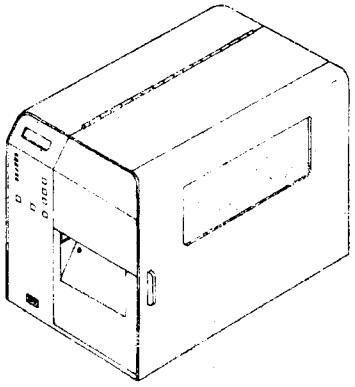
M–8450

Thermal Transfer Electronic Printer



Operator's Manual

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.

PREFACE

M–8450 OPERATOR'S MANUAL

The M–8450 Operator's Manual 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: 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, load the labels and ribbon, and use the operator panel to configure the printer.

SECTION 3: CLEANING AND MAINTENANCE

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

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M–8450 PROGRAMMER AND TECHNICAL REFERENCE MANUAL

The M–8450 Programmer and Technical Reference Manual contains technical information about the printer's programming language and interface. The following is a brief description of each section in this manual:

SECTION 1: M–8450 PROGRAMMING

This section introduces the SATO M–8450 printer programming language. It contains the commands that are used with the printer to produce labels with bar codes, alphanumeric data, and other graphics.

SECTION 2: INTERFACE SPECIFICATIONS

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

SECTION 3: TROUBLESHOOTING

This section contains troubleshooting procedures to follow in the event that you have printer problems.

APPENDIXES

Appendixes A through F contain the following information:

- Command codes quick reference chart
- Detailed bar code specifications
- Examples of custom–designed characters and custom graphics
- Instructions for setting the user default configuration
- Instructions for using the M–8450 optional features
- Character Tables

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Operator's Manual

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SECTION 2: INSTALLATION AND CONFIGURATION

SECTION 2: INSTALLATION AND CONFIGURATION (continued)

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SECTION 1
PRINTER OVERVIEW

INTRODUCTION

The SATO M–8450 Thermal Transfer Printer is a complete, high–performance on–site labeling system. It is a breakthrough product in the thermal transfer industry with the ability to print at 100, 150, or 300 dots per inch. It can print at speeds up to 10 inches per second and uses a 5–inch wide print head. All printer parameters are user–programmable through the LCD and keypad. All popular bar codes and eight human–readable fonts are resident in memory, including a vector font, 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 Features

GENERAL PRINTER SPECIFICATIONS

Printing Method	Thermal Transfer.
Printing Speed	Up to 10 inches (250 mm) per second.
Bar Code Symbology	UPC–A, UPC–E, EAN–8, EAN–13, CODE 39, I 2/5, CODE 128 subset A, B, C, CODABAR, MSI, 2/5, CODE 93, UPC Bookland, Post Net.
PCS Value	75% minimum.
Bar Code Ratio	1:2, 1:2.5, 1:3 or bar widths individually programmable.
Bar Code Height	User definable.
Human Readable Fonts	Eight fonts including OCR–A and OCR–B representation and a vector font. American and European fonts, upper case and lower case with descenders plus memory available for custom fonts.

Flexibility	360°degree rotation of bar codes and text; character expansion horizontally and vertically; RAM storage for special characters; dot–addressable graphics; sequential numbering. Battery backed–up RAM storage for up to 99 formats and/or graphic images. Form overlay for high speed editing of complex formats.
Sensing	Adjustable stock sensor for die cut labels or tags. Reflective sensor for use with sensing marks. Automatic or programmable setting of top of form. Continuous form printing possible.
Media	Die cut labels, plain paper face stock, SATO standard or equivalent. Tag stock, SATO standard or equivalent with punched feed slot for "see through" sensing. Tag caliper, .010 in. (0.25 mm). Maximum roll diameter, 8.6 in. (220 mm). Minimum gap between labels, .125 in. (3mm).
Media Size	Minimum – 1 inch (25 mm) W x .25 inch (6.35 mm) L. Maximum – 5 inches (127 mm) W x 20 inches (508 mm) L.
Interface	R232C (300 BPS – 19,200 BPS) Hardware Flow Control (DTR) Software Flow Control (X–ON/X–OFF) RS232 Bi–Directional (ENQ/Response) Parallel (Centronics compatible) RS422 (optional)
Data Transmission	ASCII.
Dimensions	10.4 inches (265 mm) W x 17 inches (435 mm) D x 13.5 inches (341 mm) H.
Weight	40 lbs. (18kg).
AC Power	100V–115V (±10%) 220V (±10%) 50/60Hz (±1%) Idling, 50W Operating, 300W
Environment	Operating, 50–95°F (10–35°C) 15–85% RH, non–condensing Storage, 0–130°F (–20–55°C) Maximum, 90% RH, non–condensing
Maximum Print Area	5 inches (127 mm) W x 14 inches (360 mm) L (7 inches maximum length if using printer at 300 DPI)

Print Module (Dot Size)	User Selectable: 0.0033 inch (300 DPI) 0.0067 inch (150 DPI) 0.0100 inch (100 DPI)
Display	LED indicators: power, on–line, label, ribbon, error, data. LCD display for printer configuration and status.
Approvals	FCC Class A; UL; CSA.

OPTIONAL FEATURES

Label Cutter	Internal attachment allowing control through programming to cut labels as they are printed at specified intervals.
Label Dispenser	Allows labels to peel off backing for immediate (on demand) application (one label at a time); resides within the printer.
Label Rewinder	External option that provides roll–to–roll rewind capabilities.
Ribbon Saver	Internal attachment that halts ribbon movement when excess "white space" is detected during printing and feeding of labels.
Memory Module	Internal daughterboard plus 128K RAM card for battery–backed storage of jobs and graphics.
OPCB	Internal daughterboard used in conjunction with the printer's RS232 interface, providing enhanced label format storage and print spooler capabilities. Memory size options of 32K, 128K, and 256K Static RAM are available.
Coax Interface	Internal interface that emulates an IBM 3287–2 printer with a Standard Type A BNC Connector. Allows the standard M–8450 printer interfaces to remain operational.
Twinax Interface	Internal interface that emulates IBM 5224, 5225, 5256, or 4214 printers with auto–terminate / cable thru capabilities. Allows the standard M–8450 printer interfaces to remain operational.

SECTION 2
INSTALLATION AND CONFIGURATION

INTRODUCTION

This section is provided to assist you in taking the M–8450 from the shipping container to the application environment.

The following information is presented in this section:

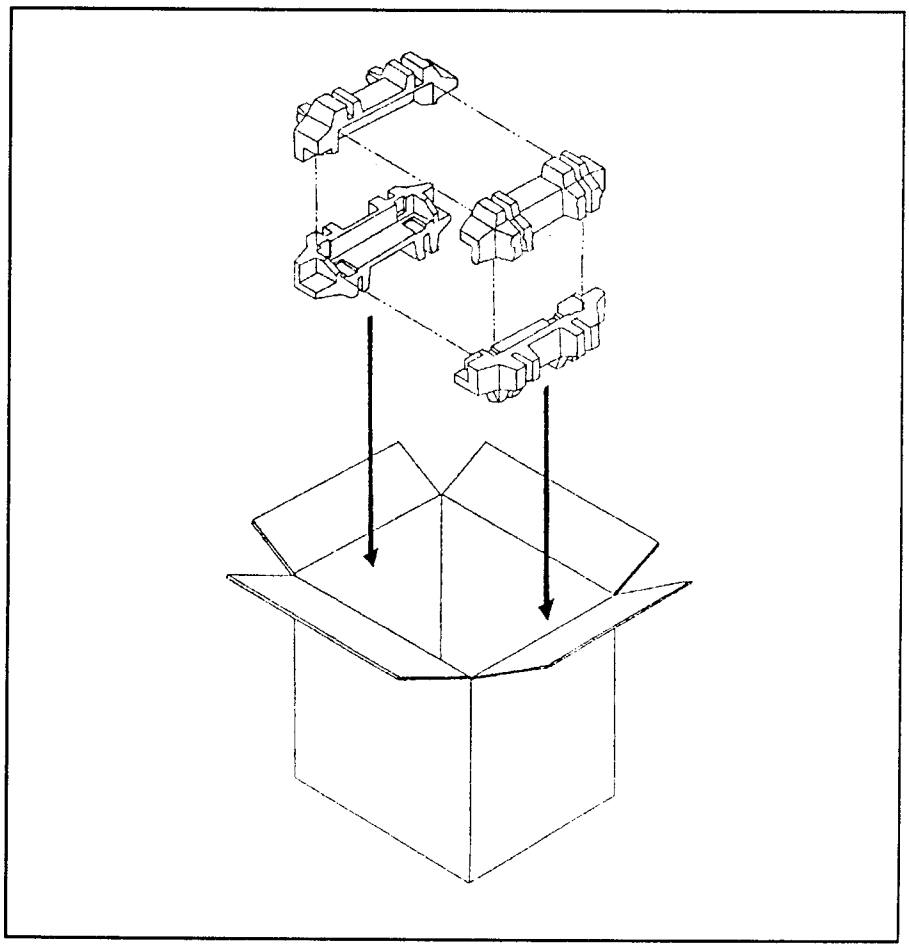
- Unpacking and Parts Identification
- Setting Up the M–8450
- Loading Labels or Tags
- Loading the Ribbon
- Operator Panel
- Printer Configuration
  - General Flowchart of M–8450 Configuration
  - User Mode
- Password–Protected Configuration Modes
  - Interface Mode
  - Service and Accessory Mode
  - Counter Mode
  - Memory Mode
  - Test Print Mode
  - Watch Mode

UNPACKING AND PARTS IDENTIFICATION

Consider the following when unpacking the printer:

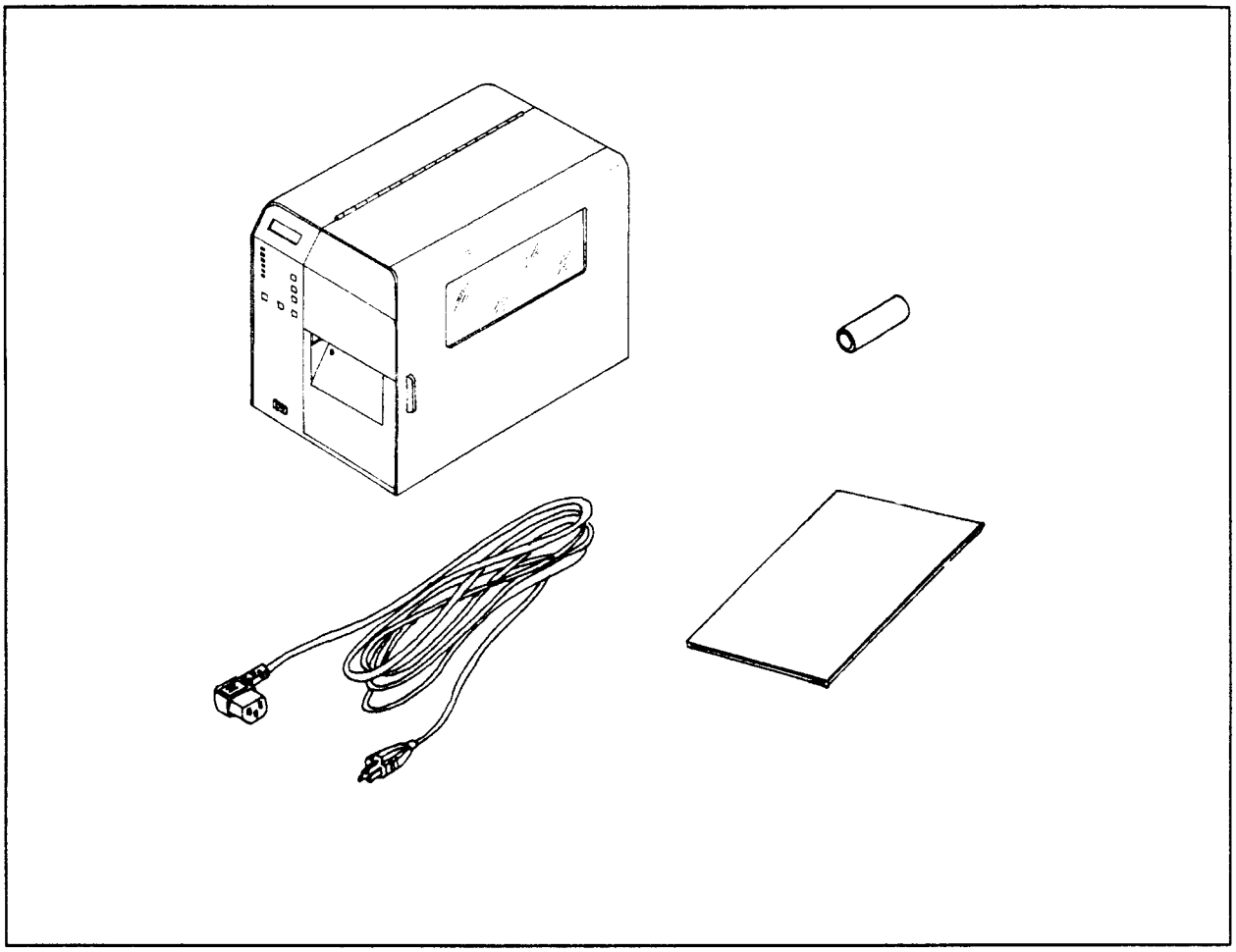
- Box stays right–side up
- Lift the printer out of the box carefully
- Remove the plastic covering from the printer
- If the printer has been stored in a cold environment, allow it to reach room temperature before powering on
- Set the printer on a solid, flat surface
- Inspect the container and printer for any signs of damage that may have occurred during shipping

Note: The following illustration is representative only. Your printer may not be packed exactly as shown here, but the unpacking steps are similar. Your printer may be wrapped in plastic with styrofoam covering the corners.



Verify that you have the following materials when unpacking:

- ☐ Printer
- ☐ Power Cord
- ☐ Extra Ribbon Core
- ☐ Operator's Manual / Programmer and Technical Reference Manual

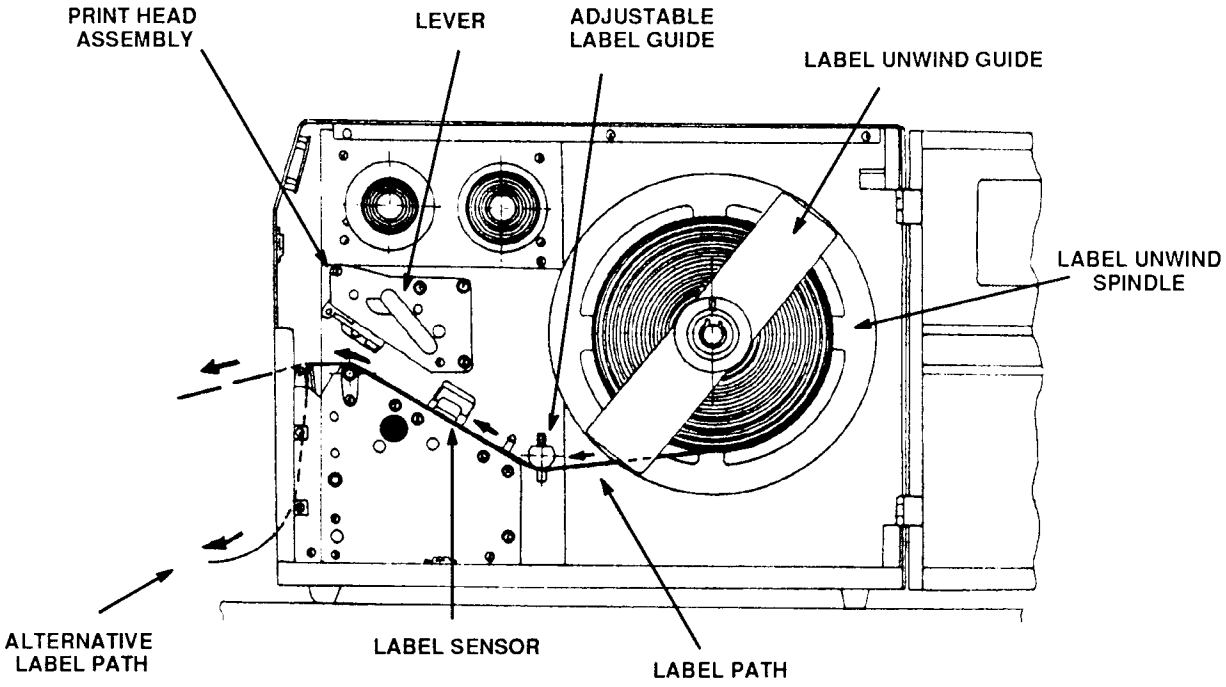


SETTING UP THE M–8450

Consider the following when setting up the printer:

- Locate a solid flat surface to set the printer (the printer's footprint is 10.5 inches wide x 17 inches deep).
- The location should be near the host computer: maximum distance for RS232 cables is 50 feet; maximum distance for Centronics Parallel cables is 6 feet. Cables can be purchased locally, and their configuration will depend upon the host computer being used.

LOADING LABELS OR TAGS



CAUTION:

If your labels are less than the full width of the print head, the outside edge of the labels will eventually wear out a small portion of the print head, resulting in an area that will not print. Special care must be taken if you plan to use multiple widths of labels, since the damaged portion of the print head caused from edge wear on a more narrow label may affect the printing on a wider label. We suggest you plan your print formats carefully to avoid using the area of possible damage on the print head when printing a wider label.

Damage from a label edge is physical damage and is unavoidable. It is not covered by warranty. It is possible to delay such damage by always ensuring that the thermal carbon used is wider than the label stock. This will help protect the print head from label edge damage.

The small area of damage will have no effect on printing with the undamaged part of the print head.

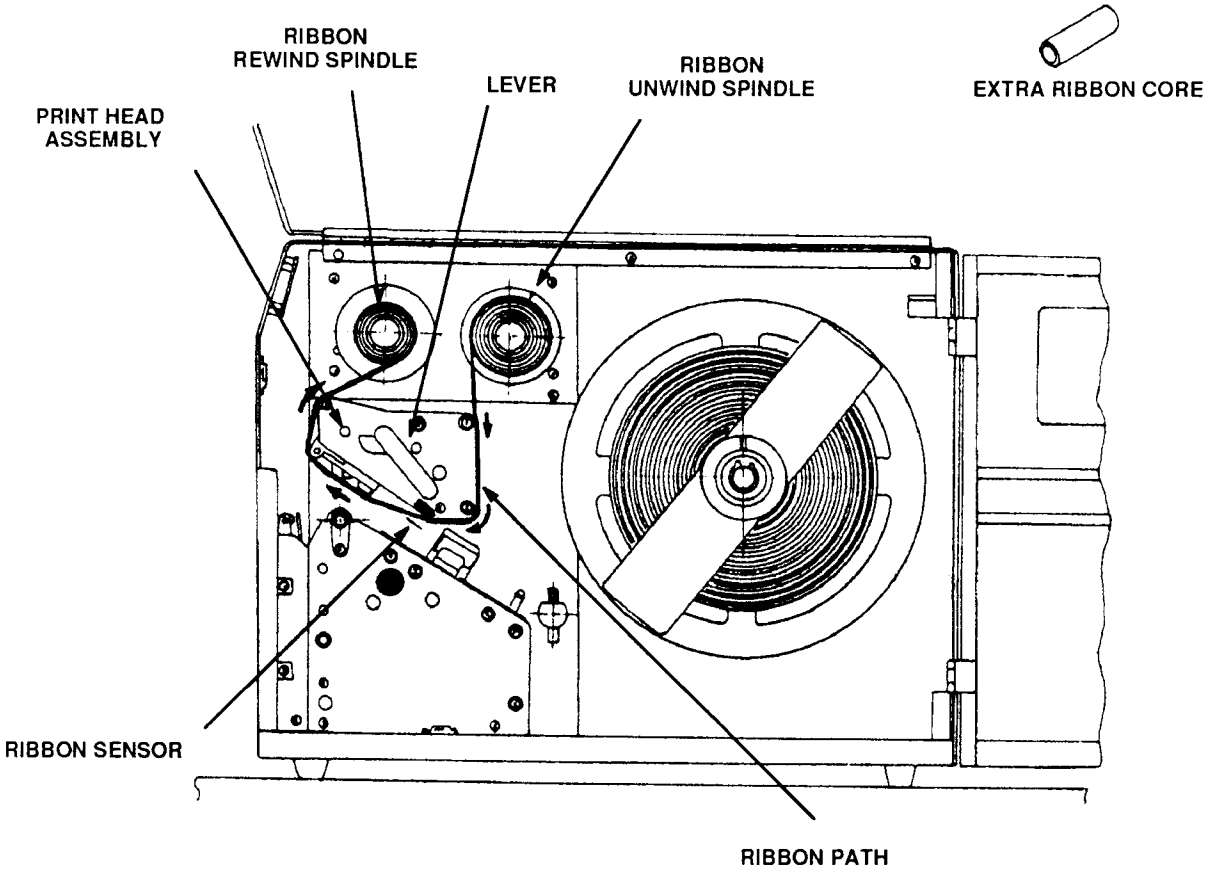
Step	Action
1	Open the side and top door.
2	Open the **PRINT HEAD ASSEMBLY** by turning the **LEVER** (on the side of the assembly) to the "HEAD OPEN" position.
3	Remove the **LABEL UNWIND GUIDE** from **LABEL UNWIND SPINDLE**.
4	If using roll labels (or tags), load the roll onto the **LABEL UNWIND SPINDLE** so that the printed side of the label faces upward as it unwinds from the roll. Push the roll all the way to the inside of the printer, and replace the **LABEL UNWIND GUIDE**. If using fanfold labels or tags, set them on a flat surface behind the printer. Open the feed slot in the rear of the printer by removing two nuts inside the printer. Pass the labels (printed side up) through the slot and under the **LABEL UNWIND SPINDLE**.
5	Feed the labels under the **ADJUSTABLE LABEL GUIDE**, under the **LABEL SENSOR**, through the **PRINT HEAD ASSEMBLY**, and out the front of the printer. Inspect the labels through the path and verify that they match the **LABEL PATH** as in the diagram above. Set the **ADJUSTABLE LABEL GUIDE** to keep the labels against the inside of the printer. NOTE: If the label dispenser option has been purchased, remove 6 to 8 inches of labels from the backing and feed the backing through the **ALTERNATE LABEL PATH** as shown in the diagram. For information on how to enable this option, see Mode S of the printer configuration (Section 2).
6	If the ribbon is already loaded, close the **PRINT HEAD ASSEMBLY** by turning the **LEVER** to the "LABEL" position.

