model printers are:

<table>
<thead>
<tr>
<th>Vertical Offset</th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Length</td>
<td>0 to 1424</td>
<td>0 to 1424</td>
<td>0 to 1424</td>
<td>0 to 2136</td>
</tr>
<tr>
<td>Expanded Length</td>
<td>0 to 2848</td>
<td>0 to 2848</td>
<td>0 to 2848</td>
<td>0 to 4272</td>
</tr>
</tbody>
</table>

Note: This setting can be overridden by the Base Reference Point Command, page 5-19.

1. The underline cursor will be positioned under the first digit of the Vertical Offset setting. Use the LINE key to step setting to the desired value. The display will increment one step for each time the LINE key is pressed.

2. Once the setting is correct for that digit, pressing the FEED key will accept the setting and advance to the next digit. The correct value for the second digit is set by pressing the LINE key. Once it is set to the correct value, pressing the FEED key will accept the setting and advance the cursor to the next digit. This process is repeated until all digits are correctly set. When the last digit is correctly set, pressing the FEED key will advance the display to the next selection.

Horizontal Offset and Direction

Horizontal Offset is distance that the label image is shifted either to the right or left on the label. The image is shifted to the left (when facing the printer) for a positive setting and it is shifted to the right for a negative setting. This setting changes the base reference point for all subsequent label jobs. Its effect is identical to the <ESC>A3 Base Reference point command (see page 5-19). Since the printer can only print in discrete steps equal to the size of the print dot, the units of measure for the Horizontal Offset distance is dots.

Note: This setting can be overridden by the Base Reference Point Command, page 5-19.
1. The underline cursor will be positioned under the Horizontal Direction setting. Use the **LINE** key to step the direction setting to the positive (+) or negative (-) value. A positive selection increases moves the horizontal reference point for the label to the right edge of the label, towards the outside, while a negative selection moves the horizontal reference point for the label to the left, towards the inside of the printer.

2. Once the correct direction setting is underlined, pressing the **FEED** key will accept the setting and advance to the first digit of the Horizontal Offset adjustment.

3. Use the **LINE** key to step the setting to the desired value. The display will increment one step for each time the **LINE** key is pressed. Pressing the **FEED** key will accept the setting and advance the underline cursor to the next digit. Use the **LINE** key to step it to the desired value and press the **FEED** key to accept the setting and advance to the next digit.

<table>
<thead>
<tr>
<th></th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal Offset</td>
<td>+/- 896</td>
<td>+/- 1216</td>
<td>+/-1024</td>
<td>+/-1344</td>
</tr>
</tbody>
</table>

*Note: The printer will not wrap images that extend beyond the print area. Any part of the image that extends beyond the print area will be truncated.*

4. Once the last digit has been correctly set, pressing the **FEED** key will accept the setting and advance to the Sensor Threshold display.
Sensor Threshold Level

The printer determines the location of the leading edge of the label by measuring the difference between light levels when it sees either a label edge or a black EYE mark. This adjustment allows you to manually set the threshold voltage level, between the maximum and minimum light levels. DIP switch DSW2-2 selects the sensor type. If DSW2-2 is in the OFF position, the setting will be for a See-Thru (or Gap) sensor and the LCD will display GAP on the top line along with the current setting. If DSW2-2 is in the ON position, the LCD will display EYE on the top line with its current setting. If the value entered for the bottom line setting is 0.0V, then the printer will automatically calculate the setting when the first label is fed after the printer is powered on or the head is closed. There are some instances where the automatically calculated value must be adjusted to ensure reliable label feeding, such as when the backing opacity or the reflectance of the EYE mark varies significantly within a roll of labels or between label rolls. In these instances the value should be set using the following procedures.

**GAP** - When setting the gap threshold, the voltage shown on the top line of the display must be measured with nothing but the backing in the sensor and then again with a label still attached to the backing. The formula to be used for setting the threshold is:

\[(\text{High Voltage Level} + \text{Low Voltage Level}) \times 0.5 = \text{Start Value}\]

1. Insert a label still attached to the backing into the sensor (see page 4-4 for location of the sensors) and close the Label Hold-Down. Record the voltage shown on the top line of the LCD panel. This line should have the message GAP on the top line (DIP switch DSW2-2 = OFF). Make sure the label is all the way under the sensor.

2. Strip the label from the backing and insert the backing strip under the sensor and close the Label Lid. Record the voltage shown on the top line of the LCD panel. The voltage ranges measured should be within the following ranges:

<table>
<thead>
<tr>
<th>Backing with Label</th>
<th>Label Backing Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0V to 3.5V</td>
<td>Less than 1.0V</td>
</tr>
</tbody>
</table>

If the measured values are outside this range, you may have trouble in finding a value that will work properly under all conditions. If this is the case, a higher quality label may be needed to get adequate performance.

3. Calculate the starting point voltage using the formula.

4. Use the **LINE** key to step the counter to the desired setting. The display will increment one step for each time the **LINE** key is pressed. If the **LINE** key is held pressed for more than two seconds, it will automatically go into the fast scroll mode. The reading will advance to a setting of 4.9 (the maximum voltage) after which it will automatically wrap and start at 0.0 again. If a value of 0.0 is set, the
printer will automatically set the level half way between the two measured voltages each time the printer is powered on with labels loaded.

5. Once the setting is correct, pressing the **FEED** key will accept the setting and advance to the Calendar Set display.

6. Repeat this procedure using values slightly higher or lower until the optimum performance is obtained. If you cannot find a setting between the high and low readings that gives adequate performance, please refer to the “S” Printer Service Manual.

**EYE** - When setting the eye threshold, the voltage must be measured with nothing but the label under the sensor and then again with the printed eye mark under the sensor. The formula for this is:

\[(\text{High Voltage Level} + \text{Low Voltage Level}) \times 0.5 = \text{Start Value}\]

1. Insert a label into the sensor (see **Section 3: Cleaning and Maintenance** for location of the sensors) and close the Label Hold-Down. Make sure the printed eye mark is **not** under the sensor. Record the voltage shown on the top line of the LCD panel. This line should have the message EYE on the top line (DIP switch DSW2-2 = ON).

2. Now pull the label forward until the eye mark is positioned under the sensor (the voltage reading should be at its highest point). Record the voltage shown on the top line of the LCD panel. The voltage ranges measured should be within the following ranges:

<table>
<thead>
<tr>
<th>Label Only</th>
<th>Eye Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1.0V</td>
<td>2.5V to 3.5V</td>
</tr>
</tbody>
</table>

If the measured values are outside this range, you may have trouble in finding a value that will work properly under all conditions. If this is the case, a higher quality label may be needed to get adequate performance.

3. Calculate the starting point voltage using the formula.

4. Use the **LINE** key to step the counter to the desired setting. The display will increment one step for each time the **LINE** key is pressed. If the **LINE** key is held pressed for more than two seconds, it will automatically go into the fast scroll mode. The reading will advance to a setting of 4.9 (the maximum voltage) after which it will automatically wrap and start at 0.0 again. If a value of 0.0 is set, the printer will automatically set the level each time the printer is powered on with labels loaded or the head is closed.

5. Once the setting is correct, pressing the **FEED** key will accept the setting and advance to the Calendar Set display.

6. Repeat this procedure using values slightly higher or lower until the value that gives adequate performance is found. If adequate performance cannot be obtained, please refer to the “S” Printer Service Manual.
Calendar Set

If the Calendar Option is installed in the printer, the date and time can be set manually using the LCD Display or via the `<ESC>`-WT Calendar Set command (see page 5-78). The last setting, set either manually via software command, received by the printer will be the value used. The format of the display is YY/MM/DD hh:mm (Year/Month/Day/hours:minutes). The date format is fixed and cannot be changed.

1. To enable the Calendar feature (if installed), press the **LINE** key until the underline cursor is beneath the Y(es). If the Calendar feature is to be disabled, press the Line key until the cursor is under the N(o). When the desired setting is selected, press the **FEED** key to strip the display to the Calendar Set display.

1. Year - The first display shown will have the two digit year selection underlined. You can scroll through the dates by pressing the **LINE** key. The year number will increase by one each time the **LINE** key is pressed until it reaches its maximum legal value (i.e., 99 for the year digits) at which point it will wrap around to the 00 setting.

2. Month - After you have set the correct year, pressing the **FEED** key will advance the underline cursor to the two digit Month position. You can scroll through the numbers corresponding to the month by pressing the **LINE** key. The month number will increase by one each time the **LINE** key is pressed until it reaches a value of 12 at which point it will wrap around to the 01 setting.

3. Day - After you have set the correct month, pressing the **FEED** key will advance the underline cursor to the two digit Day position. You can scroll through the numbers corresponding to the month date by pressing the **LINE** key. The date number will increase by one each time the **LINE** key is pressed until it reaches a value of 31 at which point it will wrap around to the 01 setting.

4. Hour - After you have set the correct day, pressing the **FEED** key will advance the underline cursor to the two digit Hour position. You can scroll through the numbers corresponding to the hour (using a 24 hour clock) by pressing the **LINE** key. The hour number will increase by one each time the **LINE** key is pressed until it reaches a value of 24 at which point it will wrap around to the 01 setting.

5. Minute - After you have set the correct hour, pressing the **FEED** key will advance the underline cursor to the two digit Minute position. You can scroll through the numbers corresponding to the hour by pressing the **LINE** key. The minute number will increase by one each time the line key is pressed until it reaches a value of 60 at which point it will wrap around to the 01 setting.

6. After you have set the minute, pressing the **FEED** key will accept the setting and advance to the Ignore CR/LF display.
Ignore CR/LF

Under certain circumstances, it is desirable to filter out all CR/LF combinations from the data stream. Selecting YES for this setting will strip all CR/LF commands from the data stream, including graphics and 2D bar codes.

![IGNORE CR/LF](https://example.com/ignore_crlf)

1. Step the underline cursor to the desired setting with the LINE key
2. Once the desired setting is selected, pressing the FEED key will accept the setting and advance to the next display.

Exit Mode

This allows you to exit the Advanced Mode or to recycle through the selections again.

![EXIT MODE](https://example.com/exit_mode)

1. Use the LINE key to step the underline cursor to either the YES or NO selection. The default position is NO.
2. Once the correct setting is underlined, pressing the FEED key will advance the display to the OFF LINE mode if YES was underlined or back to the Advanced Setup Mode display if NO was selected.

Advanced Mode Counters

An Advanced Counter Mode is provided for reading and clearing the internal counters. They allow the user to keep track of the number of centimeters of label material that has passed through the printer, how many labels have been dispensed or how many labels have been cut.

To enter the Advanced Mode, the printer is powered on while pressing the LINE key. The printer will beep one time and display Advanced Mode on the LCD panel.

![ADVANCED MODE SETUP](https://example.com/advanced_mode_setup)

Pressing the LINE key will advance the display to the Advanced Counter Mode display.
Pressing the **FEED** key will advance the display to the counter selections.

![Counters Display]

The counters are identified in the display as:

- **HD**: Head Counter (should be reset when print head is replaced)
- **DSP**: Dispense Counter (not used on “S” printers)
- **CUT**: Cutter Counter (not used on “S” printers)
- **LIFE**: Life Counter (cannot be reset)

1. Use the **LINE** key to step the underline cursor to the desired counter, the Head (HD) counter, Dispenser (DSP) counter, the CUT (Cutter) counter or the LIFE counter. The default position is the Head Counter. Use the **LINE** key to advance the underline cursor to the desired selection.

2. Once the correct setting is underlined, pressing the **FEED** key will display the current value (in kilometers) stored in the counter.

![Head Counter Display]

3. Pressing the **FEED** key again will advance the counter to the Clear mode. All counters with the exception of the LIFE counter may be cleared.

![Head Counter Clear Display]

4. Use the **LINE** key to select the desired setting. If you only wanted to read the counter value, select NO. If you want to read the counter and reset it to 0.0, place the underline cursor under the YES. Once the desired setting is selected, pressing the **FEED** key will advance the display to the Exit Advanced Mode display. (See page 3-16).

**User Test Print**

This option allows you to print a test label. It is recommended that you print a test label after you have changed any of the settings in the Advanced Mode. The test label allows you to verify that you indeed did make the desired changes. To enter the User Test Print Mode, power the printer on while pressing the **FEED** key. The printer will beep. Release the **FEED** key and the printer will display the following message on the LCD panel:

- Use the **LINE** key to step the underline cursor to either the LARGE or SMALL selection. If LARGE is underlined, a label will be printed for a maximum width label. The default position is LARGE.

If LARGE was selected, a label containing a head check pattern and the current printer setting information will be printed.
2. Once the desired label size setting is underlined, pressing the **FEED** key will cause a label to be printed if LARGE was underlined. If SMALL was underlined, the display will advance to the Print Size display.

**Print Size**

If SMALL was selected, the Print Size message will be displayed. You must enter the width of the label. The minimum and maximum label width that can be selected is:

<table>
<thead>
<tr>
<th>Label Width</th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td></td>
<td>4 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.6 in.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td>11 cm</td>
<td>15 cm</td>
<td>12 cm</td>
<td>11 cm</td>
</tr>
<tr>
<td></td>
<td>4.3 in.</td>
<td>5.9 in.</td>
<td>4.7 in.</td>
<td>4.3 in.</td>
</tr>
</tbody>
</table>

Pressing the **LINE** key will increment the setting by 1 cm for each time the key is pressed. Once the maximum size is reached, the display will wrap around and start incrementing at 04 cm again. Once the correct label width is selected, pressing the **FEED** key will initiate the print. The SMALL label only contains a head check pattern.

If you wish to pause the printer after it starts to print a test label, press the **LINE** key to place it Off-Line. Pressing the **LINE** key again will place the printer back On Line and the test label will resume printing. If you wish to stop the test label print, pause the printer and then turn power off without placing it On Line.
POTENTIOMETER ADJUSTMENTS

PITCH

After the pitch has been set with the LCD Control Panel, it is sometimes desirable to make minor adjustments. This can be done using the PITCH potentiometer on the front panel. This potentiometer is set at the factory so that it has a range of +/- 3.75 mm. The midpoint setting should have no effect on the pitch. Turning the potentiometer all the way clockwise should move the print position 3.75 mm up towards the top edge of the label. Turning it all the way counterclockwise should move the print position down 3.75 mm.

1. While depressing the LINE key on the front panel, power the printer on.

2. When you hear one beep from the printer, release the LINE key and the printer will begin printing Test Labels continuously.

3. Select the a Large or Small label width using the LCD display lanel and the LINE key. If Small is selected, you must also set the appropriate width. See page 2-39, Print Size.

4. Adjust the PITCH potentiometer on the front panel until the first print position is at the desired location on the label. If the potentiometer does not have enough range, then you will have to change the pitch setting using the front panel display.

5. Press the FEED key to stop the printer.

Adjusting the PITCH potentiometer will affect the stop position of the label.

BACKFEED OFFSET

When a label is printed it must be correctly positioned for dispensing and application. The Backfeed adjustment is used to position the label so that it is fully dispensed and ready for application. It may then be necessary to reposition the next label before printing. The Backfeed (repositioning of the label) operation is enabled if DSW3-4 is in the Off position. If Backfeed is enabled, placing DSW3-1 is in the Off position will cause the backfeed operation to be performed immediately before each label is printed. If DSW3-1 is in the On position, the backfeed operation is performed as soon as the dispensed label has been printed and taken from the printer.

The amount of backfeed is controlled by the OFFSET potentiometer on the DIP Switch Panel inside the cover. When turned all the way counterclockwise, the amount of backfeed is +3.75 mm, and -3.75 mm when turned all the way counterclockwise.

1. Turn the printer on.

2. Press the LINE key to place the printer in the Off Line status.

3. Press the FEED key to feed out a blank label.
4. Adjust the position using the OFFSET potentiometer on the front control panel and feed another label by depressing the FEED key. Repeat this procedure until the label is fully released from the liner.

**DISPLAY**

This potentiometer is used to adjust the contrast of the LCD display for optimum viewing under various lighting conditions.

**PRINT**

The PRINT potentiometer is used to adjust the amount of heat (i.e., power) applied to the head for printing. It provides a continuous range of adjustment. Maximum print darkness is obtained by turning the potentiometer all the way clockwise and a maximum counterclockwise setting will give the lightest print.

*NOTE: The PRINT potentiometer adjustment will affect the darkness in all of the command code speed and darkness ranges (see pages 5-52 and 5-58).*
HEX DUMP DIAGNOSTIC LABELS

In addition to the User Test Print Labels (see page 3-16), the printer contents of the receive and print buffers can be examined using the Hex Dump Test Labels.

Print Buffer Hex Dump

The contents of the Print Buffer can be examined using the Hex Dump mode. The label numbers each line of data received in the left-hand column, the data in hexadecimal format in the center columns followed by the same data in ASCII format in the right-hand column.

1. Turn the printer on.
2. Send and print label.
3. Place the printer in the Off Line mode by pressing the LINE key. The LINE LED should go out.
4. Place DSW2-4 in the On position.
5. Press the LINE key to place the printer back On Line.
6. Press the FEED key.
7. A label should be printed containing the contents of the print buffer in Hexadecimal format.
8. Return DSW2-4 to the off position.
9. Turn the printer off and then back on to place it back in the normal print mode.

Receive Buffer Hex Dump

The data that is being received by the printer (before it is placed in the Print Buffer) can be examined by using the Hex Dump Mode. The label numbers each line of data received in the left-hand column, the data in hexadecimal format in the center columns followed by the same data in ASCII format in the right-hand column.

1. Turn the printer off.
2. Place DSW2-4 in the on position.
3. Turn the printer on.
4. Transmit the data to the printer.
5. The data received is printed out on a label in hexadecimal format.
6. Return DSW2-4 to the off position.
7. Turn the printer off and then back on to place it back in the normal print mode.
Section 3. Configuration

Print Buffer Hex Label

Receive Buffer Hex Label
SECTION 4.
CLEANING AND MAINTENANCE

INTRODUCTION

The following information is presented in this section:

- Adjusting the Print Quality
- Cleaning the Print Head, Platen and Rollers
- Replacing the Print Head
- Replacing the Fuse

ADJUSTING THE PRINT QUALITY

One of the nice features of the SATO “S” printers are their high print quality. They are equipped with two different methods of adjusting the quality of the print: print darkness and speed. When adjusting for optimum print quality, a bar code verifier system should be used. The human eye is a poor judge of the relative widths of the bars in a symbol, a characteristic that is extremely important for good bar code quality.

Print (Darkness)

This adjustment allows the user to control (within a specified range) the amount of power that is used to activate the individual print head heat elements. It is important to find a proper print darkness level based on your particular label and ribbon combination. The printed images should not be too light nor should the ink from the ribbon “bleed.” The edges of each image should be crisp and well defined.

The Print Darkness can be set using the front panel LCD panel (see page 3-7) or by downloading the setting using the Print Darkness software command (see page 5-52). Once the range has been selected, the PRINT Potentiometer on the front panel can be used to make finer adjustments.
PRINT Potentiometer

The primary adjustment for Print Darkness is the PRINT potentiometer on the operator panel. It provides a continuous range of adjustment, allowing you to make precise changes. Use a small cross-point screwdriver, turning clockwise for darker print and counterclockwise for lighter print.

NOTE: The PRINT potentiometer adjustment will affect the darkness in all of the command code speed ranges, i.e. if the PRINT potentiometer is adjusted for lighter print, the darkness will be lighter in all speed ranges selected by the command code.

Print Speed

The other method of controlling print quality is by controlling the speed at which the label is printed. This adjustment is made only on an individual label basis using the Print Speed command code. For more details on this command, see Section 4, Programming. Changing the print speed allows the user to control the amount of time allowed for print element cooling before the media is stepped to the next print position. It is especially critical when printing “ladder” bar codes (bar codes printed with the bars parallel to the print line). When printing a “ladder” bar code, it is important to allow the head to cool sufficiently before stepping to the next position. If it does not have sufficient time to cool, the bar will be “smeared” on the trailing edge.

The Print Speed can be set using the LCD panel (see page 3-5) or with the Print Speed software command (see page 4-60). The software command will override the any setting entered using the LCD panel. The other method of controlling print quality is by controlling the speed at which the label is printed. This adjustment is made only on an individual label basis using the Print Speed command code. For more details on this command, see Section 5, Programming. Changing the print speed allows the user to control the amount of time allowed for print element cooling before the media is stepped to the next print position. It is especially critical when printing “ladder” bar codes (bar codes printed with the bars parallel to the print line). When printing a “ladder” bar code, it is important to allow the head to cool sufficiently before stepping to the next position. If it does not have sufficient time to cool, the bar will be “smeared” on the trailing edge.

CLEANING THE PRINT HEAD, PLATEN AND ROLLERS

Supplies needed: SATO SA070 Cleaning Kit

Cleaning the Print Head

1. Turn the printer off.

2. Open the Label Access door.

3. Open the Print Head Assembly by pushing the Head Latch toward the rear of the printer. The Print Head Assembly is spring-loaded and will automatically open as soon as the Head Latch is disengaged.

4. Apply SATO Thermal Print Head Cleaner to a cotton swab.
5. The **Print Head** faces downward along the front edge of the assembly. Pass the end of the dampened swab along the entire width of the **Print Head** (you may need to move the ribbon out of the way to do this).

5. Check for any black coloring or adhesive on the swab after cleaning.

6. Repeat if necessary until the swab is clean after it is passed over the head.

7. The head should be cleaned at least every time the ribbon is changed and more often in dusty environments.

**Cleaning the Platen and Rollers**

1. Turn the printer off.

2. Open the label access door.

3. Open the **Print Head Assembly** by pushing the **Head Latch** toward the rear of the printer. The **Print Head Assembly** is spring-loaded and will automatically open as soon as the **Head Latch** is disengaged.

4. Apply SATO Thermal Print Head Cleaner to one of the cotton swabs.

5. The **Platen** is the rubber roller directly below the **Print Head**. It should be cleaned of any ribbon or label residue.

6. The **Label Feed Roller** is located underneath the **Label Hold-Down**. It should be cleaned of any label residue or foreign material. Clean the **Label Pressure Rollers** on the underside of the **Label Hold-Down**.

7. There is one metal **Ribbon Guide Roller** used in guiding the ribbon through the printer. It should be cleaned of any residue or foreign material.

8. Repeat if necessary. The platen and rollers should be cleaned whenever foreign matter such as dust or adhesive is present.
CLEANING THE SENSORS AND PAPER END SWITCH

There are two sensors that are used to control the positioning of the label. One is a transmissive see-thru sensor that detects the edge of the label by looking through the backing paper which is translucent and detecting the presence of the opaque label. The other is a reflective sensor that detects the light reflected from the bottom of the label liner. When a printed black Eye-Mark passes through the beam, the light is no longer reflected back to the sensor detector, indicating to the printer that it should use this position as the start of a new label. When dust, dirt, adhesive or other foreign matter interferes with the light path of either of these sensors, the results is erratic label positioning. These sensors should be cleaned regularly, at least every two rolls of labels. The Paper End Switch is located in front of the sensor window and should be periodically checked for residue on the actuator roller.

Supplies Needed: SATO SA070 Cleaning Kit

1. Turn the printer off.

2. Open the label access door.

3. Open the Label Hold-Down by disengaging the latch. The Label Hold-Down is spring loaded and will stay in the up position. The Upper Sensor will be visible on the underside of the Label Hold-Down when it is raised. It is adjustable over a range of 0.5” (14 mm) to 2.67” (68mm ) from the inside edge of the label. The Sensor Window is positioned directly below the Upper Sensor.

4. Apply SATO Thermal Print Head Cleaner to one of the cotton swabs.

5. Use the cotton swab to clean any foreign matter from the exposed surface of the sensors.

6. Check the roller on the Paper End Switch for residue and clean if necessary.
REPLACING THE PRINT HEAD

The print head is a user-replaceable item. If it becomes damaged for any reason, it can be easily removed and replaced. Contact your local SATO representative for information on obtaining a new print head.

Supplies needed: Flat Blade Screwdriver (Note: Some units may require a No. 2 Phillips screwdriver)

1. Turn the printer off and remove the power cable.

2. Open the Label Access door.

3. View the Print Head Assembly from the front of the printer. Locate the center mounting screw on the top of the assembly. (Do not take out the two outside alignment screws!) It is accessible through the center hole in the Top Assembly Plate. Remove this screw and set it aside.

4. Open the Print Head Assembly by pushing the Head Latch toward the rear of the printer. The Print Head Assembly is spring-loaded and will automatically open as soon as the Head Latch is disengaged.

5. Remove the ribbon from the Rewind Spindle if necessary.

6. The Print Head should now be loosened from the top of the assembly by grasping either side and carefully pulling it down and forward.

7. Disconnect the signal and power cables from the print head connectors and set the Print Head aside.

8. Carefully attach the new print head to the connectors, using caution to make sure the connector keys are correctly positioned.
NOTE: Be careful not to scratch the printing surface of the print head while installing it. Scratching the surface will cause permanent and irreparable damage and is not covered by the warranty!

9. Locate the mounting screw in the top plate assembly and align it with the tapped hole in the new print head.

10. Re-secure the print head by tightening the screw.

REPLACING THE FUSE

Supplies needed: 250V 15A Fuse

1. Turn the printer power off and remove the power cable.

2. On the back of the printer, locate the **Fuse Cap** directly above the AC connector.

3. Unscrew the cap and remove the defective fuse.

4. Replace with a new 250V 15A fuse.

5. Screw the fuse cap back onto the printer and replace the power cable.
SECTION 5. PROGRAMMING

INTRODUCTION

This section presents the commands that are used with the SATO “S” printers to produce labels with logos, bar codes and alphanumeric data.

The following information is presented in this section:

- The SATO Programming Language
- Selecting Protocol Control Codes
- Using Basic
- The Print Area
- Command Codes

THE SATO PROGRAMMING LANGUAGE

A programming language for a printer is a familiar concept to most programmers. It is a group of commands that are designed to use the internal intelligence of the printer. The commands, which are referred to as SATO Command Codes, contain non-printable ASCII characters (such as `<STX>`, `<ETX>`, `<ESC>`) and printable characters. These commands must be assembled into an organized block of code to be sent as one data stream to the printer, which in turn interprets the command codes and generates the desired label output. The programmer is free to use any programming language available to send the desired data to the printer.

The command codes used are based upon “Escape” (1B hexadecimal) sequences. Typically there are four types of command sequences:

- `<ESC>{Command}`
- `<ESC>{Command} {Data}`
- `<ESC>{Command} {Parameter}`
- `<ESC> {Command} {Parameter} {Data}`

These commands generally tell the printer to perform a specific action, like “clear the memory.”

Commands with this format tell the printer to perform a specific action which is dependent upon the following data, like “print X labels”, where the value for X is contained in the data.

These commands set the operational parameters of the printer, like “set the print speed to 3.”
Some commands can contain both Parameter and Data elements, such as “print a Code 39 symbol containing the data.”

SELECTING PROTOCOL CONTROL CODES

Protocol codes are the special control characters that prepare the printer to receive instructions. For example, the <ESC> character tells the printer that a command code will follow and the <ENQ> character asks for the printer status.

There are two different sets of Protocol Control codes to choose from on the printer. Each set is made up of six special characters. The Standard Protocol Control codes are non-printable characters, and the Non-Standard Protocol Control codes are printable characters. The Non-Standard set may be useful on host computers using protocol converters or in an application where non-printable ASCII characters cannot be sent from the host. This manual uses the Standard Protocol Control codes for all of the examples.

The Protocol Control codes are selected by a DIP switch DSW2-7 on the front panel. See Section 3: Printer Configuration.

<table>
<thead>
<tr>
<th>CONTROL CHARACTER</th>
<th>STANDARD DSW2-7 OFF</th>
<th>NON-STANDARD DSW2-7 ON</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>STX</td>
<td>02 Hex</td>
<td>7B Hex = {</td>
<td>Start of Data</td>
</tr>
<tr>
<td>ETX</td>
<td>03 Hex</td>
<td>7D Hex = }</td>
<td>End of Data</td>
</tr>
<tr>
<td>ESC</td>
<td>1B Hex</td>
<td>5E Hex = ^</td>
<td>Command code to follow</td>
</tr>
<tr>
<td>ENQ</td>
<td>05 Hex</td>
<td>40 Hex = @</td>
<td>Get printer status, Bi-Com mode</td>
</tr>
<tr>
<td>CAN</td>
<td>18 Hex</td>
<td>21 Hex = !</td>
<td>Cancel print job, Bi-Com mode</td>
</tr>
<tr>
<td>Off-Line</td>
<td>40 Hex</td>
<td>5D Hex = ]</td>
<td>Take printer Off-Line</td>
</tr>
</tbody>
</table>

USING BASIC

It may be useful to test your printer using a BASIC program on a PC. You may also write your actual production programs in BASIC. Whatever the reason, if you will be working in BASIC, some of the following hints may help you get started:

1. Set the WIDTH of the output device to 255 characters to avoid automatically sending <CR> and <LF> characters after every line. The command string should be continuous and uninterrupted by <CR> and/or <LF> commands. The examples given in this manual are printed on separate lines because they will not fit on one line and do not contain any <CR> and/or <LF> characters. If these characters are needed, they are explicitly noted by the inclusion of <CR> and <LF> notations.

2. If you are using the printer's RS232 interface, it is necessary to set the COM port on the PC such that the CTS and DSR signals will be ignored. Send your OPEN “COM” statement in the following way:
OPEN “COM1:9600,E,8,1,CS,DS” AS #1

This sets the RS232 communication parameters of the host PC’s COM1 port for 9600 baud, Even parity, 8 Data bits, 1 Stop bit and directing the port to ignore the CTS and DSR control signals.

3. You may want to minimize keystrokes and program size by assigning the <ESC> character to a string variable since this character is used quite often.

The following two examples in BASIC show a typical example using these hints. Both of these examples use the Standard Protocol codes.

**Printing with the Parallel Port**

5 REM Parallel Example

10 E$=CHR$(27); Sets the “E$” string as an <ESC> character

20 WIDTH “LPT1:”,255 Sets the width of the output to 255 characters

30 LPRINT E$;“A”; Sends an “<ESC>A” command code to the LPT1 parallel port

40 LPRINT E$;“H400”,E$;“V100”;E$;“WL1SATO”; Sends the data “SATO” to be to be placed 400 dots horizontally and 100 dots vertically on the label and printed in the “WL” font.

50 LPRINT E$;“Q1”; Instructs the printer to print one label.

60 LPRINT E$;“Z”; Tells the printer that the last command has been sent. The printer can now create and print the job.

**Printing with the RS232 Port**

5 REM RS232 Example

10 E$=CHR$(27); Sets the “E$” string as an <ESC> character.

20 OPEN “COM1:9600,N,8,1,CS,DS” AS #1 Opens the COM1 port for output and sets the parameters as 9600 baud, No parity, 8 Data bits, 1 Stop bit and instructs the port to ignore the CTS and DSR control signals.

30 PRINT #1,CHR$ (2); Sends an <STX> (ASCII Code a decimal “2”) to the printer instructing it to prepare to receive a message.

50 PRINT #1,E$;“A”; Sends an “<ESC>A” command code to Print Port #1 opened by statement 20 above.
60 PRINT #1, E$;"H400",E$;"V100";E$;"WL1SATO"; Sends the data “SATO” to be placed 400 dots horizontally and 100 dots vertically on the label and printed in the “WL” autosmoothed font.

70 PRINT #1, E$;"Q1"; Instructs the printer to print a quantity of one label.

80 PRINT #1, E$; "Z"; Tells the printer that the last command has been sent. The printer can now create and print the job.

90 PRINT #1,CHR$ (3); Sends an <ETX> (ASCII Code decimal “3”) to the printer telling it that this is the end of the message.

**THE PRINT AREA**

The maximum print area depends upon the printer model (see the table on page 2-9). The length for both printers is 7 inches long in the standard mode and 14 inches long if the pitch area is expanded with the Expanded Print Length command. The maximum length can be extended to 49.2 inches for the all printers but the M-8490S and 32.8 inches for the M-8490S with the installation of additional memory. Most of your label applications will not require labels this large, therefore, it is important to understand how to work with labels that do not use the entire print area. The goal is to help you avoid printing where no label exists, which may lead to print head damage, not to mention the frustration when you cannot see the printed output.

The diagram below illustrates the print area for a standard (Right-Hand) M-8485S and a sample 2 inch wide by 3 inch long label placed within this area. As can be seen, your label will be oriented against the inside right edge of the printer as viewed from the front (label exit) of the printer. If you are using an M-8485S Left-Hand printer, the reference point is on the outside edge of the label away from the mounting plate.
The normal reference point is located at the H1, V1 position of the print area in the normal print orientation (no rotation).

The base reference point is always on the right edge of the print head as you face the front (label exit) of the printer. If you are using a label that is narrower than the maximum print width, you may have to adjust the base reference point of the Left-Hand printer to correctly position the print area. If you are using a Left-Hand M-8485S and need to adjust the position of the label, there are two methods available. They are as follows:

1. Send the Base Reference Point command as part of your data to the printer to set a new base reference point for your label.

   Calculate the distance (in dots) that corresponds to the amount you wish to shift the label print area. If you wanted to move the print area over to the left (as viewed from the front or label exit end of the printer) 3.0 inches:

   \[
   \text{Shift Distance} = 3.0'' \times 25.4 \text{ mm/in} \times 8 \text{ dpmm} = 610 \text{ dots}
   \]

   \[
   \text{New Base Reference Point} = 610 \text{ dots}
   \]

   Issue the Base Reference Point command after the Start command in your data stream.

   \[<\text{ESC}>A3H0610V0001\]

   This resets the reference point for all the following data.

   \[\text{Note: After the reference point is moved, you can no longer print on the 610 dot \text{"margin"} unless the reference point is reset.}\]

2. Use the normal base reference point from the print area and use the horizontal position for each field to properly locate it on the label.

   Calculate the distance (in dots) from the normal base reference point to the closest edge of the label.

   \[
   \text{Shift Distance} = 3.0'' \times 25.4 \text{ mm/in} \times 8 \text{ dpmm} = 610 \text{ dots}
   \]

   Each \[<\text{ESC}>H\] command would have the value “610” added to it to correctly position each field.

The Command Code subsection contains a sample label output for each command code. These samples reflect how the printed information would appear on a five inch wide label (see illustration). If you want to test any of the sample label outputs and are using labels less than five inches in width, you will have to adjust the positioning accordingly so that the printer does not try to print where there is no label.

You must be careful not to print off the label surface as the label provides a heat sink for the print head elements. Doing so will cause irreparable damage to the head. This damage is not covered under the print head warranty.
For example, the following illustrates a sample data stream and the resulting label assuming a five inch wide label on a left-hand model printer:

\[
\text{<ESC>A} \\
\text{<ESC>H0050<ESC>V0100<ESC>L0303<ESC>MSATO} \\
\text{<ESC>H0050<ESC>V0200<ESC>B103100*SATO*} \\
\text{<ESC>H0070<ESC>V0310<ESC>L0101<ESC>USATO} \\
\text{<ESC>Q1<ESC>Z}
\]

If you are using a two inch wide label, the entire image may not appear on your label. By adding the following Base Reference Point command to the second line of the data stream, the base reference point will be changed, causing the image to be shifted over toward the inside of the printer where it can be printed on the narrower label.

\[
\text{<ESC>A} \\
\text{<ESC>A3H0610V0001} \\
\text{<ESC>H0050<ESC>V0100<ESC>L0303<ESC>MSATO} \\
\text{<ESC>H0050<ESC>V0200<ESC>B103100*SATO*} \\
\text{<ESC>H0170<ESC>V0310<ESC>L0101<ESC>USATO} \\
\text{<ESC>Q1<ESC>Z}
\]
The image reference point is set at the right edge (edge closest to the printer side plate) of the label so that it can be printed on a 2 inch wide label.

*Note: The printers will not “wrap” images that extend beyond the print area. If any part of a character or image extends beyond the print area, it will disappear.*

For more information, see the Base Reference Point command description.

**ROTATED FIELDS**

The printers can rotate each print field in 90° increments using the Rotate command. There are two variations of this command.

- `<ESC>\%` - The field rotates, but the base reference point for the field remains the same.
- `<ESC>R` - The field and the base reference point rotate.

The following data stream will rotate the print field but will not change the base reference point of the field:

```
<ESC>A<ESC>%1<ESC>V800<ESC>H200<ESC>L0202<ESC>WB1E<ESC>Q1<ESC>Z
```

The following data stream will rotate both the field and the base reference point for that field:

```
<ESC>A<ESC>R<ESC>V0200<ESC>H0100<ESC>L0202<ESC>P02<ESC>WB1E<ESC>Q1<ESC>Z
```
There are some types of commands that must have a value specified before a label can be printed. If the data stream does not contain these commands, a “default” value is assumed. The commands and the corresponding default values are:

<table>
<thead>
<tr>
<th>COMMAND</th>
<th>DEFAULT</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print Rotation</td>
<td>0°</td>
<td>(1)</td>
</tr>
<tr>
<td>Vertical Reference Point</td>
<td>0</td>
<td>(1)</td>
</tr>
<tr>
<td>Horizontal Reference Point</td>
<td>0</td>
<td>(1)</td>
</tr>
<tr>
<td>Character Pitch</td>
<td>2</td>
<td>(1)</td>
</tr>
<tr>
<td>Base Reference Point</td>
<td>H=1, V=1</td>
<td>(2)</td>
</tr>
<tr>
<td>Character Expansion</td>
<td>1</td>
<td>(1)</td>
</tr>
<tr>
<td>Print Darkness</td>
<td>2</td>
<td>(1)</td>
</tr>
<tr>
<td>Print Darkness (M-8459S)</td>
<td>3</td>
<td>(1)</td>
</tr>
<tr>
<td>Print Speed</td>
<td>6 ips</td>
<td>(2)</td>
</tr>
<tr>
<td>Print Speed (M-8459S)</td>
<td>4 ips</td>
<td>(2)</td>
</tr>
</tbody>
</table>

NOTES:

(1) The settings for these commands will revert to the default value when the printer receives an <ESC>Z or an <ESC>*.

(2) These values transmitted with these commands will remain in effect until a new command is received.
The standard M-8485S is referred to as a “right-hand” printer (i.e., when facing the Control Panel, the label comes out from left to right). The M-8485S is also available in a “left-hand” (i.e., the labels come out right to left) version.

*The only difference in the print area is the horizontal base reference point for the label.* With the standard M-8485S, the reference point is the first print position nearest the inside frame. With the “left-hand” version, the reference point is the first print position away from the frame. The same command stream sent to both printers should print an identical label except the image may be shifted because of the relative positioning of the label under the print head.

The M-8459S, M-8460S and M-8490S are only available in “right-hand” versions.
This section contains all the printer Command Codes. The commands must be sent to the printer in an organized fashion in order for the label(s) to print.

The purpose of this section is to:

1. Explain the different commands and provide examples of their usage.

2. To provide a detailed reference for programming.

Each command begins on a separate page with its own heading. A uniform layout is used to help you find key information about each command. For each Command Code in this section, there will be a sample data input stream to the printer and the expected print output. By studying the examples, you can learn how to use the particular command within a whole block of printer code. Pay particular attention to the “Special Notes” with each command to learn other important information.

The subject commands are highlighted in bold letters in the Reference Sheets. There are two parts of most, but not all, commands. The first is the command character which immediately follows the `<ESC>` code. It is always an upper case alpha or a special character (such as an “&” or a “%”). It is never a lower case alpha character. If the command requires additional variable information, it is represented by a group of lower case alpha characters immediately following the command character. For example, if an `aaaabb` is listed following the basic command, the printer will look for six characters immediately following the command. The first four would represent the value of `aaaa` and the next two the value of `bb`.

The maximum number of characters defined in a parameter is represented by the number of characters shown in the command structure. For example, a command followed by an `aaaa` can have up to four characters. In general, commands with only one parameter following the command can be entered without the leading zeroes. In the above example, you could enter either “809” or “0809”. However, certain commands require the exact number of matching characters. A command with two parameters listed following the command code, such as `aaaabbbb` require the exact number of digits to be entered. If the value of `aaaa` is “800” and the value of `bbbb` is “300”, then the parameters must be entered as “08000300”. It is recommended that you make it a practice to always enter leading zeros to prevent any mistakes.

**NOTE:** These examples assume the use of the Standard Protocol Command Codes, with a Right-Hand version of the M-8485S printer with a parallel interface and a five inch wide label which is the maximum width that will fit in the printer. If the same command stream is sent to an M-8490S, the image will be reduced by 33%.

An alphabetical listing of the commands is contained in Appendix A: Command Code Quick Reference.
Bar Codes

Command Structure

1:3 narrow/wide bar ratio: <ESC>Babbcceed
2:5 narrow/wide ratio: <ESC>BDabbcceed
1:2 narrow/wide bar ratio: <ESC>Dabbcceed

a = Bar Code Symbol
  0 Codabar
  1 Code 39
  2 Interleaved 2 of 5 (I 2/5)
  3 UPC-A / EAN-13
  4 EAN-8
  5 Industrial 2 of 5
  6 Matrix 2 of 5
  7 reserved
  8 reserved
  9 reserved
  A MSI
  B reserved
  C Code 93
  D reserved
  E UPC-E
  F Bookland
  G Code 128
  I UCC 128

bb = Number of dots (01-12) for narrow bar and narrow space

ccc = Bar height in dots (001-600)

d = UCC 128 only. Not used for other bar code types
  0 No human readable text
  1 Human readable at top
  2 Human readable at bottom

Example: <ESC>BD103200

Placement: Immediately preceding data to be encoded

Default: None

Command Function

To print bar code images on a label. With this command, there are 13 standard bar code symbologies available to be printed and three two dimensional symbols (see Two Dimensional bar code symbols starting on page 5-95). Each of the bar codes are unique, and it is important to know the differences. See Appendix B for specific information on using each individual bar code symbol.
Input to Printer

<ESC>A
<ESC>H0025<ESC>V0025<ESC>B103100"CODE 39"
<ESC>H0155<ESC>V0130<ESC>XS"CODE 39"
<ESC>H0025<ESC>V0200<ESC>BD20210045676567
<ESC>H0075<ESC>V0310<ESC>XM45676567
<ESC>H0025<ESC>V0375<ESC>BD3021001234567
<ESC>H0075<ESC>V0430<ESC>XS12345
<ESC>H0025<ESC>V0500<ESC>BD4021001234567
<ESC>H0075<ESC>V0550<ESC>DE123456
<ESC>H0525<ESC>V0025<ESC>B002100A12345B
<ESC>H0565<ESC>V0135<ESC>XS12345
<ESC>H0475<ESC>V0200<ESC>BD303100123456789012
<ESC>H0525<ESC>V0375<ESC>BD4031001234567
<ESC>H0525<ESC>V0550<ESC>DE03100123456
<ESC>H0500<ESC>V0600<ESC>OB0
<ESC>H0533<ESC>V0655<ESC>OB123456
<ESC>H0350<ESC>V0725<ESC>BD30315009827721123
<ESC>L0101<ESC>H0320<ESC>V0800<ESC>OB0
<ESC>H0365<ESC>V0878<ESC>OB98277
<ESC>H0505<ESC>V0878<ESC>OB21123
<ESC>H0665<ESC>V0760<ESC>BF0313021826
<ESC>H0680<ESC>V0730<ESC>OB21826
<ESC>H0425<ESC>V1125<ESC>BD30315000633895260
<ESC>L0101<ESC>H0395<ESC>V1200<ESC>OB0
<ESC>H0440<ESC>V1278<ESC>OB60338
<ESC>H0580<ESC>V1278<ESC>OB95260
<ESC>H0730<ESC>V1155<ESC>BF0314024
<ESC>H0745<ESC>V1125<ESC>OB24
<ESC>H0325<ESC>V0950<ESC>BG03100>GAB>B789>C123456
<ESC>H0435<ESC>V1055<ESC>XSAB789123456
<ESC>Q1<ESC>Z

Note: Carriage Returns and Line Feeds have been added to the command listing for clarity and should not be included in the actual data stream.
UCC-128

Without Incrementing

<ESC>A
<ESC>H0100<ESC>V0100<ESC>BI07150101234567000000001
<ESC>Q2<ESC>Z

With Incrementing

<ESC>A
<ESC>H0100<ESC>V0100<ESC>F001+001<ESC>BI07150101234567000000001
<ESC>Q2<ESC>Z
**Special Notes**

1. UPC and EAN bar codes are not affected by the different types of narrow to wide ratios. Instead, the `<ESC>D` command adds descender bars to these codes where needed to meet UPC specifications. The `<ESC>BD` command puts descender bars and human readable text below the symbol.

2. The Code 128, UCC 128, MSI, and Code 93 bar codes are not affected by the narrow to wide ratios.

3. The Codabar, Code 39, Industrial 2 of 5, and Matrix 2 of 5 bar codes are affected by the Character Pitch command. This command must be placed before the Bar Code command.

4. See Appendix B for more specific instructions and detailed information regarding individual bar code symbols.

5. Because of their unique characteristics, two-dimensional symbols are covered separately (see page 5-95).

6. For UCC128, the FNC1 code is automatically inserted and the Mod 10 and Mod 103 check digits are automatically calculated.

7. For the MSI bar code, the check digit is not automatically calculated.
Bar Codes, Expansion

Command Structure  
<ESC>BWaa\bbb

\aa = Expansion factor by which the width of all bars and spaces will be increased (01-12)

\bbb = Bar height by dot (004-600 dots)

Example:  <ESC>BW02100

Placement: Immediately follows the <ESC>BT command and precedes data to be encoded.

Default: None

Command Function
This command works together with the <ESC>BT command to specify an expansion factor and the bar code height for the particular symbol being printed.

Input to Printer:
<ESC>A
<ESC>H0050<ESC>V0050<ESC>BT101030103
<ESC>BW04100*1234*
<ESC>Q1<ESC>Z

Printer Output:

Special Notes
1. This command must be preceded by the Variable Ratio Bar Codes <ESC>BT command (see Page 5-17).

2. The following bar codes will be affected by the Character Pitch command: Codabar, Code 39, Interleaved 2 of 5, Matrix 2 of 5.
Bar Codes, Variable Ratio

Command Structure  
\(<\text{ESC}>\text{B}a\text{bb}c\text{cd}d\text{dee}\) 

- **a** = Bar Code Symbol:  
  - 0 Codabar  
  - 1 Code 39  
  - 2 Interleaved 2 of 5  
  - 5 Industrial 2 of 5  
  - 6 Matrix 2 of 5  

- **bb** = Narrow space in dots (01-99)  
- **cc** = Wide space in dots (01-99)  
- **dd** = Narrow bar in dots (01-99)  
- **ee** = Wide bar in dots (01-99)  

Example: \(<\text{ESC}>\text{B}101030103\) 

Placement: Following print position commands and preceding \(<\text{ESC}>\text{B}W\)  

Default: Current setting  

Command Function  
To print a bar code with a ratio other than those specified through the standard bar code commands (B,BD, and D). This is done through individual control of each of the bar code elements (bars, spaces) as shown above. Remember that this command only applies to the five bar code types shown.  

Input to Printer:  
\(<\text{ESC}>\text{A}\)  
\(<\text{ESC}>\text{H}0050<\text{ESC}>\text{V}0050<\text{ESC}>\text{B}101030103\)  
\(<\text{ESC}>\text{B}W03100*1234*\)  
\(<\text{ESC}>\text{Q}1<\text{ESC}>\text{Z}\)  

Printer Output:
Special Notes

1. This command must be immediately followed by the <ESC>BW Bar Code Expansion command (see Page 5-16).

2. You may use only one variable ratio bar code per label.

3. If the data specified in this command is incorrect, the command is ignored and the ratio used will be based on the previous setting.

4. See Appendix B for more specific instructions and details regarding individual bar code symbols.
Base Reference Point

Command Structure  \(<\text{ESC}>A3\text{-}aaaa\text{V}bbbb\)

- = This character is optional. When present, it specifies that the horizontal offset is in the negative direction. If it is left out, the offset direction is positive.

aaaa = Horizontal Print Offset (see Note 7 for field range)

bbbb = Vertical Print Offset (see Note 7 for field range)

Example: \(<\text{ESC}>A3H100V0050\)

Placement: Preceding all images that are based on the new base reference point

Default: Current V and H offset setting in the printer configuration

Command Function

To establish a new base reference point for the current label. The base reference point is the top left corner or “origin” from where all print position commands are based.

This command may be very helpful when using labels less than four inches wide to place images on the printable label surface. It may also be used to move images past preprinted fields on a label.

Input to Printer:

\(<\text{ESC}>A<\text{ESC}>L0202\)
\(<\text{ESC}>H0025<\text{ESC}>V0025<\text{ESC}>\text{WB0M}\text{NORMAL REFERENCE POINT}\)
\(<\text{ESC}>A3H0300V0075\)
\(<\text{ESC}>H0100<\text{ESC}>V0050<\text{ESC}>\text{WB0M}\text{NEW REFERENCE POINT}\)
\(<\text{ESC}>Q1<\text{ESC}>Z\)

Printer Output:
Special Notes

1. Use of this command will set the Vertical/Horizontal Offset setting of the printer configuration until a new Base Reference Point command is issued or the setting is changed from the operator panel. See Section 2: Printer Configuration.

2. This command may be used more than once in a print job.

3. An alternative to using this command is to make changes to your current Horizontal and Vertical Print Position commands (see Page 5-20).

Example:
Let’s say the current base reference point is H=1, V=1 and you wish to move all the fields on your label downward vertically by 150 dots. You could either (1) add the Base Reference Point command or (2) change all the vertical position commands by an additional 150 dots.

4. For a more detailed example of the Base Reference Point command, see “Print Area” in this section (Page 5-4).

5. The “S” print engines can print as close as 2mm to the inside edge of the label.

6. The “S” print engines will not “wrap” (i.e. if any part of a character or image extends beyond the last print dot position, it will disappear and not be visible on any part of the label).

7. The allowable field ranges for this command are:

<table>
<thead>
<tr>
<th></th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td>-896 to 896</td>
<td>-1216 to 1216</td>
<td>-1024 to 1024</td>
<td>-1344 to 1344</td>
</tr>
<tr>
<td>Vertical</td>
<td>0001 to 1424</td>
<td>0001 to 1424</td>
<td>0001 to 1424</td>
<td>0001 to 2136</td>
</tr>
</tbody>
</table>
Characters, Custom-Designed

**Command Structure**

Store Command: `<ESC>Tabcc`
Recall Command: `<ESC>Kab90cc`

- a = 1 16x16 matrix
  2 24x24 matrix
- b = Specifies the character encoding method for the data stream
  H Hexadecimal characters
  B Binary characters
- cc = Memory location to store/recall the character. Valid memory locations are 21 to 52 (counting in Hex) or “I” to “R” in Binary
- (data) = Data to describe the character

**Example:**

```
<ESC>T1H3F
<ESC>K1H903F
```

See Appendix C for a more detailed explanation

**Placement:**
The Store command is typically sent in its own data stream to the printer, between the Start/Stop commands. The Recall command is sent in a secondary data stream to print the character, and follows any necessary position or size commands.

**Default:** None

**Command Function**

To allow for the creation, storage, and printing of custom characters, such as special fonts or logos. Up to 50 individual characters may be stored in the custom character volatile memory.

**Printer Input**

See Appendix C for a detailed explanation.

```
<ESC>A
<ESC>T1H3F
0100038007C00FE01FF03FF87FFCFFE07C007C007C007C007C007C007C007C0
<ESC>Z

<ESC>A
<ESC>H150<ESC>V100<ESC>L050<ESC>K1H903F
<ESC>H350<ESC>V100<ESC>L1010<ESC>K1H903F
<ESC>Q1<ESC>Z
```
Special Notes

1. When printing the custom character using the Recall command, the character is affected by the following commands:

   Character Expansion (see Page 5-23)
   Character Pitch (see Page 5-26)
   Line Feed (see Page 5-49)
   Rotate, Fixed Base Reference Point (see Page 5-64)
   Rotate, Moving Base Reference Point (see Page 5-66)

2. The characters are stored in volatile memory and must be reloaded if the printer power is lost.

3. Do not use ASCII <CR> or <LF> characters (carriage return or line feed) as line delimiters within the graphic data or the actual image will not be printed as specified.
Character Expansion

Command Structure  \texttt{<ESC>Laabb}

\begin{itemize}
  \item \texttt{aa} = Multiple to expand horizontally (01-12)
  \item \texttt{bb} = Multiple to expand vertically (01-12)
\end{itemize}

Example:  \texttt{<ESC>L0305}

Placement: Preceding the data to be expanded

Default:  \texttt{<ESC>L0101}

Command Function  To expand characters independently in both the horizontal and vertical directions. The command allows you to enlarge the base size of each font (except the vector font) up to 12 times in either direction. Expanded characters are typically used for added emphasis or for long distance readability.

Input to Printer  \begin{itemize}
  \item \texttt{<ESC>A<ESC>H0100<ESC>V0100<ESC>XMSATO}
  \item \texttt{<ESC>H0100<ESC>V0200<ESC>L0402<ESC>XMSATO}
  \item \texttt{<ESC>H0100<ESC>V0300<ESC>L0204<ESC>XMSATO}
  \item \texttt{<ESC>Q1<ESC>Z}
\end{itemize}

Printer Output
Special Notes

This command will expand the following fonts:

1. Fonts U, S, M, XU, XS, XM, OA & OB (see Page 5-33) and fonts WB, WL, XB and XL (see Page 5-36).

2. This command will also affect the following commands:
   Character Pitch (see Page 5-26)
   Characters, Custom-Designed (see Page 5-21)

3. The Character Expansion value is in effect for the current print job until a new expansion command is specified.

4. The Line and Box command, if used within the data stream, may return all subsequent text to the default expansion of 1 x 1. Therefore, either send the Character Expansion command before all printed data, or send Line and Box commands last, preceding the <ESC>Q Quantity command.
Character, Fixed Spacing

Command Structure  

- **<ESC>PR**

  Example: See Above
  
  Placement: Preceding the data
  
  Default: The default is Proportional Spacing.

Command Function  

To reset proportional spacing and place the printer back to fixed spacing.

Printer Input  

- `<ESC>A`
- `<ESC>H0100<ESC>V0050<ESC>PS`
- `<ESC>L0404<ESC>XMPROPORTIONAL SPACING`
- `<ESC>H0100<ESC>V0180<ESC>PR`
- `<ESC>L0404<ESC>XMFIXED SPACING`
- `<ESC>Q1<ESC>Z`

Printer Output

![Diagram of Fixed Spacing]

Special Notes

1. This command only works with the proportionally spaced fonts XU, XM, XS, XL and XB.
Character Pitch

Command Structure  \(<\text{ESC}>\text{P}a\text{a}\)

\(a_\text{a}\) = Number of dots between characters (00-99)

Example:  \(<\text{ESC}>\text{P}03\)

Placement:  Preceding the text to be printed

Default:  \(<\text{ESC}>\text{P}02\)

Command Function  To designate the amount of spacing (in dots) between characters. This command provides a means of altering character spacing for label constraints or to enhance readability.

Input to Printer:  
\(<\text{ESC}>\text{A}\>
\(<\text{ESC}>\text{H}0025<\text{ESC}>\text{V}0025<\text{ESC}>\text{L}0202<\text{ESC}>\text{XB}1\text{SATO}\>
\(<\text{ESC}>\text{H}0025<\text{ESC}>\text{V}0125<\text{ESC}>\text{L}0202<\text{ESC}>\text{P}20<\text{ESC}>\text{XB}1\text{SATO}\>
\(<\text{ESC}>\text{H}0025<\text{ESC}>\text{V}0225<\text{ESC}>\text{L}0202<\text{ESC}>\text{P}40<\text{ESC}>\text{XB}1\text{SATO}\>
\(<\text{ESC}>\text{Q}1<\text{ESC}>\text{Z}\>

Printer Output:

\begin{center}
\begin{tikzpicture}
\node at (0,0) {\text{SATO}};
\node at (0,1) {\text{SATO}};
\node at (0,2) {\text{SATO}};
\end{tikzpicture}
\end{center}
Special Notes

1. This command is affected by the <ESC>L Character Expansion command (see Page 5-23). The character pitch is actually the product of the current horizontal expansion multiple and the designated pitch value.

Example:
<ESC>L0304
<ESC>P03
Pitch = (03) x (03) = 9 dots

2. To avoid confusion, you may want to include the <ESC>L Character Expansion command and this command together in your program.

3. This command affects fonts U, S, M, XU, XS, XM, OA & OB (see Page 5-33 fonts WB, WL, XB and XL (see Page 5-37), and the vector font (see Page 5-35).

4. Character Pitch will always revert to the default value unless it is specified before each new font command in the data stream.

5. This command also affects Codabar, Code 39 and Industrial 2 of 5 bar codes.
Character, Proportional Spacing

**Command Structure**

- `<ESC>PS` Set to proportional spacing
- `<ESC>PR` Reset to fixed spacing

Example: See above

Placement: Preceding the data to be proportional spaced

Default: `<ESC>PS`

**Command Function**

To specify the printing of proportional or fixed spacing for proportionally spaced fonts.

**Printer Input**

- `<ESC>A`
- `<ESC>H0025<ESC>V0050<ESC>PS`
- `<ESC>L0202<ESC>XMPROPORTIONAL SPACING`
- `<ESC>H0025<ESC>V0130<ESC>PR`
- `<ESC>L0202<ESC>XMFIXED SPACING`
- `<ESC>Q1<ESC>Z`

**Printer Output**

- **PROPORTIONAL SPACING**
- **FIXED SPACING**

**Special Notes**

1. Once this command is sent in the data stream, it is in effect until the end of the print job unless a reset command is sent.
Clear Print Job(s) & Memory

Command Structure  

\(<\text{ESC}>^a\)

\(a\) = If the “a” parameter is not included with this command and the printer is in the multi-buffer mode, this command clears all print jobs in the printer memory, including the current print job.

\(a\) = If “a” is included with this command, it specifies the internal memory section to be cleared

\(T\) To clear the custom character memory

\(&\) To clear the form overlay memory

\(X\) To clear all internal memory

Example:  

\(<\text{ESC}>^*\)  
\(<\text{ESC}>^*&\)

Placement:  This command should be sent to the printer as an independent data stream.

Default: None

Command Function  

To clear individual memory or buffer areas of the printer.

Input to Printer:  

\(<\text{ESC}>A\)  
\(<\text{ESC}>^*\)  
\(<\text{ESC}>Z\)

Printer Output:  

There is no printer output as a result of this command. The current print job in the buffer will be terminated and all other print jobs in the buffer cleared.

Special Note

1. See Memory Card Functions for variations of this command used to clear data from the memory card (page 5-77).

2. It is not necessary to clear the printer’s memory between each print job.

3. The primary purpose of this command is to clear all print jobs in the multi-buffer mode. The “a” parameter can be used in either the multi-buffer or single job mode to clear specific parts of the memory.

4. When the “a” parameter is used, the section of memory specified will not be cleared until the label is printed.
Continuous Forms Printing

Command Structure

None

The printer locates the end of an adhesive label by sensing the backing between labels or through the use of an eye-mark (black rectangle on the reverse side of the backing). It locates the end of a tag from a notch, eye-mark, or a hole between tags. Both sensors should be disabled when printing continuous forms by placing the Label Sensor Selection switch (DSW3-3) in the ON position. See Section 3: Printer Configuration for instructions on configuring the printer using the front panel DIP switch array.

If you will be using continuous labels or tags, the printer must be told to stop feeding in another manner. The length is determined by the position of the last printed image on the label or tag. The printer will stop feeding when this last field is finished printing. The length may be increased with printed spaces (20 hexadecimal) if necessary. There is no command code to control label length.
Copy Image Area

Command Structure

<ESC>WDHaaaaVbbbbXccccYdddd

aaaa = Horizontal position of the top left corner of the area to be copied
bbbb = Vertical position of the top left corner of the area to be copied
cccc = Horizontal length of the image area to be copied
dddd = Vertical length of the image area to be copied

Example: <ESC>WDH0100V0050X0600Y0400

Placement: Anywhere within the data stream, after specifying the location of the duplicate image.

Default: None

Command Function

To copy an image from one location to another on the same label. This may be useful for duplicating individual fields or entire sections of the label with only one command.

Input to Printer:

<ESC>A
<ESC>H0050<ESC>V0050<ESC>E010<ESC>XM
SATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
<ESC>H0180<ESC>V0250<ESC>WDH0130V0050X0400Y0200
<ESC>Q1<ESC>Z

Printer Output:

SATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
Special Notes

1. Use the Print Position commands (V and H) to locate the new area for the duplicate image (see page 5-55).

2. Position of the new target area must not be inside the original image.

3. If you use the Rotate command, V, H, X and Y axis will be reversed.

4. If the reference area of the target image exceeds the print area, it will not be printed.

5. The allowable ranges for these fields are as follows:

<table>
<thead>
<tr>
<th></th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td>0001</td>
<td>0001</td>
<td>0001</td>
<td>0001</td>
</tr>
<tr>
<td></td>
<td>to</td>
<td>to</td>
<td>to</td>
<td>to</td>
</tr>
<tr>
<td></td>
<td>0896</td>
<td>1216</td>
<td>1024</td>
<td>1344</td>
</tr>
<tr>
<td>Vertical</td>
<td>001</td>
<td>001</td>
<td>001</td>
<td>0001</td>
</tr>
<tr>
<td></td>
<td>to</td>
<td>to</td>
<td>to</td>
<td>to</td>
</tr>
<tr>
<td></td>
<td>1424</td>
<td>1424</td>
<td>1424</td>
<td>2136</td>
</tr>
</tbody>
</table>
Fonts U, S, M, OA, OB, XU, XS & XM

Command Structure
Font XU: `<ESC>XU`  Font U:  `<ESC>U`
Font XS:  `<ESC>XS`  Font S:  `<ESC>S`
Font XM:  `<ESC>XM`  Font M:  `<ESC>M`
Font OA:  `<ESC>OA`  Font OB:  `<ESC>OB`

Example:  See above
Placement:  Preceding the data to be printed
Default:  None

Command Function
To print text images on a label. These are eight of the built-in fonts available on the printer. All matrices include descenders.

<table>
<thead>
<tr>
<th></th>
<th>NON-PROPORTIONAL</th>
<th>PROPORTIONAL (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td>5W x 9H dot matrix</td>
<td>XU 5W x 9H dot matrix</td>
</tr>
<tr>
<td>S</td>
<td>8W x 15H dot matrix</td>
<td>XS 17W x 17H dot matrix</td>
</tr>
<tr>
<td>M</td>
<td>13W x 20H dot matrix</td>
<td>XM 24W x 24H dot matrix</td>
</tr>
<tr>
<td>OA</td>
<td>OCR-A font (see note 7 for matrix)</td>
<td></td>
</tr>
<tr>
<td>OB</td>
<td>OCR-B font (see note 7 for matrix)</td>
<td></td>
</tr>
</tbody>
</table>

(1) These fonts will be printed with proportional spacing only if preceded by an `<ESC>PS` command.

Input to Printer
```
<ESC>A<ESC>PS
<ESC>H0001<ESC>V0100<ESC>L0202<ESC>XUSATO
<ESC>H0001<ESC>V0175<ESC>L0202<ESC>XSSATO
<ESC>H0001<ESC>V0250<ESC>L0202<ESC>XMSATO
<ESC>H0001<ESC>V0325<ESC>L0101<ESC>OASATO
<ESC>H0001<ESC>V0400<ESC>L0101<ESC>OBSATO
<ESC>H0300<ESC>V0100<ESC>L0202<ESC>USATO
<ESC>H0300<ESC>V0175<ESC>L0202<ESC>SSATO
<ESC>H0300<ESC>V0250<ESC>L0202<ESC>MSATO
<ESC>Q1<ESC>Z
```

Printer Output
Special Notes

1. Characters may be enlarged through the use of the Character Expansion command (see Page 5-23).

2. Character spacing may be altered through the use of the Character Pitch command (see Page 5-26). The default is 2 dots between characters. It is recommended to use a spacing of 5 dots for OCR-A and 1 dot for OCR-B.

3. You may also create custom characters or fonts. See the <ESC>T Custom-Designed Characters command (Page 5-21).

4. A font must be defined for each field to be printed. There is no default font.

5. Fonts U, S, M, OA and OB are identical to fonts U, S, M, OA and OB on the SATO M-8400S printer. (Note: These fonts, except the OA and OB fonts which are fixed in size, will be 33% smaller on an M-8490S)

6. The proportionally spaced fonts XU, XS, XM, XL and XA can be printed with fixed spacing using the <ESC>PS Proportional Space command.

7. The matrices for the OA and OB fonts are scaled so that they will remain a constant size according to the OCR-A and OCR-B specifications when printed on different resolution printers.

<table>
<thead>
<tr>
<th></th>
<th>M-8459S/M-8460S/M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>OA Font</td>
<td>15 dots W x 22 dots H</td>
<td>22 dots W x 33 dots H</td>
</tr>
<tr>
<td>OB Font</td>
<td>20 dots W x 24 dots H</td>
<td>30 dots W x 36 dots H</td>
</tr>
</tbody>
</table>
Font, Vector

**Command Structure**

Specify Vector Font:  \(<\text{ESC}>\&a,\&b,\&c,\&d<\text{ESC}>\)

Data for Vector Font:  \(<\text{ESC}>\&(\text{data})<\text{ESC}>\)

- **a** = A Helvetica Bold (proportional spacing)
  B Helvetica Bold (fixed spacing)
- **b** = Font width (50-999)
- **c** = Font height (50-999 dots)
- **d** = Font variation (0-9) as follows:
  0 Standard
  1 Standard open (outlined)
  2 Gray (mesh) pattern 1
  3 Gray (mesh) pattern 2
  4 Gray (mesh) pattern 3
  5 Standard open, shadow 1
  6 Standard open, shadow 2
  7 Standard mirror image
  8 Italic
  9 Italic open, shadow

Example:  \(<\text{ESC}>\&A,100,200,0<\text{ESC}>\&(123456)<\text{ESC}>\)

Placement: Immediately preceding data to be printed.