CAUTION:
If you use more than one width of label or tag stock, the edge of the narrow stock will cause wear on the print head.

This area of wear will no longer print. If you are planning on using more than one width label, it will be necessary to program the print area on wider label to avoid printing in the damaged area.

Such edgewear is not covered by warranty.

LOADING THE RIBBON

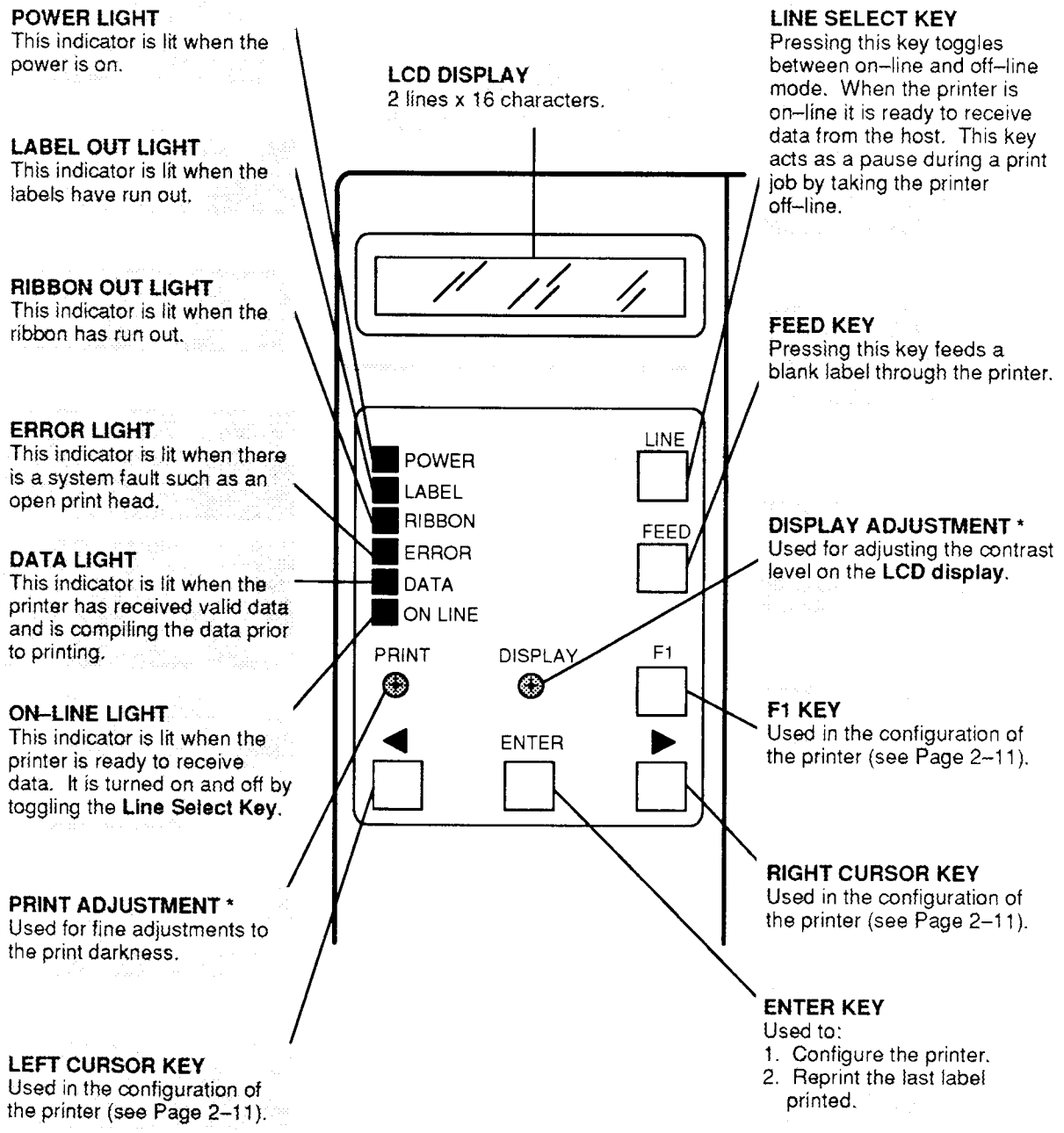


Step	Action
1	Open the side and top door.
2	Open the **PRINT HEAD ASSEMBLY** by turning the **LEVER** (on the side of the assembly) to the "HEAD OPEN" position.
3	Locate the **EXTRA RIBBON CORE** supplied with the printer. Place the core on the **RIBBON REWIND SPINDLE**, pushing it all the way to the inside of the spindle. *Note that the new empty core of each subsequent roll becomes the next rewind core.*
4	Load the ribbon onto the **RIBBON UNWIND SPINDLE**, also pushing it all the way to the inside of the spindle. The dull side of the ribbon should be facing down as it travels through the **PRINT HEAD ASSEMBLY.**
5	Feed the lead of the ribbon through the **RIBBON SENSOR** (located at the inside wall of the print head assembly area) through the **PRINT HEAD ASSEMBLY**, and up to the **RIBBON REWIND SPINDLE**. Ensure the ribbon goes between the **RIBBON SENSOR** and the metal bar directly beneath the sensor.
6	Load the ribbon behind and over the top of the **RIBBON REWIND SPINDLE** and tape it to the **EXTRA RIBBON CORE** (see diagram above). Ensure that it matches the **RIBBON PATH** in the diagram above.
7	Manually turn the ribbon onto the rewind spindle 1 to 2 turns to secure it.
8	If the labels are already loaded, close the **PRINT HEAD ASSEMBLY** by turning the **LEVER** to the "LABEL" position.

NOTE: *Run a test print to ensure the labels and ribbons were loaded correctly. See Mode T of the printer configuration for instructions on how to run test prints (Page 2–39).*

OPERATOR PANEL

This M–8450 operator panel consists of an LCD display, indicator lights, user–accessible keys, and adjustments. After you power on the printer (using the switch on the front of the printer), compare the operator panel on the printer to the diagram below. Familiarize yourself with the lights and keys as it will help you understand the configuration process.



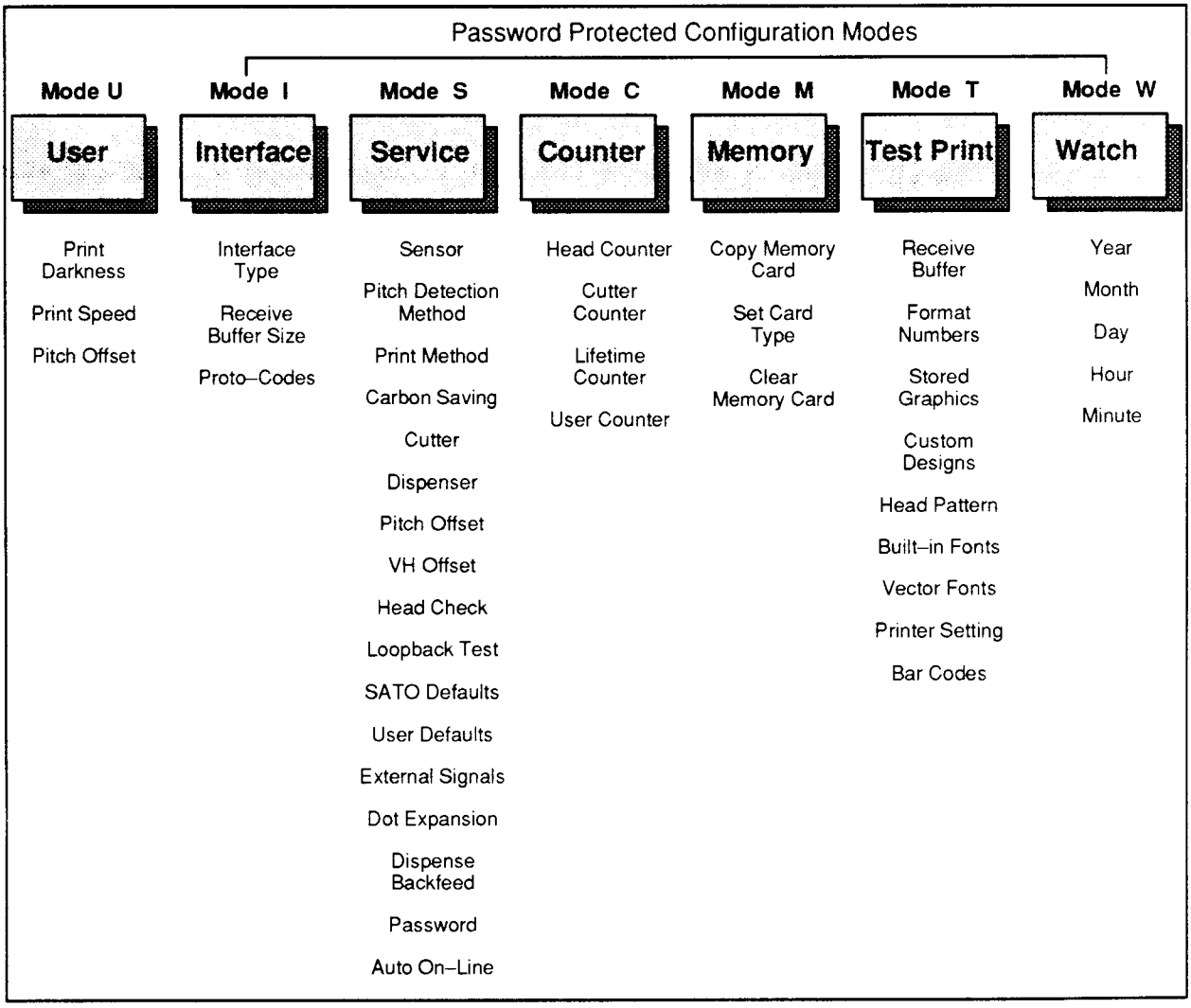
** Use a small flathead screwdriver for these adjustments.*

PRINTER CONFIGURATION

The operator panel on the M–8450 is used to configure the printer, customizing it for your needs. For example, through the configuration you can specify how dark you would like the print to be or which optional features (such as a dispenser) are being used with the printer. These settings along with other configuration options provide wide flexibility in the possible ways to use the printer.

All of the optional features are grouped under certain modes, which are listed in the chart below. For instance, Mode U (User Mode) contains only the features that pertain to the user, whereas Mode S (Service Mode) contains features that may be used more by a technician. Modes I, S, C, M, T, and W cannot be accessed without a password, and are therefore considered as password–protected modes. Using the keys on the front panel, you will work your way down to the correct mode and then the various options of that mode.

NOTE: Before you begin with the printer configuration, please note that the Programmer and Technical Reference Manual contains a *Troubleshooting* section in the Appendix. If you have any problems with the printer, refer to this section.



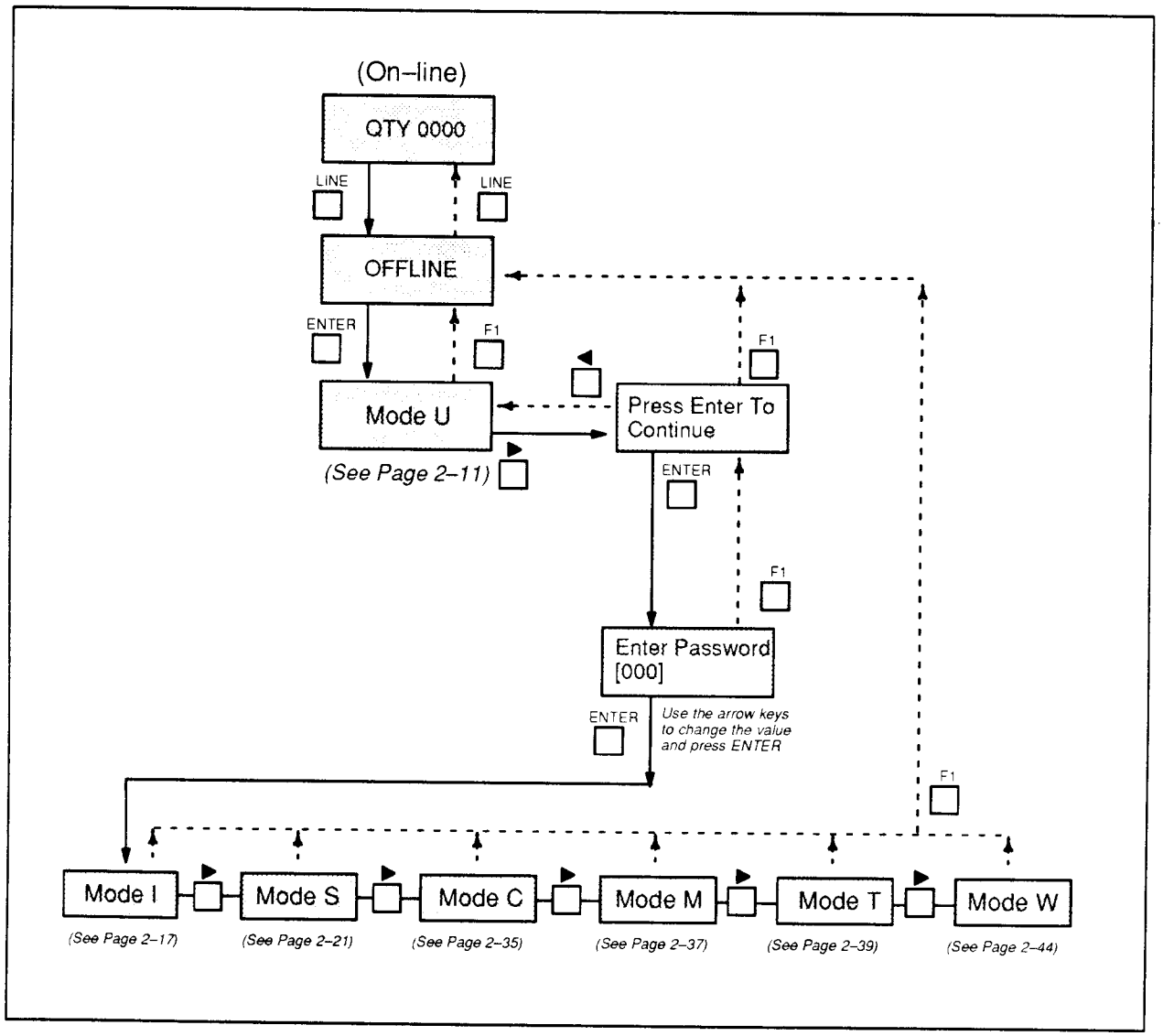
General Flowchart Of M–8450 Configuration

Once the labels and ribbon are loaded and the printer is powered on, the LCD display appears as shown:

```
          Qty
          0000
```

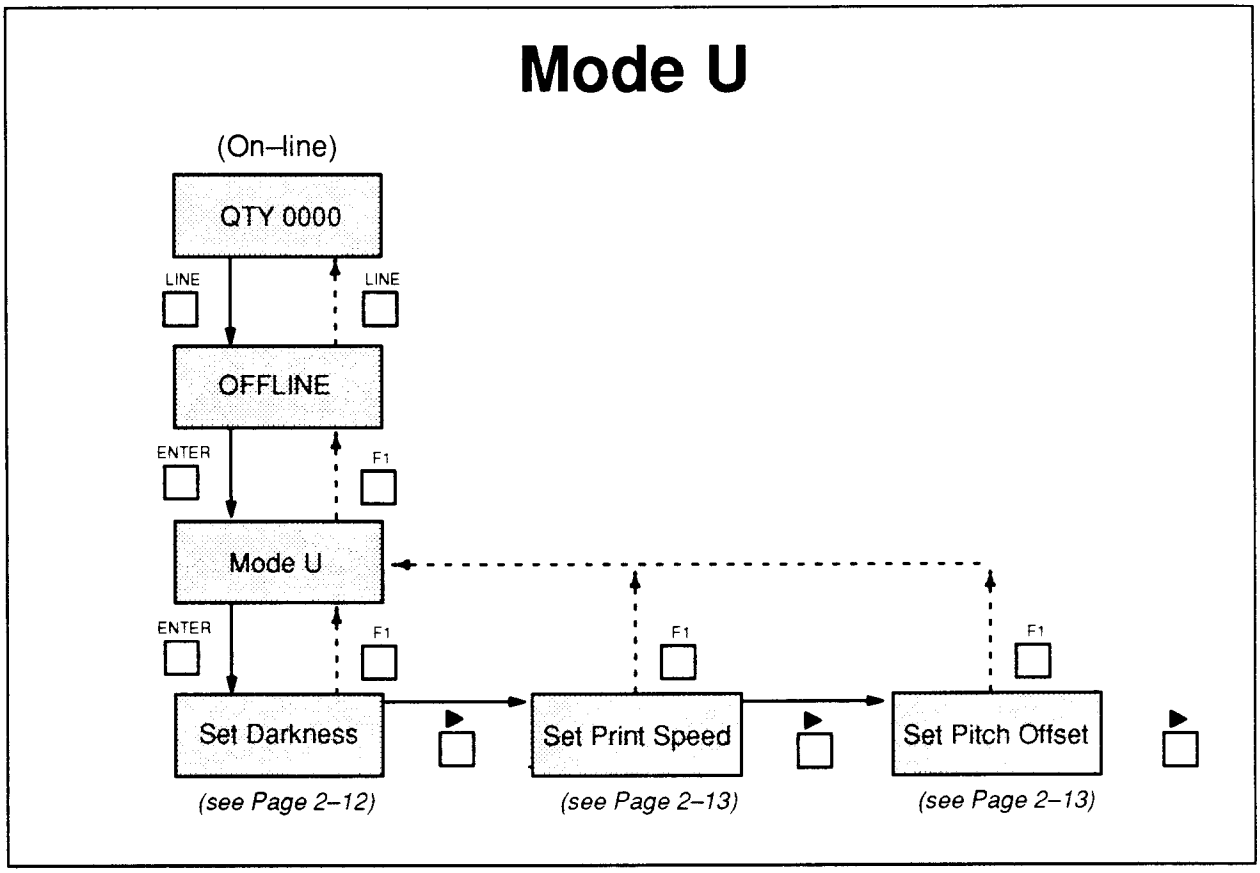
This quantity field displays the number of labels that are waiting to be printed. At this point, the printer is considered to be "on–line", and the ON–LINE light should be lit. The printer must be off–line to begin configuration. To take the printer off–line, press LINE.

The following flowchart shows how the different modes can be accessed. It also shows how Mode U is accessed first, with the other modes requiring a password for access. Each shaded box represents the status of the operator panel's LCD display, and the symbols between the large boxes represent the operator panel keys.



User Mode

The following chart shows a general flow of the configuration for Mode U. Each shaded box represents the status of the operator panel's LCD display, and the symbols between the boxes represent the operator panel keys that, if pressed, will take you forward or backward in the configuration process. For more detailed instructions of this configuration, see Pages 2–12 through 2–15.



The ENTER key, arrow keys, and F1 key are used throughout the configuration process to proceed downward (i.e., forward), horizontally, or upward (i.e., backward) through the options and values. Basically, the keys are used as follows:

ENTER

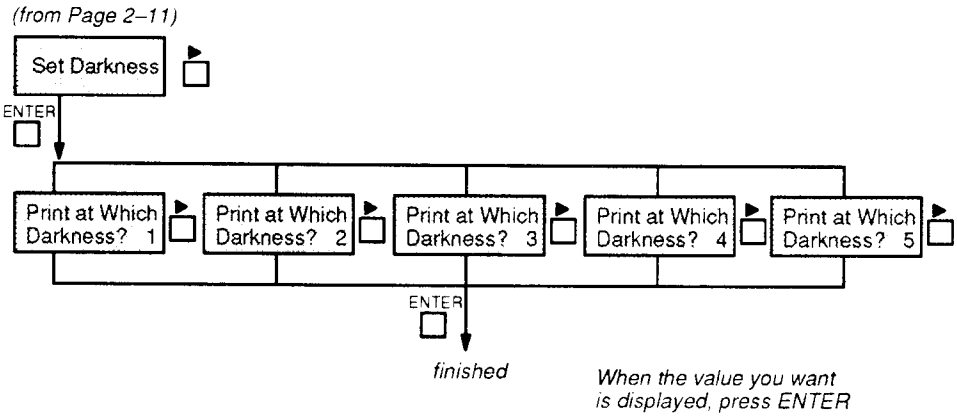
Used to select an option from the display and move down to the next menu level. Also used to set a value into the printer configuration.

Used to proceed horizontally (left or right) through a series of values, remaining on the same level until the desired value is displayed.

F1

Used to proceed upward (i.e., backward) to a previous level.

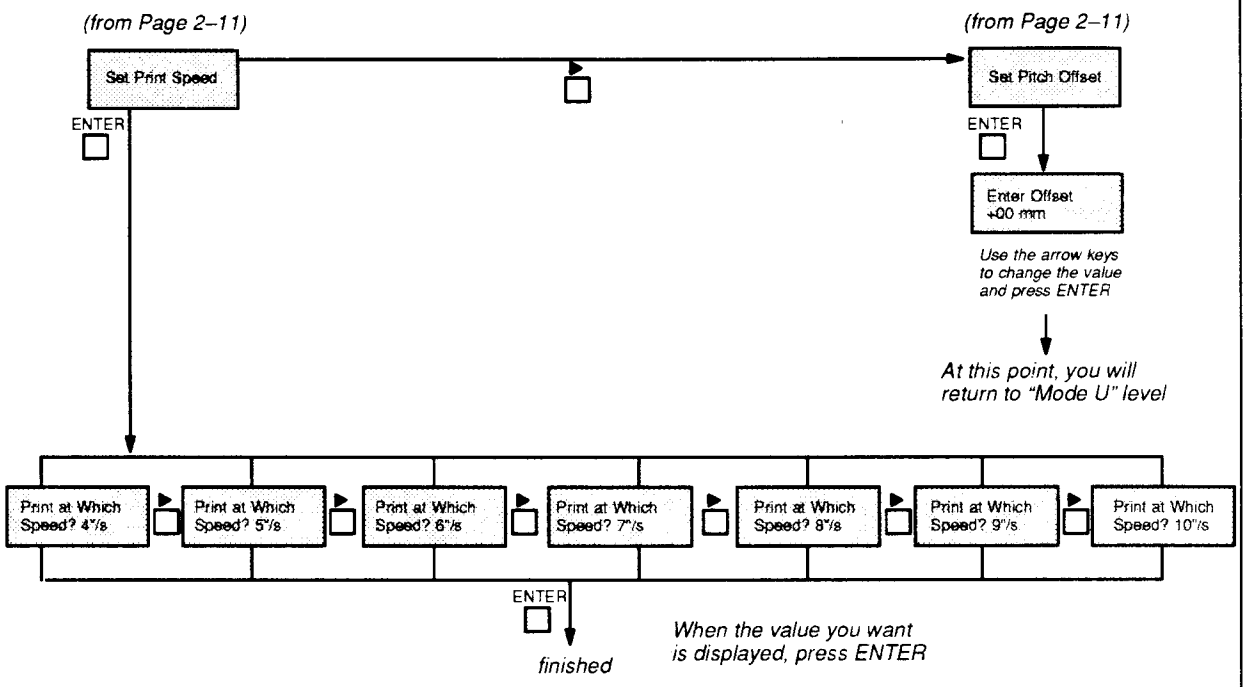
Mode U:
Print Darkness



Option	Definition/Purpose	Values/Settings
Print Darkness	To set the darkness of the print on the label. *This option should provide adequate flexibility. If the darkness needs to be fine–tuned, you may use the adjustment on the operator panel.*	5 Darkest 4 3* 2 1 Lightest

*** SATO Factory Default**

Mode U:
Print Speed & Pitch Offset



Option	Definition/Purpose	Values/Settings
Print Speed	To set the speed at which the labels are printed. *Note: If the dot expansion is set at 1X (300 DPI), the maximum print speed is 7 inches per second. At a dot expansion of 2X or 3X, the maximum print speed is 10 inches per second.*	4 in/sec 5 in/sec 6 in/sec 7 in/sec* 8 in/sec 9 in/sec 10 in/sec
Pitch Offset	To adjust the positioning of the top of form forward/backward from the normal stop position under the print head. A positive pitch offset value moves the label's top edge out from the printer, thus advancing the starting print position into the label. A negative pitch offset value moves the label's top edge into the printer, thus backing up the starting print position towards the previous label.	"mm" scale: +00 mm* (–50 mm to +50 mm) "dot" scale: (–600 dots to +600 dots) Note: Dot scale is **always** based on a dot expansion of 1X (300DPI).

*** SATO Factory Default**

Detailed Mode U Configuration Instructions

The following chart takes you step by step through the front panel configuration for Mode U. Use this chart along with the diagrams and charts on pages 2–11 through 2–13 to understand the configuration process.

Panel Displays:	Press Key:	Comments
Qty 0000	LINE	Printer is on-line. Pressing LINE takes the printer off-line, which enables you to begin configuring.
Offline	ENTER	Once off-line, simply pressing ENTER takes you to the User Mode (Mode U). *To return to the on-line mode (above), press LINE here instead of ENTER.*
[Select a Mode] Mode U	ENTER or ◀ ▶	Press ENTER and progress into Mode U. *You can also use the arrow keys to access Modes I, S, C, M, T, and W.*
<Mode U Options> Set Darkness	ENTER or ◀ ▶	This option is a primary adjustment for the darkness of print. Press ENTER to display darkness values. *You can also use the arrow keys to move to another Mode U option. (Not shown here.)*
Print at Which Darkness? 3	ENTER or ◀ ▶	Here you can: 1. Use the arrow keys to move through the numbers 1 – 5 for values of print darkness (5 is the darkest; the SATO default is 3). 2. When the value you want is displayed, press ENTER to set the darkness and move to the next Mode U option.
<Mode U Options> Set Print Speed	ENTER or ◀ ▶	Press ENTER to display print speed values. *You can also use the arrow keys to move to another Mode U option. (Not shown here.)*

Panel Displays:	Press Key:	Comments
Print at Which Speed? 7"/s	ENTER or ◀ ▶	Here you can: 1. Use the arrow keys to move through the numbers 4–10"/sec for values of print speed (the SATO default is 7"/sec). 2. When the value you want is displayed, press ENTER to set the speed and move to the next Mode U option.
<Mode U Options> Set Pitch Offset	ENTER or ◀ ▶	This option sets the positioning of the top of form forward or backward from the normal stop position under the print head. Press ENTER to display pitch offset values. *You can also use the arrow keys to move to another Mode U option. (Not shown here.)*
Enter Offset +00mm	ENTER or ◀ ▶	Here you can: 1. Use the right arrow key to move through the positive numbers (which pushes labels out from the printer) and the left arrow key to move through the negative numbers (which pulls or draws labels in from the printer). 2. When the value you want is displayed, press ENTER to set the pitch offset and return to the Mode U prompt.
[Select a Mode] Mode U	F1	Pressing F1 will return you to the OFFLINE display. *Pressing F1 from any Mode U option will return you to the Mode U level.*
Offline	LINE	Pressing LINE will return you to on–line status.
Qty 0000		The printer is ready to print. You have completed Mode U configuration.

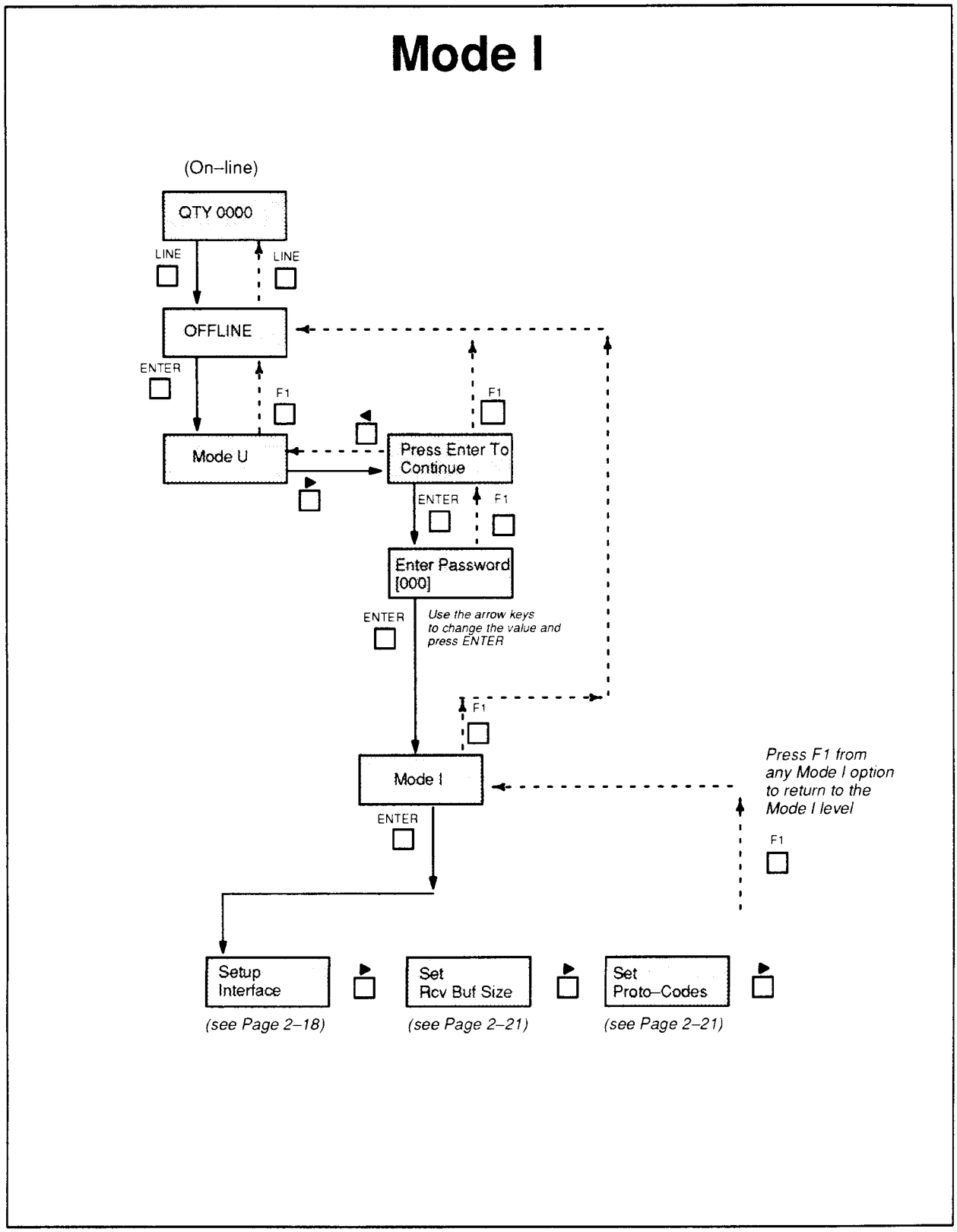
PASSWORD–PROTECTED CONFIGURATION MODES

Detailed Instructions for Accessing Modes I, S, C, M, T, & W

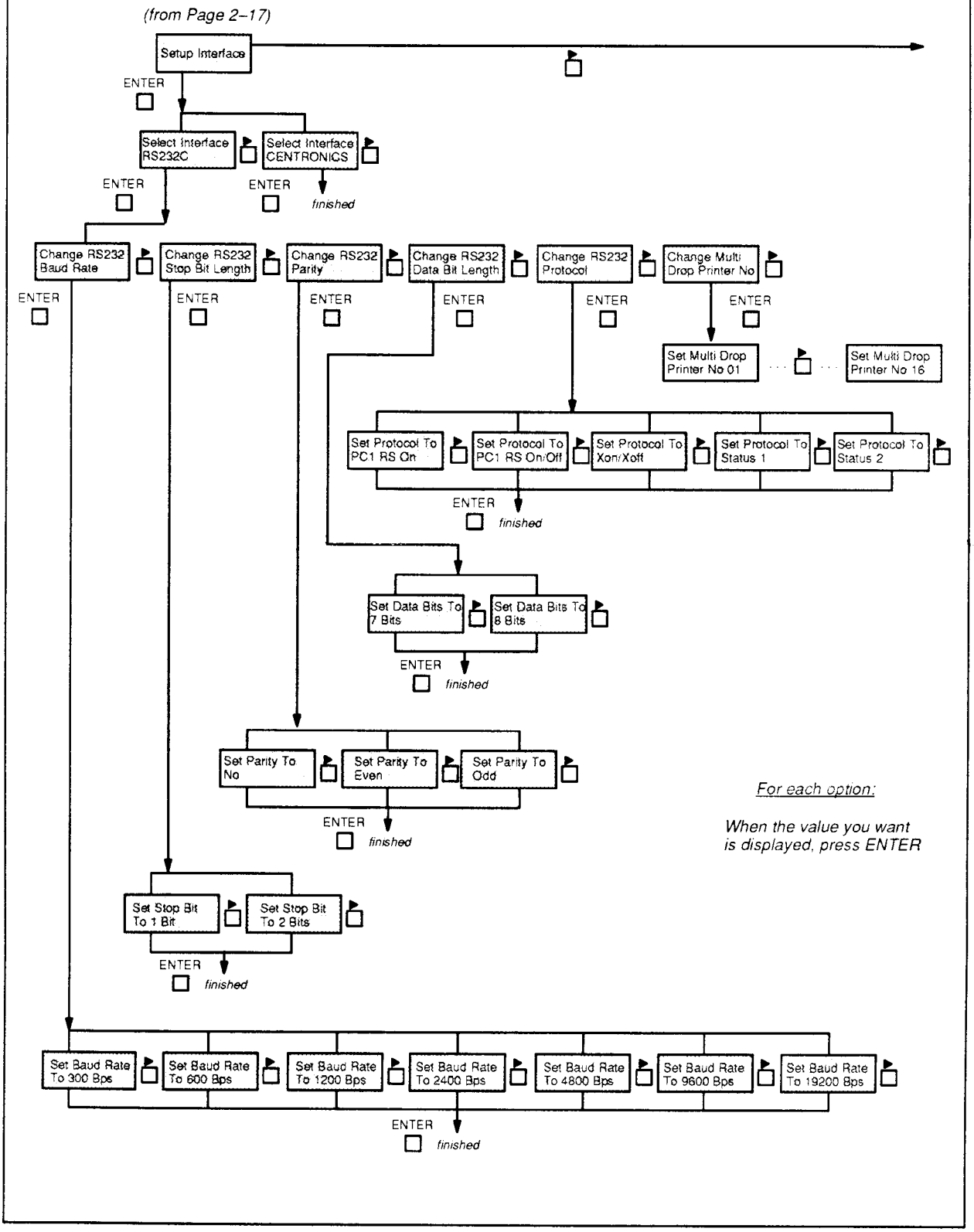
The following chart takes you step by step through the front panel configuration for accessing Modes I, S, C, M, T and W. The instructions show you only how to access the first level of these modes. For further instructions on how to use the options of each mode, see the individual mode charts and diagrams on the following pages.

Panel Displays:	Press Key:	Comments
Qty 0000	LINE	Printer is on–line. Pressing LINE takes the printer off–line, which enables you to begin configuring.
Offline	ENTER	Once off–line, simply pressing ENTER takes you to the User Mode (Mode U). *To return to the on–line mode (above), press LINE here instead of ENTER.*
[Select a Mode] Mode U	◀ ▶ or ENTER	Press the right arrow key and skip past Mode U. *To access Mode U, you would use the ENTER key here.*
Press Enter to Continue	ENTER	Press ENTER to progress into the password protected configuration modes.
Enter Password 000	◀ ▶ and ENTER	Here you can: 1. Use the arrow keys to move through the numbers 000 – 999 until you reach the password number (SATO factory default is 000; password is set in Mode S). 2. When the value you want is displayed, press ENTER to gain access to Modes I, S, C, M, T, and W.
<Select a Mode> Mode I	◀ ▶ and ENTER	Press the right arrow key skipping past Mode I, on to Mode S and so on. When you arrive at the mode you want to use to configure, press ENTER.

Interface Mode



Mode I:
Interface Type

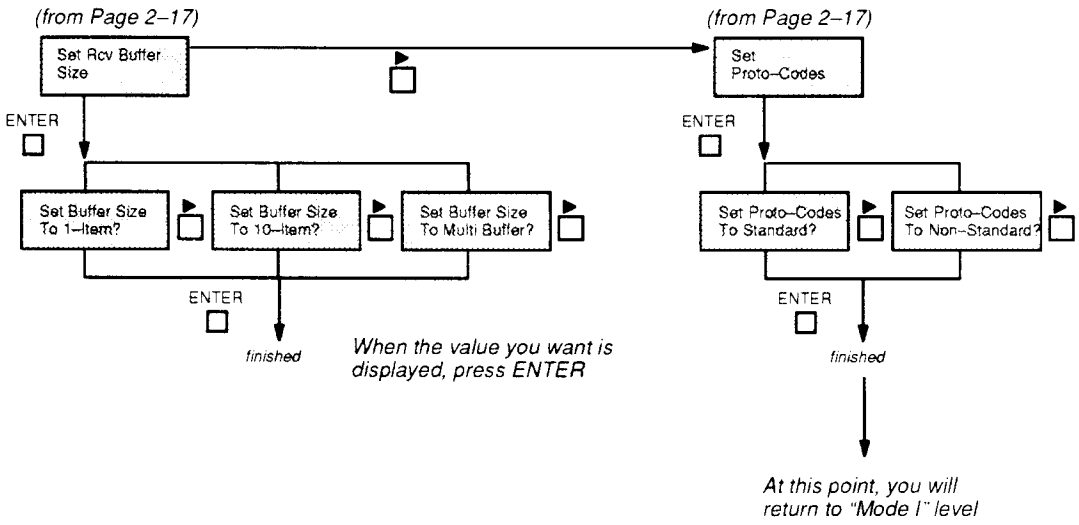


Mode I: Interface Type

Option	Definition/Purpose	Values/Settings
Interface	To indicate which interface will be used to communicate with your host computer. If RS232C is selected, you must set the following values: Baud Rate Stop Bit Parity Data Bit Protocol Multi–Drop Printer	Centronics Parallel RS232C Serial* **If RS232C:** **Baud Rate Values:** 300 Bps 600 Bps 1200 Bps 2400 Bps 4800 Bps 9600 Bps* 19200 Bps **Stop Bit Values:** 1Bit* 2 Bit **Parity Values:** No* Even Odd **Data Bit Values:** 7 Bits 8 Bits* **Protocol Values:** PC1 RS On* PC1 RS On/Off Xon/Xoff Status 1 – Reserved Status 2 – Bi–Directional ***NOTE:*** *See the Programmer and Technical Reference Manual, Section 2 – Interface Specifications, for more details on RS232 protocols.* **Multi–Drop Printer Values:** Not used.

*** SATO Factory Default**

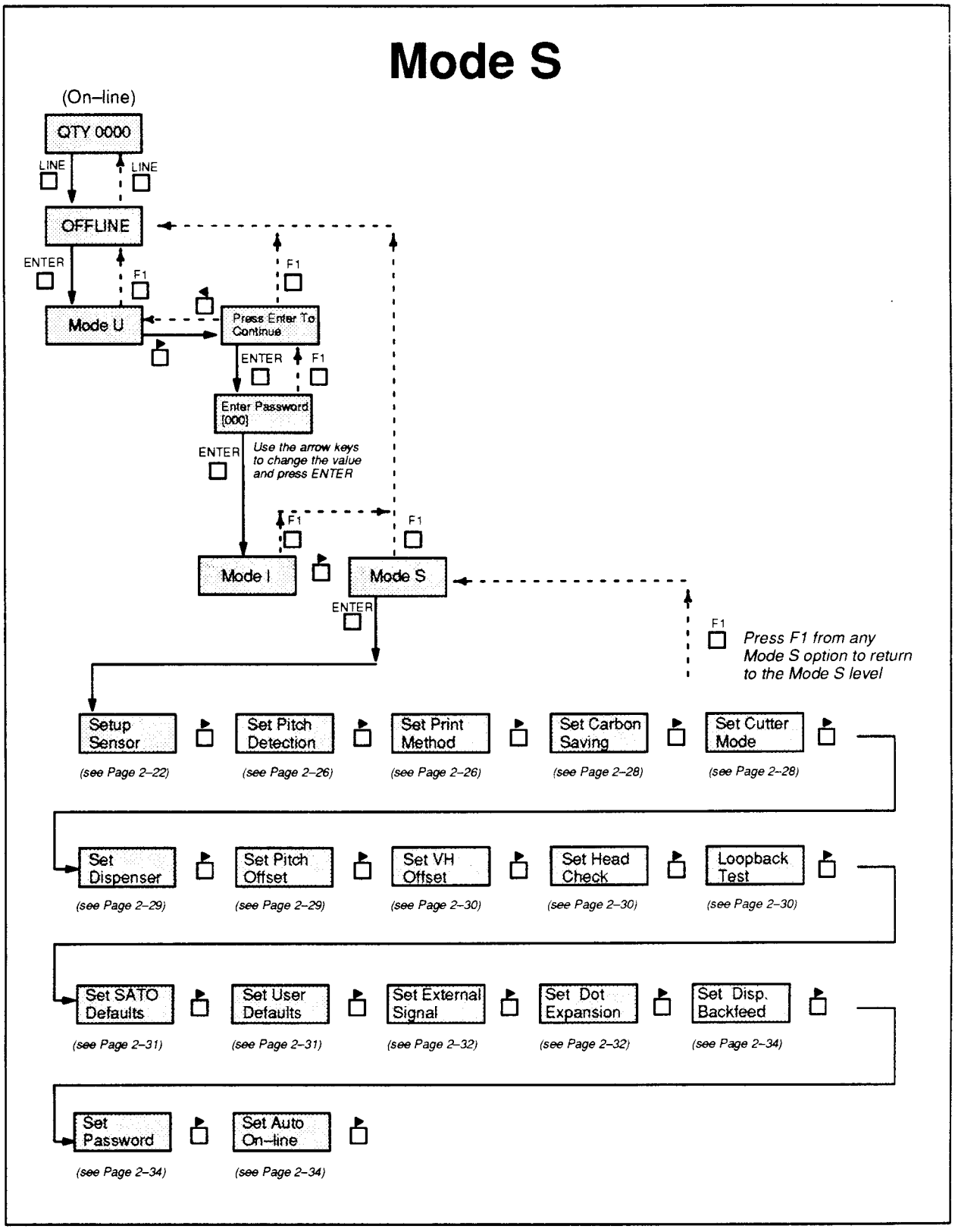
Mode I:
Receive Buffer Size & Proto–Codes