Default: None

**Command Function**

To specify printing of the unique SATO vector font. The vector font allows large characters to be printed with smooth, round edges. Each character is made of a number of vectors (or lines), and will require slightly more printer compiling time.

**Input to Printer**

\(<\text{ESC}>A<\text{ESC}>H0100<\text{ESC}>V0100<\text{ESC}>\&A,100,100,0<\text{ESC}>\&(123456)<\text{ESC}>H0100<\text{ESC}>V0200<\text{ESC}>\&(VECTOR FONT)<\text{ESC}>H0100<\text{ESC}>V0350<\text{ESC}>\&A,200,300,8<\text{ESC}>\&(SATO)<\text{ESC}>Q1<\text{ESC}>Z
Special Notes

1. The Pitch command can be used with Vector fonts.

2. If the font size designation is out of the specified range, a default value of 50 is used.

4. The font width and height values include asenders, desenders and other space.

5. A font must be defined for each field to be printed. There is no default font.
Fonts WB, WL, XB & XL

Command Structure
Font WB: <ESC>WBa
Font XB: <ESC>XBa
Font WL: <ESC>WLa
Font XL: <ESC>XLa

a = 0 Disables auto-smoothing of font
1 Enables auto-smoothing of font (see notes below)

Example: <ESC>WB1123456

Placement: Preceding the data to be printed
Default: None

Command Function
To print text images on a label. These are the four auto-smoothing fonts available on the printer.

<table>
<thead>
<tr>
<th>NON-PROPORTIONAL</th>
<th>PROPORTIONAL(^{(1)})</th>
</tr>
</thead>
<tbody>
<tr>
<td>WB 18W x 30H dot matrix</td>
<td>XB 48W x 48H dot matrix</td>
</tr>
<tr>
<td>WL 28W x 52H dot matrix</td>
<td>XL 48W x 48H dot matrix</td>
</tr>
</tbody>
</table>

\(^{(1)}\) These fonts will be printed with proportional spacing only if preceded by an <ESC>PS command.

Input to Printer:

<ESC>A<ESC>PS
<ESC>H0001<ESC>V0100<ESC>WB0SATO
<ESC>H0001<ESC>V0185<ESC>WB1SATO
<ESC>H0001<ESC>V0270<ESC>WL0SATO
<ESC>H0001<ESC>V0355<ESC>WL1SATO
<ESC>H0300<ESC>V0100<ESC>XB0SATO
<ESC>H0300<ESC>V0185<ESC>XB1SATO
<ESC>H0300<ESC>V0270<ESC>XL0SATO
<ESC>H0300<ESC>V0355<ESC>XL1SATO
<ESC>Q1<ESC>Z

Printer Output:

SATO  SATO
SATO  SATO
SATO  SATO
SATO  SATO

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Special Notes

1. Auto-smoothing (when enabled) is only effective if the character expansion rate is at least (3) times in each direction.

2. Characters may be enlarged through the use of the <ESC>L Character Expansion command (see Page 5-23).

3. Character spacing may be altered through the use of the <ESC>A Character Pitch command (see Page 5-26).

4. A font must be defined for each field to be printed. There is no default font.

5. The proportionally spaced fonts XU, XS, XM, XL and XB can be printed with fixed spacing using the <ESC>PS Proportional Space command.
Form Feed

Command Structure: `<ESC>A(space)<ESC>Z`

Example: See above

Placement: Separate data stream sent to printer

Default: None

Command Function: To feed a blank tag or label, which is the equivalent of a “form feed”

Input to Printer: `<ESC>A(space)`
`<ESC>Z`

Printer Output: Blank label or tag
Form Overlay, Recall

**Command Structure**

\(<\text{ESC}>/\>

**Example:** See above

**Placement:** Must be preceded by all other data and placed just before the Print Quantity command (\(<\text{ESC}>Q\>)

**Default:** None

**Command Function**

To recall the label image from the form overlay memory for printing. This command recalls a stored image from the overlay memory. Additional or different data can be printed with the recalled image.

**Input to Printer**

\(<\text{ESC}>A\>
\(<\text{ESC}>H0100<\text{ESC}>V0125\>
\(<\text{ESC}>ST\text{HIS IS THE STORED IMAGE WITH A BARCODE}\>
\(<\text{ESC}>H0100<\text{ESC}>V0165<\text{ESC}>B103100*12345*\>
\(<\text{ESC}>\&<\text{ESC}>Z\>

\(<\text{ESC}>A<\text{ESC}>H0100<\text{ESC}>V0050\>
\(<\text{ESC}>ST\text{HIS IS RECALLING AND ADDING TO THE STORED IMAGE}<\text{ESC}>/\>
\(<\text{ESC}>Q1<\text{ESC}>Z\>

**Printer Output**

![Image of printed output](image)

**Special Notes**

1. The overlay is stored using the \(<\text{ESC}>\&\text{ Form Overlay Store command (see Page 5-41).}\>

2. If the this command is used with the \(<\text{ESC}>AX\text{ Expanded Print Length command (see page 5-53) the Form Overlay length cannot exceed 14".}\>
Form Overlay, Store

Command Structure

<ESC>&

Example: See above

Placement: Must be preceded by all other data and placed just before the Stop command (<ESC>Z)

Default: None

Command Function
To store a label image in the volatile form overlay memory. Only one label image may be stored in this memory area at a time.

Input to Printer

<ESC>A
<ESC>H0100<ESC>V0125
<ESC>STHIS IS THE STORED IMAGE WITH A BARCODE
<ESC>H0100<ESC>V0165<ESC>B103100*12345*
<ESC>&
<ESC>Z

Printer Output
There is no output from this command. It stores the label image in the overlay buffer.

Special Notes

1. Remember that this storage is volatile. Therefore, if the printer loses power, the overlay must be sent again.

2. The overlay is recalled using the <ESC>/ Form Overlay Recall command (see Page 5-40).

3. Form overlays do not have to be recompiled each time they are called to be printed and therefore may result in much faster print output.
Graphics, Custom

Command Structure   \texttt{<ESC>Gabbbccc(data)}

\begin{itemize}
  \item \texttt{a} = Specifies format of data stream to follow
  \begin{itemize}
    \item \texttt{B} Binary format
    \item \texttt{H} Hexadecimal format
  \end{itemize}
  \item \texttt{bbb} = Number of horizontal 8 x 8 blocks
    (see note 7 for allowable range)
  \item \texttt{ccc} = Number of vertical 8 x 8 blocks
    (see note 7 for allowable range)
  \item (data) = Hex data to describe the graphic image
\end{itemize}

Example: \texttt{<ESC>GH006006}
See Appendix C for a detailed example

Placement: May be placed anywhere within the data stream after the necessary position commands.

Default: None

Command Function
To create and print custom graphics (logos, pictures, etc.) on a label. The graphic image may be printed along with other printed data to enhance label appearance or eliminate the need for preprinted label stock. Using a dot-addressable matrix, design the graphic image in 8 dot by 8 dot blocks, then send it in a binary format to the printer.

Printer Input
\texttt{<ESC>A}
\texttt{<ESC>H0100<ESC>V0100<ESC>GH006006}
\texttt{FFFFFFFFFFFFFFFFFFFFFFFC000000000003}
\texttt{C000000003C000FFFFFFF3C00080000013}
\texttt{C0008000013C0009FFFFFF13C00080000013}
\texttt{C0008000013C0009FFFFFF13C00080000013}
\texttt{C0008000013C0009FFFFFF13C00080000013}
\texttt{C0000000003C0000000003C000000000003}
\texttt{C0000000003C0000000003C000000000003}
\texttt{C0000000003C0000000003C000000000003}
\texttt{C0000000003C0000000003C000000000003}
\texttt{C00007E0003C0000FF0003C00000000003}
\texttt{C000FF0003C0000FF0003C00000000003}
\texttt{C0003C00003C0000003C0000003C0000003}
\texttt{C0003C00003C0000003C0000003C0000003}
\texttt{C0003C00003C0000003C0000003C0000003}
\texttt{C0003C00003C0000003C0000003C0000003}
\texttt{C0000000003C0000001800003C00000000003}
\texttt{C0000000003C000000000003C00000000003}
\texttt{<ESC>H0300<ESC>V0100<ESC>XPLEAS Pa SE YOUR DISK}
\texttt{<ESC>H0300<ESC>V0150<ESC>XSIN A SAFE PLACE}
\texttt{<ESC>Q1<ESC>Z}

See Appendix C for a details on the data format.
Special Notes

1. Do not use ASCII <CR> or <LF> characters (carriage return or line feed) as line delimiters within the graphic data or the actual image will not be printed as specified.

2. A custom graphic cannot be enlarged by the <ESC>L Character Expansion command (Page 5-23).

3. A custom graphic is not affected by either of the Rotation commands. Therefore, always design and locate your graphic image to print in the appropriate orientation.

4. Use an optional Memory Card to expand the print length.

5. To store graphic images in an optional memory card, see the Memory Card Functions section.

6. The binary format reduces the transmission time by 50%.

7. The maximum allowable settings are:

<table>
<thead>
<tr>
<th></th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hor Blocks bbb</td>
<td>001 to 112</td>
<td>001 to 152</td>
<td>001 to 128</td>
<td>001 to 168</td>
</tr>
<tr>
<td>Vertical Blocks ccc</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Std 7”</td>
<td>001 to 178</td>
<td>001 to 178</td>
<td>001 to 178</td>
<td>001 to 267</td>
</tr>
<tr>
<td>Exp 14”</td>
<td>001 to 356</td>
<td>001 to 356</td>
<td>001 to 356</td>
<td>001 to 534</td>
</tr>
</tbody>
</table>
Graphics, PCX

**Command Structure**

<ESC>GPaaaa,(data)

| aaaaa | = Number of bytes to be downloaded |

Example:  
<ESC>G32000, ... data...

Placement: Anywhere within the job data stream

Default: None

**Command Function**

To allow the creation and printing of graphic images using a PCX file format.

**Printer Input**

See Appendix Appendix C for a detailed example

<ESC>A
<ESC>V0150<ESC>H0100<ESC>GP03800,(...Data...)
<ESC>Q1
<ESC>Z

**Printer Output**

Special Notes

1. The maximum number of bytes that can be downloaded is 32K (compressed). The number specified by this command includes the PCX header information. The maximum size of the uncompressed PCX file is 64K. If the uncompressed file exceeds 64K, the graphic will not print.

2. Only black and white PCX files can be downloaded.

3. The image created by this command cannot be rotated.

4. The file size specified by this command is the DOS file size in bytes.
Job ID Store

**Command Structure**  
<ESC>Idaa

aa = Job ID assigned (01 to 99)

**Example:**  
<ESC>ID09

**Placement:** Immediately following the <ESC>A in the job data stream.

**Default:** None

**Command Function**  
To add an identification number to a job. The status of the job can then be determined using the ENQ command in the Bi-Com status mode (See Section 5: Interface Specifications for more information).

**Printer Input**  
<ESC>A  
<ESC>ID02  
... Job ...  
<ESC>Z

**Printer Output**  
There is no printer output as a result of this command.

**Special Notes**

1. Works only in Bi-Com mode. The Job ID number must be stored before Bi-Com status mode can be used.

2. If more than one ID number is sent in a single job, i.e.

   <ESC>A  
   <ESC>ID01  
   ............  
   <ESC>ID02  
   ............

   the last number transmitted will be used.
Journal Print

Command Structure  
<ESC>J

Example: See above

Placement: Immediately following <ESC>A

Default: None

Command Function  
To print text in a line by line format on a label. By specifying this command, you automatically select Font XS with a Character Expansion of 2x2. You also establish a base reference point of H2,V2. The character pitch is 2 dots and the line gap is 16 dots. Simply issue an ASCII <CR> at the end of each text line.

Input to Printer  
<ESC>A
<ESC>J WITH THE JOURNAL FEATURE
YOU CAN PRINT TEXT WITHOUT
USING ANY FONT COMMANDS
OR POSITION COMMANDS
<ESC>Q1<ESC>Z

Printer Output

WITH THE JOURNAL FEATURE
YOU CAN PRINT TEXT WITHOUT
USING ANY FONT COMMANDS
OR POSITION COMMANDS

Special Notes

1. Journal mode assumes a maximum label width. Otherwise, you may print where there is no label and damage your print head.

2. It is effective only for the current print job.
Lines and Boxes

Command Structure

Line

\(<\text{ESC}>FWaabcccc\>

\(aa\) = Width of horizontal line in dots (01-99)

\(b\) = Line orientation

H  Horizontal line
V  Vertical Line

\(cccc\) = Length of line in dots (see Note 2 for max length)

Box:

\(<\text{ESC}>FWaabbVccccHdddd\>

\(aa\) = Width of horizontal side in dots (01-99)

\(bb\) = Width of vertical side in dots (01-99)

\(cccc\) = Length of vertical side in dots (see Note 2 for max length)

\(dddd\) = Length of horizontal side in dots (see Note 2 for max length)

Example:

\(<\text{ESC}>FW02H0200\>

Placement:  Following the necessary positioning commands

Default:    None

Command Function

To print horizontal lines, vertical lines, and boxes as images on the label.

Input to Printer

\(<\text{ESC}>A\>
\(<\text{ESC}>H0100<\text{ESC}>V0100<\text{ESC}>FW20H0200\>
\(<\text{ESC}>H0320<\text{ESC}>V0100<\text{ESC}>FW20V0200\>
\(<\text{ESC}>H0350<\text{ESC}>V0100<\text{ESC}>FW1010H0200V0200\>
\(<\text{ESC}>Q1<\text{ESC}>Z\)
Printer Output

Special Notes

1. It is recommended that all lines and boxes be specified in the normal print direction.

2. The maximum allowable lengths are as follows.

<table>
<thead>
<tr>
<th>LINE/BOX LENGTH</th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td>0001 to 896</td>
<td>0001 to 1216</td>
<td>0001 to 1024</td>
<td>0001 to 1344</td>
</tr>
<tr>
<td>Vertical</td>
<td>0001 to 1424</td>
<td>0001 to 1424</td>
<td>0001 to 1424</td>
<td>0001 to 2136</td>
</tr>
<tr>
<td></td>
<td>0001 to 2824</td>
<td>0001 to 2824</td>
<td>0001 to 2824</td>
<td>0001 to 4272</td>
</tr>
<tr>
<td></td>
<td>with Expanded Print Length</td>
<td>with Expanded Print Length</td>
<td>with Expanded Print Length</td>
<td>with Expanded Print Length</td>
</tr>
</tbody>
</table>
Line Feed

Command Structure  
\(<\text{ESC}>E\text{aaa}\)

\(\text{aaa} = \) Number of dots (001-999) between the bottom of the characters on one line to the top of the characters on the next line

Example:  \(<\text{ESC}>E010\)

Placement:  Preceding the text that will use the line feed function

Default:  None

Command Function

To print multiple lines of the same character size without specifying a new print position for each line. With the Line Feed command, specify the number of dots you want between each line. Then, send an ASCII \(<\text{CR}>\) at the end of each line of text. The printer automatically identifies the size of the last character, moves down the number of dots specified, and begins printing the next line.

Input to Printer

\(<\text{ESC}>A\)
\(<\text{ESC}>E010<\text{ESC}>H0050<\text{ESC}>V0050<\text{ESC}>L0202<\text{ESC}>S\)
THIS IS THE 1ST LINE<\text{CR}>
THIS IS THE 2ND LINE<\text{CR}>
THIS IS THE 3RD LINE<\text{CR}>
\(<\text{ESC}>Q1<\text{ESC}>Z\)

Printer Output

\(\text{THIS IS THE 1ST LINE}\)
\(\text{THIS IS THE 2ND LINE}\)
\(\text{THIS IS THE 3RD LINE}\)

Special Notes

1. It is effective only for the current data stream.

2. When printing lines or boxes in the same data stream with the Line Feed command, the Lines and Boxes command should be specified last, preceding \(<\text{ESC}>Q\) Quantity command.

3. This command is invalid only if the value specified is zero.

4. Following this command with a \(<\text{CR}>\) character will allow you to print with auto line feed. The print position will be determined from the value specified and the H value set in the printer. If you specify several H values after this command, the print position will be determined by the H value last specified. You must redefine the font to be used after each H command.
## Off-Line/Pause

### Command Structure

<ESC>@,nn n

nn...n = Optional message to be displayed on the LCD. Maximum of 32 characters.

Example: See above

Placement: Anywhere in the print job between the <ESC>A and <ESC>Z

Default: None

### Command Function

To specify the printer to come to an off-line state. When used within a print job, the printer goes off-line after finishing the print job.

### Input to Printer

<ESC>A
<ESC>@, Load Blue Labels and place printer On-Line
...Job...
<ESC>Z

### Printer Output

There is no printer output for this command. The printer is placed in the Off-Line mode as soon as the current print job is finished.

### Special Notes

1. You must press the LINE key on the front panel to return the printer to an On-Line status (see Operator Panel in Section 2 of this manual).

2. Remember, when using this command, that the print job specifies <ESC>Q10, all ten labels will print before the printer goes off-line.
Postnet

Command Structure  \texttt{<ESC>BPn...n}

\texttt{n...n} =  
- 5 digits (Postnet-32 format)
- 6 digits (Postnet-37 format)
- 9 digits (Postnet-52 format)
- 11 digits (Postnet-62, Delivery Point format)

Example: \texttt{<ESC>BP123456789}

Placement: Immediately preceding the data to be encoded

Default: None

Command Function
To print Postnet bar codes

Printer Input
\texttt{<ESC>A}
\texttt{<ESC>H0100<ESC>V0120<ESC>BP94089}
\texttt{<ESC>H0100<ESC>V0160<ESC>BP123456}
\texttt{<ESC>H0100<ESC>V0200<ESC>BP123456789}
\texttt{<ESC>H0100<ESC>V0240<ESC>BP12345678901}
\texttt{<ESC>Q1<ESC>Z}

Printer Output
![Postnet Bar Code]

Special Notes
1. If the number of data digits does not match those listed, the command is ignored.
2. Only numeric data will be accepted.
# Print Darkness

## Command Structure

`<ESC>#{Ea`  

\[ a = \text{Print darkness value} \]  

(see note 2 for allowable range)

Example:  

`<ESC>#{E2`

Placement:  

Must be placed immediately after `<ESC>A` and immediately before `<ESC>Z` in its own separate data stream

Default:  

2

## Command Function

To specify a new print darkness setting. This command allows software control of the darkness setting for unique media and ribbon combinations.

## Input to Printer

`<ESC>A`  

`<ESC>#{E2`  

`<ESC>Z`

## Printer Output

There is no printer output for this command.

## Special Notes

1. This becomes the new setting in the printer configuration for all subsequent print jobs, unless changed. The setting is stored in non-volatile memory and is not affected by cycling power.

2. The allowable ranges for heat settings are:

<table>
<thead>
<tr>
<th>Heat Range</th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The lighest setting is the smallest value and the darkest setting is the largest value.
Print Length, Expanded

Command Structure

<ESC>AX Sets the print length to 14" (356 mm)

<ESC>AR Resets the maximum print length to 7" (178 mm)

Example: See above

Placement: Must follow the Start Code command (see Page 5-70) and be in its own separate data stream.

Default: <ESC>AR

Command Function

To double the maximum print length (in feed direction) for a label.

Input to Printer:

<ESC>A
<ESC>AX
<ESC>Z

<ESC>A
<ESC>H0050<ESC>V0100<ESC>WB1 EXPAND TO:
<ESC>H0050<ESC>V2700<ESC>WB1 14 INCHES
<ESC>Q1<ESC>Z

<ESC>A
<ESC>AR
<ESC>Z

Printer Output:

14"

EXPAND TO:

14 INCHES
Special Notes

1. AX is effective until AR is sent to reset the printer to its standard print length, or until the printer is repowered.

2. It may be included in an independent data stream to specify the size of the maximum print area:

<table>
<thead>
<tr>
<th>LENGTH</th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;ESC&gt;A</td>
<td>14”</td>
<td>14”</td>
<td>14”</td>
<td>14”</td>
</tr>
<tr>
<td></td>
<td>356 mm</td>
<td>356 mm</td>
<td>356 mm</td>
<td>356 mm</td>
</tr>
<tr>
<td></td>
<td>2848 dots</td>
<td>2848 dots</td>
<td>2848 dots</td>
<td>4272 dots</td>
</tr>
<tr>
<td>&lt;ESC&gt;AX</td>
<td>14”</td>
<td>14”</td>
<td>14”</td>
<td>14”</td>
</tr>
<tr>
<td>&lt;ESC&gt;Z</td>
<td>356 mm</td>
<td>356 mm</td>
<td>356 mm</td>
<td>4272 dots</td>
</tr>
<tr>
<td></td>
<td>2848 dots</td>
<td>2848 dots</td>
<td>2848 dots</td>
<td>4272 dots</td>
</tr>
</tbody>
</table>

3. When this command is used with the <ESC>& Store Form Overlay command (see page 5-41) the Form length cannot exceed 14”.
Print Position

Command Structure

Horizontal Position: \(<\text{ESC}>H\text{aaaa}\)

Vertical Position: \(<\text{ESC}>V\text{bbbb}\)

aaaa = Number of dots horizontally from the base reference point (1 to maximum) See Note 2.

bbbb = Number of dots vertically from the base reference point (1 to maximum) See Note 2.

Example: \(<\text{ESC}>H0020<\text{ESC}>V0150\)

Placement: Preceding any printed field description of lines/boxes, fonts, bar codes or graphics.

Default: \(<\text{ESC}>H0001\)  
\(<\text{ESC}>V0001\)

Command Function

The Horizontal and Vertical commands specify the top left corner of a field or label, using the current base reference point as an origin. They also establish a reference point for subsequent fields until the next horizontal and/or vertical print position command is issued.

Input to Printer

\(<\text{ESC}>A\)  
\(<\text{ESC}>H0025<\text{ESC}>V0050<\text{ESC}>L0303<\text{ESC}>\text{MSATO}\)  
\(<\text{ESC}>H0100<\text{ESC}>V0150<\text{ESC}>\text{MSATO}\)  
\(<\text{ESC}>Q2<\text{ESC}>Z\)

Printer Output

Special Notes

1. The print position of a field is affected by both the Rotate (\(<\text{ESC}>R\) and \(<\text{ESC}>A3\)) commands.
2. For print lengths greater than 14 inches an optional Memory Card must be used.

<table>
<thead>
<tr>
<th></th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Print Width</td>
<td>896</td>
<td>1216</td>
<td>1024</td>
<td>1344 dots</td>
</tr>
<tr>
<td>aaaa</td>
<td>4.4 in.</td>
<td>6.0 in.</td>
<td>5.0 in.</td>
<td>4.4 in.</td>
</tr>
<tr>
<td></td>
<td>112 mm</td>
<td>152 mm</td>
<td>127 mm</td>
<td>112 mm</td>
</tr>
<tr>
<td>Standard Print Length</td>
<td>1424 dots</td>
<td>1424 dots</td>
<td>1424 dots</td>
<td>2136 dots</td>
</tr>
<tr>
<td>bbbb</td>
<td>7.0 in.</td>
<td>7.0 in.</td>
<td>7.0 in.</td>
<td>7.0&quot;</td>
</tr>
<tr>
<td></td>
<td>178 mm</td>
<td>178 mm</td>
<td>178 mm</td>
<td>178mm</td>
</tr>
<tr>
<td>Expanded with &lt;ESC&gt;AX</td>
<td>2848 dots</td>
<td>2848 dots</td>
<td>2848 dots</td>
<td>4272 dots</td>
</tr>
<tr>
<td>bbbb</td>
<td>14.0 in.</td>
<td>14.0 in.</td>
<td>14.0 in.</td>
<td>14&quot;</td>
</tr>
<tr>
<td></td>
<td>356 mm</td>
<td>356 mm</td>
<td>356 mm</td>
<td>356 mm</td>
</tr>
</tbody>
</table>

Maximum Length with Memory Card (2)

<table>
<thead>
<tr>
<th></th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>128 Kbyte bbbb</td>
<td>1160 dots</td>
<td>860 dots</td>
<td>1022 dots</td>
<td>778 dots</td>
</tr>
<tr>
<td></td>
<td>5.7 in.</td>
<td>4.2 in.</td>
<td>5.0 in.</td>
<td>2.5 in.</td>
</tr>
<tr>
<td></td>
<td>145 mm</td>
<td>107 mm</td>
<td>127 mm</td>
<td>6.4 mm</td>
</tr>
<tr>
<td>512 Kbyte bbbb</td>
<td>4640 dots</td>
<td>3447 dots</td>
<td>4094 dots</td>
<td>3119 dots</td>
</tr>
<tr>
<td></td>
<td>22.8 in.</td>
<td>16.9 in.</td>
<td>16.5 in.</td>
<td>10.1 in.</td>
</tr>
<tr>
<td></td>
<td>580 mm</td>
<td>430 mm</td>
<td>511 mm</td>
<td>259 mm</td>
</tr>
<tr>
<td>1 Mbyte bbbb</td>
<td>9280 dots</td>
<td>6896 dots</td>
<td>8190 dots</td>
<td>6240 dots</td>
</tr>
<tr>
<td></td>
<td>45.7 in.</td>
<td>37.9 in.</td>
<td>40.3 in.</td>
<td>20.4 in.</td>
</tr>
<tr>
<td></td>
<td>1160 mm</td>
<td>962 mm</td>
<td>1024 mm</td>
<td>520 mm</td>
</tr>
<tr>
<td>2 Mbyte bbbb</td>
<td>9999 dots (1)</td>
<td>9999 dots (1)</td>
<td>9999 dots (1)</td>
<td>9999 dots (1)</td>
</tr>
<tr>
<td></td>
<td>49.2 in.</td>
<td>49.2 in.</td>
<td>49.2 in.</td>
<td>32.7 in.</td>
</tr>
<tr>
<td></td>
<td>1249 mm</td>
<td>1249 mm</td>
<td>1249 mm</td>
<td>833 mm</td>
</tr>
</tbody>
</table>

(1) Limited by the number of digits in the command field.
(2) When a Memory Card is used to expand the print length, the card capacity is used instead of the internal memory, not in addition to the internal memory.

3. If any part of an image is placed past the maximum number of dots for standard length and or the capacity of the memory card, that part of the image will be lost.

4. If any part of an image is placed past maximum allowable dots across the label, that part of the image will be lost.

5. If you attempt to print where there is no paper, you may damage the print head.

6. For these commands, the leading zeroes do not have to be entered. The command V1 is equivalent to V0001.
Print Quantity

**Command Structure**  
<ESC>Qaaaaaa

aaaaaa  =  Total number of labels to print (1-999999)

Example:  <ESC>Q500

Placement:  Just preceding <ESC>Z, unless <ESC>NUL exists, then preceding that. This command must be present in every print job.

Default:  None

**Command Function**  
To specify the total number of labels to print for a given print job.

**Input to Printer**  
<ESC>A  
<ESC>H0100<ESC>V0100<ESC>WB1M-8485S  
<ESC>Q3  
<ESC>Z

**Printer Output**  
Three labels containing the data “M-8485S” will be printed.

**Special Notes**

1. To pause during a print job, you must press the LINE key on the Operator Panel.

2. To cancel a print job, you must turn off the printer, or you may send the <CAN> code if using the Bi-Com mode. Multi-Buffer jobs can be cleared with the <ESC>* Clear Print Job(s) and Memory command (see page 5-29).

3. When used with the <ESC>F Sequential Numbering command (see Page 5-68, the Print Quantity value should be equal to the total number of labels to be printed.

4. If you do not specify a Print Quantity, the printer will not print a label.

5. For this command, leading zeroes do not have to be entered. The command Q1 is equivalent to Q000001.
Print Speed

Command Structure

\(<\text{ESC}>\text{CSa}\)

a = Designates the speed selection (see note 2)

Example: \(<\text{ESC}>\text{CS6}\)

Placement: Must be placed immediately after \(<\text{ESC}>A\) and immediately before \(<\text{ESC}>Z\) in its own separate data stream

Default: As previously set in the printer configuration

Command Function

To specify a unique print speed through software for a particular label. This allows flexibility in finding the best performance and quality for the particular label format, media, and ribbon. All subsequent labels will print at this speed unless the speed is changed with this command or through the Operator Panel.

Input to Printer

\(<\text{ESC}>A\)
\(<\text{ESC}>\text{CS6}\>
\(<\text{ESC}>Z\>

Printer Output

There is no printer output for this command. It sets the print speed of the printer.

Special Notes

1. This becomes the new setting in the printer configuration for all subsequent print jobs, unless changed. The setting is stored in non-volatile memory and is not affected by cycling the power.

2. The allowable speed ranges are:

<table>
<thead>
<tr>
<th>Print Speed a</th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2 ips</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 mm/sec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3 ips</td>
<td>4 ips</td>
<td>4 ips</td>
<td>4 ips</td>
</tr>
<tr>
<td></td>
<td>75 mm/sec</td>
<td>100 mm/sec</td>
<td>100 mm/sec</td>
<td>100 mm/sec</td>
</tr>
<tr>
<td>4</td>
<td>4 ips</td>
<td>4 ips</td>
<td>4 ips</td>
<td>4 ips</td>
</tr>
<tr>
<td></td>
<td>100 mm/sec</td>
<td>100 mm/sec</td>
<td>100 mm/sec</td>
<td>100 mm/sec</td>
</tr>
<tr>
<td>5</td>
<td>5 ips</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>125 mm/sec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>6 ips</td>
<td>6 ips</td>
<td>6 ips</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 mm/sec</td>
<td>150 mm/sec</td>
<td>150 mm/sec</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>8 ips</td>
<td>8 ips</td>
<td>8 ips</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200 mm/sec</td>
<td>200 mm/sec</td>
<td>200 mm/sec</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>10 ips</td>
<td>10 ips</td>
<td>10 ips</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250 mm/sec</td>
<td>250 mm/sec</td>
<td>250 mm/sec</td>
</tr>
</tbody>
</table>
Repeat Label

Command Structure  <ESC>C
Example: See above
Placement: Must be placed immediately after <ESC>A and immediately before <ESC>Z in its own separate data stream
Default: None

Command Function  To print duplicate of the last label printed

Input to Printer  <ESC>A
<ESC>C
<ESC>Z

Printer Output  A duplicate of the previous label will be printed.

Special Notes  1. This command will have no effect if the power to the printer was cycled off and back on since printing the previous label.
Replace Data (Partial Edit)

*Command Structure*

- `<ESC>0` (<ESC>zero)

  *Example:* See above

  *Placement:* Must follow `<ESC>A` and precede all other print data

  *Default:* None

*Command Function*

To replace a specified area of the previous label with new data. This command will cause the previous label to print along with any changes specified within the current data stream.

*Input to Printer*

```
<ESC>A
<ESC>H0025<ESC>V0020<ESC>WB0Company Name
<ESC>H0025<ESC>V0085<ESC>WB1SATO
<ESC>H0025<ESC>V0150<ESC>WL0SATO
<ESC>H0025<ESC>V0215<ESC>WL1SATO
<ESC>Q1<ESC>Z

<ESC>A
<ESC>0<ESC>H0025<ESC>V0020<ESC>WB0SATO
<ESC>Q1<ESC>Z
```

*Printer Output*

---

**Company Name**

SATO

SATO

SATO

---

SATO

SATO

SATO

SATO
Special Notes

1. Specify the exact same parameters for the image to be replaced as were specified in the original data stream, including rotation, expansion, pitch, etc. This will ensure that the new data will exactly replace the old image. If the replacement data contains fewer characters than the old data, then the characters not replaced will still be printed.

2. This command will not function if the power has been cycled off and back on since the last label was printed.

3. Proportional Pitch text cannot be used with this command.
Reverse Image

Command Structure

\(<ESC>\)(aaaa,bbbb\)

- \(a\) = Horizontal length in dots of reverse image area
- \(b\) = Vertical height in dots of reverse image area.

See Note 6 for field ranges

Example: \(<ESC>\)(100,50\)

Placement: This command must be preceded by all other data and be placed just before \(<ESC>Q\)

Default: None

Command Function

To reverse an image area from black to white and vice versa. Use the Print Position commands (\(<ESC>H\) and \(<ESC>V\)) to locate the top left corner of the reverse image area.

Input to Printer

\(<ESC>A\)
\(<ESC>H0050<ESC>V0120<ESC>L0202<ESC>WB1REVERSE\)
\(<ESC>H0250<ESC>V0300<ESC>L0202<ESC>WB1HALF\)
\(<ESC>H0040<ESC>V0110<ESC>(370,100\)
\(<ESC>H0240<ESC>V0290<ESC>(220,47\)
\(<ESC>Q1<ESC>Z\)

Printer Output
Special Notes

1. A reverse image area is affected by the rotate commands. Therefore, always assume the printer is in the normal print orientation when designing and sending the Reverse Image command.

2. If using reverse images with the form overlay, place this command before the Form Overlay command in the data stream.

3. If the Rotate commands are used with this command, the V and H parameters are reversed.

4. If the height and width to be reversed contain other than alphanumeric data, the area is not printed.

5. If the values specified exceed the maximum ranges, the reverse image is not created.

6. The maximum allowable settings are as follows:

<table>
<thead>
<tr>
<th></th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>aaaa</td>
<td>001 to 896</td>
<td>0001 to 1216</td>
<td>0001 to 1024</td>
<td>0001 to 1344</td>
</tr>
<tr>
<td>Vertical</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bbbb</td>
<td>0001 to 1424</td>
<td>0001 to 1424</td>
<td>0001 to 1424</td>
<td>0001 to 2136</td>
</tr>
</tbody>
</table>
### Rotate, Fixed Base Reference Point

**Command Structure**

<ESC>%a

- **a**
  - 0: Sets print to normal direction
  - 1: Sets print to 90° CW
  - 2: Sets print to 180° rotated (upside down)
  - 3: Sets print to 270° CW

**Example:** <ESC>%3

**Placement:** Preceding any printed data to be rotated

**Default:** <ESC>%0

**Command Function**

To rotate the print direction in 90° increments without changing the location of the base reference point. The diagram below illustrates the use of the <ESC>% Rotate command. Note that the entire print area is shown, but your label will probably not be as large as the entire area.

**Input to Printer**

<ESC>A

- <ESC>%0<ESC>L202<ESC>H0200<ESC>V0100<ESC>MNORMAL DIRECTION
- <ESC>%1<ESC>H0200<ESC>V0300<ESC>MONE
- <ESC>%2<ESC>H0200<ESC>V0400<ESC>MTWO
- <ESC>%3<ESC>H0200<ESC>V0500<ESC>MTHREE
- <ESC>Q1<ESC>Z

**Printer Output**

![Diagram of rotated print directions]
Special Notes

1. Do not combine this command and the <ESC>R Rotate command (see Page 5-66) in the same data stream.

2. The specified values are valid until another Rotate (<ESC>%) command is received.

3. Receipt of a Stop Print (<ESC>Z) command will reset the setting to the default value.
**Rotate, Moving Base Reference Point**

**Command Structure**

Normal Direction: \(<\text{ESC}>N\)

Rotated Direction: \(<\text{ESC}>R\)

Example: See above

Placement: Preceding any printed data to be rotated

Default: \(<\text{ESC}>N\)

**Command Function**

The \(<\text{ESC}>R\) command rotates the printing of all subsequent images in a print job by 90° counterclockwise each time it is used. It also moves the base reference point to a different corner of the print area.

The \(<\text{ESC}>N\) command returns to the original base reference point and returns printing to the normal orientation.

**Input to Printer**

\(<\text{ESC}>A\>

\(<\text{ESC}>N<\text{ESC}>\text{L202}<\text{ESC}>\text{H0100}<\text{ESC}>\text{V0010}<\text{ESC}>\text{MNORMAL DIRECTION}<\text{ESC}>\text{R}<\text{ESC}>\text{H0100}<\text{ESC}>\text{V0100}<\text{ESC}>\text{MONE}<\text{ESC}>\text{R}<\text{ESC}>\text{H0100}<\text{ESC}>\text{V0100}<\text{ESC}>\text{MTWO}<\text{ESC}>\text{R}<\text{ESC}>\text{H0100}<\text{ESC}>\text{V0100}<\text{ESC}>\text{MTHREE}<\text{ESC}>\text{R}<\text{ESC}>\text{H0100}<\text{ESC}>\text{V0100}<\text{ESC}>\text{MFOUR}<\text{ESC}>\text{Q1}<\text{ESC}>\text{Z}\)

**Printer Output**

![Diagram showing the rotation and movement of the base reference point](image-url)
**Special Notes**

1. Do not combine this command and the `<ESC>%` rotate command (see Page 5-64) in the same data stream.

2. A custom graphic is not affected by this command. Therefore, always design and locate your graphic image to print in the appropriate orientation.

3. See Section 5, Rotated Fields, Page 5-7, for more information.

4. The specified values are valid until another Rotate (<ESC>R) command is received.

5. Receipt of a Stop Print (<ESC>Z) command will reset the setting to the default value.
Sequential Numbering

Command Structure  
<ESC>Faaaabcccc,dd,ee

- aaaa = Number of times to repeat the same data (0001-9999)
- b = Plus or minus symbol (+ for increments; - for decrements)
- cccc = Value of step for sequence (0001-9999)
- ,dd = Number of digits for sequential numbering (01-99). The first incrementing character position starts after the positions exempted from sequential numbering as specified in ee. If these digits are left out, the default is 8.
- ,ee = Number of digits free from sequential numbering (00-99) starting with the right most position. If these digits are left out, the default is 0.

Example:  
<ESC>F001-001,04,03

Decrementing

Free from Decrementing

In this example, the right most (least significant) three digits would not decrement and the next four would decrement.

Placement: Preceding the starting value to be incremented or decremented.

Default: None

Command Function
To allow the ability to print sequential fields (text, bar codes) where all incrementing is done within the printer. Up to eight different sequential fields can be specified per label. Sequencing is effective for up to 99-digit numeric data within each field.

Input to Printer  
<ESC>A<ESC>H0100<ESC>V0100<ESC>MSERIAL NUMBER:
<ESC>H0100<ESC>V0200<ESC>F001+005
<ESC>L0202<ESC>M1000
<ESC>Q2<ESC>Z
Special Notes

1. The value specified for Print Quantity (see Page 5-57) should be equal to the number of different sequential values desired multiplied by the number of repeats specified.

Example:
To print 2 sets each of the numbers 1001-1025 on separate labels, we need 50 total labels. The commands would be as follows:

```
<ESC>A
<ESC>H0100<ESC>V0100<ESC>F002+001<ESC>XM1001
<ESC>Q50
<ESC>Z
```

2. It is necessary to specify the print position for each sequential field on a label.

3. Up to eight different sequential fields can be specified per label.

4. This command ignores alpha characters in the sequential number field.

5. This command can not be used with the following commands:
   - Copy Image, Page 5-31
   - Reverse Image, Page 5-62
   - Line Feed, Page 5-49
Start/Stop Label

Command Structure

Start Command: <ESC>A
Stop Command: <ESC>Z

Example: See above

Placement: <ESC>A must precede data
<ESC>Z must follow data

Default: None

Command Function

For all print jobs, the Start command must precede the data, and the Stop command must follow. The print job will not run properly if these are not in place.

Input to Printer

<ESC>A
<ESC>H0001<ESC>V0100<ESC>WB1SATO
<ESC>H0130<ESC>V0200<ESC>B103150*M-8485S*
<ESC>H0170<ESC>V0360<ESC>L0202<ESC>S*M-8485S*
<ESC>Q1<ESC>Z

Printer Output

There is not output for these commands they are not accompanied by other label printing commands. However, these commands must precede and follow each print job sent to the printer.
Calendar Option Commands

The following commands in this section require the Calendar option.
Calendar Increment

Command Structure  
<ESC>WPabb

- **a** = Y Years
- **M Months**
- **D Days**
- **h Hours**

- **bbb** = Numeric data: Years (1-9), Months (01-99), Days (001-999), Hours (001-999)

Example: <ESC>WPM03

Placement: Anywhere within the data stream

Default: None

Command Function  
To add a value to the printer’s current date and/or time, which may then be printed on the label. This command does not change the printer’s internal clock setting.

Input to Printer:

- <ESC>A
- <ESC>H0100<ESC>V100<ESC>XB1Current Date:
- <ESC>WAmM/dd/YY
- <ESC>WPM06
- <ESC>H0100<ESC>V0200<ESC>XB1Expiration Date:
- <ESC>WAmM/dd/YY
- <ESC>Q1<ESC>Z

Printer Output:

- **Current Date**: 01/01/95
- **Expiration Date**: 07/01/95
Special Notes:

1. This command requires the Calendar Option. See your SATO representative for more details.

2. Once the year increments past “99” it will wrap back to “00”.

3. This command can only be used once per data stream.

4. The printer’s internal clock may be set through the Calendar Set command (see Page 5-76).

5. If a print quantity of more than one label per job is used, the same time and date will be on each label of the entire print job.
Calendar Print

Command Structure

<ESC>WA(elements)

(elements) = YY Year
               MM Month
               DD Day
               hh Hour
               mm Minute

Example: <ESC>WAMM/DD/YY hh:mm

Placement: Anywhere within the data stream

Default: None

Command Function

To specify the printing of a date and/or time field from the printer’s internal clock. This may be used to date/time stamp your labels.

Input to Printer:

<ESC>A
<ESC>H0100<ESC>V0100<ESC>XB1The current date is:
<ESC>XB1<ESC>WAMM/DD/YY
<ESC>H0100<ESC>V0200<ESC>XB1The current time is:
<ESC>XB1<ESC>WAhh:mm
<ESC>Q1<ESC>Z

Printer Output:

The current date is: 01/01/95
The current time is: 00:00
Special Notes:

1. This function requires the Calendar Option. See your SATO representative for details.

2. The date and time elements may be placed in any order for printing.

3. Use a slash (/) to separate date elements and a colon (:) to separate time elements.

4. The font for the date/time elements must be specified before this command.

6. The printer’s internal clock may be set through the Calendar Set command (see Page 5-76).

7. This command can be used up to six times per job.

8. The Copy (<ESC>WD) or Reverse Image (<ESC>/) commands cannot be used with this command.

9. Up to 16 characters can be used with this command.
Calendar Set

**Command Structure**  \(<\text{ESC}>\text{WT}aabbccddeee\)

- **aa** = Year (00-99)
- **bb** = Month (01-12)
- **cc** = Day (01-31)
- **dd** = Hour (00-23)
- **ee** = Minute (00-59)

Example:  \(<\text{ESC}>\text{WT}9101311200\)

**Placement:** This command must be sent in an independent data stream.

**Default:** None

**Command Function**  To set the time and date of the printer’s internal clock.

**Input to Printer:**
\(<\text{ESC}>A\>
\(<\text{ESC}>\text{WT}9312251300\>
\(<\text{ESC}>Z\>

**Printer Output**  There is no printer output for this command. It sets the current date to December 25, 1993 and the current time to 1:00 PM in the printer.

**Special Notes**  This command requires the Calendar Option. See your SATO representative for details.
Memory Card Option Commands

These commands require the Memory Card Option.

Note: Before a Memory Card can be used for the first time, it must be initialized using the <ESC>BJF command (see page 5-90). If it is not initialized, the printer will not recognize the card and respond as if no card was installed.
Memory Card Function
Clear Card Memory

Command Structure
<ESC>*a,bbb

- **a** = Memory card section to be cleared
  - G To clear SATO graphic files from memory card
  - P To clear PCX graphic files
  - F To clear formats from the memory card
  - O To clear TrueType fonts

- **bbb** = Memory Card storage area to be cleared
  - 001 to 999 for Graphics, PCX or Formats
  - 000 to 009 for TrueType fonts

Example: <ESC>*G,01

Placement: This command should be sent to the printer immediately following the <ESC>CC Slot Select command.

Default: None

Command Function
To clear individual memory areas in the Memory Card.

Input to Printer
- <ESC>A
- <ESC>CC1<ESC>*O,09
- <ESC>Z

Printer Output
There is no printer output as a result of this command.

Special Notes
1. To clear everything in the memory card, use the <ESC>BJF Memory Card Initialize command (see page 5-90).
2. This command is ignored if there is no data to be cleared.
3. This command is ignored if a memory card is not installed in the printer.
Memory Card Function
Expand Memory Area

Command Structure
<ESC>EXa

a = Memory Designation
  0 Use Printer Memory
  1 Use Memory Card Slot 1
  2 Use Memory Card Slot 2

Example: <ESC>EX1

Placement: In its own data stream immediately after powering on.

Default: None

Command Function
This command expands the memory available to image labels by using the Memory Card.

Input to Printer
<ESC>A
<ESC>EX2
<ESC>Z

Printer Output
There is no printer output as a result of this command.

Special Notes
1. You must have the optional Memory Card to use this command. Call your local SATO representative for details.

2. When the printer is turned off, the Memory Card is reset to normal operation.

3. If the Memory Card specified already contains data, it cannot be used for memory expansion.

4. The printer will reserve the specified Memory Card for expanded memory until it is turned off or receives another <ESC>EX Expand Memory Area command.

5. Use care with Line and Box commands as excessively long lines can damage the print head.

6. The maximum vertical position that can be specified by the <ESC>V vertical position command is shown in the table below:
7. If a job contains elements out of the memory range, it is ignored.

8. This command cannot be used with the <ESC>AX and <ESC>AR Expanded Print Length commands or the <ESC>R Rotate, Moving Base Reference Point command.

9. If the Forms Overlay command <ESC>& is used with a Memory Card to expand the print area, the Form Overlay length is still limited to 14".

<table>
<thead>
<tr>
<th></th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Print Length</td>
<td>1424 dots 7.0 in. 178 mm</td>
<td>1424 dots 7.0 in. 178 mm</td>
<td>1424 dots 7.0 in. 178 mm</td>
<td>2136 dots 7.0 in. 178 mm</td>
</tr>
<tr>
<td>Expanded with &lt;ESC&gt;AX Command</td>
<td>1424 dots 7.0 in. 178 mm</td>
<td>1424 dots 7.0 in. 178 mm</td>
<td>2848 dots 14.0 in. 356 mm</td>
<td>4272 dots 14.0 in. 356 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum Length with Memory Card (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>128 Kbyte</td>
</tr>
<tr>
<td>1160 dots 5.7 in. 145 mm</td>
</tr>
<tr>
<td>860 dots 4.2 in. 107 mm</td>
</tr>
<tr>
<td>1022 dots 5.0 in. 127 mm</td>
</tr>
<tr>
<td>778 dots 2.5 in. 6.4 mm</td>
</tr>
<tr>
<td>512 Kbyte</td>
</tr>
<tr>
<td>4640 dots 72.8 in. 580 mm</td>
</tr>
<tr>
<td>3447 dots 16.9 in. 430 mm</td>
</tr>
<tr>
<td>4094 dots 16.5 in. 511 mm</td>
</tr>
<tr>
<td>3119 dots 10.1 in. 259 mm</td>
</tr>
<tr>
<td>1 Mbyte</td>
</tr>
<tr>
<td>9280 dots 45.7 in. 1160 mm</td>
</tr>
<tr>
<td>6896 dots 37.9 in. 962 mm</td>
</tr>
<tr>
<td>8190 dots 40.3 in. 1024 mm</td>
</tr>
<tr>
<td>6240 dots 20.4 in. 520 mm</td>
</tr>
<tr>
<td>2 Mbyte</td>
</tr>
<tr>
<td>9999 dots (1) 49.2 in. 1249 mm</td>
</tr>
<tr>
<td>9999 dots (1) 49.2 in. 1249 mm</td>
</tr>
<tr>
<td>9999 dots (1) 49.2 in. 1249 mm</td>
</tr>
<tr>
<td>9999 dots (1) 32.7 in. 833 mm</td>
</tr>
</tbody>
</table>

(1) Limited by the number of digits in the command field.
(2) When a Memory Card is used to expand the print length, the card capacity is used instead of the internal memory, not in addition to the internal memory.
Memory Card Function
Fonts, TrueType Recall

Command Structure  

<ESC>BJRabccddeeeeff...f

a = Font ID (0 thru 9)
b = Horizontal Expansion (01 thru 12)
cc = Vertical Expansion (01 thru 12)
dd = Character Pitch (01 thru 99)
eeee = Number of characters to be printed using the font
ffe = Data to be printed

Example:  <ESC>BJR1020201000004SATO

Placement: Immediately following the <ESC>CC Slot Select command.

Default: None

Command Function
This command recalls previously stored TrueType fonts from a Memory Card.

Printer Input
<ESC>A
<ESC>V0100<ESC>H0100<ESC>CC1<ESC>BJR1020201000004SATO
<ESC>Q1<ESC>Z

Printer Output

Special Notes
1. This command requires the Memory Card option. See your SATO representative for details.
# Memory Card Function
## Fonts, TrueType Store

**Command Structure**

- **Begin Download**: `<ESC>BJ( aa...abb..b`
- **Download**: `<ESC>BJDccccccddddde...e`
- **End Download**: `<ESC>BJ)`

- `aa..a` = 40 byte font description
- `bb..b` = 10 byte date information
- `cccc` = Memory offset (hexadecimal)
- `dddd` = Number of data bytes to be stored (0001-2000)
- `ee...e` = Font data to be downloaded

**Example:**
```
<ESC>BJ({50 byte header}
<ESC>BJD{5 byte hex memory offset}{data}
<ESC>BJ)
```

**Placement:** Immediately following the `<ESC>CC Slot Select` command.

**Default:** None

**Command Function**
This command allows TrueType fonts to be stored in a Memory Card.

**Printer Input**
The download data stream is very complex and it is recommended that the TrueType Download utility program be used instead of manually creating the required command and data stream.

**Printer Output**
There is no printer output as a result of this command. See `<ESC>BJR TrueType Font Recall` command.

**Special Notes**

1. This command requires the Memory Card option. See your SATO representative for details.

2. The SATO TrueType Download utility program can be used to automate the download process from a computer running Windows 3.1 or above. A copy of this utility program is included as a part of the Memory Card Option.
Memory Card Function
Format/Field Recall

Command Structure

<ESC>YR,aa <ESC>/D,bb,cc...c

aa = Format number to be recalled (01-99)
b = Field number to be recalled (01-99)
cc...c = Data to be placed in recalled field.

Example: <ESC>YR,01 <ESC>/D,01,99

Placement: Immediately after <ESC>CC Slot Select command

Default: None

Command Function
To recall a field from a stored format and place new data in the field.

Printer Input

<ESC>A
<ESC>CC1
<ESC>YR,02 <ESC>/D,01,TWO FIELDS OF<ESC>/D,02,VARIABLE DATA
<ESC>Q1<ESC>Z

Printer Output

TWO FIELDS OF
VARIABLE DATA

Special Notes

1. This command requires the Memory Card option. See your SATO representative for details.

2. Only one format can be recalled at a time. However, multiple fields may be recalled from the same format.

3. The number of data characters contained in the “cc...c” field cannot exceed the value designated in the <ESC>/N Field Store command. If it does, the data will be truncated to fit the field length defined in the Field Store Command.
Memory Card Function
Format/Field Store

Command Structure

<ESC>YS,aa<ESC>/N,bb,cc{......}

- aa = Format number to be stored (01-99)
- bb = Field number to be stored (01-99)
- cc = Length of field to be stored (01-99)
- {......} = Command stream describing the field to be stored.

Example: <ESC>YS,01<ESC>/N,01,05

Placement: Immediately after <ESC>CC Slot Select command.

Default: None

Command Function
To store a format field description in the memory card.

Printer Input

<ESC>A
<ESC>CC1
<ESC>YS,02<ESC>/N,01,13<ESC>V0100<ESC>H0100<ESC>XB1
<ESC>/N,02,13<ESC>V0200<ESC>H0200<ESC>XB1
<ESC>Z

Printer Output
There is no printer output as a result of this command. See <ESC>YR Format/Field Recall command.

Special Notes
1. This command requires the Memory Card option. See your SATO representative for details.

2. Each job should be sent individually. If more than one job is sent in a data stream, only the first one will be accepted and the remainder ignored.

3. The following commands cannot be stored in a format:

- <ESC>CS Print Speed
- <ESC>C Repeat Label
- <ESC>NULL Cut Label
- <ESC>Q Print Quantity
- <ESC>/D Recall Field
- <ESC>EX Expanded Label Storage
- <ESC>T Custom Characters
- <ESC>& Store Form Overlay
- <ESC>@ Off Line
- <ESC>#E Print Darkness
- <ESC>BJ TrueType Fonts
- <ESC>ID Store Job ID
- <ESC>G Store Custom Graphics
- <ESC>* Clear Memory & Buffer
- <ESC>BT Variable Ratio Bar Codes
- <ESC>PI Store PCX Graphics
- <ESC>0 Partial Edit
Memory Card Function
Graphics, Custom Recall

Command Structure  
\(<\text{ESC}\>\text{GR}aaa\)

\(aaa = \) Graphics storage number (001-999)

Example:  \(<\text{ESC}\>\text{GR111}\)

Placement: The Recall command is sent in a secondary data stream to print the graphic, and follows any necessary position or size commands.

Default: None

Command Function  
Use the Recall command any time you want to print a graphic image on a label along with other printed data.

Printer Input

Non Rotated Graphic
\(<\text{ESC}\>\text{A}<\text{ESC}\>\text{CC}1\)
\(<\text{ESC}\>\text{V0100}<\text{ESC}\>\text{H0080}<\text{ESC}\>\text{L0505}\)
\(<\text{ESC}\>\text{GR}001\)
\(<\text{ESC}\>\text{Q1}<\text{ESC}\>\text{Z}\)

Graphic Rotated 90°
\(<\text{ESC}\>\text{A}<\text{ESC}\>\text{CC}1<\text{ESC}\>\%1\)
\(<\text{ESC}\>\text{V0180}<\text{ESC}\>\text{H0250}<\text{ESC}\>\text{L0505}\)
\(<\text{ESC}\>\text{GR}001\)
\(<\text{ESC}\>\text{Q1}<\text{ESC}\>\text{Z}\)

Graphic Rotated 180°
\(<\text{ESC}\>\text{A}<\text{ESC}\>\text{CC}1<\text{ESC}\>\%2\)
\(<\text{ESC}\>\text{V0180}<\text{ESC}\>\text{H0500}<\text{ESC}\>\text{L0505}\)
\(<\text{ESC}\>\text{GR}001\)
\(<\text{ESC}\>\text{Q1}<\text{ESC}\>\text{Z}\)

Graphic Rotated 270°
\(<\text{ESC}\>\text{A}<\text{ESC}\>\text{CC}1<\text{ESC}\>\%3\)
\(<\text{ESC}\>\text{V0100}<\text{ESC}\>\text{H0700}<\text{ESC}\>\text{L0505}\)
\(<\text{ESC}\>\text{GR}001\)
\(<\text{ESC}\>\text{Q1}<\text{ESC}\>\text{Z}\)

Printer Output

Special Notes

1. The graphic image to be stored cannot be rotated before it is stored. It can be rotated when it is recalled.

2. Graphic images cannot be stored as part of a label format.

3. See the \(<\text{ESC}\>\text{GI Custom Graphic Store command.}\)
Memory Card Function
Graphics, Custom Store

**Command Structure**

\(<\text{ESC}>\)G<sub>a</sub><sub>b</sub><sub>c</sub><sub>d</sub>\{data\}

- **a** = Specifies character format of the data
  - H = Hex data
  - B = Binary data
- **b** = Number of horizontal 8 x 8 blocks (see Note 7 for range)
- **c** = Number of vertical 8 x 8 blocks (see Note 7 for range)
- **d** = Graphics storage number (001-099)
- **{data}** = Hex or binary data to describe the graphic image

**Example:** See Appendix C for detailed information on creating Hex and Binary graphic files.

**Placement:** Immediately following the \(<\text{ESC}>\)CC Slot Select command.

**Default:** None

**Command Function**

To provide similar functionality to the \(<\text{ESC}>\)G Custom Graphic command (see Page 5-42), but allows for the graphic image to be stored in a Memory Card. Use the Store command to send the graphic data to the printer, which is held in the optional memory card, even if printer power is lost.

**Printer Input**

\(<\text{ESC}>\)A
\(<\text{ESC}>\)CC1<ESC>GIH002002001
0100038007C00FE01FF03FF87FFCFFFFE07C007C007C007C007C007C007C007C0
\(<\text{ESC}>\)Z

**Note:** See Appendix C for detailed explanation on how to format a graphics data stream.

**Printer Output**

There is no printer output as a result of this command. See \(<\text{ESC}>\)GR Recall Custom Graphics command.

**Special Notes**

1. You must have the optional Memory Card to use this command. Call your SATO representative for details.

2. The maximum storage capacity is 999 graphics, up to the capacity of the memory card used.

3. If a data transmission error occurs, the printer will beep and the “ERROR” LED will come on. You must then retransmit the image. See Appendix D for information on Memory Card error reporting.

4. Each graphic to be stored must be sent in its own data stream.
Example of correct data stream:
<ESC>A
<ESC>G\Haaabbb001(DATA)
<ESC>Z
<ESC>A
<ESC>G\Haaabbb002(DATA)
<ESC>Z

Example of incorrect data stream:
<ESC>A
<ESC>GI\Haaabbb001(DATA)
<ESC>GI\Haaabbb002(DATA)
<ESC>Z

5. Do not use ASCII <CR> or <LF> characters (carriage return or line feed) as line delimiters within the graphic data or the actual image will not be printed as specified.

6. The graphics storage number (ddd) must be specified with this command.

<table>
<thead>
<tr>
<th>Hor Blocks</th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>bbb</td>
<td>001 to 112</td>
<td>001 to 152</td>
<td>001 to 128</td>
<td>001 to 168</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vertical Blocks</th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Std 7”</td>
<td>001 to 178</td>
<td>001 to 178</td>
<td>001 to 178</td>
<td>001 to 267</td>
</tr>
<tr>
<td>Exp 14”</td>
<td>001 to 356</td>
<td>001 to 356</td>
<td>001 to 356</td>
<td>001 to 534</td>
</tr>
</tbody>
</table>
Memory Card Function
Graphics, PCX Recall

Command Structure

\[ <\text{ESC}>PY\text{aaa} \]

\( aa = \) Storage area number (001 thru 099)

Example: \( <\text{ESC}>PY001 \)

Placement: This command must be placed within its own data stream specifying the placement of the graphic.

Default: None

Command Function
To recall for printing a graphic file previously stored in a PCX format in the Memory Card.

Printer Input

Normal Rotation
\( <\text{ESC}>A<\text{ESC}>CC1 \)
\( <\text{ESC}>V0100<\text{ESC}>H0050<\text{ESC}>PY001 \)
\( <\text{ESC}>Q1<\text{ESC}>Z \)

Rotate Base Reference Point
\( <\text{ESC}>A<\text{ESC}>CC1<\text{ESC}>%1 \)
\( <\text{ESC}>V0330<\text{ESC}>H0160<\text{ESC}>PY001 \)
\( <\text{ESC}>Q1<\text{ESC}>Z \)

2nd Rotation, Base Reference Point
\( <\text{ESC}>A<\text{ESC}>CC1<\text{ESC}>%2 \)
\( <\text{ESC}>V0330<\text{ESC}>H0600<\text{ESC}>PY001 \)
\( <\text{ESC}>Q1<\text{ESC}>Z \)

3rd Rotation, Base Reference Point
\( <\text{ESC}>A<\text{ESC}>CC1<\text{ESC}>%3 \)
\( <\text{ESC}>V0100<\text{ESC}>H0800<\text{ESC}>PY001 \)
\( <\text{ESC}>Q1<\text{ESC}>Z \)

Printer Output

Special Notes:
1. This command requires Memory Card option. See your SATO representative for details.
2. See the \( <\text{ESC}>PI \) Store PCX Graphics command.
Memory Card Function
Graphics, PCX Store

Command Structure  \(<\text{ESC}>PI\text{aaa,bbbb,}\{\text{data}\}\)

\text{aaa} = Storage area number (001 thru 999)
\text{bbbb} = Size of PCX file in bytes
\text{\{data\}} = Data

Example:  \(<\text{ESC}>PI001,32000,\{\text{data}\}\)

Placement: This command must be placed within its own data stream

Default: None

Command Function
To store for later printing a PCX graphic file in the Memory Card.

Printer Input
BASIC Program to Download a PCX file to Memory Card #1, Location #1

\text{OPEN “C:\WIZARD\GRAPHICS\LION.PCX” FOR INPUT AS #2}
\text{DA$ = INPUT$(3800,#2)}
\text{C$ = CHR$(27)}
\text{WIDTH “LPT1:”, 255}
\text{LPRINT C$; “A”; C$; “CC1”;}
\text{LPRINT C$; “PI001,03800,”; DA$}
\text{LPRINT C$; “Z”;}
\text{CLOSE #2}

Printer Output
There is no printer output as a result of this command. See \(<\text{ESC}>PY\)
PCX Graphics Recall command.

Special Notes:
1. This command requires Memory Card option. See your SATO representative for details.
2. Graphics cannot be stored as part of a format.
3. Only black and white PCX files can be stored.
4. The file size specified by this command is the DOS file size in bytes.
## Memory Card Function

### Initialize

<table>
<thead>
<tr>
<th><strong>Command Structure</strong></th>
<th><code>&lt;ESC&gt;BJFaaaaaaa</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>aaaaaaa = Eight character alphanumeric user ID</td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td><code>&lt;ESC&gt;BJFsatocard</code></td>
</tr>
<tr>
<td><strong>Placement:</strong></td>
<td>Immediately following the <code>&lt;ESC&gt;CC</code> Slot Select command.</td>
</tr>
<tr>
<td><strong>Default:</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

**Command Function**: This clears all of the data from Memory Card in the specified slot and prepares the card to accept data.

**Input to Printer**

```
<ESC>A
<ESC>CC2<ESC>BJFsatocard
<ESC>Z
```

**Printer Output**

There is no printer output as a result of this command.

**Special Notes**

1. You must have the optional memory card to use this command. Call your local SATO representative for information.

2. All Memory Cards must be initialized before they can be used for the first time.

3. Care should be exercised when using this command as it destroys any data previously written to the card. It will clear all data from the card and assign the new ID (“satocard” in the above example).
Memory Card Function
Slot Select

Command Structure  \(<ESC>CCa\)

a = Memory Card Slot
  1 Slot 1
  2 Slot 2

Example:  \(<ESC>CC1\)

Placement:  Immediately following the \(<ESC>A\) Start Code.

Default:  Last selected Memory Card Slot.

Command Function  Selects the card slot to be used for following Memory Card commands.

Printer Input  \(<ESC>A\)
\(<ESC>CC1\)
{commands}
\(<ESC>Z\)

Printer Output  There is no printer output as a result of this command.

Special Notes  1.  This command requires the Memory Card option. See your SATO representative for more information.
Memory Card Function
Status

Command Structure  
<ESC>BJS

Example:  
<ESC>BJS

Placement:  
After the <ESC>CC Slot Select command.

Default:  
None

Command Function  
Causes the printer to print the card status.

Printer Input  
<ESC>A
<ESC>CC1<ESC>BJS
<ESC>Z

Printer Output

<table>
<thead>
<tr>
<th>MEMORY CARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slot [1]</td>
</tr>
<tr>
<td>Print buffer expansion 1024 Kbyte</td>
</tr>
<tr>
<td>ID Number  UNIMCARD</td>
</tr>
<tr>
<td>0 bytes for 0 formats are used</td>
</tr>
<tr>
<td>0 bytes for 0 graphic are used</td>
</tr>
<tr>
<td>0 bytes for 0 PCX files are used</td>
</tr>
<tr>
<td>0 bytes for 0 T,T fonts are used</td>
</tr>
<tr>
<td>1048320 bytes free</td>
</tr>
<tr>
<td>Expandable print length 9999 dots</td>
</tr>
<tr>
<td>48,2 inches</td>
</tr>
<tr>
<td>Battery Check OK</td>
</tr>
</tbody>
</table>

Special Notes
1. This command requires the Memory Card option. See your SATO representative for more information.

2. The following information is provided on the status label:
   - Line 1: Memory size of the card in Kbytes
   - Line 2: The ID number assigned with the <ESC>BJF command
   - Line 3: Number of formats stored and bytes used
   - Line 4: Number of graphics stored and bytes used
   - Line 5: Number of PCX files and bytes used
   - Line 6: Number of TT fonts stored and bytes used
   - Line 7: Remaining free memory
   - Line 8: Max expandable print length using the card
   - Line 9: Battery check results
Custom Protocol Command Codes
Download

Command Structure  
<ESC>LD,a,b,c,d,e,f,g,h,i

- a = Replacement character for STX in ASCII or hex format
- b = Replacement character for ETX in ASCII or hex format
- c = Replacement character for ESC in ASCII or hex format
- d = Replacement character for ENQ in ASCII or hex format
- e = Replacement character for CAN in ASCII or hex format
- f = Replacement character for NULL in ASCII or hex format
- g = Replacement character for OFFLINE in ASCII or hex format
- h = Auto-Online. Printer powers up in the On Line mode.
  0 = Yes
  1 = No
- i = Zero Slash. Places a slash through the “0” character.
  0 = Yes
  1 = No

Example:  
<ESC>LD,{,},%,#,&,*,~,0,0

Placement:  Immediately following the <ESC>A Start command and in an independent data stream.