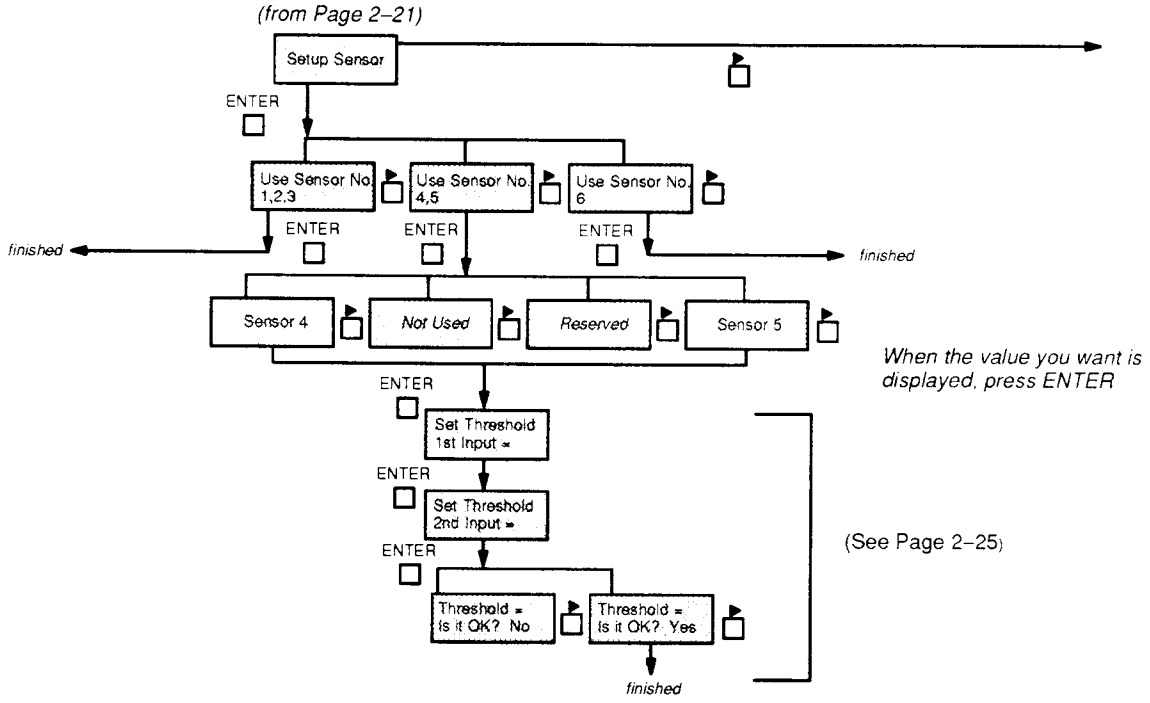
Option	Definition/Purpose	Values/Settings
Receive Buffer Size	To indicate the size of the job buffer. A print job is defined by a Start command at the beginning and a Stop command at the end of a data block.	**1–Item Buffer*** – The printer can process only one print job at a time and is busy until completion. **10–Item Buffer** – Allows up to 10 print jobs to be sent in one data stream. **Multi Buffer** – Allows print jobs to continuously be sent to the M–8450. Jobs are spooled, compiled, and printed, in the order received.
Proto–Codes	To select which Proto–Code set will be used in the data stream to the printer. *See the beginning of Section 1 of the Programmer and Technical Reference Manual for a list of each proto–code set.*	**Standard*** **Non Standard**

*** SATO Factory Default**

Service and Accessory Mode



Mode S:
Sensor



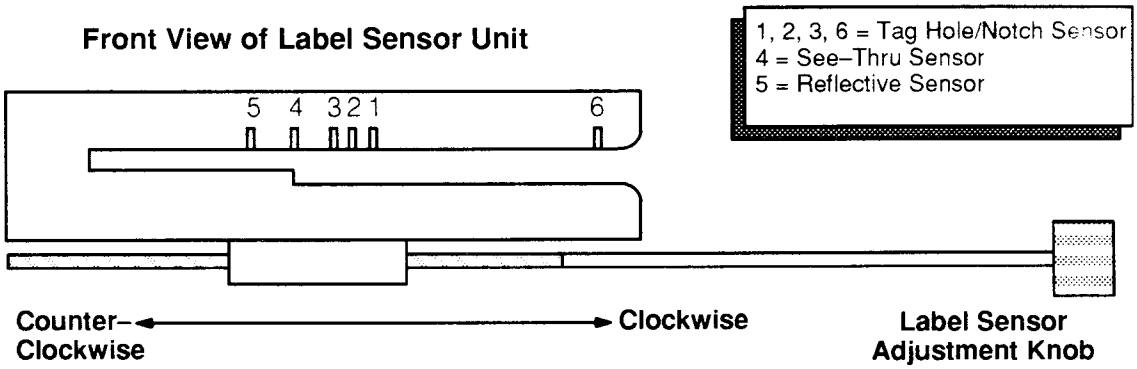
Option	Definition/Purpose	Values/Settings
Sensor	There are (6) individual label sensors available on the M–8450. Each sensor is used to detect the lead edge of the label or tag, in order to begin printing at the proper position. This option is used to select a sensor, then set the threshold for your labels. *Note: You may need to position the sensor to find a notch or I–mark on your labels/tags. See Page 2–23, Label Sensor Adjustment.*	**1,2,3** Tag Hole / Notch **4,5*** See–Thru & Reflective **6** Center Hole Sensor
		If 4,5: **Sensor 4 (See–Thru)*** – For use with label backing or feed slots in tags **Sensor 5 (Reflective)** – For use with I–marks on label or tag stock **Not Used** – For continuous forms stock
	Once value 4 or 5 is selected, the threshold level is requested. For more information on this, see Page 2–25, *Setting the Sensor Threshold.* *Note: When using sensors 1, 2, 3, or 6, it is not necessary to set threshold as for sensors 4 or 5. Sensors 1, 2, 3, or 6 are see–thru sensors primarily for use with tag stock having feed slots or tag holes in various positions.*	If 4 or 5: **1st Input** – Printer reads a voltage level based on what portion of the label is beneath the label sensor. **2nd Input** – Printer reads a voltage level based on what portion of the label is beneath the label sensor.
		Is Threshold O.K.? **No** **Yes**

*** SATO Factory Default**

Label Sensor Adjustment

As mentioned, you may need to position the label sensor to match the position of your feed slots (notches) or I–marks on your labels/tags. The following diagrams below show the relative position of each sensor along the label sensor unit and its range of movement (values based on distance from inside edge of a tag or backing paper). To position the sensor(s), use the adjustment knob located outside and below the print head assembly area.

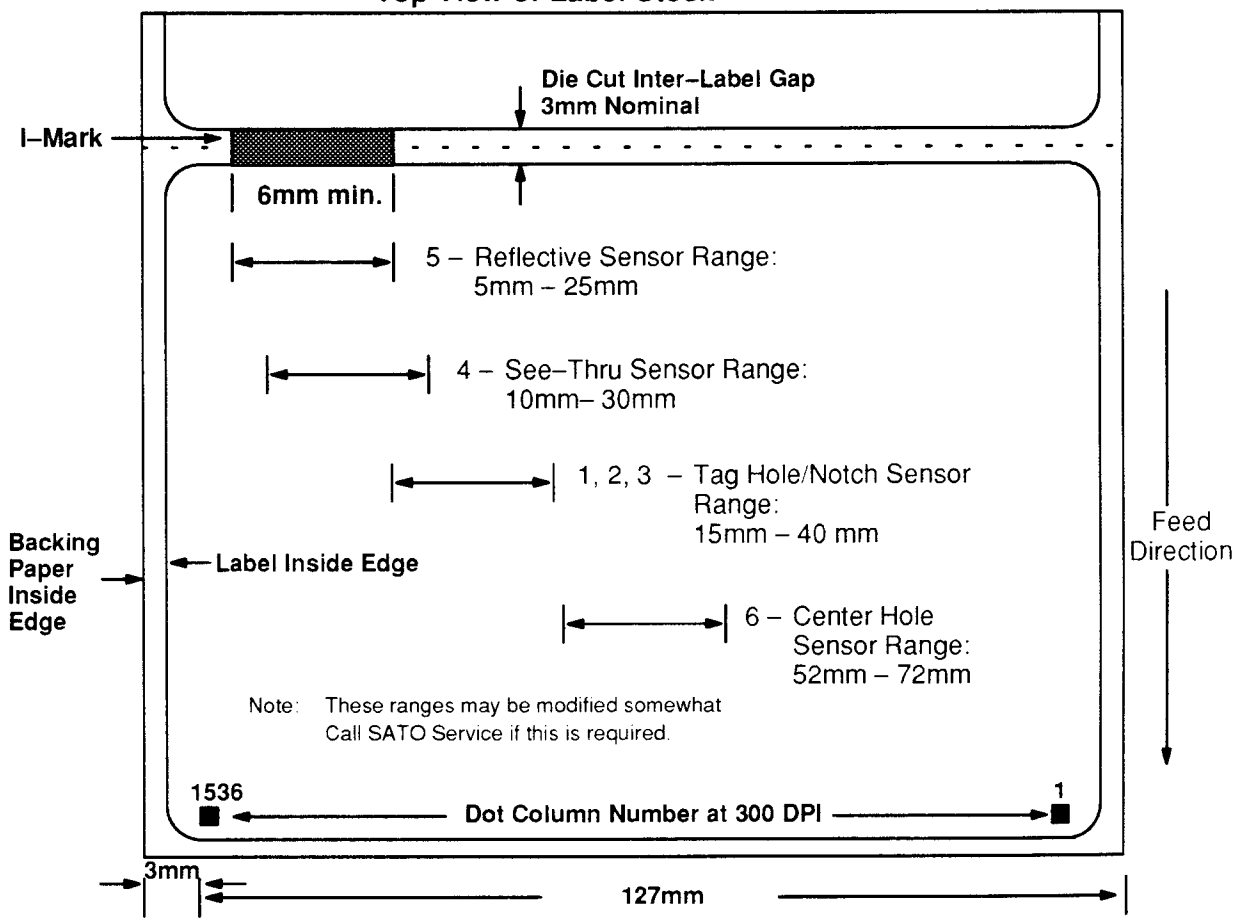
Front View of Label Sensor Unit



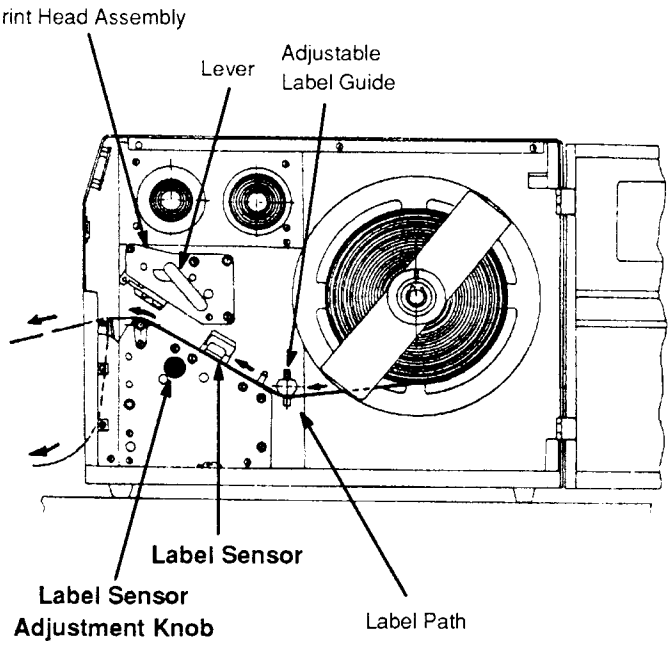
Turn adjustment knob CW to move label sensor towards outside print edge.

Turn the knob CCW to move label sensor towards inside print edge.

Top View of Label Stock



Mode S: Setting the Sensor Threshold



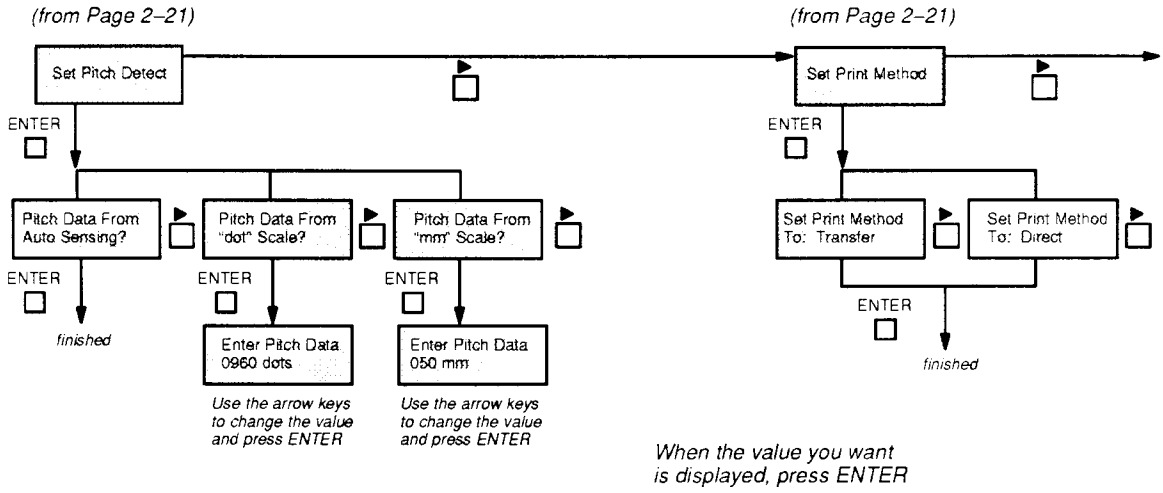
The Label Sensors calculate a voltage level based on the amount of light passing through the label stock, or the amount of light reflected back.

If Sensor 4 (See–Thru) or Sensor 5 (Reflective) is chosen during the use of the Sensor option in Mode S, a setting of threshold values will be required for the configuration. The printer will find a voltage level according to what part of the label is directly beneath the label sensor (see diagram above) at that time.

You will be required to move the label stock to different positions beneath the sensor to set the threshold. Use the following instruction chart to guide you through each step.

To Set Threshold 1st Input = 2.8V	When the printer requests a setting for the 1st input: 1. Open the print head assembly by turning its lever to the "head open" position, and follow these instructions: 2. Move the printable portion of the label stock directly under the sensor until the highest voltage is obtained. (This should result in a voltage reading somewhere around 3.0V). 3. When the voltage value you want is displayed, press ENTER.
To Set Threshold 2nd Input = 0.2V	When the printer requests a setting for the 2nd input: 1. Move the label backing or tag hole portion of the label stock directly under the sensor until the lowest voltage is obtained. (This should result in a voltage reading something less than 1V). 2. When the voltage value you want is displayed, press ENTER.
Threshold = 1.5V Is it OK? No	The printer will then calculate and display an average of the two voltage values. If the threshold value is correct, use the arrow keys to display a "Yes" and press ENTER to set the value. You are finished with the Sensor option. Close the print head assembly using its lever. *Note: The threshold value resulting here should be nominally greater than 1.5V. If not, consistent feeding/printing cannot be maintained. A threshold less than 1.5V usually means either backing paper is too thick or stock is too thin, a problem in either case.*

Mode S:
Pitch Detection & Print Method

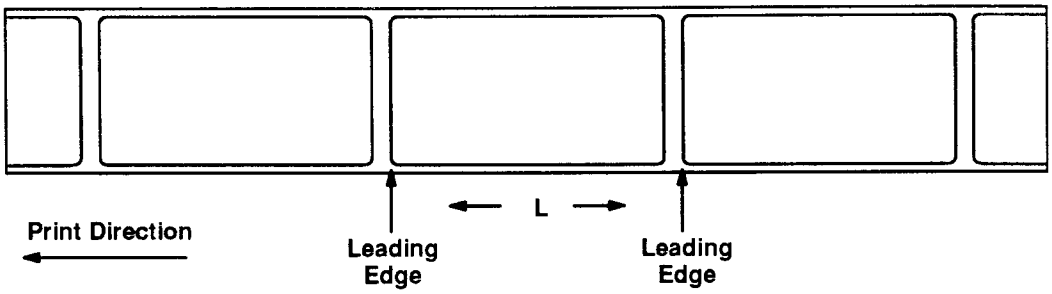


Option	Definition/Purpose	Values/Settings
Pitch Detection	To indicate the method by which the printer will determine the top of form. Choosing "dot" scale can save label stock at printer power up. Only one label will feed before stopping at top of form.	**Auto–Sensing*** – The printer automatically determines label length. It will feed 2 or 3 labels each time the printer is powered on or label stock is changed. **"dot" scale** – The label length will be determined by an entered dot value (see next page) **"mm" scale** –The label length will be determined by an entered mm value (25.4mm per inch).
		If "dot" or "mm": **"dot" data** – (0000–3000) 0960 is the default value **"mm" data** – (000–178) 050 is the default value
Print Method	To indicate the method by which the labels or tags are printed. Printer makes adjustments in the amount of heat applied based on the method chosen. **NOTE:** If you have trouble powering up the printer for Direct Thermal mode, see Section 3 (Troubleshooting) of the Programmer and Technical Reference Manual.	**Thermal Transfer*** – Method of printing using a carbon–based ribbon on standard label or stock. **Direct Thermal** – Method of printing using special paper that is heat sensitive. No ribbon is required.

*** SATO Factory Default**

Setting Pitch Detection for Dot Scale

To determine the proper setting for label top of form using the dot scale method, begin by measuring from the leading edge of one label to the leading edge of the next label.



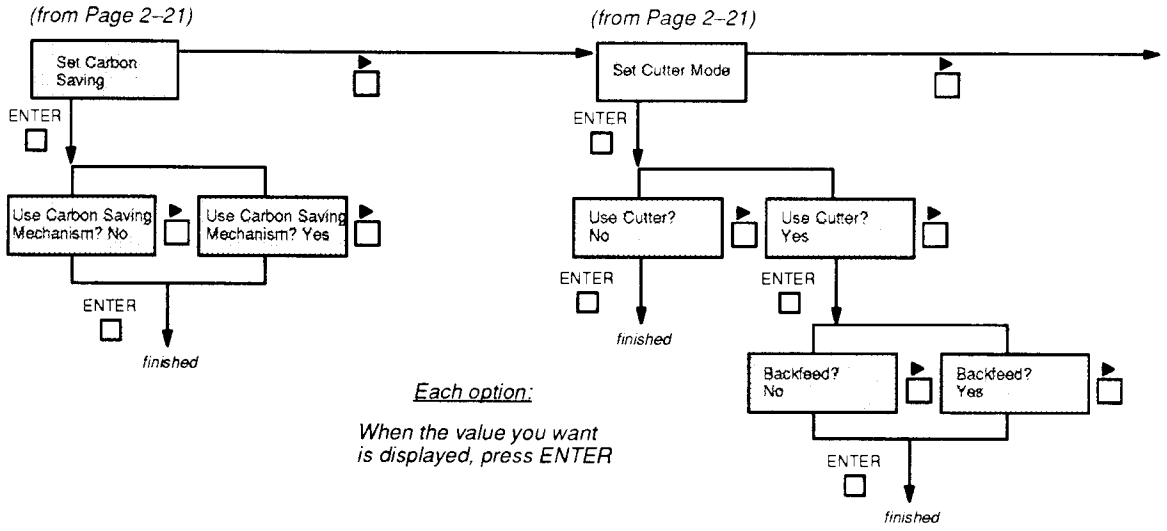
Step	Action
1	If the label length from one leading edge to the next leading edge is 3.15 inches or greater, set the dot scale to 960 dots.
2	If this length is less than 3.15 inches, use the following formula to determine the setting for the dot scale: **Dot Scale Setting Formula: (3.15 – N(L)) x 300** **N** Number of whole labels (leading edge to leading edge) that will fit into 3.15 inches: **N = (3.15 ÷ L) – remainder** **L** Label length from leading edge to leading edge (in inches)

Example for Using Dot Scale Setting Formula

In this example, assume the label length from one leading edge to the next **(L)** is 1.25″.