Default:  Standard Protocol command Codes

Command Function  
Allows the user to defines custom Protocol Command codes.

Printer Input  
<ESC>A
<ESC>LD,{,},%,#,&,*,~,0,0
<ESC>Z

Printer Output  
A Protocol Command code status label will be printed as a result of the a successful download of a custom set of Protocol Command codes.

STX = 7B  ETX = 7D  ESC = 25
ENQ = 23  CAN = 26  NULL = 2A
OFFLINE = 7E
AUTO ONLINE = YES
ZERO SLASH = YES

Press the “FEED” key to activate the User Default or power the printer off to ignore them.
Special Notes

1. Commas must be used to separate the parameters. If a parameter is omitted between two commas, the default Non-Standard Protocol Command codes for that parameter will be used. See Appendix E.

2. This command must be sent as an independent data stream immediately following the <ESC>A Start code and immediately preceding the <ESC>Z Stop code. No other commands can be included in the data stream.

3. If more or less than nine commas are included in the command, the entire command sequence will be ignored. The command must contain exactly nine commas.

4. If two characters are specified for a parameter, it will be interpreted as a hex value. For example:

<table>
<thead>
<tr>
<th>Command Parameter</th>
<th>Resulting Command Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>2B + + + + + + + +</td>
<td>+ + + + + + + + + +</td>
</tr>
</tbody>
</table>

If a combination of characters are outside the hexadecimal range, the entire command sequence will be ignored.

5. Downloading Auto Online and Zero Slash settings will overwrite the values selected using the LCD panel. If these settings are changed using the LCD panel, they will overwrite any previously downloaded settings.
Two-Dimensional Symbols

The following commands are used to create the two-dimensional symbologies supported by the printers.
Two-Dimensional Bar Codes
Data Matrix, Data Format

Command Structure

\(<\text{ESC}>\text{BX}aabbccddeeffghh\)

- **aa** = Format ID. 01-06 or 11-16. The values 07 and 17 will not be accepted by the printer.
- **bb** = Error correction level. 00, 01, or 04-14. The values 02, 03 or values of 15 or greater will be processed as a 00.
- **cc** = Horizontal cell size. 03 - 12 dots/cell.
- **dd** = Vertical cell size. 03 - 12 dots/cell.
- **eee** = Number of cells in one line. Must use 000 to optimize.
- **fff** = Number of cell lines. Must use 000 to optimize.
- **g** = Mirror Image
  - 0 = Normal Print
  - 1 = Reverse Print
- **hh** = Guide Cell Thickness. 01-15. 01 indicates normal type.

Example: \(<\text{ESC}>\text{BX}030805000000001\)

Placement: Immediately preceding data to be encoded

Default: None

Command Function

To designate the format for a Data Matrix two-dimensional bar code image on a label.

Printer Input

\(<\text{ESC}>\text{A}\)
\(<\text{ESC}>%0<\text{ESC}>\text{V}0100<\text{ESC}>\text{H}0100<\text{ESC}>\text{BX}05051010000000001\)
\(<\text{ESC}>\text{DCDATA MATRIX DATA MATRIX}\)
\(<\text{ESC}>\text{Q}1<\text{ESC}>\text{Z}\)

Printer Output

There is no printer output as a result of this command. See the \(<\text{ESC}>\text{DC}\) Print Data command for printer output.

Special Notes

1. If any of the parameters entered are outside the valid range, a symbol will not be printed when the \(<\text{ESC}>\text{DC}\) Print Data command is sent to the printer.

2. The number of cells per line (eee) and the number of cell lines (fff) should be specified as all zeroes, allowing the printer to automatically calculate the optimum configuration for the symbol.

3. The Reference Point for the Data Matrix symbol is the upper-left corner. If an \(<\text{ESC}>\text{R}\) Rotate command is used to rotate the symbol, it will rotate in the counter-clockwise direction.
4. The Format ID specified for “aa” is defined by the following table. The printer only supports the Format ID’s defined in the table.

<table>
<thead>
<tr>
<th>ID NUMBER</th>
<th>CHARACTER SET</th>
<th>ENCODING SCHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>16 Bit CRC</strong></td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>Numeric, Space</td>
<td>Base 11</td>
</tr>
<tr>
<td>02</td>
<td>Upper Case Alpha, Space</td>
<td>Base 27</td>
</tr>
<tr>
<td>03</td>
<td>Upper Case Alpha, Space, Comma, Period, Slash, Minus</td>
<td>Base 41</td>
</tr>
<tr>
<td>04</td>
<td>Upper Case Alphanumeric, Space</td>
<td>Base 37</td>
</tr>
<tr>
<td>05</td>
<td>ASCII 7-bit, Full Keyboard (20H -7FH)</td>
<td>ASCII</td>
</tr>
<tr>
<td>06</td>
<td>ISO 8-bit, International (20H -FFH)</td>
<td>8-Bit</td>
</tr>
<tr>
<td></td>
<td><strong>32 Bit CRC</strong></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Numeric, Space</td>
<td>Base 11</td>
</tr>
<tr>
<td>12</td>
<td>Upper Case Alpha, Space</td>
<td>Base 27</td>
</tr>
<tr>
<td>13</td>
<td>Upper Case Alpha, Space, Comma, Period, Slash, Minus</td>
<td>Base 41</td>
</tr>
<tr>
<td>14</td>
<td>Upper Case Alphanumeric, Space</td>
<td>Base 37</td>
</tr>
<tr>
<td>15</td>
<td>ASCII 7-bit, Full Keyboard (20H -7FH)</td>
<td>ASCII</td>
</tr>
<tr>
<td>16</td>
<td>ISO 8-bit, International (20H -FFH)</td>
<td>8-Bit</td>
</tr>
</tbody>
</table>

5. The maximum number of data characters that can be specified for either the 16-Bit or 32-Bit CRC modes is 500.
**Two-Dimensional Bar Codes**

**Data Matrix, Print Data**

**Command Structure**

\(<\text{ESC}>\text{DC}xx...x\)

\(xx...x = \) Data, maximum of 500 characters

**Example:** \(<\text{ESC}>\text{DC00006000}\)

**Placement:** Immediately following the \(<\text{ESC}>\text{BC}\) Data Format designation command or the \(<\text{ESC}>\text{FX}\) Sequential Numbering command.

**Default:** None

**Command Function**

To print a Data Matrix two-dimensional bar code image on a label.

**Printer Input**

\(<\text{ESC}>\text{A}\>
\(<\text{ESC}>\%0<\text{ESC}>\text{V0100}<\text{ESC}>\text{H0100}<\text{ESC}>\text{BX05051010000000001}\>
\(<\text{ESC}>\text{DCDATA MATRIX DATA MATRIX}\>
\(<\text{ESC}>\text{Q1}<\text{ESC}>\text{Z}\>

**Printer Output**

![Data Matrix Bar Code Image]

**Special Notes**

1. The maximum amount of data that can be printed with this command is 500 characters.

2. If an \(<\text{ESC}>\text{BX}\) Data Format designation command contains any parameters out of the valid range, no symbol will be printed when this command is sent.
Two-Dimensional Bar Codes
Data Matrix, Sequential Numbering

Command Structure  \texttt{<ESC>FXaabccdddeee}

- \texttt{aaa} = Number of duplicate labels to be printed (001 - 999)
- \texttt{b} = Increment or Decrement
  - \texttt{+} = Increment
  - \texttt{-} = Decrement
- \texttt{ccc} = Increment/Decrement Steps (001 - 999)
- \texttt{ddd} = Sequential numbering start position (001 - 999)
  Referenced to left side.
- \texttt{eee} = Incremented data length measured from start position (001 - 999)

Placement: Immediately following the \texttt{<ESC>BX Data Format} designation command and preceding the \texttt{<ESC>DC Print Data Command}.

Default: None

Command Function
To print sequential numbered Data Matrix symbols.

Printer Input
\begin{itemize}
  \item \texttt{<ESC>A}
  \item \texttt{<ESC>V0100<ESC>H0100}
  \item \texttt{<ESC>BX03081010000000001}
  \item \texttt{<ESC>FX002+001005003}\texttt{<ESC>DC000060000}
  \item \texttt{<ESC>Q4<ESC>Z}
\end{itemize}

Printer Output
Label Set #1

[Image of examples of sequential numbered Data Matrix symbols]
Special Notes

1. The maximum number of <ESC>FX Sequential Numbering commands that can be used in one job is eight.

2. In the example above four total labels will be printed (<ESC>FX002+005003<ESC>DC00006000), the sequential numbering will start at position 5 and the three digits “600” will be incremented in steps of 1. A total of two sets of labels will be printed, the first set of two labels with the value “00006000” and the next two label set with the value “00006010”.

<table>
<thead>
<tr>
<th>Label Set #1</th>
<th>Label Set #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Label</td>
<td>3rd Label</td>
</tr>
<tr>
<td>00006000</td>
<td>00006010</td>
</tr>
<tr>
<td>2nd Label</td>
<td>4th Label</td>
</tr>
<tr>
<td>00006000</td>
<td>00006010</td>
</tr>
</tbody>
</table>

3. The <ESC>Q Label Quantity command must be set for the total number of labels to be printed. In the above example, the value for the <ESC>Q command should be 2 sets x 2 labels/set = 4. If, in the above example, it was set to a value of “1”, only the first label would be printed.
Two-Dimensional Bar Codes
Maxicode

Command Structure

\(<\text{ESC}>BUaaabbb,ccccc,ddddd,ee...e\)

- **aaa** = Service class, numeric only (001-999)
- **bbb** = Country code, numeric only (001-999)
- **ccccc** = ZIP code, alphanumeric (000000-999999)
- **ddddd** = Extended ZIP code, numeric only (0001-9999)
- **ee...e** = Low priority message, alphanumeric, 84 digits.

Example: \(<\text{ESC}>BU001,840,94089,0000\)

Placement: Immediately preceding data to be encoded

Default: None

Command Function

To print a Maxicode two-dimensional bar code image on a label. See Appendix B for specific information on using each individual bar code symbol.

Command Function

To print a UPS Maxicode symbol.

\(<\text{ESC}>A<\text{ESC}>V0100<\text{ESC}>H0100<\text{ESC}>BU001,840,94089,0000\)

\[\text{Rs}\]
01\text{Gs}\text{96}
1Z12345675
\text{Gs}\text{UPSN}\text{Gs}\text{12345E}\text{Gs}\text{089}
\text{Gs}\text{Gs}\text{1/1}\text{Gs}\text{10.1}\text{Gs}\text{Y}
\text{Gs}\text{Gs}\text{Gs}\text{UT}
\text{Rs}\text{Eot}\)

Printer Output

\(<\text{ESC}>Q1<\text{ESC}>Z\)
Special Notes

1. The Secondary Message field (ee...e) must contain exactly 84 characters. If a smaller message is specified, the field must be padded with “exclamation point” character(s).

2. <Rs> represents Hex 1E, <Gs> represents Hex 1D, <Eot> represents Hex 04, <ESC> represents Hex 1B and <Sp> represents Hex 20.
Two-Dimensional Bar Codes
PDF417

Command Structure

\texttt{<ESC>BKaa\textit{bb}cddeeffffnn...n}}

\begin{itemize}
  \item \texttt{aa} = Minimum module dimension (03-09 dots). Will not print if values of 01, 02 or greater than 10 are specified.
  \item \texttt{bb} = Minimum module pitch dimension (04-24 dots). Will not print if values of 01, 02, 03 or greater than 25 are specified.
  \item \texttt{c} = Security (error detection) Level (1-8).
  \item \texttt{dd} = Code words per line (01-30). If 00 is specified for both \texttt{dd} and \texttt{ee}, the printer automatically optimizes the number of rows per symbol.
  \item \texttt{ee} = Rows per symbol (00 or 03-40). If 00 is specified for both \texttt{dd} and \texttt{ee}, the printer automatically optimizes the number of rows per symbol.
  \item \texttt{ffff} = Number of characters to be encoded (0001-2700).
  \item \texttt{nn...n} = Data to be printed.
\end{itemize}

Example: \texttt{<ESC>BK0304400000021}

Placement: Immediately preceding data to be encoded

Default: None

Command Function
To print a PDF417 two-dimensional bar code image on a label.

Printer Input
\texttt{<ESC>A}<ESC>V0100<ESC>H0100<ESC>BK0607400000021PDF417 PDF417 PDF417}<ESC>Q1<ESC>Z

Printer Output

Special Notes
1. When the code words per line and the number of rows per symbol ("dd" and"ee") are set to all zeroes, the printer will calculate the optimum configuration.
2. If the product of the values entered for “dd” and “ee” are not equal to or less than the value of “fff” (i.e., “ffff” is greater than “dd” x “ee”), an error will occur and the symbol will not be printed. It is recommended that these values each be set to “000” and the printer be allowed to automatically calculate the optimum values.

3. The values for “dd” and “ee” need to be made larger if the security level is increased.

4. The maximum data length is 2700 characters, but may be less depending upon:
   - the minimum module dimension (“aa”)
   - the security level specified by “c”.
   - the number of data characters

5. The Reference Point of the PDF417 symbol is the upper-left corner.

6. The <ESC>F Sequential Numbering command cannot be used with this command.

7. The <ESC>E Line Feed command cannot be used with this command.

8. The Macro and Truncated PDF417 symbols are not supported.

9. The values 00H thru 1FH can be specified as print data.

10. This command can be stored in a format.

11. The <ESC>R Rotate command can be used.

12. The print height of the symbol will vary depending upon the data specified; numeric only, alpha only or alphanumeric.
SECTION 6.
INTERFACE SPECIFICATIONS

INTRODUCTION

This section presents the interface specifications for the “S” printers. These specifications include detailed information on how to properly interface your printer with your host system.

The following information is presented in this section:

- Interface Types
- Using the Receive Buffer
- RS32C Serial Interface
  - General Specifications
  - Electrical Specifications
  - Pin Assignments
  - Ready/Busy Flow Control
  - X-On/X-Off Flow Control
  - Bi-Directional Communications Protocol
- Centronics Parallel Interface
- Accessory (EXT) Connector

INTERFACE TYPES

In order to provide flexibility in communicating with a variety of host computer systems, the printers come standard with two interface types. The Centronics Parallel interface will probably be the most useful in communicating with IBM PCs and compatibles. The RS232C Serial interface allows connectivity to a number of other hosts. For instructions on how to properly configure your printer for either of these interface types, see the Printer Configuration instructions in Section 2 of this manual.

NOTE: Both the Centronics and RS232C interfaces are active at the same time, i.e. data can be received on either one, however no provision is made for port contention. If data is transmitted to both ports simultaneously, it will cause the data in the receive buffer to be corrupted.

THE RECEIVE BUFFER

The “S” printers have the ability to receive a data stream from the host in one of two ways. The receive buffer may be configured to accept one print job at a time or multiple print jobs. The single job print buffer is generally used by software programs that wish to maintain control of the job print queue so that it can move a high priority job in front of ones of lesser importance. The multiple job buffer, on the other hand, prints all jobs in the order they are received by the printer, and the order of printing cannot be changed.
Single Job Buffer

The printer receives and prints one job at a time. Each job must not exceed 64K bytes. The single Job Buffer mode is selected with DSW2-5 (see page 3-3).

Multi Job Buffer

The printer is able to continuously receive print jobs, compiling and printing other jobs at the same time. It acts much like a “print buffer” to maximize the performance of the host and the printer. The Multi Job Buffer mode is selected with DSW2-5 (see page 3-3).

When using the RS232 Serial interface, the Multi Job Buffer uses either the Ready/Busy with DTR (pin 20) or X-On/X-Off flow control protocols. See these sections for more details. With an empty receiving buffer, the status of DTR is “high” (or an X-On status if using X-On/X-Off), meaning the printer is ready to receive data. When the receive buffer is holding 62K bytes of data (2K bytes from being full), DTR will go “low” (or an X-Off is sent) indicating the printer can no longer receive data. This condition is called “Buffer Near Full” (see figure below).

The receiving buffer will not be able to receive more data again until a “Buffer Available” condition occurs. This takes place when the receiving buffer has emptied so that only 56K bytes of data are being held (8K bytes from being full). At this time, DTR will go “high” or an X-On is sent to tell the host that it can again receive data.

All printer error conditions (i.e., label out, ribbon out) will cause the printer to go busy (DTR “low” or X-Off) until the problem is corrected and the printer is placed on-line. The printer will also be busy if taken off-line from the front panel.
RS232C SERIAL INTERFACE

GENERAL SPECIFICATIONS

Asynchronous ASCII
Half-duplex communication

Ready/Busy Hardware Flow Control
Pin 20, DTR Control
Pin 4, RTS Error Condition

X-On/X-Off Software Flow Control

Bi-Directional Communication (ENQ/Response)

Data Transmission Rate
2400, 4800, 9600 and 19200 bps

Character Format
1 Start Bit (fixed)
7 or 8 data bits (selectable)
Odd, Even or No Parity (selectable)
1 or 2 Stop bits (selectable)

ELECTRICAL SPECIFICATIONS

Connector
DB-25S (Female)

Cable
DB-25P (Male), 50 ft maximum length. For cable configuration, refer to Cable Requirements appropriate to the RS232C protocol chosen.

Signal Levels
High = +5V to +12V
Low = -5V to -12V
PIN ASSIGNMENTS

RS232C Interface Signals

<table>
<thead>
<tr>
<th>PIN</th>
<th>DIRECTION</th>
<th>SIGNAL DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reference</td>
<td>FG (Frame Ground)</td>
</tr>
<tr>
<td>2</td>
<td>To Host</td>
<td>TD (Transmit Data) - Data from the printer to the host computer. Sends X-On/X-Off characters or status data (Bi-Directional protocol).</td>
</tr>
<tr>
<td>3</td>
<td>To Printer</td>
<td>RD (Receive Data) - Data to the printer from the host computer.</td>
</tr>
<tr>
<td>4</td>
<td>To Host</td>
<td>RTS (Request to Send) - Used with Ready/Busy flow control to indicate an error condition. RTS is high and remains high unless the print head is open (in this case, RTS would return to the high state after the print head is closed and the printer is placed back on-line) or an error condition occurs during printing (e.g., ribbon out, label out).</td>
</tr>
<tr>
<td>5</td>
<td>To Printer</td>
<td>CTS (Clear to Send) - When this line is high, the printer assumes that data is ready to be transmitted. The printer will not receive data when this line is low. If this line is not being used, it should be tied high (to pin 4).</td>
</tr>
<tr>
<td>6</td>
<td>To Printer</td>
<td>DSR (Data Set Ready) - When this line is high, the printer will be ready to receive data. This line must be high before data is transmitted. If this line is not being used, it should be tied high (to pin 20).</td>
</tr>
<tr>
<td>7</td>
<td>Reference</td>
<td>SG (Signal Ground)</td>
</tr>
<tr>
<td>20</td>
<td>To Host</td>
<td>DTR (Data Terminal Ready) - This signal applies to Ready/Busy flow control. The printer is ready to receive data when this pin is high. It goes low when the printer is off-line, either manually or due to an error condition, and while printing in the Single Job Buffer mode. It will also go low when the data in the buffer reaches the Buffer Near Full level.</td>
</tr>
</tbody>
</table>

READY/BUSY FLOW CONTROL

Ready/Busy is the hardware flow control for the “S” printers. By raising/lowering the voltage level on Pin 20 of the RS232 port, the printer notifies the host when it is ready to receive data. Pin 4 (RTS) and pin 20 (DTR) are the important signals on the printer for this method of flow control. The host must be capable of supporting this flow control method for it to function properly.
Cable Requirements

<table>
<thead>
<tr>
<th>HOST</th>
<th>INTERCONNECTION</th>
<th>PRINTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>FG</td>
<td>←-------------→</td>
<td>1 FG (Frame Ground)</td>
</tr>
<tr>
<td>TD</td>
<td>←-------------→</td>
<td>3 RD (Receive Data)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 RTS (Request to Send)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 CTS (Clear to Send)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 DSR (Data Set Ready)</td>
</tr>
<tr>
<td>*</td>
<td>←-------------→</td>
<td>20 DTR (Data Terminal Ready)</td>
</tr>
<tr>
<td>SG</td>
<td>←-------------→</td>
<td>7 SG (Signal Ground)</td>
</tr>
</tbody>
</table>

* This connection at the host side of the interface would depend upon the pin that is being used as the Ready/Busy

Data Streams

Once the flow control method has been chosen for the RS232C interface, the data stream must be sent in a specific manner. The **STX** and **ETX** control characters must frame the data stream.

\(<\text{STX}><\text{ESC}>A\ldots \text{Job#1}\ldots <\text{ESC}>Z<\text{ETX}><\text{STX}><\text{ESC}>A\ldots \text{Job#n}\ldots <\text{ESC}>Z<\text{ETX}>\)

**NOTE:** All characters, including STX, ESC and ETX are in ASCII.

X-On/X-Off FLOW CONTROL

X-On/X-Off flow control must be used whenever hardware (Ready/Busy) flow control is not available or desirable. Instead of a voltage going high/low at pin 20, control characters representing “Printer Ready” (X-On =11 hexadecimal) or “Printer Busy” (X-Off = 13 hexadecimal) are transmitted by the printer on pin 2 (Transmit Data) to the host. The X-On/X-Off flow control protocol is selected with DSW1-6 and DSW1-7 (see page 3-2). In order for this method of flow control to function correctly, the host must be capable of supporting it. X-On/X-Off operates in a manner similar to the function of pin 20 (DTR) as previously explained. When the printer is first powered on and goes on-line, an X-On is sent out. In the Single Job Buffer mode, when the printer receives a viable job, it transmits an X-Off and begins printing. When it is done printing, it transmits an X-On. In the Multi Job Buffer mode, the printer sends an X-Off when the “Buffer Near Full” level is reached and a X-On when the data level of the buffer drops below the “Buffer Available” mark. When the printer is taken off-line manually, it transmits an X-Off indicating it cannot accept data. When it is placed back on line manually, it sends an X-On, indicating it is again available for receipt of data. If an error occurs during printing (paper out, ribbon out), the printer sends nothing in the Single Job Buffer mode since the last character transmitted was an X-Off. When the error is cleared and the printer resumes printing, no X-On is sent until the current job is completed and the printer is once again ready to receive the next job. If it is in the Multi Job Buffer mode, it sends an X-Off as soon as an error condition is detected. When the error is cleared and the printer is placed back on-line, it transmits an X-On indicating it is again ready to accept data.

Upon power up if no error conditions are present, the printer will continually send X-On characters at five millisecond intervals until it receives a transmission from the host.
Cable Requirements

<table>
<thead>
<tr>
<th>HOST</th>
<th>INTERCONNECTION</th>
<th>PRINTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>FG</td>
<td>←---------------</td>
<td>1 FG (Frame Ground)</td>
</tr>
<tr>
<td>RD</td>
<td>←---------------</td>
<td>2 TD (Transmit Data)</td>
</tr>
<tr>
<td>TD</td>
<td>←---------------</td>
<td>3 RD (Receive Data)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 RTS (Request to Send)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 CTS (Clear to Send)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 DSR (Data Set Ready)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 DTR (Data Terminal Ready)</td>
</tr>
<tr>
<td>SG</td>
<td>←---------------</td>
<td>7 SG (Signal Ground)</td>
</tr>
</tbody>
</table>

Data Streams

The data streams for X-On/X-Off are constructed in the same way as they are for Ready/Busy flow control. The STX and ETX control characters must frame the data stream (NOTE: All characters, including STX, ESC and ETX are in ASCII).

<STX><ESC>A . . Job#1 . . <ESC>Z<ESC>A . . Job#n . . <ESC>Z<ETX>

Example: <STX><ESC>A . . Job#1 . . <ESC>Z<ESC>A . . Job#n . . <ESC>Z<ETX>XXXXX

BI-DIRECTIONAL COMMUNICATIONS

This is a two-way communications protocol between the host computer and the printer, thus enabling the host to check printer status. The Bi-Directional flow control protocol is selected with DSW1-6 and DSW1-7 (see page 3-2). When this protocol is selected, there is no busy signal from the printer (pin 20, DTR, is always high). The host must request the complete status from the printer, including ready/busy. Whenever the host requests printer status, it transmits an ENQ to the printer and the printer will respond with its status within five milliseconds. If printing, it will respond upon finishing the current label, then resume printing. In order for this protocol to work properly, pin 6 (DTR) and pin 5 (CTS) must be held high by the host. One way to ensure these pins are always in the correct state is to make no connection to them in the interface cable, or preferably, tie pin 20 (DTR) to pin 6 (DSR) and pin 4 (RTS) to pin 5 (CTS) at the printer end of the cable.

Cable Requirements

<table>
<thead>
<tr>
<th>HOST</th>
<th>INTERCONNECTION</th>
<th>PRINTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>FG</td>
<td>←---------------</td>
<td>1 FG (Frame Ground)</td>
</tr>
<tr>
<td>RD</td>
<td>←---------------</td>
<td>2 TD (Transmit Data)</td>
</tr>
<tr>
<td>TD</td>
<td>←---------------</td>
<td>3 RD (Receive Data)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 RTS (Request to Send)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 CTS (Clear to Send)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 DSR (Data Set Ready)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 DTR (Data Terminal Ready)</td>
</tr>
<tr>
<td>SG</td>
<td>←---------------</td>
<td>7 SG (Signal Ground)</td>
</tr>
</tbody>
</table>
If a **CAN** (18 hexadecimal) is received by the printer, it will cancel the current print job and clear all data from the receive buffer.

### Status Response

The Bi-Com protocol is an advanced version of bi-directional communications where the printer can also report the number of labels remaining to be printed for the current print job. Upon receipt of an **ENQ** command, the printer responds with nine bytes of status information bounded by an **STX/ETX** pair. The Bi-Com protocol works only in the Multi Job Buffer mode. The status information is defined as follows:

\[<\text{STX}>\{\text{2 Byte ID}\}{\text{1 Status Byte}}{\text{6 Byte Label Remaining}}<\text{ETX}>\]

- **ID** - This is a two byte number identifying the current print job ID. The print job ID is defined using the `<ESC>ID` Job ID command transmitted with the print job (see Job ID Store in the command listing for more information on how to use this command). The range is from 00 to 99.

- **Status** - A single byte defining the current status of the printer (see the Status Byte Definition table on page 6-8).

- **Label Remaining** - Six bytes defining the number of labels remaining in the current print job. The range is from 000000 to 999999 labels.

If an **ENQ** is received after the print job specified in the ID bytes has been completed, or there is no data in the buffer, the printer will respond with two “space” characters (20 hexadecimal) for the ID number and six “zero” characters (30 hexadecimal) in the Remaining Labels bytes.

If a **CAN** (18 hexadecimal) command is received while in the B-Communications mode, it will stop the print job and clear all data from the receive and print buffers. The printer will return an **ACK** (06 hexadecimal) if there is no printer error condition and a **NAK** (15 hexadecimal) if an error condition exists. A delay of five milliseconds or more is required before any new data can be downloaded. The **CAN** command is effective immediately upon receipt, even if the printer is off-line or in an error condition.

Upon receipt of a valid print job (`<ESC>A . . . <ESC>Z`), and **ACK** (06 hexadecimal) will be returned by the printer if there are no errors and a **NAK** (16 hexadecimal) if a printer error exists.
## Status Byte Definition, Bi-Com Protocol

<table>
<thead>
<tr>
<th>ASCII</th>
<th>HEX</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>OFF-LINE</strong></td>
</tr>
<tr>
<td>0</td>
<td>30</td>
<td>No Errors</td>
</tr>
<tr>
<td>1</td>
<td>31</td>
<td>Ribbon Near End</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
<td>Buffer Near Full</td>
</tr>
<tr>
<td>3</td>
<td>33</td>
<td>Ribbon Near End and Buffer Near Full</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>ON-LINE, WAITING FOR DATA</strong></td>
</tr>
<tr>
<td>A</td>
<td>41</td>
<td>No Errors</td>
</tr>
<tr>
<td>B</td>
<td>42</td>
<td>Ribbon Near End (not valid on M-8459S)</td>
</tr>
<tr>
<td>C</td>
<td>43</td>
<td>Buffer Near Full</td>
</tr>
<tr>
<td>D</td>
<td>44</td>
<td>Ribbon Near End and Buffer Near Full</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>ON-LINE, PRINTING</strong></td>
</tr>
<tr>
<td>G</td>
<td>47</td>
<td>No Errors</td>
</tr>
<tr>
<td>H</td>
<td>48</td>
<td>Ribbon Near End (not valid on M-8459S)</td>
</tr>
<tr>
<td>I</td>
<td>49</td>
<td>Buffer Near Full</td>
</tr>
<tr>
<td>J</td>
<td>4A</td>
<td>Ribbon Near End and Buffer Near Full</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>ON-LINE, WAITING TO DISPENSE A LABEL</strong></td>
</tr>
<tr>
<td>M</td>
<td>4D</td>
<td>No Errors</td>
</tr>
<tr>
<td>N</td>
<td>4E</td>
<td>Ribbon Near End (not valid on M-8459S)</td>
</tr>
<tr>
<td>O</td>
<td>4F</td>
<td>Buffer Near Full</td>
</tr>
<tr>
<td>P</td>
<td>50</td>
<td>Ribbon Near End and Buffer Near Full</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>ON-LINE, COMPILING PRINT JOB</strong></td>
</tr>
<tr>
<td>S</td>
<td>53</td>
<td>No Errors</td>
</tr>
<tr>
<td>T</td>
<td>54</td>
<td>Ribbon Near End (not valid on M-8459S)</td>
</tr>
<tr>
<td>U</td>
<td>55</td>
<td>Buffer Near Full</td>
</tr>
<tr>
<td>V</td>
<td>56</td>
<td>Ribbon Near End and Buffer Near Full</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>OFF-LINE, ERROR CONDITION</strong></td>
</tr>
<tr>
<td>a</td>
<td>61</td>
<td>Receive Buffer Full</td>
</tr>
<tr>
<td>b</td>
<td>62</td>
<td>Head Open</td>
</tr>
<tr>
<td>c</td>
<td>63</td>
<td>Paper End</td>
</tr>
<tr>
<td>d</td>
<td>64</td>
<td>Ribbon End (not valid on M-8459S)</td>
</tr>
<tr>
<td>e</td>
<td>65</td>
<td>Media Error</td>
</tr>
<tr>
<td>f</td>
<td>66</td>
<td>Sensor Error</td>
</tr>
<tr>
<td>g</td>
<td>67</td>
<td>Head Error</td>
</tr>
<tr>
<td>h</td>
<td>68</td>
<td>Cover Open</td>
</tr>
<tr>
<td>i</td>
<td>69</td>
<td>Memory Card Error</td>
</tr>
<tr>
<td>k</td>
<td>6B</td>
<td>Other Error Conditions</td>
</tr>
</tbody>
</table>
CENTRONICS PARALLEL INTERFACE

ELECTRICAL SPECIFICATIONS

**Printer Connector**  
AMP 57-40360 (DDK) or equivalent

**Cable Connector**  
AMP 57-30360 (DDK) or equivalent

**Cable Length**  
10 ft or less

**Signal Level**  
High = +2.4V to +5.0V  
Low = 0V to -0.4V

DATA STREAMS

Single Job Buffer: The Single Job Buffer mode is not available when using the Centronics interface.

Multi Job Buffer:  
<ESC>A . . Job#1 . . <ESC>Z<ESC>A . . Job#n . . <ESC>Z

Note that for parallel communications, the STX and ETX characters are not required.

### Centronics Parallel Interface Pin Assignments

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>DIRECTION</th>
<th>PIN</th>
<th>SIGNAL</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STROBE</td>
<td>To Printer</td>
<td>19</td>
<td>STROBE</td>
<td>Return</td>
</tr>
<tr>
<td>2</td>
<td>DATA 1</td>
<td>To Printer</td>
<td>20</td>
<td>DATA 1</td>
<td>Return</td>
</tr>
<tr>
<td>3</td>
<td>DATA 2</td>
<td>To Printer</td>
<td>21</td>
<td>DATA 2</td>
<td>Return</td>
</tr>
<tr>
<td>4</td>
<td>DATA 3</td>
<td>To Printer</td>
<td>22</td>
<td>DATA 3</td>
<td>Return</td>
</tr>
<tr>
<td>5</td>
<td>DATA 4</td>
<td>To Printer</td>
<td>23</td>
<td>DATA 4</td>
<td>Return</td>
</tr>
<tr>
<td>6</td>
<td>DATA 5</td>
<td>To Printer</td>
<td>24</td>
<td>DATA 5</td>
<td>Return</td>
</tr>
<tr>
<td>7</td>
<td>DATA 6</td>
<td>To Printer</td>
<td>25</td>
<td>DATA 6</td>
<td>Return</td>
</tr>
<tr>
<td>8</td>
<td>DATA 7</td>
<td>To Printer</td>
<td>26</td>
<td>DATA 7</td>
<td>Return</td>
</tr>
<tr>
<td>9</td>
<td>DATA 8</td>
<td>To Printer</td>
<td>27</td>
<td>DATA 8</td>
<td>Return</td>
</tr>
<tr>
<td>10</td>
<td>ACK</td>
<td>To Host</td>
<td>28</td>
<td>ACK</td>
<td>Return</td>
</tr>
<tr>
<td>11</td>
<td>BUSY</td>
<td>To Host</td>
<td>29</td>
<td>BUSY</td>
<td>Return</td>
</tr>
<tr>
<td>12</td>
<td>PE</td>
<td>To Host</td>
<td>30</td>
<td>PE</td>
<td>Return</td>
</tr>
<tr>
<td>13</td>
<td>SELECT</td>
<td>To Host</td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td>32</td>
<td>FAULT</td>
<td>To Host</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>FG</td>
<td>Frame Ground</td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>+5V (Z=24K ohm)</td>
<td></td>
<td>36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The EXT connector on the rear panel of the “S” printers is intended for use with the external printer accessories such as label rewinders or applicators. The DB-9S type connector provides a choice of four different output signals along with various error conditions.

### Pin Assignments

<table>
<thead>
<tr>
<th>PIN</th>
<th>DIRECTION</th>
<th>SIGNAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To Host</td>
<td>Vcc - +5V</td>
</tr>
<tr>
<td>2</td>
<td>To Host</td>
<td>Ribbon Near End - This pin goes high when the amount of ribbon on the unwind shaft is approximately 46 feet (14 m). The output will be low when the ribbon is completely out.</td>
</tr>
<tr>
<td>3</td>
<td>To Host</td>
<td>Error - This pin goes low when the printer detects an error condition such as head open or receiving buffer full.</td>
</tr>
<tr>
<td>4</td>
<td>To Printer</td>
<td>Reprint - The last label will be reprinted when this signal is received.</td>
</tr>
<tr>
<td>5</td>
<td>To Printer</td>
<td>Print Start - The printer will print one label when this pin is pulled to ground. This signal must be enabled by placing switch DSW3-5 on the Control Panel in the OFF position.</td>
</tr>
<tr>
<td>6</td>
<td>To Host</td>
<td>End Print - It is used to drive an applicator or other external device requiring synchronization with the print cycle. You may choose between four types of output signals using control panel DSW3-6 and DSW3-7 selections.</td>
</tr>
<tr>
<td>7</td>
<td>To Host</td>
<td>Label Out - This pin goes low (0V) when a label out error exists.</td>
</tr>
<tr>
<td>8</td>
<td>To Host</td>
<td>Ribbon Out - This pin goes low when the ribbon is out.</td>
</tr>
<tr>
<td>9</td>
<td>Reference</td>
<td>Signal Ground</td>
</tr>
</tbody>
</table>

*NOTE: The signals on pins 2, 3, 6, 7 and 8 each have an open collector output. These pins normally measure +.07V maximum when a true condition exists. If a false condition occurs, the voltage will drop to 0V. To achieve a signal level of +5V, you must add a 330 ohm, 1/4W pull-up resistor between the open collector output pin and Vcc (pin 1) as illustrated. This will provide a signal level of +5V for a true condition and 0V when a false condition exists. The maximum voltage that can be applied to these pins is +50V and the maximum current they can sink is 500 millamps.*
External Connector Input/Output Signal Types

STANDARD OPERATION

<table>
<thead>
<tr>
<th></th>
<th>Start Print</th>
<th>End Print</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Print Start Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Print Repeat Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Print End Type 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Print End Type 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td>20 milliseconds</td>
<td></td>
</tr>
<tr>
<td>0V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Print End Type 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Print End Type 4</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

REPEAT PRINT

<table>
<thead>
<tr>
<th></th>
<th>Start Print</th>
<th>End Print</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Print Start Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Print Repeat Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Print End Type 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Print End Type 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td>20 milliseconds</td>
<td></td>
</tr>
<tr>
<td>0V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Print End Type 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0V</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Print End Type 4</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION 7.
TROUBLESHOOTING

This section has been devised to help you if you are unable to produce output on the printer. Use this section to make sure the basics have been checked before deciding you are unable to proceed any further. The section is divided into four parts:

- Initial Checklist
- Centronics Parallel Interface
- RS232C Serial Interface
- Error Signals

INITIAL CHECKLIST

1. Is the printer powered up and On-line?

2. Is the ERROR light on the front panel OFF? If this light is ON, it may mean the print head assembly is open.

3. Are the LABEL and RIBBON lights on the front panel OFF? If these lights are ON, labels or ribbons may be loaded incorrectly.

4. Is the Label Hold-Down and Print Head Assembly in the down and latched position?

USING THE CENTRONICS (PARALLEL) INTERFACE

1. Is the IBM parallel printer cable connected securely to your parallel port (DB-25S Female) on the PC and to the Centronics connector on the printer?

2. Is there more than one parallel interface port on your PC (LPT1, LPT2, etc.)? If so, make sure you are sending data out the correct port.

3. When you send the print job to the printer, and it does not respond, do you get an error message on your PC that says “Device Fault” or something similar?

   This may mean that the computer doesn’t know the printer is there. Verify that:

   A. Both ends of the cable are securely inserted into their respective connectors.

   B. The printer is On-line.

   C. The cable is not defective. There are other things that can cause this error message on your computer, but at this stage, a defective cable may be one of the reasons.
4. When you send the print job to the printer and it does not respond, and there is no error message on the PC:

   A. Check your data stream for some of the basics. Is your job framed as follows?

      <ESC>A—DATA—<ESC>Z

   B. Verify that you've included all required parameters in the data stream.

   C. Verify the following:

      • You have not typed a “0” (zero) for an “O” (letter) or vice-versa.
      • You have not missed any <ESC> characters where they’re needed.
      • Make sure all printer command codes are capital letters.
      • Your protocol codes are set for Standard or Non-Standard and your data stream is consistent with these.

5. If you've checked all of the above and the printer still isn't printing, you may want to try a Hex Dump to determine what (if anything) the printer is receiving from your computer. See the User Test Print section, page 3-16.

   The Centronics port is now listening for incoming data. Send your print job. The M-8485S will now print (only once) a Hexadecimal (Hex) Dump of everything it received from the host computer. Each 2-digit hexadecimal character represents a character the printer received. It may be tedious, but now you can analyze and troubleshoot the data stream.

6. While checking the Hex Dump printout, if you notice 0D 0A (Carriage Return and Line Feed) characters throughout. The command string should be continuous and nor CR or LF characters are allowed between the Start Command (<ESC>A) and the Stop Command (<ESC>Z). If you are using BASIC, it may be adding these characters automatically as the line wraps. Adding a “width” statement to your program can help to suppress these extra 0D 0A characters by expanding the line length up to 255 characters. See the beginning of Section 5: Programming for information on writing a program in BASIC.

   If you're not programming in BASIC, check to see if you have an equivalent statement in the language you're using to suppress extra carriage returns and line feeds from your data being sent out to the printer. We want the data stream to be one complete line going to the printer.
USING THE RS232C (SERIAL) INTERFACE

1. Is the RS232C Serial cable connected securely to your serial port on the PC (DB-25S Male) and to the RS232C connector on the printer?

2. Is the cable defective? At the very least, you should be using a “Null Modem Cable,” which crosses pins in a specific manner. This should enable your printer to print. But we recommend that you eventually use a cable built to specifications as described in Section 5: Interface Specifications.

3. Check for obvious errors in the data stream. Remember that all print jobs for serial data must be framed by an **STX** and **ETX**. Again, see Section 5 if necessary.

4. If after sending your job to the printer, it only “beeps” indicating a “framing error” message, you may have a configuration problem. There may be some inconsistencies with the Baud Rate, Parity, Data Bits, or Stop Bits in relation to your host computer. If you are confused as to what the printer's current RS232 settings are, you may choose the SATO defaults (all DIP switches in the OFF position) to achieve 9600 baud, no parity, 8 databits, and 1 stop bit.

5. If you still are unable to get printer output, try the Hex Dump as described in Step 5 under the Centronics Interface troubleshooting. In this case, the printer monitors its RS232C interface for incoming data.

6. From the Hex Dump, if you are seeing extra 0D 0A (CR and LF) characters, and are using BASIC, refer to the beginning of the Command Code section. It provides hints for writing a SATO program in BASIC.
## ERROR SIGNALS

<table>
<thead>
<tr>
<th>LED</th>
<th>LCD MESSAGE</th>
<th>AUDIBLE BEEP</th>
<th>ERROR CONDITION</th>
<th>TO CLEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error On</td>
<td>Machine Error</td>
<td>1 Long</td>
<td>Machine Error</td>
<td>Cycle power on/off</td>
</tr>
<tr>
<td>Error On</td>
<td>EEPROM Error</td>
<td>1 Long</td>
<td>EEPROM Read/Write</td>
<td>Cycle power on/off</td>
</tr>
<tr>
<td>Error On</td>
<td>Head Error</td>
<td>1 Long</td>
<td>Head</td>
<td>Cycle power on/off</td>
</tr>
<tr>
<td>Error On</td>
<td>Sensor Error</td>
<td>3 Short</td>
<td>Sensor</td>
<td>Cycle power on/off</td>
</tr>
<tr>
<td>Error Blinks</td>
<td>Card R/W Error</td>
<td>1 Long</td>
<td>Memory Card Read/Write</td>
<td>Cycle power on/off</td>
</tr>
<tr>
<td>Error Blinks</td>
<td>Card Low Battery</td>
<td>1 Long</td>
<td>Memory Card Battery Low</td>
<td>Cycle power on/off</td>
</tr>
<tr>
<td>Error Blinks</td>
<td>Head Open</td>
<td>3 Short</td>
<td>Head Open</td>
<td>Close head lever</td>
</tr>
<tr>
<td>Error Blinks</td>
<td>Cutter Error</td>
<td>3 Short</td>
<td>Cutter</td>
<td>Cycle power on/off</td>
</tr>
<tr>
<td>Error On Line Blinks</td>
<td>PARITY ERROR</td>
<td>3 Short</td>
<td>RS232 Parity Error</td>
<td>Cycle power on/off</td>
</tr>
<tr>
<td>Error On Line Blinks</td>
<td>Overrun Error</td>
<td>3 Short</td>
<td>RS232 Overrun Error</td>
<td>Cycle power on/off</td>
</tr>
<tr>
<td>Error On Line Blinks</td>
<td>Framing Error</td>
<td>3 Short</td>
<td>RS232 Framing Error</td>
<td>Cycle power on/off</td>
</tr>
<tr>
<td>Error On Line Blinks</td>
<td>Buffer Over</td>
<td>3 Short</td>
<td>Buffer Overflow</td>
<td>Cycle power on/off</td>
</tr>
<tr>
<td>Error Blinks Label On</td>
<td>Paper End</td>
<td>3 Short</td>
<td>Label End</td>
<td>Open/close Head Lever Open/close Label Hold-down</td>
</tr>
<tr>
<td>Error Blinks Ribbon On (1)</td>
<td>Ribbon End</td>
<td>3 Short</td>
<td>Ribbon End</td>
<td>Open/close Head Lever Open/close Label Hold-down</td>
</tr>
<tr>
<td>Error Blinks Label Blinks</td>
<td>Media Error</td>
<td>3 Short</td>
<td>Media Error</td>
<td>Open/close Head Lever</td>
</tr>
<tr>
<td>Ribbon Blinks (1)</td>
<td>None</td>
<td></td>
<td>Ribbon Near End</td>
<td>Replace ribbon with full roll</td>
</tr>
<tr>
<td>Line Blinks</td>
<td>None</td>
<td></td>
<td>Buffer Near Full</td>
<td>Slow down transmission rate</td>
</tr>
</tbody>
</table>

(1) The M-8459S does not have a Ribbon LED. This Error Code is not valid.
APPENDIX A.
COMMAND CODE QUICK REFERENCE

<table>
<thead>
<tr>
<th>INSTRUCTION</th>
<th>DESCRIPTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Start Code. Begins all print jobs.</td>
<td>Page 5-70</td>
</tr>
<tr>
<td>A(space)Z</td>
<td>Form Feed. Feeds a blank tag or label.</td>
<td>Page 5-39</td>
</tr>
<tr>
<td>AR</td>
<td>Normal Print Length. This command resets the printer to the Standard print length (7 inches).</td>
<td>Page 5-53</td>
</tr>
<tr>
<td>AX</td>
<td>Expanded Print Length. This command sets the printer to the Expanded print length (14 inches).</td>
<td>Page 5-53</td>
</tr>
<tr>
<td>A3H-aaaaVbbbb</td>
<td>Base Reference Point. Establishes a new base reference point position in dots for the current label. Units of measurement are dots. - = Optional character. If included, will shift reference point in negative direction.</td>
<td>Page 5-19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>aaaa = Horizontal Print Offset</td>
<td>M-8459S</td>
</tr>
<tr>
<td></td>
<td>+/- 896</td>
<td>+/- 1216</td>
</tr>
<tr>
<td></td>
<td>bbbb = Vertical Print Offset</td>
<td>0001-1424</td>
</tr>
<tr>
<td>Babbcccd</td>
<td>Bar Codes. Prints a 1:3 ratio bar code.</td>
<td>Page 5-11</td>
</tr>
<tr>
<td>a=</td>
<td>Codabar</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>Code 39</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Interleaved 2 of 5 (I 2/5)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>UPC-A/EAN-13</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>EAN-8</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Industrial 2 of 5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Matrix 2 of 5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>reserved</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>reserved</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>reserved</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>MSI</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>reserved</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Code 93</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>reserved</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>UPC-E</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Bookland</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Code 128</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>UCC 128</td>
<td></td>
</tr>
<tr>
<td>bb</td>
<td>Number of dots (01-12) for narrow bar and narrow space</td>
<td></td>
</tr>
<tr>
<td>ccc</td>
<td>Bar height in dots (001-600)</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>UCC 128 only</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>No human readable text</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Human readable at top</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 Human readable at bottom</td>
<td></td>
</tr>
</tbody>
</table>
### Bar Codes

**BDabbcccd**

Prints a 2:5 ratio bar code, except for UPC, EAN, Code 93, Code 128 and UCC128 symbols, which are fixed width bar codes. For values a, bb, ccc and d see instructions for Babbcccd.

For UPC/EAN bar codes, this command puts descender bars and human readable text below the symbol.

**BKaabbccdd**

**PDF417**

Prints PDF417 2-D symbols.

- **aa** = Minimum module dimension (03-09 dots). Will not print for values of 01, 02 or ≥ 10.
- **bb** = Minimum module pitch dimension (04-240 dots). Will not print for values of 01, 02, 03 or greater than 25.
- **c** = Security level (1-8).
- **dd** = Code words per line (01-30). If 00 is specified for dd and ee, printer will automatically optimize settings.
- **ee** = Rows/symbol (00 or 03). If 00 is specified for dd and ee, printer will automatically optimize settings.
- **fff** = Number of characters to be encoded (0001-2700)
- **nn...n** = Data to be printed.

**BPn...n**

**Postnet**

Prints Postnet bar codes.

- **n...n** = 5 digit ZIP (Postnet-32 format)
- 6 digits (Postnet-37 format)
- 9 digit ZIP+4 (Postnet -52 format)
- 11 digit ZIP+4+DPC (Postnet-62, Delivery Point format).

**BTabbccddee**

**Bar Codes**

Variable Ratio. provides the ability to print a bar code with a ratio other than those specified through the standard bar code commands (B, BD, and D).

- **a** = Bar code option:
  - 0 Codabar
  - 1 Code 39
  - 2 Interleaved 2 of 5
  - 5 Industrial 2 of 5
  - 6 Matrix 2 of 5
- **bb** = Narrow space in dots (01-99)
- **cc** = Wide space in dots (01-99)
- **dd** = Narrow bar in dots (01-99)
- **ee** = Wide bar in dots (01-99)

**BUaaa,bbb,cccccc,dddd,ee...e**

**Maxicode**

Prints 2-D Maxicode symbols.

- **aaa** = Service class, numeric only (001-999).
- **bbb** = Country code, numeric only (001-999).
- **cccccc** = ZIP code, alphanumeric (000000-999999).
- **dddd** = Extended ZIP code, numeric only (0001-9999)
- **ee...e** = Low priority message, alphanumeric, 84 characters.

**BWaabb**

**Bar Codes**

Expansion. Works together with the BT command to specify an expansion factor and the bar code height for the particular symbol being printed.

- **aa** = Expansion factor by which the width of all bars and spaces is increased (01-12)
- **bbb** = Bar height by dot (004-600 dots)
**INSTRUCTION** | **DESCRIPTION** | **PAGE**
--- | --- | ---
BXaabbccdd | **Data Matrix.** Data Format. Specifies the format of the Data Matrix 2-D symbology. | Page 5-96
| aa = Format ID (01-16, The values 07 and 17 will not be accepted) |  |
| bb = Error correction level (00, 01, or 04-14, the values 02, 03 or ≥ 15 will not be accepted). |  |
| cc = Horizontal cell size (03-12 dots/cell) |  |
| dd = Vertical cell size (03-12 dots per cell) |  |
| eee = Cells per line. Must use 000 for optimized symbol. |  |
| fff = Cell lines. Must use 000 to optimize. |  |
| g = Mirror image |  |
| 0 Normal Print |  |
| 1 Reverse Print |  |
| hh = Guide cell thickness (01-15) 01 indicates normal type. |  |
| eeuffghhh |  |
| C | **Repeat Label.** Prints a duplicate of the last label printed. | Page 5-59
| CSa | **Print Speed Selection.** Specifies a unique print speed in in./sec. through software for a particular label. | Page 5-58
| |  |
| Dabbcccd | **Bar Codes.** Prints 1:2 ratio bar code. For UPC and EAN bar codes, this will add descender bars. For values a, bb, ccc and d see instructions for Babbcccd. | Page 5-11
| DCxx...x | **Data Matrix.** Print Data. Prints data using Data Matrix format specified in BX Data Format command. | Page 5-98
| | xx...x = Data to be printed. Cannot exceed 500 characters. |  |
| Eaaa | **Line Feed.** Provides the ability to print multiple lines of the same character size without specifying a new print position for each line. | Page 5-49
| | aaa = Number of dots (1-999) between the bottom of the characters on one line to the top of the characters on the next line. |  |
| Faaaabccccddeee | **Sequential Numbering.** Allows the printing of sequencing fields (text, bar codes) where all incrementing is done within the printer. | Page 5-68
| | aaaa = Number of times to repeat the same data (0001-9999) |  |
| | b = Plus or minus symbol (+ for increments; - for decrements) |  |
| | cccc = Value of step for sequence (001-9999) |  |
| | dd = No. of digits for sequential numbering (01-99, default = 8) |  |
| | ee = No. of digits free from sequential numbering (01-99, default = 0) |  |
Horizontal Line.** Prints a horizontal line. Units of measurement are dots.**

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>FWaaHbbbb</td>
<td>horizontal line</td>
<td>Page 5-47</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>aa = Width of Hor Line 01 to 99</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bbbbb = Length of HorLine 0001 -0896 0001 to 1216 0001 -1024 0001 -1344</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Box. Prints a box. For values aa, bbbb, cc, and dddd, see instructions for horizontal and vertical lines. Units of measurement are dots.

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>FWaabbVccc</td>
<td>Box.</td>
<td>Page 5-47</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>aa = Width of Hor Side 01 to 99</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bb = Width of Vert Side 01 to 99</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cccc = Length of Vert Side Expanded 0001 -1424 0001 -2824</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dddd = Length of Hor Side 0001 to 0896 0001 to 1216 0001 -1024 0001 -1344</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vertical Line. Prints a vertical line. Units of measurement are dots.

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>FWccVddd</td>
<td>Vertical Line</td>
<td>Page 5-47</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>cc = Width of Vert Line 01 to 99</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dddd = Length of Vert Line Expanded 0001-1424 0001 -2848</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>FXaabbccc</td>
<td>Data Matrix</td>
<td>Page 5-99</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>aaa = Number of duplicate labels (001-999)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b = Increment or decrement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ Increment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Decrement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ccc = Increment/decrement steps (001-999)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ddd = Sequential numbering start position (001-999). Referenced to left side.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>eee = Incremented data length (001-999). Measured from start position.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Custom Graphics. Allows the creation and printing of graphic images using a dot-addressable matrix.

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gabbbc(data)</td>
<td>Custom Graphics</td>
<td>Page 5-42</td>
</tr>
</tbody>
</table>

| a = Specifies format of data stream to follow |
| B Binary |
| H Hexadecimal |
| bbb = Number of horizontal 8 x 8 blocks (see page 5-42 for range) |
| ccc = Number of vertical 8 x 8 blocks (see page 5-42 for range) |
| data = Data to describe the graphic image |

PCX File. Downloads PCX file to the internal graphics image memory.

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPaaaaa</td>
<td>PCX File</td>
<td>Page 5-44</td>
</tr>
</tbody>
</table>

| aaaaa = No. of bytes to be downloaded (max DOS file size = 32K) |

Page A-4 9001034 Rev E SATO “S” Print Engines
<table>
<thead>
<tr>
<th>INSTRUCTION</th>
<th>DESCRIPTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haaaa</td>
<td><strong>Horizontal Position.</strong> Specifies a field’s horizontal location across the width of the label from the current base reference point. The units of measurement are dots.</td>
<td>Page 5-55</td>
</tr>
<tr>
<td></td>
<td><strong>Table:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>aaa</strong> = New Horizontal Position</td>
<td>M-8459S</td>
</tr>
<tr>
<td></td>
<td>0001 to 0896</td>
<td>0001 to 1216</td>
</tr>
<tr>
<td>IDaa</td>
<td><strong>Store Job ID.</strong> Stores the Job ID number.</td>
<td>Page 5-45</td>
</tr>
<tr>
<td></td>
<td>aa = Job ID number assigned (01-99)</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td><strong>Journal Print.</strong> Provides the ability to print text line by line. Fixed spacing between lines and characters.</td>
<td>Page 5-46</td>
</tr>
<tr>
<td>Kab90cc</td>
<td><strong>Recall Custom Designed Characters.</strong> Recalls for printing a custom character stored by the Tabcc(data) command.</td>
<td>Page 5-21</td>
</tr>
<tr>
<td></td>
<td>a = 1 16 x 16 matrix</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 24 x 24 matrix</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b = Indicates the format that data stream was stored in</td>
<td>B Binary</td>
</tr>
<tr>
<td></td>
<td>H Hexadecimal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bb = Memory location where the character was stored. Valid locations are 21 to 52 or “1” to “R” in hex values.</td>
<td></td>
</tr>
<tr>
<td>Laabb</td>
<td><strong>Character Expansion.</strong> Expands characters in both directions.</td>
<td>Page 5-23</td>
</tr>
<tr>
<td></td>
<td>aa = Multiple to expand horizontally (01-12)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bb = Multiple to expand vertically (01-12)</td>
<td></td>
</tr>
<tr>
<td>LD,a,b,c,d,e,f,g,i</td>
<td><strong>Download Protocol Command Codes.</strong> Downloads a user defined set of Alternate Protocol Command Codes. See Appendix F for details on the proper usage of this command.</td>
<td>Page 5-93</td>
</tr>
<tr>
<td>M</td>
<td><strong>Font type.</strong> Specifies the 13W x 20H dot matrix font (including descenders).</td>
<td>Page 5-33</td>
</tr>
<tr>
<td>N</td>
<td><strong>Rotate.</strong> Moving Base Reference Point. Sets the original base reference point and returns printing to normal orientation.</td>
<td>Page 5-66</td>
</tr>
<tr>
<td>OA</td>
<td><strong>Font type.</strong> Specifies the OCR-A font with dot matrix.</td>
<td>Page 5-33</td>
</tr>
<tr>
<td></td>
<td><strong>Table:</strong></td>
<td>M-8459S</td>
</tr>
<tr>
<td></td>
<td><strong>OA Font Matrix</strong></td>
<td>15W x 22H</td>
</tr>
<tr>
<td>OB</td>
<td><strong>Font type.</strong> Specifies the OCR-B font dot matrix.</td>
<td>Page 5-33</td>
</tr>
<tr>
<td></td>
<td><strong>Table:</strong></td>
<td>M-8459S</td>
</tr>
<tr>
<td></td>
<td><strong>OB Font Matrix</strong></td>
<td>20 W x 24H</td>
</tr>
</tbody>
</table>
**INSTRUCTION** | **DESCRIPTION**                  | **PAGE**
--- | --- | ---
Paa | **Character Pitch.** Designates the number of dots between characters.  
\[aa = \text{Number of dots between characters (01-99)}\] | Page 5-26
PR | **Fixed Font Spacing.** Returns the printer to fixed character spacing mode. | Page 5-25
PS | **Proportional Font Spacing.** Places the printer in the proportional character spacing mode. Will not work with U Font. | Page 5-28
Qaaaaaa | **Print Quantity.** Specifies the total number of labels to print.  
\[aaaaaa = \text{Total number of labels to print for the job (000001-999999)}\] | Page 5-57
R | **Rotate, Moving Base Reference Point.** Rotates the printing of all subsequent images by 90 degrees counterclockwise each time it is used. Also moves the base reference point. | Page 5-66
S | **Font type.** Specifies the 8W x 15H dot matrix font (including descenders). | Page 5-33
Tabcc(data) | **Store Custom Designed Characters.** To create and store custom characters or images in the printer’s volatile memory. See Kab90cc to recall the character for printing.  
\[a = 1 \text{ 16 x 16 matrix} \]
\[2 \text{ 24 x 24 matrix}\]
\[b = \text{Specifies data stream format to follow}\]
\[B \text{ Binary}\]
\[H \text{ Hexadecimal}\]
\[cc = \text{Memory location to store the character. Valid locations are 21 to 52 or “!” to “R” in hex values.}\]
\[(\text{data}) = \text{Data to describe the character.}\] | Page 5-21
U | **Font type.** Specifies a 5W x 9L dot matrix font (including descenders). | Page 5-33
Vbbbb | **Vertical Position.** Specifies a field’s vertical location down the length of the label from the current base reference point. Units of measurement are dots. | Page 5-55

<table>
<thead>
<tr>
<th></th>
<th>M-8459S</th>
<th>M-8460S</th>
<th>M-8485S</th>
<th>M-8490S</th>
</tr>
</thead>
<tbody>
<tr>
<td>bbbbb</td>
<td>0001-1424</td>
<td>0001-2824</td>
<td>0001-2136</td>
<td>0001-4272</td>
</tr>
<tr>
<td>Expanded</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WBa | **Font type.** Specifies the 18W x 30L dot matrix font (including descenders).  
\[a = 0 \text{ Disables auto-smoothing of font}\]
\[1 \text{ Enables auto-smoothing if expansion is greater than 3}\] | Page 5-37
<table>
<thead>
<tr>
<th>INSTRUCTION</th>
<th>DESCRIPTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>WDHaaaaVbbbb</td>
<td><strong>Copy Image Area.</strong> To copy an image to another location of the label.</td>
<td>Page 5-31</td>
</tr>
<tr>
<td>XccccYddddd</td>
<td>[aaaa = \text{Horizontal position of the top left corner of image area}] [bbbb = \text{Vertical position of the top left corner of image area}] [cccc = \text{Horizontal length of image area}] [dddd = \text{Vertical length of image area}]</td>
<td></td>
</tr>
<tr>
<td>WLa</td>
<td><strong>Font type.</strong> Specifies the 28W x 52L dot matrix font (including descenders).</td>
<td>Page 5-37</td>
</tr>
<tr>
<td></td>
<td>[a = 0 \quad \text{Disables auto-smoothing of font}] [1 \quad \text{Enables auto-smoothing if expansion is greater than 3}]</td>
<td></td>
</tr>
<tr>
<td>XM</td>
<td><strong>Font type.</strong> Specifies the 24W x 24H dot matrix font (including descenders).</td>
<td>Page 5-33</td>
</tr>
<tr>
<td>XS</td>
<td><strong>Font type.</strong> Specifies the 17W x 17H dot matrix font (including descenders).</td>
<td>Page 5-33</td>
</tr>
<tr>
<td>XU</td>
<td><strong>Font type.</strong> Specifies the 5W x 9L dot matrix font (including descenders).</td>
<td>Page 5-33</td>
</tr>
<tr>
<td>XWa</td>
<td><strong>Font type.</strong> Specifies the 48W x 48L dot matrix font (including descenders).</td>
<td>Page 5-37</td>
</tr>
<tr>
<td></td>
<td>[a = 0 \quad \text{Disables auto-smoothing of font}] [1 \quad \text{Enables auto-smoothing if expansion is greater than 3}]</td>
<td></td>
</tr>
<tr>
<td>XBa</td>
<td><strong>Font type.</strong> Specifies the 48W x 48L dot matrix font (including descenders).</td>
<td>Page 5-37</td>
</tr>
<tr>
<td></td>
<td>[a = 0 \quad \text{Disables auto-smoothing of font}] [1 \quad \text{Enables auto-smoothing if expansion is greater than 3}]</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td><strong>Stop Code.</strong> Ends all print jobs.</td>
<td>Page 5-70</td>
</tr>
<tr>
<td>%a</td>
<td><strong>Rotate.</strong> Fixed Base Reference Point. Rotates printing in 90° increments without changing the base reference point.</td>
<td>Page 5-64</td>
</tr>
<tr>
<td></td>
<td>[a = 0 \quad \text{Sets print to normal direction}] [1 \quad \text{Sets print to 90° CCW}] [2 \quad \text{Sets print to 180° rotated (upside down)}] [3 \quad \text{Sets print to 270° CCW (90° CW)}]</td>
<td></td>
</tr>
</tbody>
</table>
**Vector font.** Specifies printing of the unique SATO vector font.  
\[ \text{vector font} \]  
\[ a,b,c,d \]  
\[ \text{a} \]  
\[ \text{A} \text{ Helvetica Bold (proportional spacing)} \]  
\[ \text{B} \text{ Helvetica Bold (fixed spacing)} \]  
\[ \text{b} \]  
\[ \text{Font width (50-999 dots*)} \]  
\[ \text{c} \]  
\[ \text{Font height (50-999 dots*)} \]  
\[ \text{d} \]  
\[ \text{Font variation (0-9) as follows:} \]  
\[ 0 \text{ Standard} \]  
\[ 1 \text{ Standard open (outlined)} \]  
\[ 2 \text{ Gray (mesh) pattern 1} \]  
\[ 3 \text{ Gray (mesh) pattern 2} \]  
\[ 4 \text{ Gray (mesh) pattern 3} \]  
\[ 5 \text{ Standard, shadow 1} \]  
\[ 6 \text{ Standard, shadow 2} \]  
\[ 7 \text{ Standard mirror image} \]  
\[ 8 \text{ Italic} \]  
\[ 9 \text{ Italic open (outlined)} \]  

**Data** for Vector font.  
\[ \text{(data)} \]  

**Print Darkness.** Specifies a new print darkness setting. The lightest setting is “1”. There are three darkness levels that can be specified.  
\[ \#(\text{data}) \]  

**Reverse Image.** Reverse image from black to white and vice versa. Units of measure are dots.  
\[ (\text{aaaa},\text{bbbb}) \]  

**Store Form Overlay.** Stores a specified label image in the printer’s volatile form overlay memory.  
\[ \text{&} \]  

**Recall Form Overlay.** Recalls the label image from the printer’s form overlay memory for printing.  
\[ / \]  

**Replace Data (Partial Edit).** Provides the ability to replace a specified area of the previous label with new data.  
\[ 0 \text{ (zero)} \]  

**Clear Print Job(s) and Memory.** Clears individual memory and buffers.  
\[ *a \]  
\[ \text{a} \]  
\[ \text{When not included in command, clears print jobs in Multi-Buffer mode.} \]  
\[ \text{a} \]  
\[ \text{If included in command, specifies memory section to be cleared} \]  
\[ \text{T Custom character memory, printer} \]  
\[ \& \text{ Form overlay memory, printer} \]  
\[ \text{X Clears all memory all memory and buffers} \]
### Off-Line
Signals the printer to go off-line after the completion of a print job.