Step	Action
1	Calculate the number of whole labels (N) that will fit in 3.15 inches: N = (3.15 ÷ 1.25) – remainder N = 2.52 – remainder N = 2.52 – .52 = **2**
2	Multiply the number of whole labels (**2**) by the label length from one leading edge to the next: 2 x 1.25 = **2.5** inches
3	Subtract the total in Step 2 from 3.15 inches: 3.15 – 2.5 = **.65** inches
4	Convert .65 inches to dots: .65 inches x 300 dots/inch = **195** dots
5	Set the dot scale setting to **195**

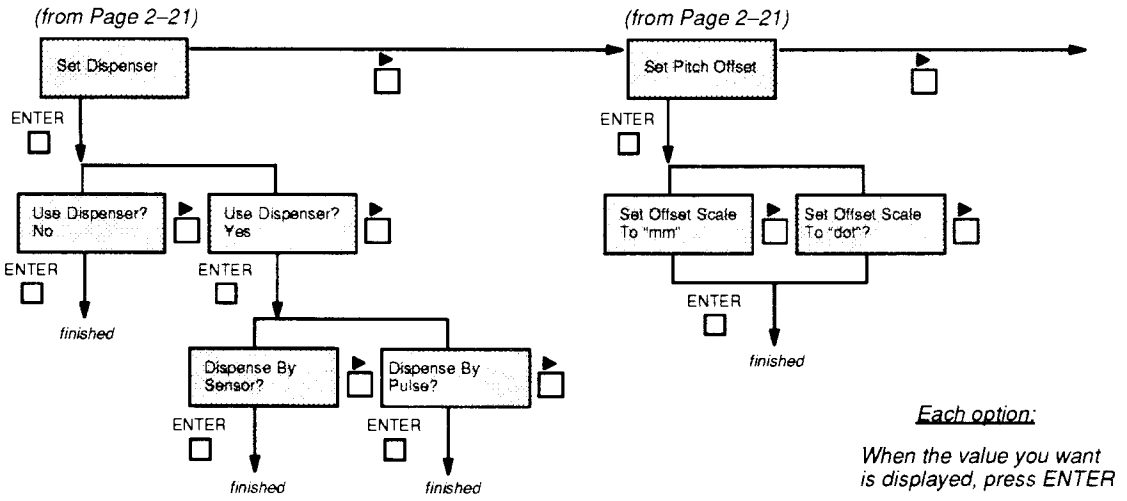
Mode S:
Carbon Saving & Cutter



Option	Definition/Purpose	Values/Settings
Carbon Saving	To indicate the use of the ribbon (carbon) saver option. **Note:** The M–8450 Ribbon Saver is an option to the printer and must be installed before enabling this feature. See the Programmer and Technical Reference Manual, Appendix E.	**No*** – Disables use of Ribbon Saver **Yes** – Enables use of Ribbon Saver
Cutter Mode	To indicate the use of the label cutter option. **Note:** The M–8450 Cutter is an option to the printer and must be installed before enabling this feature. See the Programmer and Technical Reference Manual, Appendix E.	**No*** – Disables use of Cutter **Yes** – Enables use of Cutter If Yes, Backfeed?: **No** – Disables backfeed **Yes** – Enables backfeed

*** SATO Factory Default**

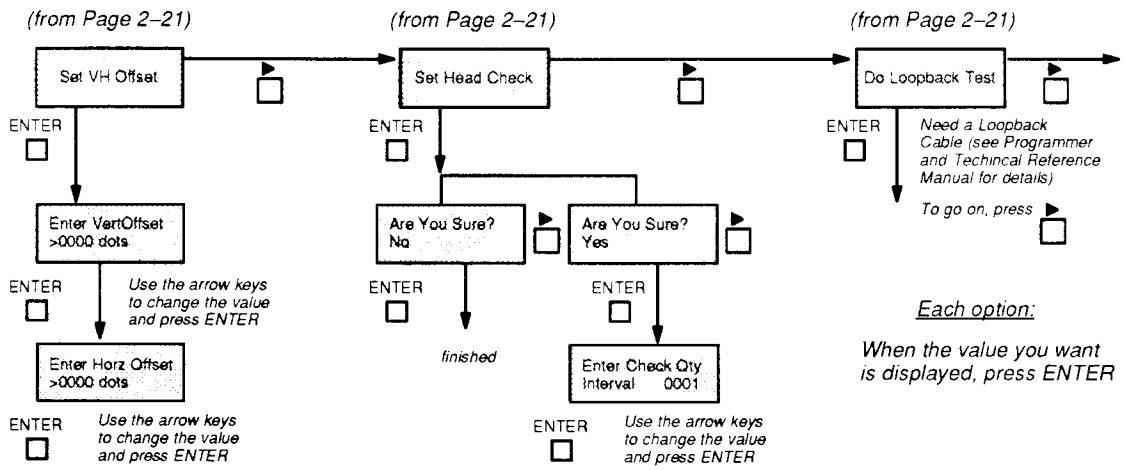
Mode S:
Dispenser & Pitch Offset



Option	Definition/Purpose	Values/Settings
Dispenser	To indicate the use of the label dispenser option, which peels the backing from the labels for immediate placement. **Note:** The M–8450 Dispenser is an option to the printer and must be installed before enabling this feature. See the Programmer and Technical Reference Manual, Appendix E. For more details on the signals available with **Dispenser By Pulse**, see Section 2 (Interface Specifications), of the Programmer and Technical Reference Manual.	**No*** – Disables use of Dispenser **Yes** – Enables use of Dispenser If yes: **Dispense By Sensor** – Printing of next label is triggered by the removal of the current label. **Dispense By Pulse** – Printing of next label is based on a signal from an external device attached to the Accessory connector.
Pitch Offset	To indicate the type of scale for the pitch offset option in the User Mode (Mode U).	**"mm" scale*** **"dot" scale**

*** SATO Factory Default**

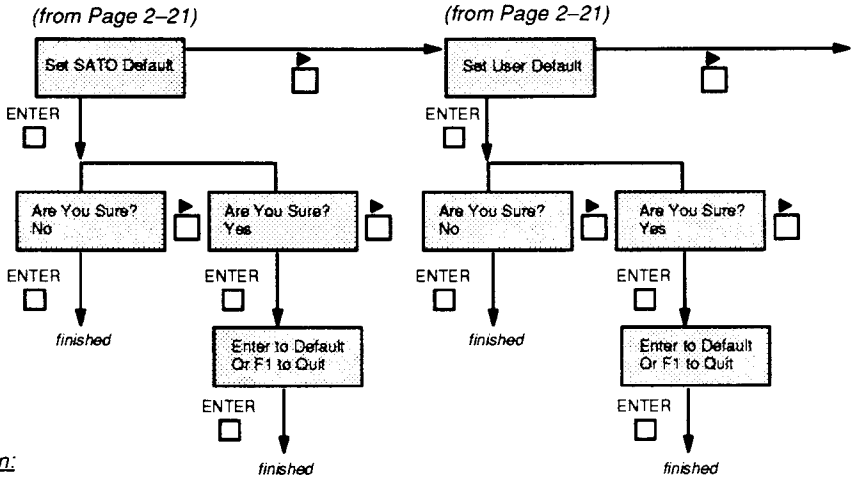
Mode S:
VH Offset, Head Check & Loopback Test



Option	Definition/Purpose	Values/Settings
VH Offset	To adjust the print area in both vertical and horizontal directions. This may be useful for various preprinted stock. **Note:** This setting will not affect the position of custom graphics on the label.	Vertical: 0000*–2136 Horizontal: 0000*–1536
Head Check	To allow the printer to monitor the print head for any problems. If this option is enabled, the user then must enter an interval of the number of labels printed between every print head check.	**No*** – Disables head check **Yes** – Enables head check If Yes: Check Interval: 0001* – 9999
Loopback Test	To check the printer's RS232 interface before attaching to the host. Must use a special connector. For more details, see Section 2, Interface Specifications, of the Programmer and Technical Reference Manual.	N/A

*** SATO Factory Default**

Mode S:
SATO Defaults & User Defaults



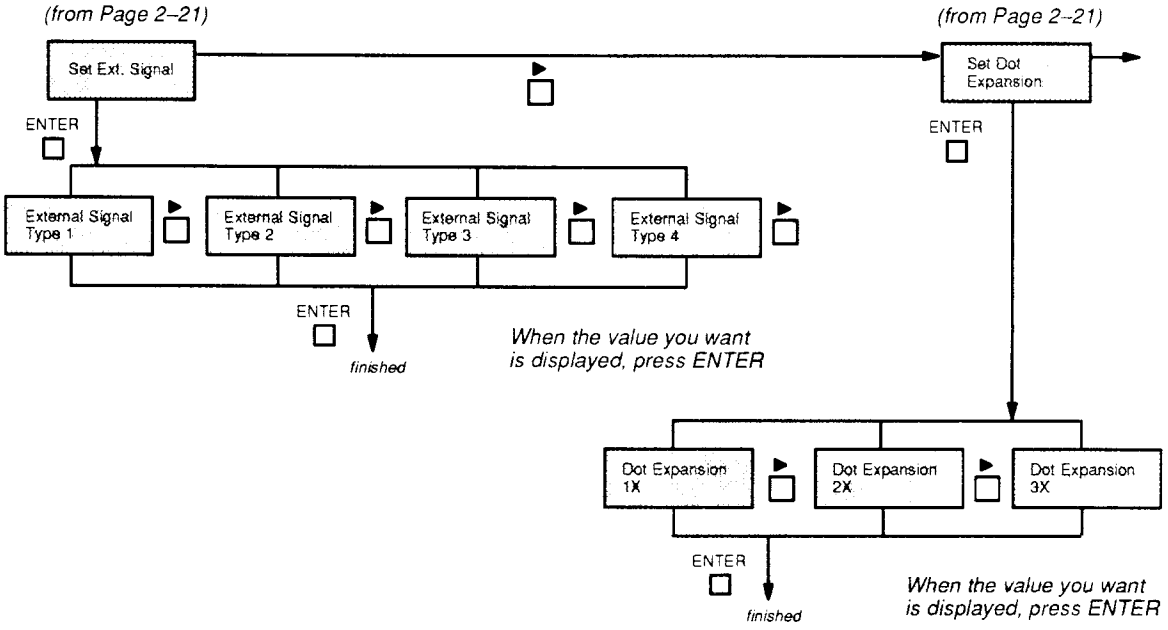
Each option:

When the value you want is displayed, press ENTER

Option	Definition/Purpose	Values/Settings
SATO Defaults	To set all current configuration options back to SATO **factory** defaults. *These are different from the user–programmed defaults in the next option.* **Note:** The SATO factory defaults are indicated by asterisks (*) throughout the configuration section.	**No*** – Does not change current configuration **Yes** – Resets configuration to factory default
User Defaults	To set all current configuration options to **user programmed** defaults. The User Default Configuration is a storage area on the printer used for holding a printer configuration designed especially for the end user's application environment. The user defaults can be stored by sending a short program to the printer (see the Programmer and Technical Reference Manaul, Appendix D). The defaults can then be placed into the current configuration by selecting this option.	**No*** – Does not change current configuration **Yes** – Resets configuration to the user default

*** SATO Factory Default**

Mode S:
External Signal & Dot Expansion



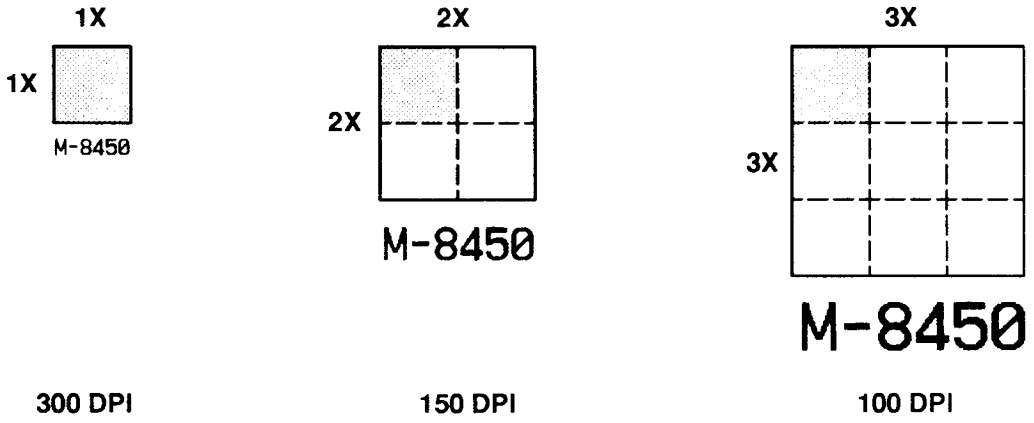
Option	Definition/Purpose	Values/Settings
External Signal	To select a particular output signal meant to drive applicators or other such external devices from the M–8450 accessory connector. For more details on these signals, see Section 2, Interface Specifications, of the Programmer and Technical Reference Manual,.	**Type 1*** **Type 2** **Type 3** **Type 4**
Dot Expansion	To allow the M–8450 to print at one of three different dot resolutions. At 300 DPI, each dot is printed as sent. At 150 DPI and 100 DPI, each printed dot will be expanded in the vertical and horizontal directions by a factor of 2 or 3 respectively. Note: With graphic characters, the dot expansion is effective in the vertical direction only. Note: At 300 DPI, the maximum print speed is 7 inches per second, and the maximum print length is 7 inches. See next page for more details on dot expansion.	**1X *– 300 DPI resolution** **2X – 150 DPI resolution** **3X – 100 DPI resolution**

*** SATO Factory Default**

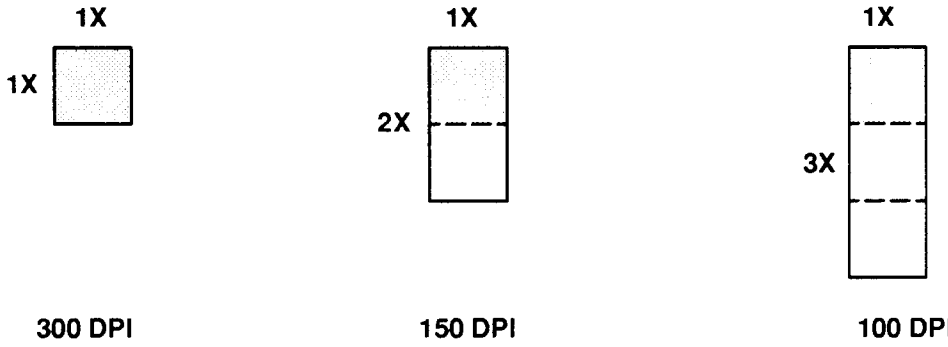
Setting the Dot Expansion

The SATO M–8450 printer is capable of printing at three dot resolutions: **300 DPI (1X), 150 DPI (2X), and 100 DPI (3X).** The following diagram explains the size of the resulting printed dot based on the chosen dot expansion from Mode S.

For **Bar code images, Human readable characters, Custom Characters,** and **Positioning commands,** a single dot is expanded vertically and horizontally as follows:

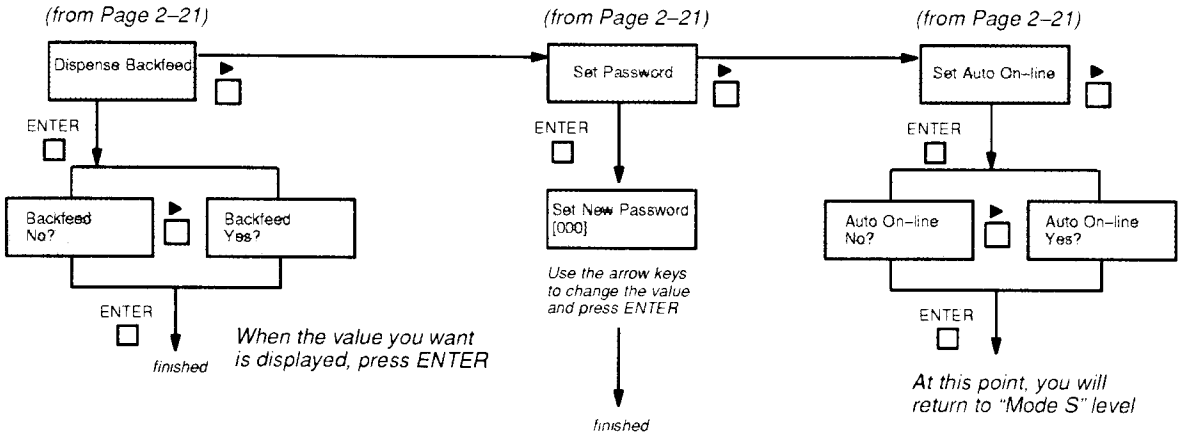


For **Custom graphics**, a single dot is expanded in the vertical direction only as follows:



It is important to note that given the above information, if graphics and non–graphic characters are mixed together on the same label, the expansion of the graphic characters will be different than the expansion of the non–graphic (human readable and bar code) characters. The appropriate adjustments for correct print must be made in your print code.

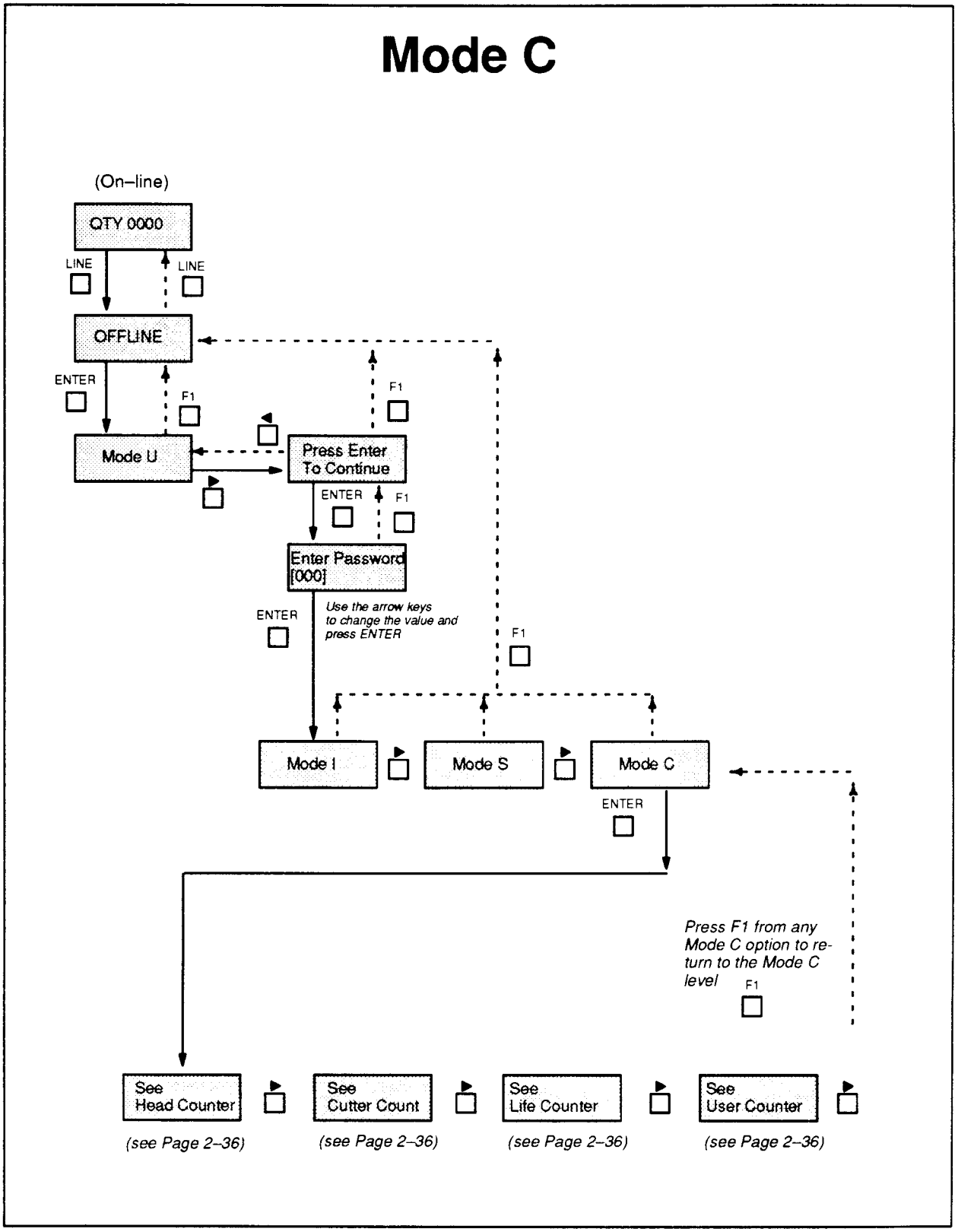
Mode S:
Dispense Backfeed, Password & Auto On–line



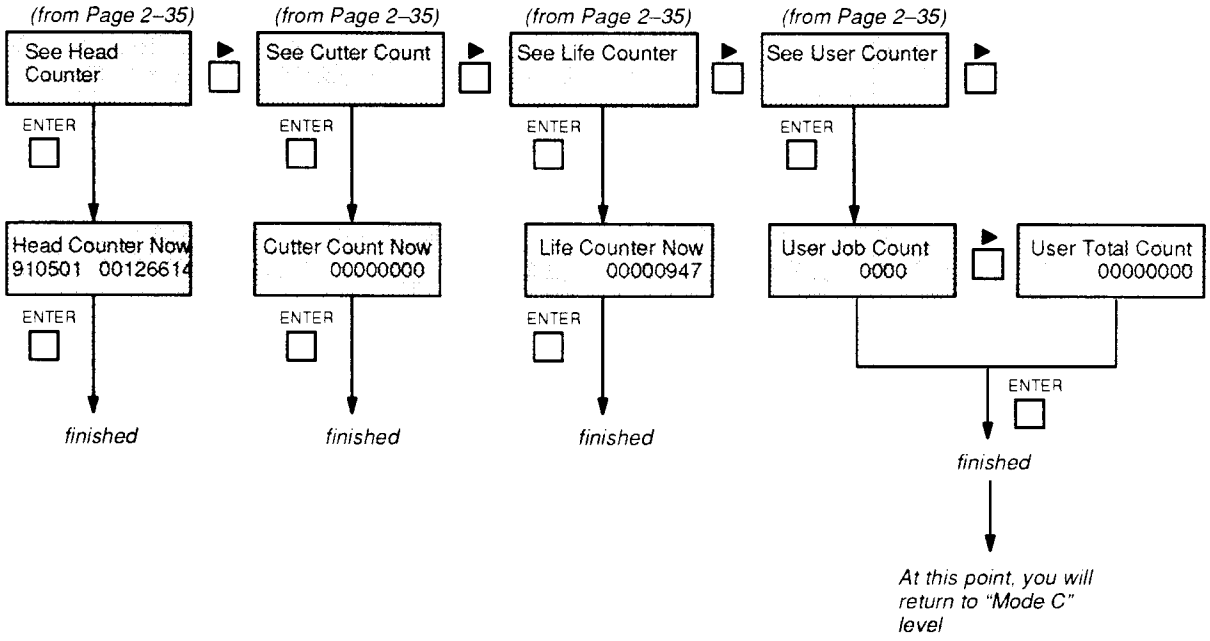
Option	Definition/Purpose	Values/Settings
Backfeed	To select whether the printer will use the backfeed feature to allow for easy removal of labels with the optional label dispenser.	**No*** – Does not backfeed **Yes** – Backfeeds
Password	To set the current password number that allows access to all password protected configuration modes.	000*–999
Auto On–line	To select whether the printer will power up in an on–line or off–line state.	**No*** – Off–line at power up **Yes** – On–line at power up