### Calendar Option Commands

<table>
<thead>
<tr>
<th>INSTRUCTION</th>
<th>DESCRIPTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>WA(elements)</td>
<td><strong>Calendar Print</strong>. Prints the date and/or time field (up to 16 characters) from the printer’s internal clock. Use slash to separate date elements and colon to separate time elements.</td>
<td>Page 5-74</td>
</tr>
<tr>
<td>elements = YY Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MM Month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DD Day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hh Hour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mm Minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WPabbb</td>
<td><strong>Calendar Increment</strong>. To add a value to the printer’s current date and/or time. Does not change the printer’s internal time setting.</td>
<td>Page 5-72</td>
</tr>
<tr>
<td>a = Y Years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D Days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h Hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bbb = Numeric data, Years (1-9), Months (01-99), Days (001-999), Hours (001-999).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WTaabbccdde</td>
<td><strong>Calendar Set</strong>. To set the time and date of the printer’s internal clock.</td>
<td>Page 5-76</td>
</tr>
<tr>
<td>aa = Year (00-99)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bb = Month (01-12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cc = Day (01-31)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dd = Hour (00-23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ee = Minute (00-59)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Memory Card Option Commands

<table>
<thead>
<tr>
<th>INSTRUCTION</th>
<th>DESCRIPTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BJ(aa..abb..b)</td>
<td><strong>Start TrueType Font Storage</strong>. Prepares the Memory Card to accept TrueType font data.</td>
<td>Page 5-82</td>
</tr>
<tr>
<td>aa...a = 40 byte font description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bb...b = 10 byte date field</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BJDcccccdedd ee...e</td>
<td><strong>Download TrueType Font Data</strong>. Downloads the TrueType font data to the memory area specified.</td>
<td>Page 5-82</td>
</tr>
<tr>
<td>cccc = Memory Offset (hexadecimal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dddd = Data size in bytes (max = 2000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ee...e = Font data to be downloaded</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BJ)</td>
<td><strong>End TrueType Font Storage</strong>. Ends the TrueType font storage process</td>
<td>Page 5-82</td>
</tr>
<tr>
<td>BJFaaaaaaaaa</td>
<td><strong>Initialize Memory Card</strong>. Initializes the Memory Card and formats it for use. Should be preceded by the Slot Select command for the card to be initialized.</td>
<td>Page 5-90</td>
</tr>
<tr>
<td>aaaaaaaa = 8 character alphanumeric password</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSTRUCTION</td>
<td>DESCRIPTION</td>
<td>PAGE</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>BJRabbccddd</td>
<td><strong>TrueType Font Recall.</strong> Recalls a previously stored TrueType font for use.</td>
<td>Page 5-81</td>
</tr>
<tr>
<td>eeeff.f</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Font ID (1-9)</td>
<td></td>
</tr>
<tr>
<td>bb</td>
<td>Horizontal Expansion (01-12)</td>
<td></td>
</tr>
<tr>
<td>cc</td>
<td>Vertical Expansion (01-12)</td>
<td></td>
</tr>
<tr>
<td>dd</td>
<td>Character pitch (01-99)</td>
<td></td>
</tr>
<tr>
<td>eeee</td>
<td>Number of characters</td>
<td></td>
</tr>
<tr>
<td>ff...f</td>
<td>Data to be printed using font</td>
<td></td>
</tr>
<tr>
<td>BJS</td>
<td><strong>Memory Card Status.</strong> Reports the status of the currently active Memory Card to the host by printing a status label.</td>
<td>Page 5-92</td>
</tr>
<tr>
<td>CCa</td>
<td><strong>Slot Select.</strong> Selects the Memory Card slot for all following Memory Card commands.</td>
<td>Page 5-91</td>
</tr>
<tr>
<td>a</td>
<td>1 Slot 1</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>2 Slot 2</td>
<td></td>
</tr>
<tr>
<td>EXa</td>
<td><strong>Expand Memory Area.</strong> Expands the memory area used by the printer to image the label.</td>
<td>Page 5-79</td>
</tr>
<tr>
<td>a</td>
<td>0 Return to using internal printer RAM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Use Memory Card in Slot 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 Use Memory Card in Slot 2</td>
<td></td>
</tr>
<tr>
<td>Glabbbcccdde</td>
<td><strong>Store Custom Graphics.</strong> Stores a graphic image in the memory card to be called later for printing on a label.</td>
<td>Page 5-86</td>
</tr>
<tr>
<td>ee...e</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Specifies format of data stream to follow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B Binary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H Hexadecimal</td>
<td></td>
</tr>
<tr>
<td>bbb</td>
<td>Number of horizontal 8 x 8 blocks</td>
<td></td>
</tr>
<tr>
<td>ccc</td>
<td>Number of vertical 8 x 8 blocks</td>
<td></td>
</tr>
<tr>
<td>ddd</td>
<td>Graphics storage number (001-999)</td>
<td></td>
</tr>
<tr>
<td>ee...e</td>
<td>Data to describe the graphic image</td>
<td></td>
</tr>
<tr>
<td>GRccc</td>
<td><strong>Recall Custom Graphics.</strong> Recalls for printing the graphic image stored by the GI command.</td>
<td>Page 5-85</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ccc = Storage number (001-999)</td>
<td></td>
</tr>
<tr>
<td>Plaaa,bbbbbb,</td>
<td><strong>Store PCX Graphics File.</strong> Stores a PCX graphic file.</td>
<td>Page 5-89</td>
</tr>
<tr>
<td>cc...c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>aaa</td>
<td>Storage number (001-999)</td>
<td></td>
</tr>
<tr>
<td>bbbbb</td>
<td>Number of bytes in the file to be stored.</td>
<td></td>
</tr>
<tr>
<td>PYaaa</td>
<td><strong>Recall PCX Graphics File.</strong> Recalls a PCX graphics file.</td>
<td>Page 5-88</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>aaa</td>
<td>The storage number assigned to the file (001-999)</td>
<td></td>
</tr>
<tr>
<td>YR,aaa</td>
<td><strong>Recall Format/Field.</strong> To recall a field from a format previously stored in the memory card.</td>
<td>Page 5-83</td>
</tr>
<tr>
<td>/D,bb,cc...c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>aaa</td>
<td>Number of format to be recalled (001 to 999)</td>
<td></td>
</tr>
<tr>
<td>bb</td>
<td>Number of field to be recalled (01-99)</td>
<td></td>
</tr>
<tr>
<td>cc...c</td>
<td>Data to be placed in field</td>
<td></td>
</tr>
</tbody>
</table>
YS,aaa  **Store Format/Field.** To store a field in a format in the memory card.  Page 5-84
/Nbb,cc
  aaa = Format number (001 -999)
  bb = Field number (01-99)
  cc = Number of characters in the field

*a,bbb  **Clear Card Memory.** Clears individual memory and buffer areas.  Page 5-78
  a = Memory section to be cleared
      G SATO graphic files (001-999)
      P PCX graphic file (001-999)
      F Stored formats (001-999)
      O TrueType fonts, memory card (001-009)
  bbb = Storage number
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APPENDIX B.
BAR CODE SPECIFICATIONS

BAR CODE SYMBOLOGIES

This section contains detailed information on the printing of bar codes on the “S” Series printers. Information on printing the following bar code symbologies is provided:

- Codabar
- Code 39
- Interleaved 2 of 5
- UPC-A/EAN-13
- EAN-8
- Industrial 2 of 5
- Matrix 2 of 5
- Code 128
- MSI
- Code 93
- UPC-E
- UPC Supplements(Bookland)
- UCC-128
- Postnet
- Data Matrix
- Maxicode
- PDF417
Codabar

Command Structure

1:3 ratio  <ESC>B0bbcccd (data) d
2:5 ratio  <ESC>BD0bbcccd (data) d
1:2 ratio  <ESC>D0bbcccd (data) d

bb = Width of narrow element in dots (01-12)
ccc = Bar height in dots (001-600)
d = Required Start and Stop character (A, B, C, or D)
(data) = Bar code data (alphanumeric)

Character Set

0-9, -, $, :, /, +
A, B, C, D (Start/Stop characters)

Density Table

<table>
<thead>
<tr>
<th>Printer Model</th>
<th>Narrow/ Wide Ratio</th>
<th>Value of “bb”</th>
<th>“X” Dimension (mils)</th>
<th>Density (char/inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-8490S</td>
<td>1:3</td>
<td>01</td>
<td>3.3</td>
<td>25.0</td>
</tr>
<tr>
<td></td>
<td>1:3</td>
<td>02</td>
<td>6.7</td>
<td>12.6</td>
</tr>
<tr>
<td></td>
<td>2:5</td>
<td>01</td>
<td>6.7</td>
<td>13.6</td>
</tr>
<tr>
<td></td>
<td>1:2</td>
<td>02</td>
<td>3.3</td>
<td>15.1</td>
</tr>
<tr>
<td>M-8459S</td>
<td>1:3</td>
<td>01</td>
<td>5.0</td>
<td>16.9</td>
</tr>
<tr>
<td>M-8460S</td>
<td>1:3</td>
<td>02</td>
<td>10.0</td>
<td>8.5</td>
</tr>
<tr>
<td>M-8485S</td>
<td>2:5</td>
<td>01</td>
<td>10.0</td>
<td>9.2</td>
</tr>
<tr>
<td></td>
<td>1:2</td>
<td>02</td>
<td>5.0</td>
<td>10.2</td>
</tr>
</tbody>
</table>

Example

<ESC>H0400<ESC>V0025<ESC>B002100A12345B
<ESC>H0440<ESC>V0135<ESC>XS12345

Notes

You must add the appropriate (A, B, C or D) Start and Stop characters to the data string. The printer does not automatically add them when printing.
# Code 39

## Command Structure

1:3 ratio: \(<\text{ESC}>\text{Blbbccc}* (\text{data}) *\)

2:5 ratio: \(<\text{ESC}>\text{BD1bbccc}* (\text{data}) *\)

1:2 ratio: \(<\text{ESC}>\text{D1bbccc}* (\text{data}) *\)

\( \text{bb} = \) Width of narrow element in dots (01-12)

\( \text{ccc} = \) Bar height in dots (001-600)

\(* = \) Required Start and Stop character (asterisk)

\((\text{data}) = \) Bar code data (alphanumeric)

## Character Set

0-9, A-Z, Space, $, %, +, -, ., /

\(* = \) (Start/Stop character)

## Density Table

<table>
<thead>
<tr>
<th>Printer Model</th>
<th>Narrow/Wide Ratio</th>
<th>Value of “bb”</th>
<th>“X” Dimension (mils)</th>
<th>Density (char/inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-8490S</td>
<td>1:3</td>
<td>01</td>
<td>3.3</td>
<td>18.8</td>
</tr>
<tr>
<td></td>
<td>1:3</td>
<td>02</td>
<td>6.7</td>
<td>9.5</td>
</tr>
<tr>
<td></td>
<td>2:5</td>
<td>01</td>
<td>3.3</td>
<td>10.3</td>
</tr>
<tr>
<td></td>
<td>1:2</td>
<td>01</td>
<td>6.7</td>
<td>23.1</td>
</tr>
<tr>
<td></td>
<td>1:2</td>
<td>02</td>
<td>3.3</td>
<td>11.5</td>
</tr>
<tr>
<td>M-8459S</td>
<td>1:3</td>
<td>01</td>
<td>5.0</td>
<td>12.7</td>
</tr>
<tr>
<td>M-8460S</td>
<td>1:3</td>
<td>02</td>
<td>10.0</td>
<td>6.4</td>
</tr>
<tr>
<td>M-8485S</td>
<td>2:5</td>
<td>01</td>
<td>10.0</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>1:2</td>
<td>01</td>
<td>5.0</td>
<td>15.6</td>
</tr>
<tr>
<td></td>
<td>1:2</td>
<td>02</td>
<td>10.0</td>
<td>7.8</td>
</tr>
</tbody>
</table>

## Example

\(<\text{ESC}>\text{H0100}<\text{ESC}>\text{V0025}<\text{ESC}>\text{B103100*CODE 39}*>\)

\(<\text{ESC}>\text{H0230}<\text{ESC}>\text{V0130}<\text{ESC}>\text{XS*CODE 39}*>\)

## Notes

You must add the “**” Start/Stop characters to the data stream. The printer does not add them automatically.
**Interleaved Two of Five (I 2/5)**

**Command Structure**
1:3 ratio: \(<\text{ESC}>B2bbccc \text{(data)}\)
2:5 ratio: \(<\text{ESC}>BD2bbccc \text{(data)}\)
1:2 ratio: \(<\text{ESC}>D2bbccc \text{(data)}\)

- **bb** = Width of narrow element in dots (01-12)
- **ccc** = Bar height in dots (001-600)
- **(data)** = Bar code data (numeric); must be an even number of digits or else the printer will add a leading zero; start and stop code are provided by the printer

**Character Set**
0-9 (numeric only)

**Density Table**

<table>
<thead>
<tr>
<th>Printer Model</th>
<th>Narrow/ Wide Ratio</th>
<th>Value of “bb”</th>
<th>“X” Dimension (mils)</th>
<th>Density (char/inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-8490S</td>
<td>1:3</td>
<td>01</td>
<td>3.3</td>
<td>33.4</td>
</tr>
<tr>
<td></td>
<td>1:3</td>
<td>02</td>
<td>6.7</td>
<td>16.7</td>
</tr>
<tr>
<td></td>
<td>2:5</td>
<td>01</td>
<td>3.3</td>
<td>18.8</td>
</tr>
<tr>
<td></td>
<td>1:2</td>
<td>01</td>
<td>6.7</td>
<td>21.4</td>
</tr>
<tr>
<td></td>
<td>1:2</td>
<td>02</td>
<td>3.3</td>
<td>14.3</td>
</tr>
<tr>
<td>M-8459S</td>
<td>1:3</td>
<td>01</td>
<td>5.0</td>
<td>22.6</td>
</tr>
<tr>
<td>M-8460S</td>
<td>1:3</td>
<td>02</td>
<td>10.0</td>
<td>11.3</td>
</tr>
<tr>
<td>M-8485S</td>
<td>2:5</td>
<td>01</td>
<td>10.0</td>
<td>12.7</td>
</tr>
<tr>
<td></td>
<td>1:2</td>
<td>01</td>
<td>5.0</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>1:2</td>
<td>02</td>
<td>10.0</td>
<td>9.7</td>
</tr>
</tbody>
</table>

**Example**
\(<\text{ESC}>H0100<\text{ESC}>V0100<\text{ESC}>B20310045676567\)
\(<\text{ESC}>H0140<\text{ESC}>V0210<\text{ESC}>XM4567 6567\)

**Notes**
To add horizontal guard bars to the top and bottom of the bar code, use the Line and Box command (see page 5-47).
UPC-A/EAN-13

Command Structure

\(<\text{ESC}>B3\text{bb}ccc\ (\text{data})\)
\(<\text{ESC}>D3\text{bb}ccc\ (\text{data})\)
\(<\text{ESC}>BD3\text{bb}ccc\ (\text{data})\)

\(\text{bb} = \) Width of narrow element in dots (01-03)
\(\text{ccc} = \) Bar height in dots (001-600)
\(\text{(data)} = \) Bar code data (numeric); must be exactly 13 digits. For UPC-A, the first digit must be a zero and the last 11 digits are the actual UPC-A data followed by a check digit.

To select UPC-A, 11 digits of data is sent. The printer adds a “0” and automatically generates the check digit. If 12 digits of data are sent, the printer assumes an EAN-13 symbol and automatically generates the check digit. The last digit of the bar code data is a modulo 10 check digit. If 13 digits of data are sent to the printer, the check digit is not created and must be supplied by the programmer. It must be the last character in the 13 digit string and can be determined by using the calculations outlined below.

Character Set

0-9 (numeric only)

Density Table

<table>
<thead>
<tr>
<th>Printer Model</th>
<th>Value of “bb”</th>
<th>Narrow Bar Width (mils)</th>
<th>Magnification Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-8490S</td>
<td>02</td>
<td>6.7</td>
<td>Below Minimum</td>
</tr>
<tr>
<td></td>
<td>03</td>
<td>10.0</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td>04</td>
<td>13.3</td>
<td>100%</td>
</tr>
<tr>
<td>M-8459S</td>
<td>02</td>
<td>10.0</td>
<td>75%</td>
</tr>
<tr>
<td>M-8460S</td>
<td>03</td>
<td>15.0</td>
<td>112%</td>
</tr>
<tr>
<td>M-8485S</td>
<td>04</td>
<td>20.0</td>
<td>150%</td>
</tr>
</tbody>
</table>

Notes

D3 provides guide bars that extend longer than the rest of the bar code. BD3 provides guide bars and the human readable text below the symbol.

Example

\(<\text{ESC}>H0100<\text{ESC}>V0375<\text{ESC}>BD30215001234567890\)
Calculating the Mod 10 Check Digit

If you wish to encode the UPC-A data “01234567890”, follow these steps to find the correct check digit.

<table>
<thead>
<tr>
<th>ODD</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVEN</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>9</td>
<td>CD</td>
</tr>
</tbody>
</table>

1. First add all the numbers in the ODD positions.
   i.e., 0+2+4+6+8+0 = 20

2. Multiply the result of Step 1 by 3.
   i.e., 20 x 3 = 60

3. Add up all the numbers in the EVEN positions.
   i.e., 1+3+5+7+9 = 25

4. Add the result of Step 2 to that of Step 3.
   i.e., 60 + 25 = 85

5. Subtract the result of Step 4 from the next highest increment of 10.
   i.e., 90 - 85 = 5

6. The correct Modulo 10 check digit for the 11 digit string “01234567890” is 5.
EAN-8

Command Structure

<ESC>B4bbcccc (data)
<ESC>D4bbcccc (data)

bb = Width of narrow element in dots (01-03)
ccc = Bar height in dots (001-600)
(data) = Bar code data (numeric); must be exactly 8 digits.

Character Set

0-9 (numeric only)

Density Table

<table>
<thead>
<tr>
<th>Printer Model</th>
<th>Value of “bb”</th>
<th>Narrow Bar Width (mils)</th>
<th>Magnification Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-8490S</td>
<td>02</td>
<td>6.7</td>
<td>Below Minimum</td>
</tr>
<tr>
<td></td>
<td>03</td>
<td>10.0</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td>04</td>
<td>13.3</td>
<td>100%</td>
</tr>
<tr>
<td>M-8459S</td>
<td>02</td>
<td>10.0</td>
<td>75%</td>
</tr>
<tr>
<td>M-8460S</td>
<td>03</td>
<td>15.0</td>
<td>112%</td>
</tr>
<tr>
<td>M-8485S</td>
<td>04</td>
<td>20.0</td>
<td>150%</td>
</tr>
</tbody>
</table>

Notes

1. D4 provides guide bars that extend longer than the rest of the bar code and the human readable text below the symbol.

2. The check digit is automatically calculated for EAN-8.

Example

<ESC>H0400<ESC>V0375<ESC>BD4031001234567
Industrial Two of Five

Command Structure

1:3 ratio: \( \text{B5bbccc (data)} \)
2:5 ratio: \( \text{BD5bbccc (data)} \)
1:2 ratio: \( \text{D5bbccc (data)} \)

\( \text{bb} \) = Width of narrow element in dots (01-12)
\( \text{ccc} \) = Bar height in dots (001-600)
\( \text{(data)} \) = Bar code data (numeric); must be an even number of digits or else the printer will add a leading zero

Character Set

0-9 (numeric only)

Notes

To add horizontal guard bars to the top and bottom of the bar code, use the Line and Box command (see Page 5-47).

Example

<ESC>H0100<ESC>V0600<ESC>BD50310012345
<ESC>H0300<ESC>V0710<ESC>XS12345
Matrix Two of Five

Command Structure

1:3 ratio: \(<\text{ESC}>\text{B}6\text{bb}\text{ccc} \text{ (data)}\)
2:5 ratio: \(<\text{ESC}>\text{BD}6\text{bb}\text{ccc} \text{ (data)}\)
1:2 ratio: \(<\text{ESC}>\text{D}6\text{bb}\text{ccc} \text{ (data)}\)

- \(bb\) = Width of narrow element in dots (01-12)
- \(ccc\) = Bar height in dots (001-600)
- \(\text{(data)}\) = Bar code data (numeric only); must be an even number of digits or else the printer will add a leading zero.

Character Set

0-9 (numeric only)

Notes

To add horizontal guard bars to the top and bottom of the bar code, use the Line and Box command (see Page 5-47).

Example

\(<\text{ESC}>\text{H}0100<\text{ESC}>\text{V}0775<\text{ESC}>\text{BD}60310012345\)
\(<\text{ESC}>\text{H}0230<\text{ESC}>\text{V}0885<\text{ESC}>\text{XS}12345\)
Code 128

Command Structure  \(<\text{ESC}>BG\text{bb}c\text{cc}d\text{d} \text{(data)}\)

- **bb** = Width of narrow element in dots (01-12)
- **ccc** = Bar height in dots (001-600)
- **dd** = Start code to specify initial subset of bar code data
  - \(>\text{G}\) Subset A Start code
  - \(>\text{H}\) Subset B Start code
  - \(>\text{I}\) Subset C Start code

- **(data)** = Includes bar code data and subset Shift codes; Shift codes are used to change the subset type within the bar code data.
  - Shift codes:
    - \(>\text{E}\) Subset A Shift code
    - \(>\text{D}\) Subset B Shift code
    - \(>\text{C}\) Subset C Shift code

Character Set  See Code 128 Character Table on Page B-18

Density Table

<table>
<thead>
<tr>
<th>Printer Model</th>
<th>Value of “bb”</th>
<th>“X” Dimension (mils)</th>
<th>Density (char/inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Subsets A, B</td>
<td>Subset C</td>
</tr>
<tr>
<td>M-8490S</td>
<td>01</td>
<td>3.3</td>
<td>27.3</td>
</tr>
<tr>
<td></td>
<td>02</td>
<td>6.7</td>
<td>13.6</td>
</tr>
<tr>
<td></td>
<td>03</td>
<td>10</td>
<td>9.1</td>
</tr>
<tr>
<td>M-8459S</td>
<td>01</td>
<td>5.0</td>
<td>18.2</td>
</tr>
<tr>
<td>M-8460S</td>
<td>01</td>
<td>10.0</td>
<td>9.1</td>
</tr>
<tr>
<td>M-8485S</td>
<td>03</td>
<td>15.0</td>
<td>13.8</td>
</tr>
</tbody>
</table>

Example  The following will start in Subset A for the characters “AB”, shift to Subset B for “789”, then shift to Subset C for “123456”.

\(<\text{ESC}>H0200<\text{ESC}>V0550<\text{ESC}>BG03100>\text{GAB}>B789>C123456\)
\(<\text{ESC}>H0310<\text{ESC}>V655<\text{ESC}>XSAB789123456\)

![Barcode Image]
MSI

Command Structure

1:3 ratio: \(<\text{ESC}>\text{B} \text{AA}b \text{cc} \text{(data)} \text{ d}\)
2:5 ratio \(<\text{ESC}>\text{BDA}bb \text{cc} \text{(data)} \text{ d}\)
1:2 ratio \(<\text{ESC}>\text{DAb}b \text{cc} \text{(data)} \text{ d}\)

\(bb\) = Width of narrow element in dots (01-12)
\(ccc\) = Bar height in dots (001-600)
\(\text{(data)}\) = Bar code data (numeric); maximum of 15 digits
\(d\) = Required check digit

Character Set

0-9 (numeric only)

Example

\(<\text{ESC}>\text{H}0100<\text{ESC}>\text{V}0950<\text{ESC}>\text{BA}03100123455\)
\(<\text{ESC}>\text{H}0170<\text{ESC}>\text{V}1060<\text{ESC}>\text{XS}12345\)
Code 93

Command Structure  1:3 ratio:  \textless ESC\textgreater B B b c c c d d \text{(data)}

\begin{itemize}
\item \textit{bb} = Width of narrow element in dots (01-12)
\item \textit{ccc} = Bar height in dots (001-600)
\item \textit{dd} = Length of data (number of digits, 00-99)
\item \textit{(data)} = Bar code data (alphanumeric); length must match value of parameter \textit{“dd”}; check digit is supplied by printer
\end{itemize}

Character Set  0-9, A-Z, -, ., Space, $, /, +, %

Density Table

<table>
<thead>
<tr>
<th>Printer Model</th>
<th>Narrow/Wide Ratio</th>
<th>Value of “bb”</th>
<th>“X” Dimension (mils)</th>
<th>Density (char/inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-8490S</td>
<td>1:3</td>
<td>01</td>
<td>3.3</td>
<td>33.3</td>
</tr>
<tr>
<td></td>
<td>1:3</td>
<td>02</td>
<td>6.7</td>
<td>16.7</td>
</tr>
<tr>
<td></td>
<td>1:3</td>
<td>03</td>
<td>10</td>
<td>11.1</td>
</tr>
<tr>
<td>M-8459S</td>
<td>1:3</td>
<td>01</td>
<td>5.0</td>
<td>22.5</td>
</tr>
<tr>
<td>M-8460S</td>
<td>1:3</td>
<td>02</td>
<td>10.0</td>
<td>11.3</td>
</tr>
<tr>
<td>M-8485S</td>
<td>1:3</td>
<td>03</td>
<td>15</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Example

\begin{itemize}
\item \textless ESC\textgreater H0100<ESC>V1125<ESC>B C 0 3 1 0 0 0 8 1 2 3 4 A B C D
\item \textless ESC\textgreater H0155<ESC>V1240<ESC>X S 1 2 3 4 A B C D
\end{itemize}
UPC-E

Command Structure

<ESC>BEbbccc (data)
<ESC>DEbbccc (data)

bb = Width of narrow element in dots (01-03)
ccc = Bar height in dots (001-600)
(data) = Bar code data (numeric); must be exactly 6 digits

Character Set

0-9 (numeric only)

Density Table

<table>
<thead>
<tr>
<th>Printer Model</th>
<th>Value of “bb”</th>
<th>Narrow Bar Width (mils)</th>
<th>Magnification Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-8490S</td>
<td>02</td>
<td>6.7</td>
<td>Below Minimum</td>
</tr>
<tr>
<td></td>
<td>03</td>
<td>10.0</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td>04</td>
<td>13.3</td>
<td>100%</td>
</tr>
<tr>
<td>M-8459S</td>
<td>02</td>
<td>10.0</td>
<td>75%</td>
</tr>
<tr>
<td>M-8460S</td>
<td>03</td>
<td>15.0</td>
<td>112%</td>
</tr>
<tr>
<td>M-8485S</td>
<td>04</td>
<td>20.0</td>
<td>150%</td>
</tr>
</tbody>
</table>

Notes

Command DE provides guide bars that extend longer than the rest of the bar code.

Example

<ESC>H0400<ESC>V0550<ESC>DE03100123456
<ESC>H0375<ESC>V0600<ESC>OB0
<ESC>H0408<ESC>V0655<ESC>OB123456

01234567
Bookland (UPC/EAN Supplements)

Command Structure  
\langle ESC \rangle BFbbccc (data)

\begin{align*}
bb &= \text{Width of narrow element in dots (01-03)} \\
ccc &= \text{Bar height in dots (001-600)} \\
\text{(data)} &= \text{Bar code data (numeric); must be exactly 2 or 5 digits}
\end{align*}

Character Set  
0-9 (numeric only)

Density Table

<table>
<thead>
<tr>
<th>Printer Model</th>
<th>Value of “bb”</th>
<th>Narrow Bar Width (mils)</th>
<th>Magnification Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-8490S</td>
<td>02</td>
<td>6.7</td>
<td>Below Minimum</td>
</tr>
<tr>
<td></td>
<td>03</td>
<td>10.0</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td>04</td>
<td>13.3</td>
<td>100%</td>
</tr>
<tr>
<td>M-8459S</td>
<td>02</td>
<td>10.0</td>
<td>75%</td>
</tr>
<tr>
<td>M-8460S</td>
<td>03</td>
<td>15.0</td>
<td>112%</td>
</tr>
<tr>
<td>M-8485S</td>
<td>04</td>
<td>20.0</td>
<td>150%</td>
</tr>
</tbody>
</table>

Example

\begin{align*}
\langle ESC \rangle H0325<ESC>V0725<ESC>D30315009827721123 \\
\langle ESC \rangle L0101<ESC>H0295<ESC>V0800<ESC>OB0 \\
\langle ESC \rangle H0340<ESC>V0878<ESC>OB98277 \\
\langle ESC \rangle H0480<ESC>V0878<ESC>OB21123 \\
\langle ESC \rangle H640<ESC>V0760<ESC>BF0313021826 \\
\langle ESC \rangle H655<ESC>V0730<ESC>OB21826
\end{align*}
UCC-128

Command Structure

\texttt{<ESC>-Bibcccd (data)}

\begin{itemize}
  \item \texttt{bb} = Width of the narrow elements in dots (01 to 12)
  \item \texttt{ccc} = Bar height in dots (001 to 600)
  \item \texttt{d} = Placement of human readable text
    \begin{itemize}
      \item 0 None
      \item 1 Text at top of bar code
      \item 2 Text at bottom of bar code
    \end{itemize}
  \item \texttt{(data)} = 17 digits made up of the following:
    \begin{itemize}
      \item 1st digit = Container type
      \item digits 2-8, Shipper identification
      \item digits 9-17, Container Sequential number
    \end{itemize}
\end{itemize}

Note: The Container Sequential number is not automatically sequenced by the printer.

Character Set

See Code 128 Character Table on Page B-18

Density Table

See Code 128, Page B-10

Notes

1. The Start, Function, Stop and Extension codes will be created by the printer and added automatically.

2. The internal Modulo 10 check character will be automatically created and added by the printer. The overall Code 128 symbol check character will be automatically created by the printer and added.

3. The automatically created human readable text will be created according to the following rules:

   \begin{itemize}
     \item The spacing between the bar code and the text is fixed at 10 dots (.050 inches).
     \item If the width of the human readable text is wider than the bar code, it will start at the same position as the bar code and extend past the right of the bar code.
     \item If the width of the human readable text is less than the bar code, it will be centered on the bar code.
     \item The automatically generated human readable font is OCR-B.
     \item If any part of the human readable text extends outside the printable area, none of it will be printed. Care should be exercised when placing the bar code to allow for any automatically created human readable text.
   \end{itemize}
Example

Without incrementing

<ESC>A
<ESC>H0100<ESC>V0100<ESC>B\text{I04150101234567000000001}
<ESC>Q2<ESC>Z

With incrementing

<ESC>A
<ESC>H0100<ESC>V0100<ESC>F001+001
<ESC>B\text{I04150101234567000000001}
<ESC>Q2<ESC>Z
Postnet

Command Structure

\(<\text{ESC}>\text{BP (data)}\)

data

- 5 digits ZIP
- 6 digits for Postnet 37
- 9 digits for ZIP+4
- 11 digits for Delivery Point Bar Code

Character Set

1-9 (numeric only)

Notes

1. Frame bits and check digits added automatically by printer.

2. Bar code width and height are fixed and cannot be changed.

3. If the number of digits sent to the printer as data does not match one of the formats specified above (i.e. 5, 6, 9 or 11), the command is ignored and nothing will be printed.

4. If a “–” is included in the data stream (i.e. 84093-1565), it is ignored.

Example

\(<\text{ESC}>\text{H0100<ESC>V0120<ESC>BP94089}\>
\(<\text{ESC}>\text{H0100<ESC>V0160<ESC>BP123456}\>
\(<\text{ESC}>\text{H0100<ESC>V0200<ESC>BP123456789}\>
\(<\text{ESC}>\text{H0100<ESC>V0240<ESC>BP12345678901}\>

\[\text{Bar code}\]
# Data Matrix

## Command Structure

<table>
<thead>
<tr>
<th>Data Format</th>
<th>&lt;ESC&gt;BXaabbccddeeefffghh</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>aa</th>
<th>Format ID. 01-06 or 11-16. The values 07 and 17 will not be accepted by the printer.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>bb</th>
<th>Error correction level. 00, 01, or 04-14. The values 02, 03 or values of 15 or greater will be processed as a 00.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>cc</th>
<th>Horizontal cell size. 03 - 12 dots/cell.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>dd</th>
<th>Vertical cell size. 03 - 12 dots/cell.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>eee</th>
<th>Number of cells in one line. Must use 000 to optimize.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>fff</th>
<th>Number of cell lines. Must use 000 to optimize.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>g</th>
<th>Mirror Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal Print</td>
</tr>
<tr>
<td>1</td>
<td>Reverse Print</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>hh</th>
<th>Guide Cell Thickness. 01-15. 01 indicates normal type.</th>
</tr>
</thead>
</table>

## Sequential Numbering

<table>
<thead>
<tr>
<th>&lt;ESC&gt;FXaaabcccdddeee</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>aaa</th>
<th>Number of duplicate labels to be printed (001 - 999)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>b</th>
<th>Increment or Decrement</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Increment</td>
</tr>
<tr>
<td>-</td>
<td>Decrement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ccc</th>
<th>Increment/Decrement Steps (001 - 999)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>ddd</th>
<th>Sequential numbering start position (001 - 999)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>eee</th>
<th>Incremented data length measured from start position (001 - 999)</th>
</tr>
</thead>
</table>

## Print Data

<table>
<thead>
<tr>
<th>&lt;ESC&gt;DCxxx...x</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>xx...x</th>
<th>Data, maximum of 500 characters</th>
</tr>
</thead>
</table>
## Character Set

<table>
<thead>
<tr>
<th>ID NUMBER</th>
<th>CHARACTER SET</th>
<th>ENCODING SCHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>16 Bit CRC</strong></td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>Numeric, Space</td>
<td>Base 11</td>
</tr>
<tr>
<td>02</td>
<td>Upper Case Alpha, Space</td>
<td>Base 27</td>
</tr>
<tr>
<td>03</td>
<td>Upper Case Alpha, Space, Comma, Period, Slash, Minus</td>
<td>Base 41</td>
</tr>
<tr>
<td>04</td>
<td>Upper Case Alphanumeric, Space</td>
<td>Base 37</td>
</tr>
<tr>
<td>05</td>
<td>ASCII 7-bit, Full Keyboard (20H - 7FH)</td>
<td>ASCII</td>
</tr>
<tr>
<td>06</td>
<td>ISO 8-bit, International (20H - FFH)</td>
<td>8-Bit</td>
</tr>
<tr>
<td></td>
<td><strong>32 Bit CRC</strong></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Numeric, Space</td>
<td>Base 11</td>
</tr>
<tr>
<td>12</td>
<td>Upper Case Alpha, Space</td>
<td>Base 27</td>
</tr>
<tr>
<td>13</td>
<td>Upper Case Alpha, Space, Comma, Period, Slash, Minus</td>
<td>Base 41</td>
</tr>
<tr>
<td>14</td>
<td>Upper Case Alphanumeric, Space</td>
<td>Base 37</td>
</tr>
<tr>
<td>15</td>
<td>ASCII 7-bit, Full Keyboard (20H - 7FH)</td>
<td>ASCII</td>
</tr>
<tr>
<td>16</td>
<td>ISO 8-bit, International (20H - FFH)</td>
<td>8-Bit</td>
</tr>
</tbody>
</table>

### Notes

See AIM USA Technical Specification Data Matrix for information on the structure of this symbology.