*** SATO Factory Default**

Counter Mode (A Display Only Mode)

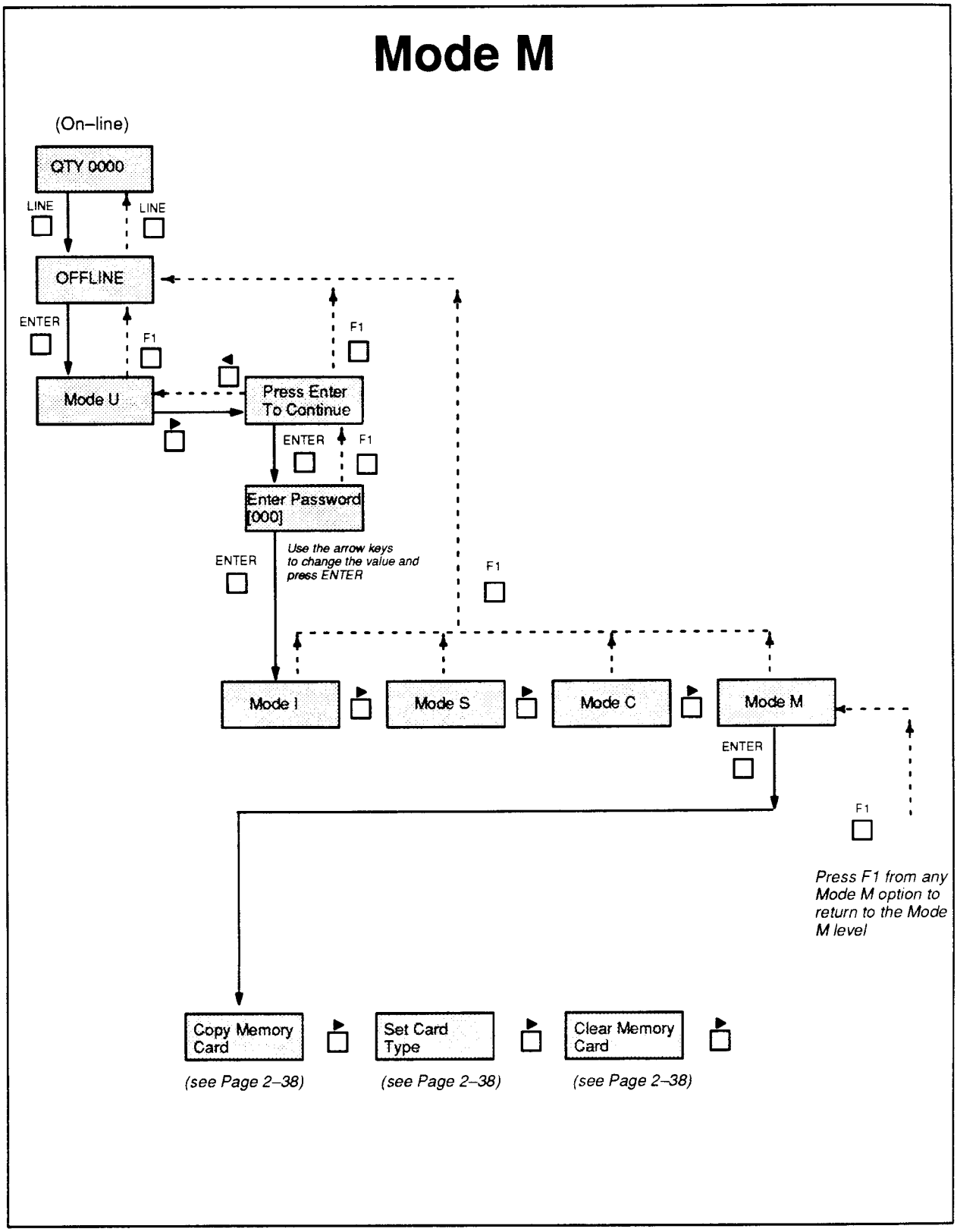


Mode C:
Head, Cutter, Lifetime & User Counters

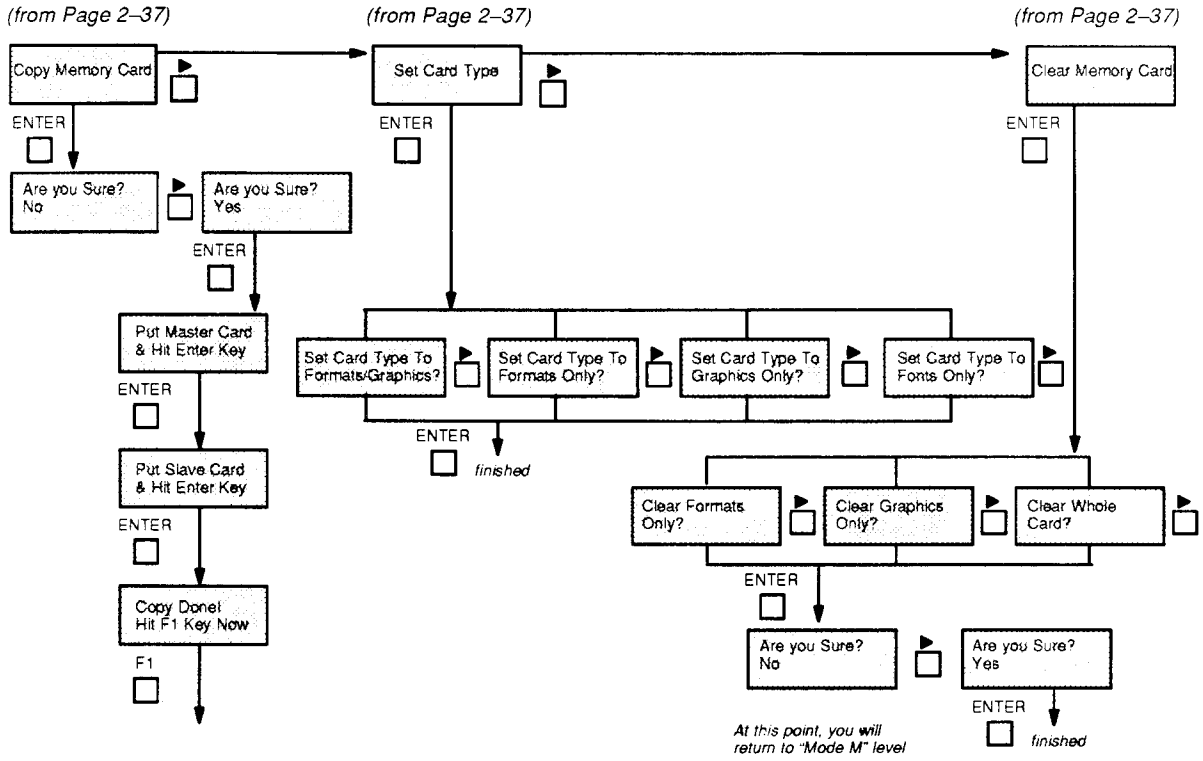


Option	Definition/Purpose	Values/Settings
Head Counter	Displays two values: 1. The install date for the current print head. 2. The total length (mm) of label stock that has passed through the print head assembly.	Head Counter Now: 1. 000000 – 991231 (YYMMDD) 2. 00000000 – 99999999
Cutter Counter	Displays the number of cuts made by the M–8450 Label Cutter (optional device), if the cutter is being used.	Cutter Count Now: 00000000 – 99999999
Lifetime Counter	Displays the total number of labels (of all sizes) that have passed through the print head assembly.	Life Counter Now: 00000000 – 99999999
User Counter	The User Job Count displays the current number of labels waiting to print, and the User Total Count displays the number of different print jobs sent to the printer since the last power on.	User Job Count: 0000 – 9999 User Total Count: 00000000 – 99999999

Memory Card Mode



Mode M:
Copy Memory, Card Type & Clear Memory

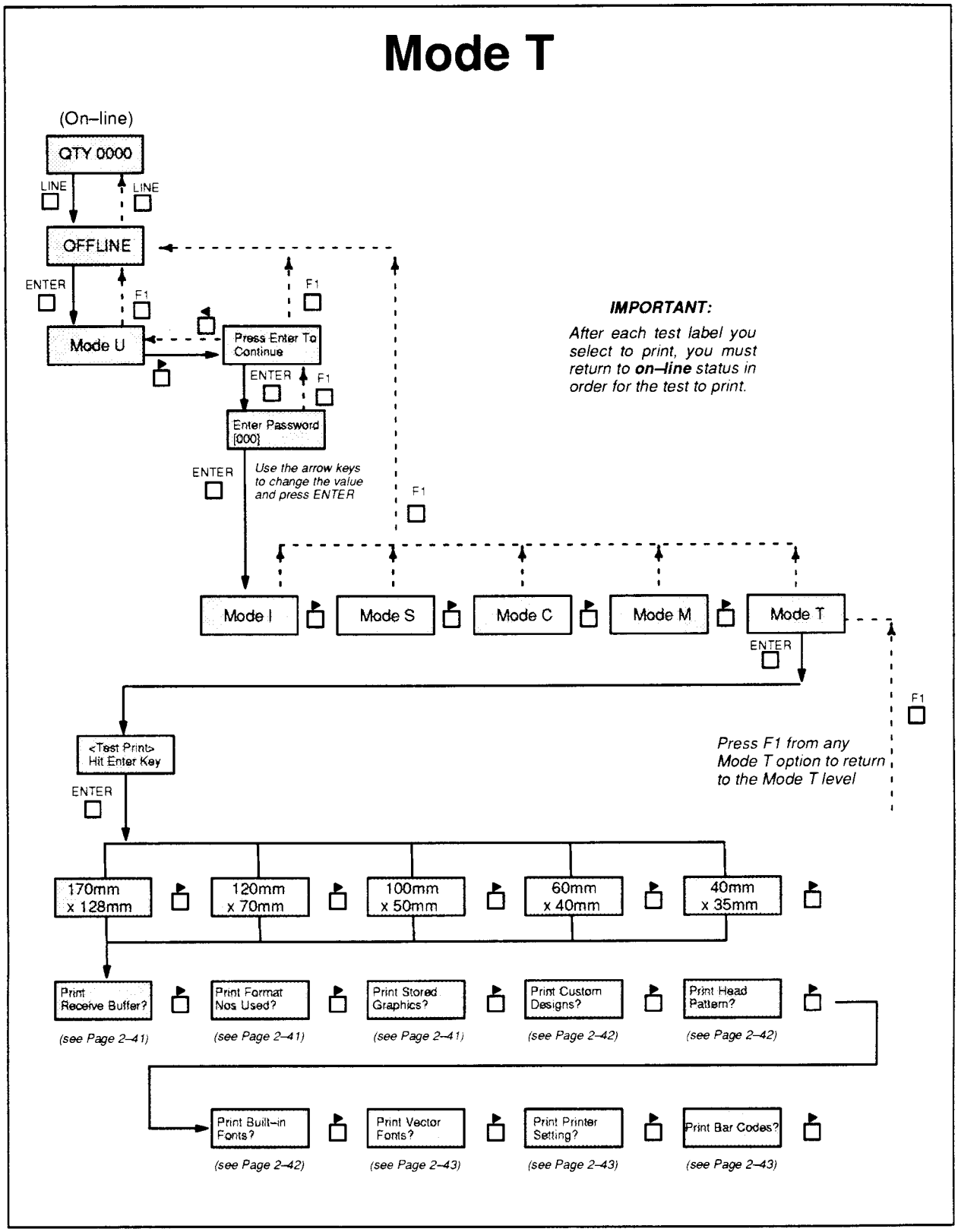


Option	Definition/Purpose	Values/Settings
Copy Memory Card	To allow data to be copied from one memory card to another. **Note:** The M–8450 memory card is an optional feature used to provide additional storage for label formats, graphic images, or downloaded fonts.	**No*** – Does not select memory card copy **Yes** – Selects memory card copy If yes: Load the master memory card, and press ENTER. Then load the blank memory card, and press ENTER.
Set Card Type	To indicate how the optional memory card will be formatted to properly store and recall data.	**Formats & Graphics*** – Card used to store label formats and custom graphic images **Formats Only** – Stores label formats only **Graphics Only** – Stores graphic images only **Fonts Only** – Card used to store downloaded fonts
Clear Memory Card	To allow stored data to be cleared from the optional memory card.	**Clear Formats Only*** – Clears label format data **Clear Graphics Only** – Clears custom graphic images **Clear Whole Card** – Clears all stored data from card

*** SATO Factory Default**

NOTE: A "CARD ERROR" will occur if trying to access the memory card when no card is installed.

Test Print Mode



Important Notes About Using Mode T

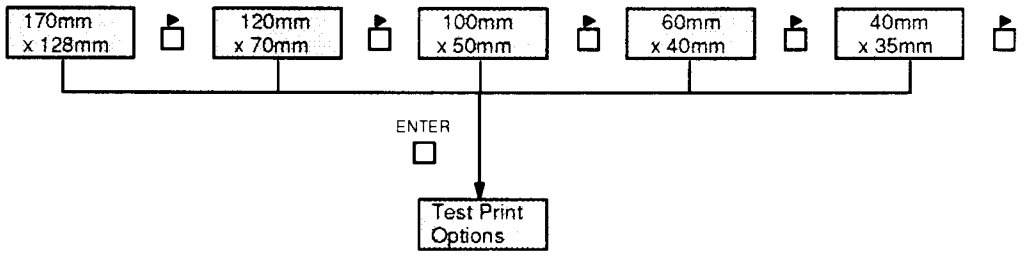
All Mode T features work only at 300 DPI (1X).

The tests in this section are printed only when the printer is placed back on–line. In other words, after using a *single* Mode T option, you must return back to the on–line status (after each option) in order for the test to print. You can return to on–line status using the F1 keys first until the LCD displays "OFF–LINE". Then press LINE, and your test should print. After the selected test print has completed, the printer is again able to process your normal print jobs. **To avoid damaging the M–8450 print head, make sure the label and ribbon are wide enough for the test label size selected.**

Mode T:

Label Size

(from Page 2–39)

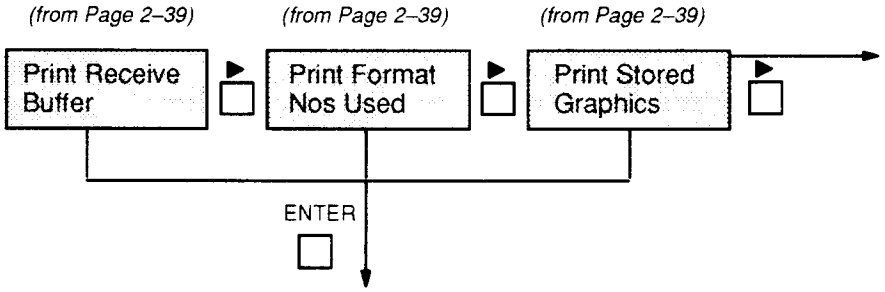


(see Page 2–41)

Option	Definition/Purpose	Values/Settings
(Label Size)	To indicate the size of the test print area on the label. Choose a size that will fit within the boundaries of your current label stock to avoid damaging the print head.	**170mm x 128mm*** – 7" length x 5" width **120mm x 70mm** – 4.75" length x 2.75 width **100mm x 50mm** – 4" length x 2" width **60mm x 40mm** – 2.5" length x 1.75" width **40mm x 35mm** – 1.75" length x 1.5" width

*** SATO Factory Default**

Mode T:
Receive Buffer, Format Numbers & Stored Graphics

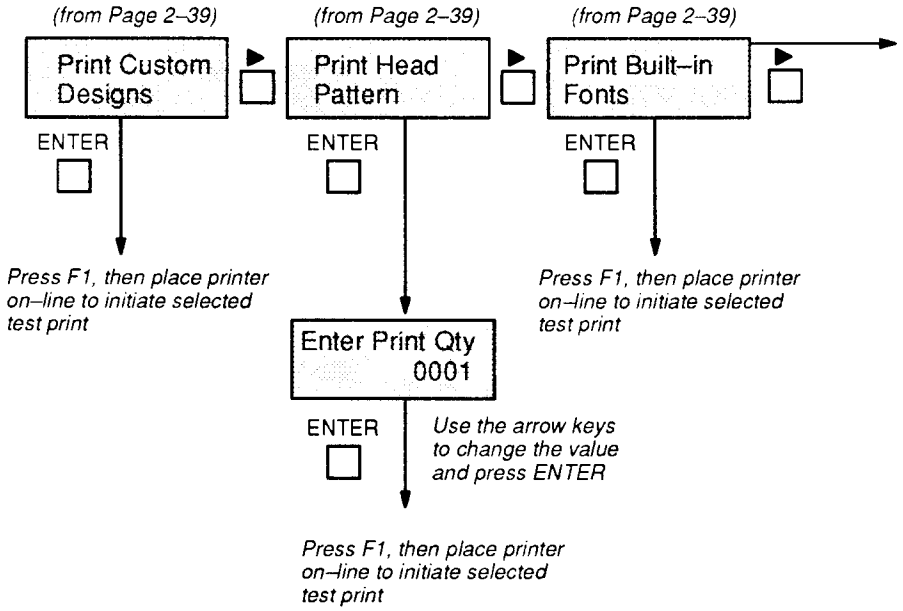


Press F1, then place printer on–line to initiate selected test print

Option	Definition/Purpose	Values/Settings
Receive Buffer	To allow you to receive a printout of the exact data received by the printer in hexidecimal format. This is equivalent to a "hex dump" and is typically used as a debugging tool. To use this option, select it here in the configuration, then put the printer back on–line. Send your data stream from your host in the normal fashion. The M–8450 should then print your data stream as a hexidecimal printout to be analyzed. **Note 1:** Test prints function only at 300 DPI (1X). **Note 2:** Sometimes the receive buffer will contain random characters, which print upon selecting this option. If this occurs, reselect this option and then send your data stream. **Note 3:** This option must be reselected for each print job you want to analyze.	N/A
Format Numbers	To print the memory locations where jobs have been stored on the optional memory card.	N/A
Stored Graphics	To print all custom graphics that have been stored on the optional memory card.	N/A

*** SATO Factory Default**

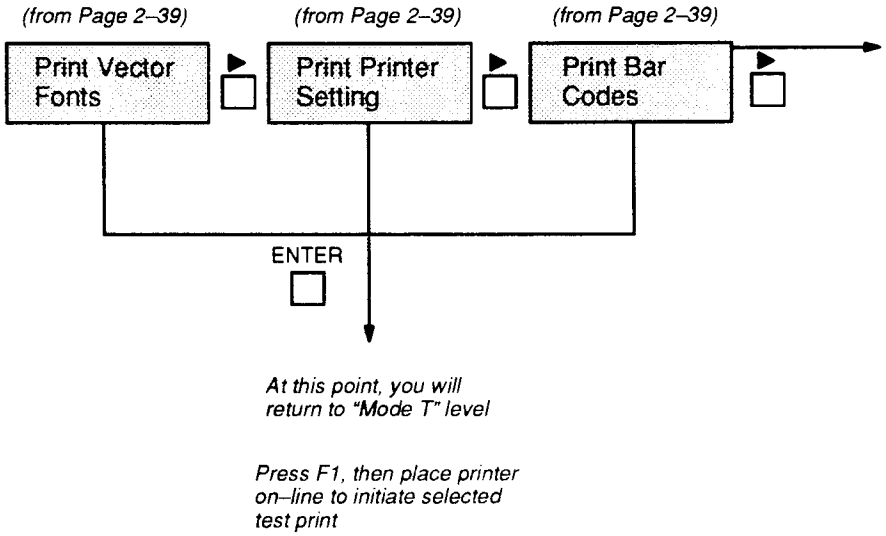
Mode T:
Custom Designs, Head Pattern & Built–in Fonts



Option	Definition/Purpose	Values/Settings
Custom Designs	To print all custom characters that have been stored in memory.	N/A
Head Pattern	To print a test pattern using all of the print head elements. Also shows the printer's firmware level and the printer's current date/time.	Qty Required: 0001* – 9999
Built–in Fonts	To print a test pattern of the seven built–in printer fonts (U, S, M, OA, OB, WB, and WL).	N/A

*** SATO Factory Default**

Mode T:
Vector Fonts, Printer Setting & Bar Codes

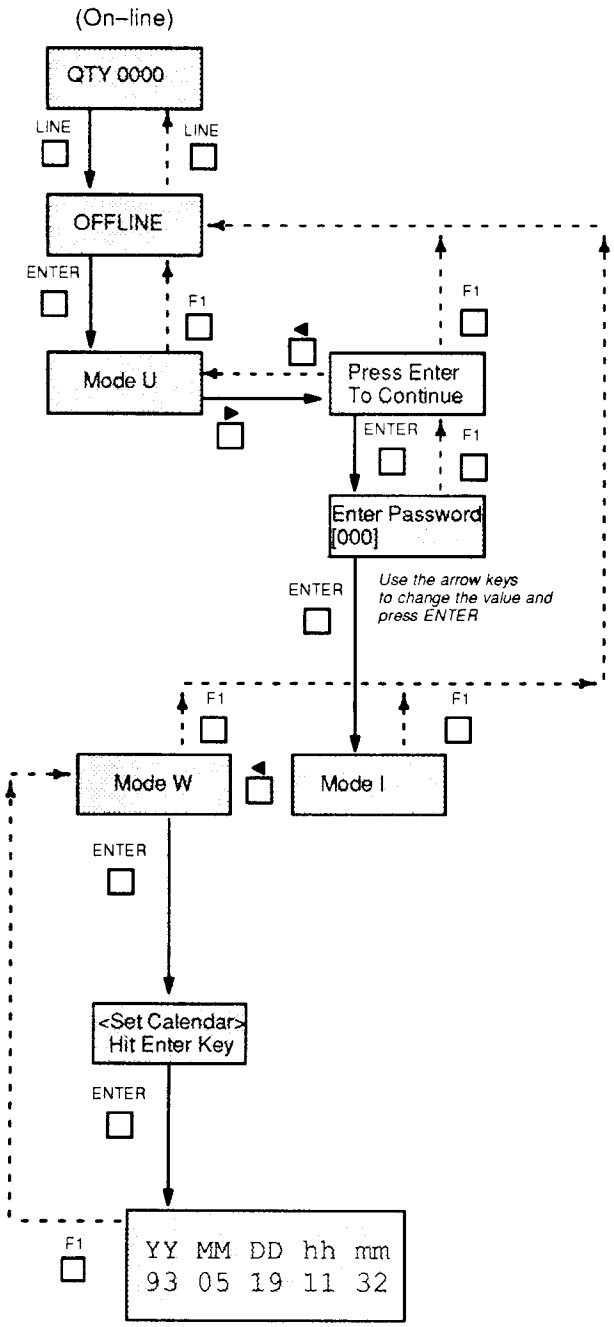


Option	Definition/Purpose	Values/Settings
Vector Fonts	To print a test pattern of the SATO vector font.	N/A
Printer Setting	To print a list of the current printer configuration settings.	N/A
Bar Codes	To print a sample of the bar code capabilities.	N/A

*** SATO Factory Default**

Watch Mode

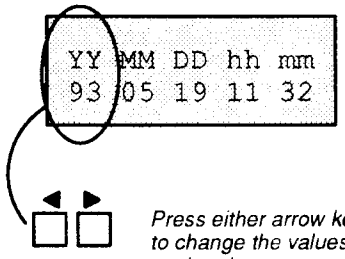
Mode W



(see Page 2–45)

Mode W:
YY MM DD hh mm

(from Page 2–44)



Press either arrow key to change the values for each unit: year, month, day, hour, and minute.

ENTER

When the value you want for each unit is displayed, press Enter to set it and progress to the next unit.

After setting the last unit, you will return to "Mode W" level

Option	Definition/Purpose	Values/Settings
YY	To set the year on the printer's internal clock.	00 – 99
MM	To set the month on the printer's internal clock.	00 – 12
DD	To set the day on the printer's internal clock.	00 – 31
hh	To set the hour on the printer's internal clock.	00 – 23
mm	To set the minute on the printer's internal clock.	00 – 59

*** SATO Factory Default**

How to Enable Certain Printer Configuration Settings

When changing certain printer settings, it is required that the printer be repowered or label stock be fed in order for the new setting to be enabled (i.e., activated). The following chart displays which settings are affected by this requirement:

Mode	Setting	Requirement	
		Repower Printer	Feed a Label
U	Pitch Offset		X
I	Interface	X	
	Baud Rate	X	
	Stop Bits	X	
	Parity	X	
	Data Bit Length	X	
	Protocol	X	
	Multi–Drop Address	X	
	Receive Buffer Size	X	
	Proto–Codes	X	
S	Sensor		X
	Pitch Detect		X
	Print Method		X
	Ribbon Saver	X	
	Cutter Mode		X
	Dispenser		X
	Pitch Offset (mm, dot)		X
	VH Offset	X	
	SATO Default	X	
	User Default	X	
	Dot Expansion	X	
	Dispenser Backfeed		X

SECTION 3
CLEANING AND MAINTENANCE

INTRODUCTION

The following information is presented in this section:

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

ADJUSTING THE PRINT QUALITY (DARKNESS)

One of the main features of the SATO M–8450 is its good print quality. The M–8450 is equipped with a few different adjustments for print darkness. 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 carbon "bleed". The edges of each image should be crisp and defined.

There are two methods for setting the print darkness on the M–8450:

(1) Through the printer configuration (Mode U)
(2) Through software using the Print Darkness command code

The Set Print Darkness option under Mode U of the printer configuration allows a range of 5 values (1 is the lightest; 5 is the darkest). This is your primary adjustment for print quality and should provide you with enough flexibility in finding the proper darkness.

The Print Darkness command code provides control of the darkness on an individual label basis. For more details on this command, see Section 1 (M–8450 Programming) of the Programmer and Technical Reference Manual.

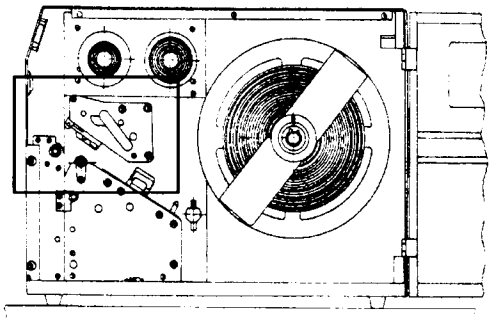
Note: Although it is rarely needed, in the event that you require more control in finding your darkness setting, you can use the print adjustment (identified as PRINT) on the operator (front) panel (see Section 1). Use a small flathead screwdriver, turning right for darker print and left for lighter print.

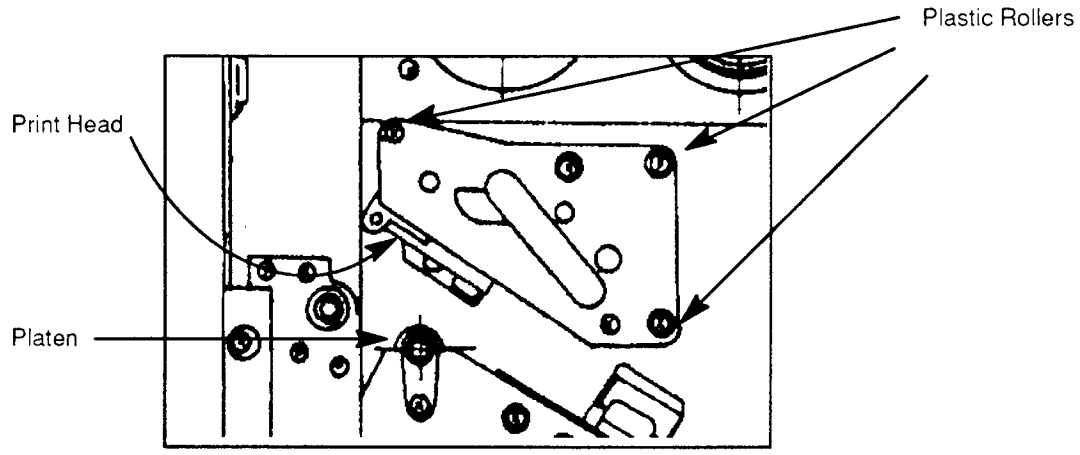
CLEANING THE PRINT HEAD, PLATEN, AND ROLLERS

Supplies needed:

☐ SATO SA070 Cleaning Kit

(or equivalent)





Cleaning the Printhead

Step	Action
1	Power off the printer.
2	Open the printer side and top doors.
3	Open the print head assembly using the lever on the side of the assembly.
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 accomplish this.)
6	Check for any black or adhesive on the swab after cleaning.
7	Repeat if necessary. The print head should be cleaned at least every time the ribbon is changed.

Cleaning the Platen and Rollers

Step	Action
1	Power off the printer.
2	Open the printer side and top doors.
3	Open the print head assembly using the lever on the side of the assembly.
4	Apply SATO Platen Cleaner to one of the clean wipes.
5	The platen is the rubber roller directly below the print head. It should be cleaned of any ribbon or label residue.
6	Note the (3) plastic rollers at the corners of the print head assembly and clean these as well. (It may be necessary to temporarily move the ribbon to clean those areas.)
7	Repeat if necessary. The platen and rollers should be cleaned whenever foreign matter such as dust or adhesive is present.

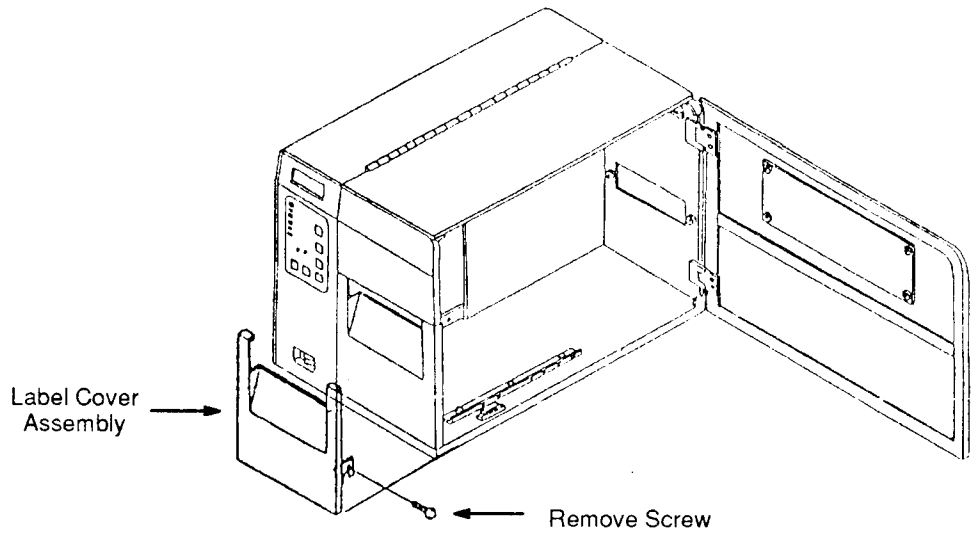
REPLACING THE PRINT HEAD

The print head on the M–8450 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:

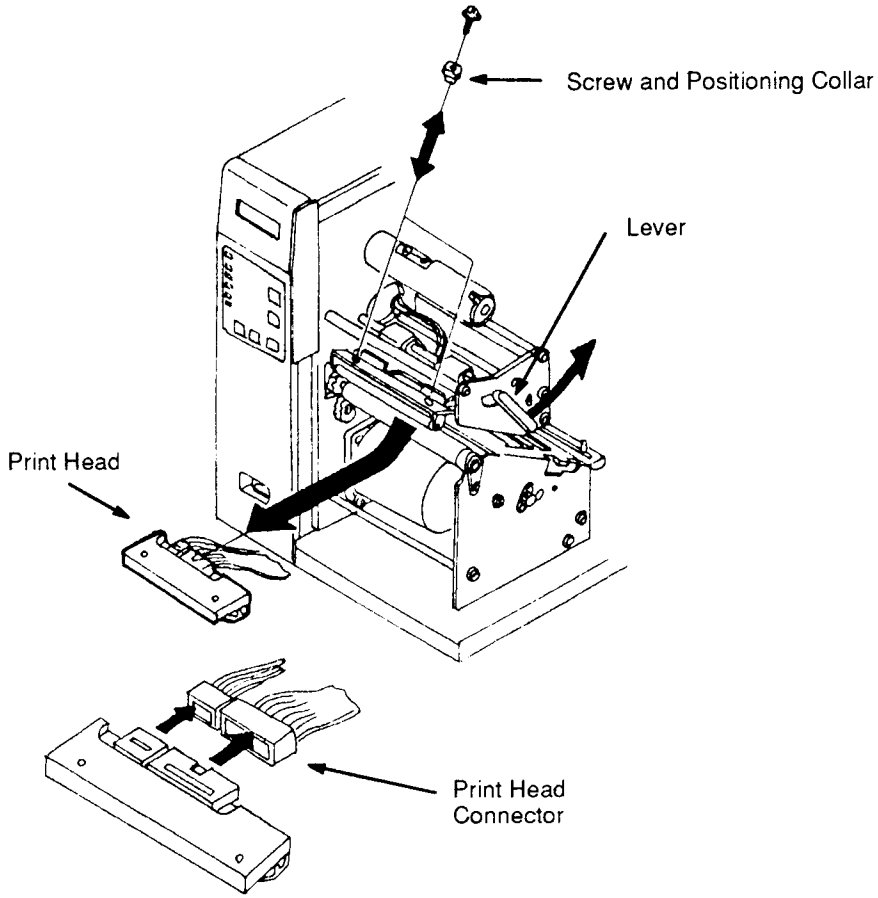
☐ No. 2 Phillips Screwdriver (a magnetic tip is helpful)

Step	Action
1	Power off the printer.
2	Open the printer side and top doors.
3	Remove the label cover assembly by removing the securing screw from the assembly.



Step	Action
4	Open the print head assembly using the lever on the side of the assembly.
5	Remove the ribbon from the unwind spindle if necessary.
6	View the print head assembly from the front of the printer. Locate the first set of screws on the top of the assembly, from the front edge.
7	Unscrew these two screws and set them aside along with the corresponding positioning collars. (Before removing the positioning collars and screws, note the direction of the "dots" on the flat of each positioning collar. When the collars are replaced, they must be installed with the "dots" facing in the same direction as when they are removed.)
8	The print head should now be loosened from the top of the assembly by grasping it on either side. Carefully disconnect the two connectors attached to its back edge, and remove the print head from the machine. Set the print head aside.

(Continued on the next page . . .)

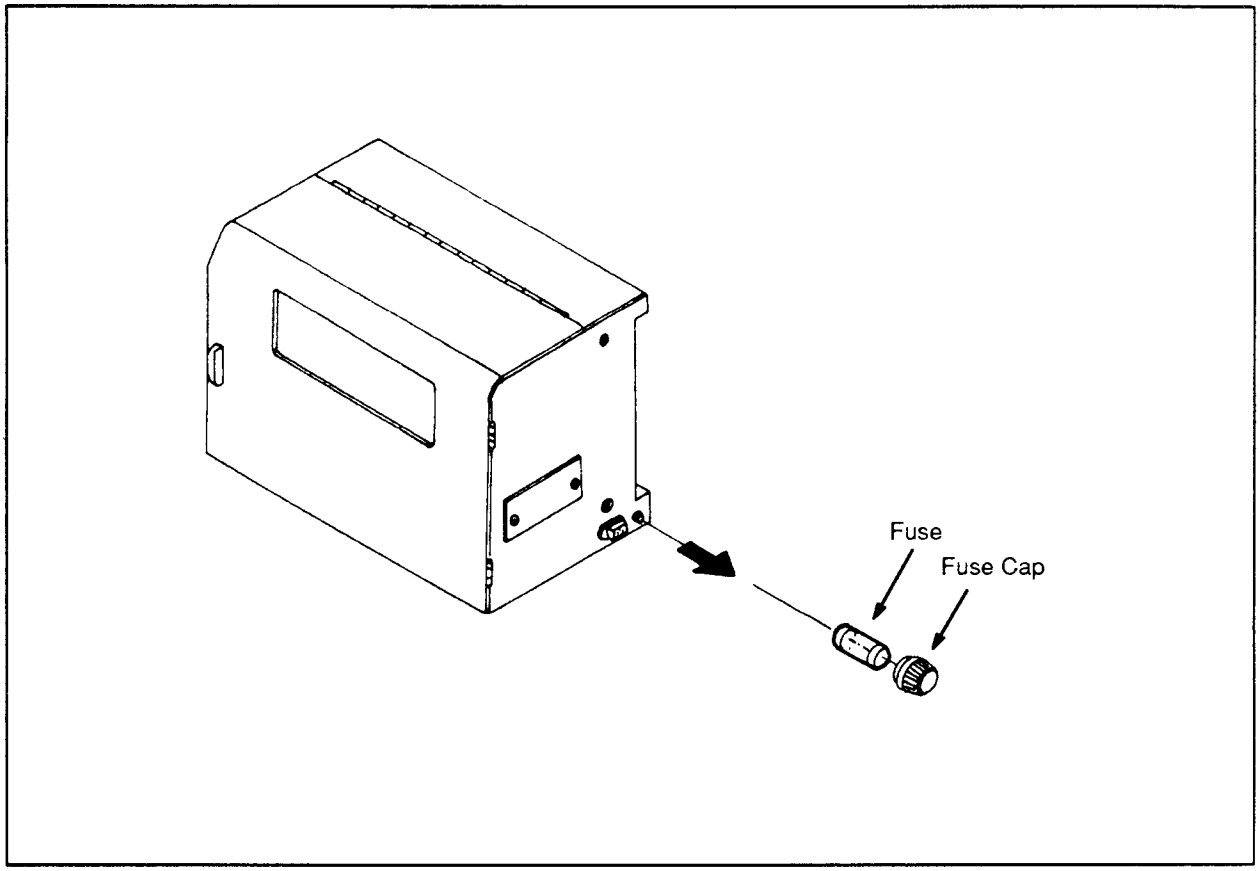


Step	Action
9	Carefully attach the new print head to the connectors. **NOTE: Be very careful not to scratch the printing surface of the print head when installing. Scratching the surface will cause permanent and irreparable damage!!**
10	Locate the screws and positioning collars and replace them through the top of the print head assembly, making sure the dots on the positioning collars are in the same orientation they were before they were removed. Re-secure the print head by tightening the screws.
11	Reattach the label cover that was removed in Step 3.

REPLACING THE FUSE

Supplies needed:

☐ 250V 3A Fuse



Step	Action
1	Power off the printer.
2	On the back of the printer, locate the fuse cap at the bottom right corner.
3	Unscrew the cap and remove the defective fuse.
4	Take (1) 250V 3A fuse and replace it into the cap.
5	Screw the cap back into the printer.

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S

T

U

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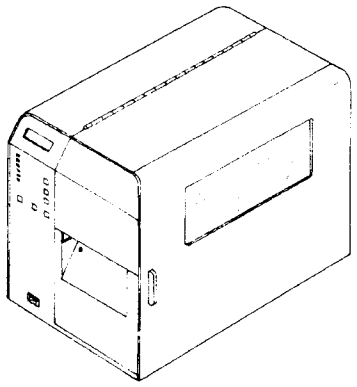
W

M–8450

Thermal Transfer / Electronic Printer



Programmer and Technical Reference Manual

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.

PREFACE

M–8450 OPERATOR'S MANUAL

The M–8450 Operator's Manual 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: 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, load the labels and ribbon, and use the operator panel to configure the printer.

SECTION 3: CLEANING AND MAINTENANCE

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

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M–8450 PROGRAMMER AND TECHNICAL REFERENCE MANUAL

The M–8450 Programmer and Technical Reference Manual contains technical information about the printer's programming language and interface. The following is a brief description of each section in this manual:

SECTION 1: M–8450 PROGRAMMING

This section introduces the SATO M–8450 printer programming language. It contains the commands that are used with the printer to produce labels with bar codes, alphanumeric data, and other graphics.

SECTION 2: INTERFACE SPECIFICATIONS

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

SECTION 3: TROUBLESHOOTING

This section contains troubleshooting procedures to follow in the event that you have printer problems.

APPENDIXES

Appendixes A through F contain the following information:

- Command codes quick reference chart
- Detailed bar code specifications
- Examples of custom–designed characters and custom graphics
- Instructions for setting the user default configuration
- Instructions for using the M–8450 optional features
- Character Tables

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SECTION 1
M–8450 PROGRAMMING

INTRODUCTION

This section presents the commands that are used with the SATO M–8450 Printer to produce labels with logos, bar codes, and alphanumeric data.

The following information is presented in this section:

- What is the SATO M–8450 Programming Language?
- Selecting Proto–Codes
- If You Are Using BASIC
- Understanding the M–8450 Print Area
- Command Codes

WHAT IS THE SATO M–8450 PROGRAMMING LANGUAGE?

A programming language for a printer may be a new concept for many computer programmers, but it is actually a fairly simple idea. The M–8450 language is really only a group of commands. The commands, which we refer to as 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 generates the desired label output. The programmer is free to use any programming language available on his/her computer system to send the data to the attached M–8450.

SELECTING PROTO–CODES

Proto–Codes are special control characters that prepare the M–8450 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 Proto–Codes to choose from on the M–8450. Each set is made up of (6) special characters. The Standard Proto–Codes are non–printable characters, and the Non–Standard Proto–Codes are printable characters. The Non–Standard set may be useful on host computers using protocol converters or in any application where non–printable ASCII characters cannot be sent from the host. This manual uses the Standard Proto–Codes for all of its examples. See Mode I of the Printer Configuration in Section 2 of the M–8450 Operator's Manual for help in selecting the desired Proto–Code set for your application.

PROTO–CODES			
Control Character	**Standard**	**Non–Standard**	**Description**
STX	02H	7BH = {	Start of data – RS232, 10–job buffer
ETX	03H	7DH = }	End of data – RS232, 10–job buffer
ESC	1BH	5EH = ^	Command code to follow
NULL	00H	7EH = ~	Cutter command
ENQ	05H	40H = @	Get printer status – Bi–directional mode
CAN	18H	21H = !	Cancel print job – Bi–directional mode

IF YOU ARE USING BASIC

It may be useful to test your M–8450 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.

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, N, 8, 1, CS, DS" AS #1

   Note: This will provide no flow control.