### Example

<ESC>V0100<ESC>H0100
<ESC>BX0505101000000001
<ESC>DCDATA MATRIX DATA MATRIX
# Maxicode

## Command Structure

<ESC>BUaaa,bbb,cccccc,dddd,eee..e

<table>
<thead>
<tr>
<th>Character</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>aaa</td>
<td>Service class, numeric only (001-999)</td>
</tr>
<tr>
<td>bbb</td>
<td>Country code, numeric only (001-999)</td>
</tr>
<tr>
<td>ccccccc</td>
<td>ZIP code, alphanumeric (000000-999999)</td>
</tr>
<tr>
<td>dddd</td>
<td>Extended ZIP code, numeric only (0001-9999)</td>
</tr>
<tr>
<td>ee...e</td>
<td>Low priority message, alphanumeric, 84 digits.</td>
</tr>
</tbody>
</table>

## Character Set

Field dependent.

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Class</td>
<td>Numeric</td>
</tr>
<tr>
<td>Country Code</td>
<td>Numeric</td>
</tr>
<tr>
<td>ZIP Code</td>
<td>Alphanumeric</td>
</tr>
<tr>
<td>Message</td>
<td>Alphanumeric</td>
</tr>
</tbody>
</table>

## Notes

See AIM USA Uniform Symbology Specification - Maxicode for information on the structure of this symbology.

## Example

<ESC>A<ESC>V0100<ESC>H0200<ESC>BU001,840,94089,0000,[]><Rs>01<Gs>961Z12345675<Gs>UPSN<Gs>12345E<Gs>089<Gs><Gs>1/1<Gs>10.1<Gs>Y<Gs><Gs>UT<Rs><Eot>!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!<ESC>Q1<ESC>Z
PDF417

Command Structure  \texttt{<ESC>BFaabbcddeeffffffnn...n}

- \texttt{aa} = Minimum module dimension (03-09 dots). Will not print if values of 01, 02 or greater than 10 are specified.
- \texttt{bb} = Minimum module pitch dimension (04-24 dots). Will not print if values of 01, 02, 03 or greater than 25 are specified.
- \texttt{c} = Security (error detection) Level (1-8).
- \texttt{dd} = Code words per line (01-30). If 00 is specified for both \texttt{dd} and \texttt{ee}, the printer automatically optimizes the number of rows per symbol.
- \texttt{ee} = Rows per symbol (00 or 03-40). If 00 is specified for both \texttt{dd} and \texttt{ee}, the printer automatically optimizes the number of rows per symbol.
- \texttt{ffff} = Number of characters to be encoded (0001-2700).
- \texttt{nn...n} = Data to be printed.

Character Set  ASCII 128 character set plus PC437 Extended Character set.

Notes  See AIM USA Uniform Symbology Specification PDF417 for information on the structure of this symbology.

Example  \texttt{<ESC>V0100<ESC>H0100<ESC>BK0607400000021PDF417 PDF417 PDF417}
The Code 128 Table lists 105 data values for the three subsets: A, B, and C. Each subset column displays either a single column of data or a double column of data.

- If the subset column displays a single column of data, that is the data to be entered to produce the result.
- If the subset column displays a double column of data, the first column contains the desired output, and the second column contains the actual characters to be entered.

For example, look at value 99 in the table:

If you are currently using Subset A or Subset B, you can change to Subset C by encoding “>C”.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>SUBSET A</th>
<th>SUBSET B</th>
<th>SUBSET C</th>
</tr>
</thead>
<tbody>
<tr>
<td>99</td>
<td>Subset C &gt;C</td>
<td>Subset C &gt;C</td>
<td>99</td>
</tr>
<tr>
<td>100</td>
<td>Subset B &gt;D</td>
<td>FNC4 &gt;D</td>
<td>Subset B &gt;D</td>
</tr>
<tr>
<td>101</td>
<td>FNC4 &gt;E</td>
<td>Subset A &gt;E</td>
<td>Subset A &gt;E</td>
</tr>
<tr>
<td>102</td>
<td>FNC1 &gt;F</td>
<td>FNC1 &gt;F</td>
<td>FNC1 &gt;F</td>
</tr>
</tbody>
</table>

Note: When Subset C is chosen, you must specify an even number of data positions because of the interleaved encodation method.
## Code 128 Character Table

<table>
<thead>
<tr>
<th>VALUE</th>
<th>SUBSET A</th>
<th>SUBSET B</th>
<th>SUBSET C</th>
<th>VALUE</th>
<th>SUBSET A</th>
<th>SUBSET B</th>
<th>SUBSET C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>SP</td>
<td>SP</td>
<td>00</td>
<td>36</td>
<td>D</td>
<td>D</td>
<td>36</td>
</tr>
<tr>
<td>1</td>
<td>!</td>
<td>!</td>
<td>01</td>
<td>37</td>
<td>E</td>
<td>E</td>
<td>37</td>
</tr>
<tr>
<td>2</td>
<td>&quot;</td>
<td>&quot;</td>
<td>02</td>
<td>38</td>
<td>F</td>
<td>F</td>
<td>38</td>
</tr>
<tr>
<td>3</td>
<td>#</td>
<td>#</td>
<td>03</td>
<td>39</td>
<td>G</td>
<td>G</td>
<td>39</td>
</tr>
<tr>
<td>4</td>
<td>$</td>
<td>$</td>
<td>04</td>
<td>40</td>
<td>H</td>
<td>H</td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td>%</td>
<td>%</td>
<td>05</td>
<td>41</td>
<td>I</td>
<td>I</td>
<td>41</td>
</tr>
<tr>
<td>6</td>
<td>&amp;</td>
<td>&amp;</td>
<td>06</td>
<td>42</td>
<td>J</td>
<td>J</td>
<td>42</td>
</tr>
<tr>
<td>7</td>
<td>'</td>
<td>'</td>
<td>07</td>
<td>43</td>
<td>K</td>
<td>K</td>
<td>43</td>
</tr>
<tr>
<td>8</td>
<td>(</td>
<td>(</td>
<td>08</td>
<td>44</td>
<td>L</td>
<td>L</td>
<td>44</td>
</tr>
<tr>
<td>9</td>
<td>)</td>
<td>)</td>
<td>09</td>
<td>45</td>
<td>M</td>
<td>M</td>
<td>45</td>
</tr>
<tr>
<td>10</td>
<td>*</td>
<td>*</td>
<td>10</td>
<td>46</td>
<td>N</td>
<td>N</td>
<td>46</td>
</tr>
<tr>
<td>11</td>
<td>+</td>
<td>+</td>
<td>11</td>
<td>47</td>
<td>O</td>
<td>O</td>
<td>47</td>
</tr>
<tr>
<td>12</td>
<td>,</td>
<td>,</td>
<td>12</td>
<td>48</td>
<td>P</td>
<td>P</td>
<td>48</td>
</tr>
<tr>
<td>13</td>
<td>-</td>
<td>-</td>
<td>13</td>
<td>49</td>
<td>Q</td>
<td>Q</td>
<td>49</td>
</tr>
<tr>
<td>14</td>
<td>.</td>
<td>.</td>
<td>14</td>
<td>50</td>
<td>R</td>
<td>R</td>
<td>50</td>
</tr>
<tr>
<td>15</td>
<td>/</td>
<td>/</td>
<td>15</td>
<td>51</td>
<td>S</td>
<td>S</td>
<td>51</td>
</tr>
<tr>
<td>16</td>
<td>0</td>
<td>0</td>
<td>16</td>
<td>52</td>
<td>T</td>
<td>T</td>
<td>52</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>1</td>
<td>17</td>
<td>53</td>
<td>U</td>
<td>U</td>
<td>53</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
<td>2</td>
<td>18</td>
<td>54</td>
<td>V</td>
<td>V</td>
<td>54</td>
</tr>
<tr>
<td>19</td>
<td>3</td>
<td>3</td>
<td>19</td>
<td>55</td>
<td>W</td>
<td>W</td>
<td>55</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
<td>4</td>
<td>20</td>
<td>56</td>
<td>X</td>
<td>X</td>
<td>56</td>
</tr>
<tr>
<td>21</td>
<td>5</td>
<td>5</td>
<td>21</td>
<td>57</td>
<td>Y</td>
<td>Y</td>
<td>57</td>
</tr>
<tr>
<td>22</td>
<td>6</td>
<td>6</td>
<td>22</td>
<td>58</td>
<td>Z</td>
<td>Z</td>
<td>58</td>
</tr>
<tr>
<td>23</td>
<td>7</td>
<td>7</td>
<td>23</td>
<td>59</td>
<td>[</td>
<td>]</td>
<td>59</td>
</tr>
<tr>
<td>24</td>
<td>8</td>
<td>8</td>
<td>24</td>
<td>60</td>
<td>\</td>
<td>\</td>
<td>60</td>
</tr>
<tr>
<td>25</td>
<td>9</td>
<td>9</td>
<td>25</td>
<td>61</td>
<td>]</td>
<td>)</td>
<td>61</td>
</tr>
<tr>
<td>26</td>
<td>:</td>
<td>:</td>
<td>26</td>
<td>62</td>
<td>^</td>
<td>^</td>
<td>62</td>
</tr>
<tr>
<td>27</td>
<td>;</td>
<td>;</td>
<td>27</td>
<td>63</td>
<td>_</td>
<td>_</td>
<td>63</td>
</tr>
<tr>
<td>28</td>
<td>&lt;</td>
<td>&lt;</td>
<td>28</td>
<td>64</td>
<td>NUL</td>
<td>&gt;(space)</td>
<td>&gt;(space)</td>
</tr>
<tr>
<td>29</td>
<td>=</td>
<td>=</td>
<td>29</td>
<td>65</td>
<td>SOH</td>
<td>&gt;!</td>
<td>a</td>
</tr>
<tr>
<td>30</td>
<td>&gt;</td>
<td>&gt;</td>
<td>30</td>
<td>66</td>
<td>STX</td>
<td>&gt;*</td>
<td>b</td>
</tr>
<tr>
<td>31</td>
<td>?</td>
<td>?</td>
<td>31</td>
<td>67</td>
<td>ETX</td>
<td>&gt;#</td>
<td>c</td>
</tr>
<tr>
<td>32</td>
<td>@</td>
<td>@</td>
<td>32</td>
<td>68</td>
<td>EOT</td>
<td>&gt;$</td>
<td>d</td>
</tr>
<tr>
<td>33</td>
<td>A</td>
<td>A</td>
<td>33</td>
<td>69</td>
<td>ENQ</td>
<td>&gt;%</td>
<td>e</td>
</tr>
<tr>
<td>34</td>
<td>B</td>
<td>B</td>
<td>34</td>
<td>70</td>
<td>ACK</td>
<td>&gt;&amp;</td>
<td>f</td>
</tr>
<tr>
<td>35</td>
<td>C</td>
<td>C</td>
<td>35</td>
<td>71</td>
<td>BEL</td>
<td>&gt;'</td>
<td>g</td>
</tr>
</tbody>
</table>
## Code 128 Character Table (cont’d)

<table>
<thead>
<tr>
<th>VALUE</th>
<th>SUBSET A</th>
<th>SUBSET B</th>
<th>SUBSET C</th>
<th>VALUE</th>
<th>SUBSET A</th>
<th>SUBSET B</th>
<th>SUBSET C</th>
</tr>
</thead>
<tbody>
<tr>
<td>72</td>
<td>BS</td>
<td>&gt;(&lt;</td>
<td>72</td>
<td>89</td>
<td>EM</td>
<td>&gt;9</td>
<td>89</td>
</tr>
<tr>
<td>73</td>
<td>HT</td>
<td>&gt;)</td>
<td>73</td>
<td>90</td>
<td>SUB</td>
<td>&gt;:</td>
<td>90</td>
</tr>
<tr>
<td>74</td>
<td>LF</td>
<td>&gt;*</td>
<td>74</td>
<td>91</td>
<td>ESC</td>
<td>&gt;;</td>
<td>91</td>
</tr>
<tr>
<td>75</td>
<td>VT</td>
<td>&gt;&gt;</td>
<td>75</td>
<td>92</td>
<td>FS</td>
<td>&gt;&lt;</td>
<td>92</td>
</tr>
<tr>
<td>76</td>
<td>FF</td>
<td>&gt;.</td>
<td>76</td>
<td>93</td>
<td>GS</td>
<td>&gt;:</td>
<td>93</td>
</tr>
<tr>
<td>77</td>
<td>CR</td>
<td>&gt;-</td>
<td>77</td>
<td>94</td>
<td>RS</td>
<td>&gt;&gt;</td>
<td>94</td>
</tr>
<tr>
<td>78</td>
<td>SO</td>
<td>&gt;.</td>
<td>78</td>
<td>95</td>
<td>US</td>
<td>&gt;?</td>
<td>95</td>
</tr>
<tr>
<td>79</td>
<td>SI</td>
<td>&gt;/</td>
<td>79</td>
<td>96</td>
<td>FNC3</td>
<td>&gt;@</td>
<td>96</td>
</tr>
<tr>
<td>80</td>
<td>DLE</td>
<td>&gt;0</td>
<td>80</td>
<td>97</td>
<td>FNC2</td>
<td>&gt;A</td>
<td>97</td>
</tr>
<tr>
<td>81</td>
<td>DC1</td>
<td>&gt;1</td>
<td>81</td>
<td>98</td>
<td>SHIFT</td>
<td>&gt;B</td>
<td>98</td>
</tr>
<tr>
<td>82</td>
<td>DC2</td>
<td>&gt;2</td>
<td>82</td>
<td>99</td>
<td>Subset C</td>
<td>&gt;C</td>
<td>99</td>
</tr>
<tr>
<td>83</td>
<td>DC3</td>
<td>&gt;3</td>
<td>83</td>
<td>100</td>
<td>Subset B</td>
<td>&gt;D</td>
<td>Subset B</td>
</tr>
<tr>
<td>84</td>
<td>DC4</td>
<td>&gt;4</td>
<td>84</td>
<td>101</td>
<td>FNC4</td>
<td>&gt;E</td>
<td>Subset A</td>
</tr>
<tr>
<td>85</td>
<td>NAK</td>
<td>&gt;5</td>
<td>85</td>
<td>102</td>
<td>FNC1</td>
<td>&gt;F</td>
<td>FNC1</td>
</tr>
<tr>
<td>86</td>
<td>SYN</td>
<td>&gt;6</td>
<td>86</td>
<td>103</td>
<td>SUBSET A</td>
<td>START CODE</td>
<td>&gt;G</td>
</tr>
<tr>
<td>87</td>
<td>ETB</td>
<td>&gt;7</td>
<td>87</td>
<td>104</td>
<td>SUBSET B</td>
<td>START CODE</td>
<td>&gt;H</td>
</tr>
<tr>
<td>88</td>
<td>CAN</td>
<td>&gt;8</td>
<td>88</td>
<td>105</td>
<td>SUBSET C</td>
<td>START CODE</td>
<td>&gt;I</td>
</tr>
</tbody>
</table>
The following example is presented to help understand the use of the Custom Designed Characters command. It demonstrates the design and printing of an “arrow” in a 16 x 16 matrix.

1. Determine which matrix size to use
   - 16 dot x 16 dots
   - 24 dots by 24 dots

2. Lay out a grid and draw the image on the grid.
   - Each square represents one dot
   - Blacken squares for each printed dot
3. Transfer the image into two bit map representations and then into hexadecimal or binary format.

<table>
<thead>
<tr>
<th>ROW</th>
<th>BIT MAP</th>
<th>HEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0000 0001 0000 0000</td>
<td>01 00</td>
</tr>
<tr>
<td>2</td>
<td>0000 0011 1000 0000</td>
<td>03 80</td>
</tr>
<tr>
<td>3</td>
<td>0000 0111 1100 0000</td>
<td>07 C0</td>
</tr>
<tr>
<td>4</td>
<td>0000 1111 1110 0000</td>
<td>0F E0</td>
</tr>
<tr>
<td>5</td>
<td>0001 1111 1111 0000</td>
<td>1F F0</td>
</tr>
<tr>
<td>6</td>
<td>0011 1111 1111 1000</td>
<td>3F F8</td>
</tr>
<tr>
<td>7</td>
<td>0111 1111 1111 1100</td>
<td>7F FC</td>
</tr>
<tr>
<td>8</td>
<td>1111 1111 1111 1110</td>
<td>FF FE</td>
</tr>
<tr>
<td>9</td>
<td>0000 0111 1100 0000</td>
<td>07 C0</td>
</tr>
<tr>
<td>10</td>
<td>0000 0111 1100 0000</td>
<td>07 C0</td>
</tr>
<tr>
<td>11</td>
<td>0000 0111 1100 0000</td>
<td>07 C0</td>
</tr>
<tr>
<td>12</td>
<td>0000 0111 1100 0000</td>
<td>07 C0</td>
</tr>
<tr>
<td>13</td>
<td>0000 0111 1100 0000</td>
<td>07 C0</td>
</tr>
<tr>
<td>14</td>
<td>0000 0111 1100 0000</td>
<td>07 C0</td>
</tr>
<tr>
<td>15</td>
<td>0000 0111 1100 0000</td>
<td>07 C0</td>
</tr>
<tr>
<td>16</td>
<td>0000 0111 1100 0000</td>
<td>07 C0</td>
</tr>
</tbody>
</table>

4. To store the custom designed character in memory using a hexadecimal data stream, the command would be:

```
<ESC>A
<ESC>T1H3F0100038007C00FE01FF03FF87FFCFFE07C007C007C007C007C007C007C007C0
<ESC>Z
```

*Note: This should be a continuous data string without any CR or LF characters.*

5. To recall the custom character from memory, send the following code to the printer. Note that you can print other data as well. Also note how the character size was expanded using the <ESC>L command.

```
<ESC>A
<ESC>L0505<ESC>H0150<ESC>V100<ESC>K1H903F
<ESC>A
<ESC>L0505<ESC>H0600<ESC>V100<ESC>K1H903F
<ESC>A
<ESC>L0303<ESC>H0125<ESC>V0250<ESC>MTHIS SIDE UP !
<ESC>Q1
<ESC>Z
```

6. To store the custom designed character in memory using a binary data stream, the command would be:

```
<ESC>A
<ESC>T1B3F01H 00H 03H 80H 07H C0H 0FH E0H 1FH F0H 3FH F8H 7FH FC0H FFH FEH
07H C0H 07H C0H 07H C0H 07H C0H 07H C0H 07H C0H 07H C0H 07H C0H 07H C0H
<ESC>Z
```

*NOTE: Spaces are shown between hexadecimal values in the above example for clarity only and are not included in the data string.*

*Note that the data stream is only half as long as the hexadecimal format. This is because we can send the binary equivalent of “11111111” (represented above in its hexadecimal value of FFH), for example, using one eight bit word while it takes two eight bit words to transmit the hexadecimal equivalent “F” and “F”. To send binary characters using BASIC, the expression “CHR (&HFF) will send the binary equivalent of FF (i.e., 11111111).*
6. To recall the custom character from memory, send the following code to the printer:

\(<\text{ESC}>A\>
\(<\text{ESC}>L505<\text{ESC}>H0150<\text{ESC}>V100<\text{ESC}>K1B903F\>
\(<\text{ESC}>L505<\text{ESC}>H0600<\text{ESC}>V100<\text{ESC}>K1B903F\>
\(<\text{ESC}>L0303<\text{ESC}>H0125<\text{ESC}>V0250<\text{ESC}>XM\text{THIS SIDE UP}!\>
\(<\text{ESC}>Q1\>
\(<\text{ESC}>Z\>

The printer output for both the hexadecimal and binary format examples is:
The following example is presented to help you understand the use of the Custom Graphics command. It demonstrates the design and printing of a “diskette” in a 48 x 48 matrix.

1. Determine the matrix size for the graphic. It must be in 8 dot by 8 dot blocks. The example here has six blocks horizontally and six blocks vertically (48 x 48).

2. Lay out a grid and draw the image on the grid.
   - Each square represents one dot
   - Blacken squares for each printed dot
3. Transfer the image into a bit map representation and then into hexadecimal format:

<table>
<thead>
<tr>
<th>BIT MAP</th>
<th>HEXADECIMAL FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>11111111 11111111 11111111 11111111 11111111 11111111</td>
<td>FF FF FF FF FF FF</td>
</tr>
<tr>
<td>11111111 11111111 11111111 11111111 11111111 11111111</td>
<td>FF FF FF FF FF FF</td>
</tr>
<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000001</td>
<td>C0 00 00 00 00 00 03</td>
</tr>
<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000001</td>
<td>C0 00 00 00 00 00 03</td>
</tr>
<tr>
<td>11000000 00000000 11111111 11111111 11111111 11111111</td>
<td>C0 00 80 00 00 00 13</td>
</tr>
<tr>
<td>11000000 00000000 10000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
</tr>
<tr>
<td>11000000 00000000 10000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
</tr>
<tr>
<td>11000000 00000000 10000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
</tr>
<tr>
<td>11000000 00000000 10000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
</tr>
<tr>
<td>11000000 00000000 10000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
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<tr>
<td>11000000 00000000 10000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
</tr>
<tr>
<td>11000000 00000000 10000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
</tr>
<tr>
<td>11000000 00000000 10000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
</tr>
<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
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<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
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<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
</tr>
<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
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<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
</tr>
<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
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<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
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<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
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<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
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<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
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<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
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<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
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<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
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<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
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<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
</tr>
<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
</tr>
<tr>
<td>11000000 00000000 00000000 00000000 00000000 00000000</td>
<td>C0 00 80 00 00 00 13</td>
</tr>
<tr>
<td>11111111 11111111 11111111 11111111 11111111 11111111</td>
<td>FF FF FF FF FF FF</td>
</tr>
</tbody>
</table>
4. Using the hexadecimal data, send the following code to print the graphic image as designed.

```<ESC>A<ESC>H0100<ESC>V0100<ESC>GH06006
FFFFF FFFFF FFFFF FFFFF C0000 000003
C00000 000003 C000FF FFFFF3 C00080 000013
C00080 000013 C0009F FFFF13 C00080 000013
C00080 000013 C000FF FFFFF3 C00000 000003
C00000 000003 C00000 000003 C00003 C00003
C00003 C00003 C00003 C00003 C00003 C00003
C00003 C00003 C00003 C00003 C00003 C00003
C00003 C00003 C00001 800003 C00000 000003
C00000 000003 C00000 000003 C00001 800003
C00000 000003 C00000 000003 C00000 000003
<ESC>Q1<ESC>Z```

Note: Spaces shown in the hexadecimal listing above are for emphasis only. Spaces must not be encoded within the graphic portion of the data stream to the printer. Also, CR and LF characters to separate the lines must not be encoded in the data stream.

5. To send the data in binary format, the software must convert the data into binary format before transmitting it to the printer. Using the BASIC programming language for example, this is done by notation “CHR$ (&HC0)” which sends the hexadecimal value of “C0” as binary data (11000000). The BASIC program listing for sending this graphic to the printer (using the RS232 port) in binary format is:

```CLS
OPEN "COM2:9600,N,8,1,CS,DS" FOR OUTPUT AS #1
E$ = CHR$(27)
PRINT #1,CHR$(2); E$; "A"; E$; "V0100"; E$; "H0100"; E$; "GB006006";
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);```
The printer output for both the hexadecimal and binary format examples is:
PCX GRAPHICS EXAMPLE

A graphics file in a PCX format may also be transmitted to the printer. The file must not be larger than 32K bytes (DOS file size reported in a DIR listing). For example, the WIZ.PCX image shown below has a file size of 15076 bytes.

The uncompressed size (PCX is a compressed file) of the file must not be greater than 64K bytes. Generally this is not a problem unless the graphic image is surrounded by large amount of white space which the PCX algorithm can compress very efficiently. If this is the case, the file should be recaptured to eliminate the surrounding white space as much as possible.

The following basic program will send and print this file:

```
OPEN "WIZ.PCX" FOR INPUT AS #2
DA$ = INPUT$(15706, #2)
C$ = CHR$(27)
WIDTH "LPT1:.", 255
LPRINT C$; "A"
LPRINT C$; "V150"; C$; "H100"; C$; "GP15706,"; DA$
LPRINT C$; "Q1"; C$; "Z"
CLOSE #2
```

The printer output for this program is:
APPENDIX D.
OPTIONAL ACCESSORIES

This section contains instructions for using the following features:

- PCMCIA Memory Cards
- Calendar Option
- Top Mounted Reflective Sensor

PCMCIA MEMORY CARDS

Description

The Memory Card Option provides the connectors and interface board for two PCMCIA memory cards slots. The printer memory can be expanded up to 4MB.

<table>
<thead>
<tr>
<th>Type</th>
<th>RAM or Flash-ROM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable Specifications</td>
<td>PCMCIA Version 2.1 (JEIDA Version 4.1)</td>
</tr>
<tr>
<td>Size</td>
<td>128KB, 256KB, 512KB, 1MB or 2MB</td>
</tr>
<tr>
<td>Connector Pins</td>
<td>68</td>
</tr>
<tr>
<td>Battery</td>
<td>Two years for SCAM type (approximately)</td>
</tr>
<tr>
<td>Write Protect</td>
<td>Yes</td>
</tr>
<tr>
<td>Low Battery Detect</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Installation

Instructions for installing the Memory Card Option are included with the installation kit.

Error Handling

Memory Card error conditions are indicated to the operator using a combination of the ERROR LED on the front panel and the audible indicator.
<table>
<thead>
<tr>
<th>ERROR DESCRIPTION</th>
<th>INDICATION</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Battery - Low battery</td>
<td>ERROR LED: Blinking</td>
<td>Replace Memory Card battery. Note that all data will be lost when</td>
</tr>
<tr>
<td>condition is detected when printer is powered on.</td>
<td>Audible Beep: 1 long</td>
<td>the battery is removed.</td>
</tr>
<tr>
<td></td>
<td>Display: Card Low Battery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Depress LINE key to print Card Status.</td>
<td></td>
</tr>
<tr>
<td>Card R/W Error</td>
<td>ERROR LED: On</td>
<td>1. Insert card into selected slot.</td>
</tr>
<tr>
<td>1. No card is inserted.</td>
<td>Audible Beep: 1 long</td>
<td>2. Remove write protect tab.</td>
</tr>
<tr>
<td>2. Card is write protected.</td>
<td>Display: Card R/W Error</td>
<td>3. Correct program</td>
</tr>
<tr>
<td>3. Invalid store/recall number.</td>
<td>Printer must be powered off to reset.</td>
<td>4. Initialize card with BJF command</td>
</tr>
<tr>
<td>4. Card has not been initialized.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Duplicate number.</td>
<td>Display: None</td>
<td>2. Correct program.</td>
</tr>
<tr>
<td>2. Data not in print area.</td>
<td>Printer will ignore invalid commands.</td>
<td>3. Use card with more capacity.</td>
</tr>
<tr>
<td>3. Data overflows card memory.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CALENDAR**

The Calendar Option allows the date and time to be maintained in the local printer rather than using the system clock. It consists of a daughter PCBA containing a clock IC, a lithium battery and a EEPROM. This assembly replaces the EEPROM in the standard printer. A qualified technician should perform the upgrade as it requires modifications to the main PCB assembly. Please call SATO Technical Support if you need to add this option to an existing printer in the field.
If there is a requirement for printing a registration mark on the top of a label instead of on the bottom side, a Top Mounted Reflective Sensor Assembly can be installed. This option is not available on the M-8460S and the Left-Hand version of the M-8485S.
APPENDIX E.
CUSTOM PROTOCOL COMMAND CODES

DESCRIPTION

This section contains information on creating custom Protocol Command Codes for operating the “S” printers. The Protocol Command codes are used to tell the printer that a specific type of information is being transmitted to it. As an example, the Standard Protocol Command Code specifies the use of an <ESC> character to tell the printer that the following character(s) will represent a specific command. Sometimes the host computer is unable to generate the character or it uses the <ESC> character to control another function. In this case, an Alternate Protocol Command Code set can be selected for use by placing DIP switch 2-7 in the ON position. When the Alternate set is selected, the <ESC> character is not used and is instead replaced with a “carrot” (^) character. A command stream would then start with an “^” instead of an “<ESC>”. These two sets of Protocol Command Codes are adequate for the majority of all applications, but occasionally situations occur where conflicts exist when using the Alternate set. In these cases, the user can define and download a custom set of Protocol Command Codes that are stored in EEPROM memory in the printer. After these are downloaded, they replace the Alternate Command Code set when DIP switch DS2-7 is in the ON position. When DIP switch DS2-7 is in the OFF position, the Standard Protocol Command Codes are used.

DOWNLOAD COMMAND STRUCTURE

The command for downloading a new set of Protocol Command Codes takes the form of “<ESC>LD,a,b,c,d,e,f,g,h,i”. The parameters specified for “a” through “i” can be transmitted in either ASCII characters or hex notation, allowing a complete 128 character (except for the “,”) set to be used for selecting the custom code.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>STANDARD SETTING</th>
<th>ALTERNATE SETTING (DEFAULT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>STX</td>
<td>{</td>
</tr>
<tr>
<td>b</td>
<td>ETX</td>
<td>}</td>
</tr>
<tr>
<td>c</td>
<td>ESC</td>
<td>^</td>
</tr>
<tr>
<td>d</td>
<td>ENQ</td>
<td>@</td>
</tr>
<tr>
<td>e</td>
<td>CAN</td>
<td>!</td>
</tr>
<tr>
<td>g</td>
<td>OFFLINE</td>
<td>]</td>
</tr>
<tr>
<td>h (Auto ONLINE)</td>
<td>No</td>
<td>0 = YES 1 = NO</td>
</tr>
<tr>
<td>i (Zero Slash)</td>
<td>No</td>
<td>0 = YES 1 = NO</td>
</tr>
</tbody>
</table>
RESET

If the custom Protocol Command codes are incorrect or if the printer does not respond to commands using the custom set, the Alternate Protocol Control Codes can be restored by the following procedure:

1. Turn the printer off.
2. Place DIP switch **DS2-7** in the **ON** position.
3. Turn power on while simultaneously pressing the **FEED** and **LINE** switches.
4. When the message “ALT PROTOCOL DEFAULT COMPLETED” appears on the display, turn the printer off.

   ![ALT PROTOCOL DEFAULT COMPLETE]

5. When the printer is powered up again, the Alternate Protocol Command Code set will be active. All previous custom settings will be lost.

DOWNLOAD PROCEDURE

The procedure for downloading a custom Protocol Command Code set is:

1. Reset the printer to the default settings using the Reset procedure.
2. Place DIP switch **DS2-7** in the **ON** position.
3. Turn the POWER switch ON while simultaneously pressing the **LINE** switch. This places the printer in the USER DOWNLOAD mode.

   ![USER DOWNLOAD]

4. Set DIP switch **DS2-7** in the position to accept the Protocol Control codes to be used for downloading (i.e. DS2-7 = OFF for Standard codes and DS2-7 ON to use the Alternate set).

5. Press the **LINE** key to place the M-8485S in the ON-LINE mode. The LINE LED should be on and the printer is ready to receive the download command data stream.

6. After the command has been sent, the unit will beep and print a status label. If it does not beep and print the label, the printer did not accept the data.

7. If the printer does not beep and print a setting label, turn the printer off, check your download command stream for errors and start the download process over at step 1.
8. If the custom codes are correct, press the FEED key to accept them and terminate the download process. If they are incorrect, turn the unit off without pressing the FEED key and begin the download process again at step 1.

STX = XX
ETX=XX
ESC=XX
ENQ=XX
CAN=XX
NULL=XX
AUTO ONLINE=YES
ZERO SLASH=YES
This page left blank intentionally.