3. You may help to minimize keystrokes and program size by assigning the ESC character to a string variable.

   The following two examples in BASIC show use of the hints just provided. Both of these examples assumes use of the Standard Proto–Codes:

```
5    REM M-8450 Parallel Example
10   E$=CHR$(27)
20   WIDTH "LPT1:",255
30   LPRINT E$;"A";
40   LPRINT E$;"H400";E$;"V100";E$;"WL1SATO";
50   LPRINT E$;"Q1";
60   LPRINT E$;"Z";
```

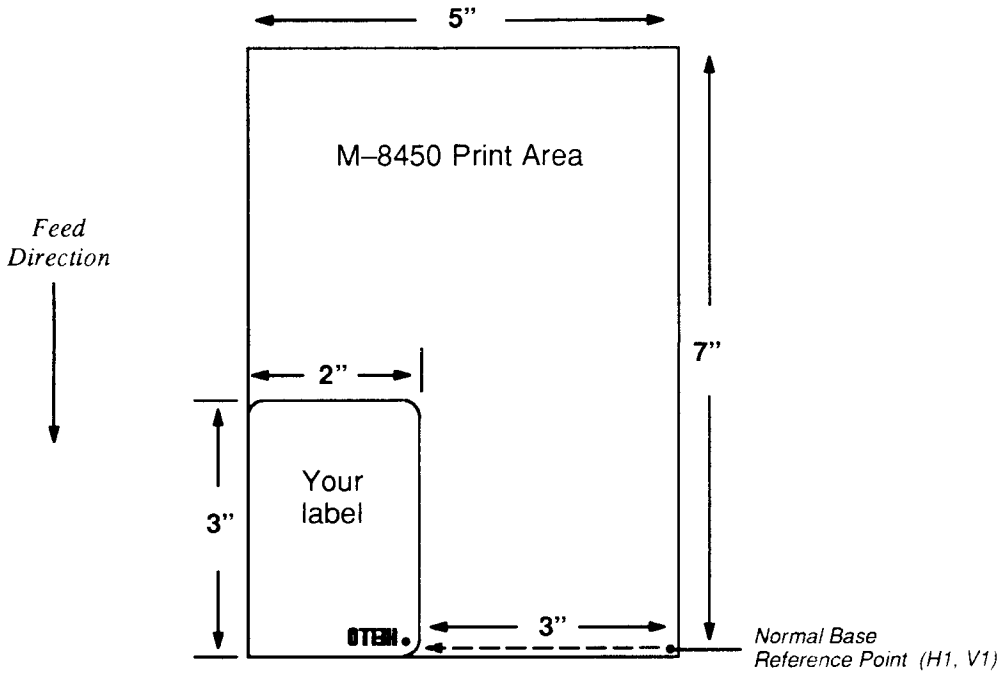
2nd Example:

```
5    REM M-8450 RS232 Example
10   STX$=CHR$(2)
20   ETX$=CHR$(3)
30   E$=CHR$(27)
40   OPEN "COM1:9600,N,8,1,CS,DS" AS #1
50   PRINT #1,STX$;
60   PRINT #1,E$; "A";
70   PRINT #1,E$;"H400";E$;"V100";E$;"WL1SATO";
80   PRINT #1,E$;"Q1";
90   PRINT #1,E$;"Z";
100  PRINT #1,ETX$;
```

UNDERSTANDING THE M–8450 PRINT AREA

The maximum print area available on the M–8450 is a width of 5 inches and a length of either 7 inches or 14 inches, depending on the dot resolution chosen. Since some of your label applications may not have labels this large, it is important to understand how to work with labels that do not use the entire print area. Be aware that you should avoid printing where no label exists so that there is no print head damage.

The diagram below illustrates the M–8450 print area and a sample 2" wide x 3" long label placed within this area. As can be seen, your label will be oriented against the inside left edge of the printer as viewed from the front of the M–8450. The normal base reference point is located at the H1, V1 position of the print area in the normal print orientation (no rotation).



There are two methods available to make sure your printed output will appear correctly on your label. They are as follows:

1. Send the Base Reference Point command as part of your data to the printer to establish a new origin for subsequent Print Position commands.

   First, calculate the distance (in dots) from the Normal Base Reference Point to the closest edge of the label.

   3 x 300 dots/in = 900 dots

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

   <ESC>A3H**900**V0001

2. Using the Normal Base Reference Point from the print area, send the appropriate horizontal Print Position command to properly locate each field on the label.

   Again find the distance (in dots) from the Normal Base Reference Point to the outside edge of your label (i.e., 900 dots). Then each horizontal Print Position command must include 900 dots plus an amount to locate the field on the label.

Adjusting Our Samples for Your Labels

The Command code subsection contains a sample label output for each command code. These samples reflect how the printed information would appear on a 4–inch wide label at 300 DPI (1X expansion) (see Figure A). Recall that the maximum print width on an M–8450 printer is actually 5 inches. If you want to test any of our sample label outputs, and you are using labels that are less than four inches wide (see Figure B), we suggest that you add the Base Reference Point command to the data stream in order for the images to print on your labels.

You must be careful not to print off the label surface. The addition of the Base Reference Point command to the sample data stream may help to adjust the print for your labels. See an example of this on the next two pages or refer to the Base Reference Point command (Page 1–15).

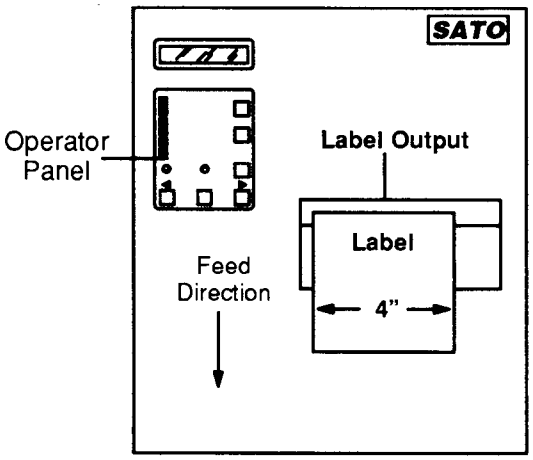


Figure A

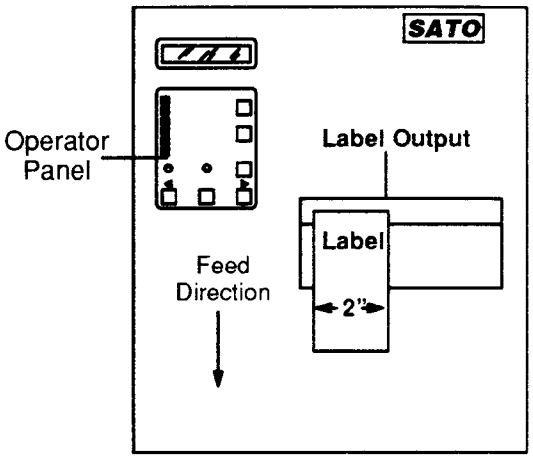


Figure B

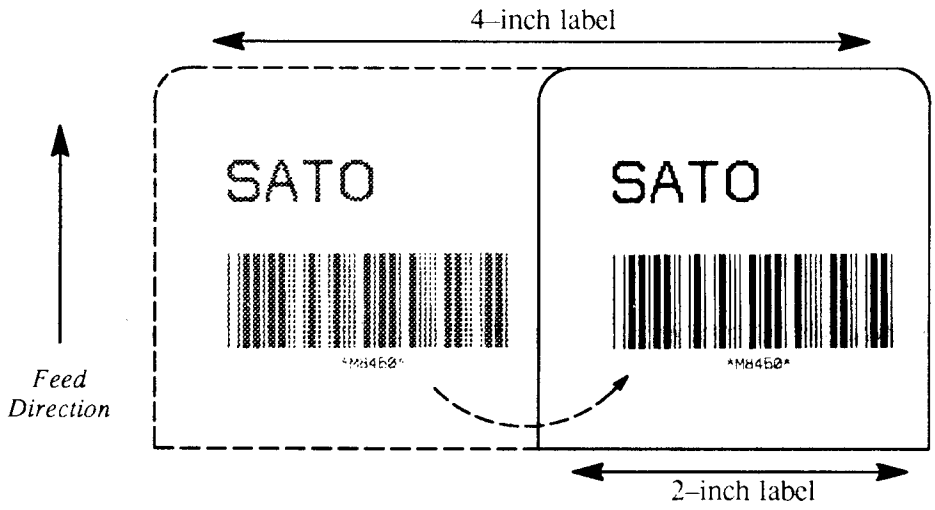
For instance, the following illustrates a sample input data stream and output label assuming a 4–inch wide label:

```
<ESC>A
<ESC>H375<ESC>V150<ESC>L0404<ESC>MSATO
<ESC>H375<ESC>V300<ESC>B104150*M8450*
<ESC>H555<ESC>V465<ESC>L0101<ESC>M*M8450*
<ESC>Q1
<ESC>Z
```

If you are using a 2–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, and the image will print on the narrower label:

```
<ESC>A
<ESC>A3H600V0001
<ESC>H375<ESC>V150<ESC>L0404<ESC>MSATO
<ESC>H375<ESC>V300<ESC>B104150*M8450*
<ESC>H555<ESC>V465<ESC>L0101<ESC>M*M8450*
<ESC>Q1
<ESC>Z
```

Image is moved horizontally to the right 600 dots to print on a 2" label.



For more information on this, see the Base Reference Point Command (page 1–15).

COMMAND CODES

The next portion of this section contains all the M–8450 printer command codes. The commands must be sent to the printer in an organized fashion in order for your labels to print.

The goal of this command section is twofold:

1. To explain the different commands and provide examples for the new M–8450 programmer.
2. To provide a detailed reference for the advanced M–8450 programmer.

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 input data stream to the printer and the expected printed output. By studying the examples, you can learn how to use the particular command within a whole block of printer code. **Note that these examples assume use of the Standard Proto–Codes, a parallel interface, dot expansion of 1X (300 DPI), and a 4–inch wide label.** In other words, no <STX>, <ETX> are included in the data stream. If you are using the RS–232 serial port, verify that these control codes are included in your data stream. Pay particular attention to the "Special Notes" with each command to learn other important information.

Note: Appendix A contains a *Command Code Quick Reference Chart*, which lists the codes alphabetically.

Bar Codes

Command Structure

1:3 narrow/wide bar ratio: <ESC>**Babbccc**

2:5 narrow/wide bar ratio: <ESC>**BDabbccc**

1:2 narrow/wide bar ratio: <ESC>**Dabbccc**

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 Code 128
- A MSI
- B *reserved*
- C Code 93
- D *reserved*
- E UPC–E
- F Bookland
- G Code 128
- P Post Net

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

ccc = Bar height in dots (001–600)

Example: <ESC>**BD103200**
Placement: Immediately preceding data to be encoded
Default: None

Command Function

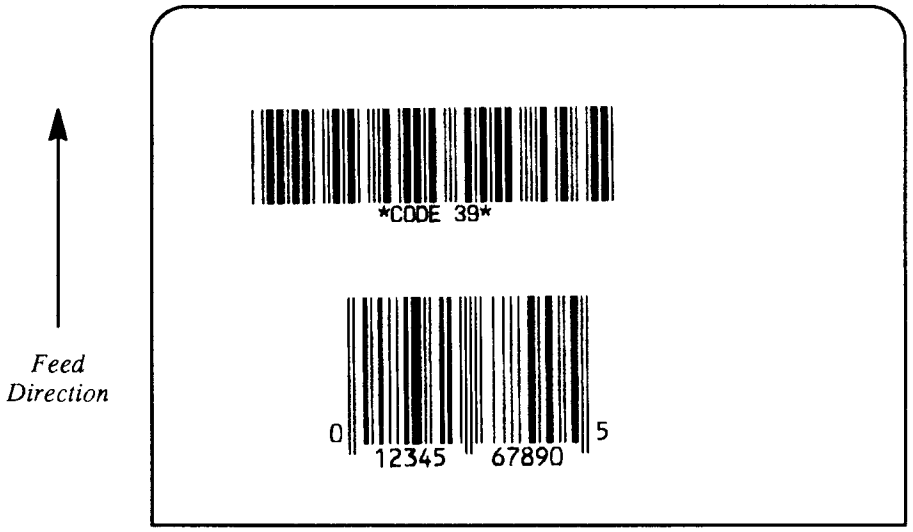
To print bar code images on a label. With this command, there are 14 different bar code symbologies available to be printed. Each of the bar codes is unique, and it is important to know the differences. See Appendix B for specific information on using each individual bar code symbol.

How to Use

Input to Printer:

```
<ESC>A
<ESC>H450<ESC>V150<ESC>B104150*CODE 39*
<ESC>H650<ESC>V305<ESC>S*CODE 39*
<ESC>H600<ESC>V450<ESC>D304250012345678905
<ESC>H570<ESC>V650<ESC>OB0<ESC>H990<ESC>OB5
<ESC>H640<ESC>V690<ESC>OB12345<ESC>H825<ESC>OB67890
<ESC>Q1
<ESC>Z
```

Printer Output:



Special Notes

- When using the <ESC>BD command, the narrow bars and spaces (elements) will be two times the width specified by the bb parameter. Wide elements will be five times the width specified by this parameter.
- 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.
- See Appendix B for more specific instructions and detailed information regarding individual bar code symbols.
- If you will be printing rotated bar codes, the actual printed height may vary somewhat from the specified bar height. See Appendix B for details.
- When Post Net is specified, the "bb" and "ccc" parameters are not specified because bar width and height are fixed. See Appendix B for more details.

Bar Codes – Variable Ratio

Command Structure

<ESC>**BTabbccddee**

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: <ESC>**BT101030103**
Placement: Following print position commands and preceding <ESC>BW
Default: None

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. This command works together with <ESC>BW to produce Variable Ratio bar codes. Remember that this command only applies to the 5 bar code types shown.

How to Use

Input to Printer:

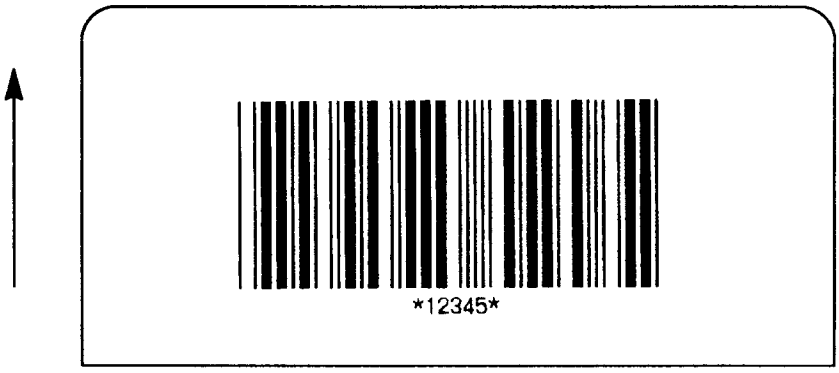
<ESC>A
<ESC>H525<ESC>V150<ESC>**BT106180618**<ESC>BW01300*12345*
<ESC>H800<ESC>V465<ESC>WB0*12345*
<ESC>Q1
<ESC>Z

(Continued on next page...)

How to Use

(...Continued from previous page)

Printer Output:



Special Notes

- This command must be immediately followed by the <ESC>BW command (see Page 1–13).
- With Interleaved 2 of 5, the total width of one narrow bar, one narrow space, one wide bar, and one wide space cannot exceed 82 dots.
- With Codabar, the total width of one narrow bar, one narrow space, one wide bar, and one wide space cannot exceed 850 dots.
- With Code 39, the total width of one narrow bar, one narrow space, one wide bar, and one wide space cannot exceed 370 dots.
- You may use only one variable ratio bar code per label.
- See Appendix B for more specific instructions and details regarding individual bar code symbols.

Bar Codes – Variable Ratio (cont.)

Command Structure

<ESC>**BWaabbb**

aa = Expansion factor by which the width of all bars and spaces is increased (01–12)

bbb = Bar height by dot (004–600 dots)

Example: <ESC>**BW**02100

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

Default: None

Command Function

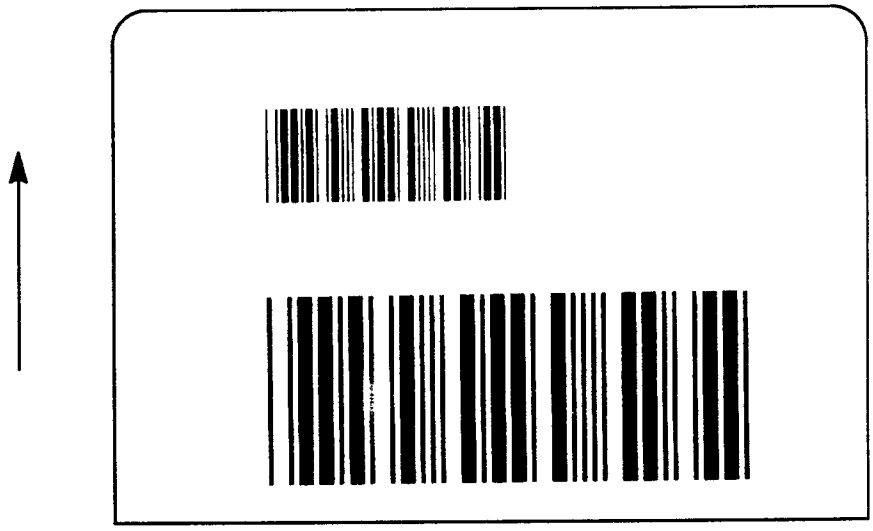
This command works together with the <ESC>BT command to specify an expansion factor and the bar code height for the particular symbol being printed.

How to Use

Input to Printer:

<ESC>A
<ESC>H525<ESC>V150<ESC>BT102060206<ESC>**BW02150***8450*
<ESC>H525<ESC>V450<ESC>BT102060206<ESC>**BW04300***8450*
<ESC>Q1
<ESC>Z

Printer Output:



Special Notes

- This command must be preceded by the <ESC>BT command (see Page 1–11).
- If you will be printing rotated bar codes, the actual printed height may vary from the specified bar height. See Appendix B for details.

Base Reference Point

Command Structure

<ESC>**A3HaaaaVbbbb**

aaaa = Horizontal Print Offset (0001 – * dots)
bbbb = Vertical Print Offset (0001 – * dots)

Example: <ESC>**A3H0100V0050**
Placement: Preceding all images that are based on the new base reference point
Default: Current VH offset setting in the printer configuration

* The maximum values for `aaaa` and `bbbb` are based upon the dot expansion chosen from Mode S of the Printer Configuration as shown below:

Dot Density	Maximum Horizontal Offset (aaaa)	Maximum Vertical Offset (bbbb)
300 DPI (1x)	1536 dots	2136 dots
150 DPI (2x)	768 dots	1068 dots [1]
100 DPI (3x)	512 dots	712 dots [2]

1 Maximum vertical offset is 2136 with Expanded Print Length
2 Maximum vertical offset is 1424 with Expanded Print Length

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 the maximum print width to place images on the printable label surface. It may also be used to move images past preprinted fields on a label.

How to Use

Input to Printer:

```
<ESC>A
<ESC>A3H0450V0150
<ESC>H1<ESC>V1<ESC>L0202<ESC>WB0SATO M-8450
<ESC>H1<ESC>V150<ESC>B104150*123456*
<ESC>Q1
<ESC>Z
```

Printer Output:

Special Notes

- The Base Reference Point command has no effect on Custom Graphics when used in the same data stream.
- Use of this command will set the VH 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 Mode S of the Printer Configuration in Section 2 of the M–8450 Operator's Manual.
- This command may not be used more than once in a print job.
- An alternative to using this command is to make changes to your current Horizontal and Vertical Positioning commands (see Page 1–55).

  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 1/2" (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.
- For a more detailed example of the Base Reference Point command, see "Adjusting Our Samples for Your Labels" (Page 1–4).

Calendar Increment

Command Structure

<ESC>**WPab**

a = Y Years
M Months
D Days
h Hours

b = Numeric data: Years (1–9), Months (01–99), Days (001–999), Hours (001–999)

Example: <ESC>**WPY3**
Placement: Anywhere within the data stream
Default: None

Command Function

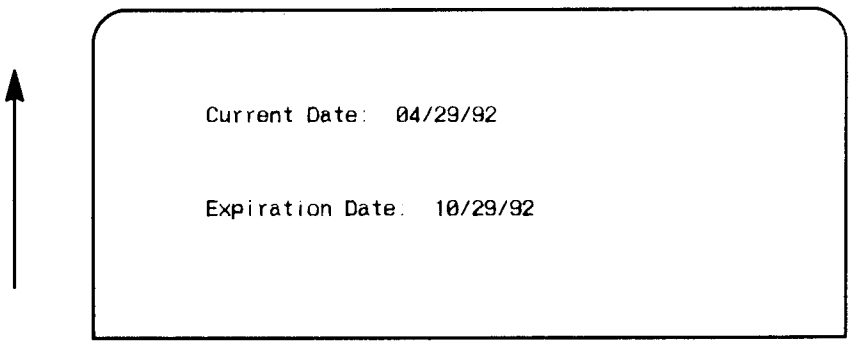
To add a value to the printer's current date and/or time, which may then be printed on the label. This command does not change the printer's internal clock setting.

How to Use

Input to Printer:

```
<ESC>A
<ESC>H450<ESC>V150<ESC>WB1Current Date:
<ESC>WAMM/DD/YY
<ESC>WPM06
<ESC>H450<ESC>V300<ESC>WB1Expiration Date:
<ESC>WAMM/DD/YY
<ESC>Q1
<ESC>Z
```

Printer Output:



Special Notes

- You cannot increment the date or time past December 31, 1999.
- This command can only be used once per data stream.
- The printer's internal clock may be set through the operator panel (see Mode W of the Printer Configuration in Section 2 of the M–8450 Operator's Manual) or through the Calendar Set command (see Page 1–21).
- 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

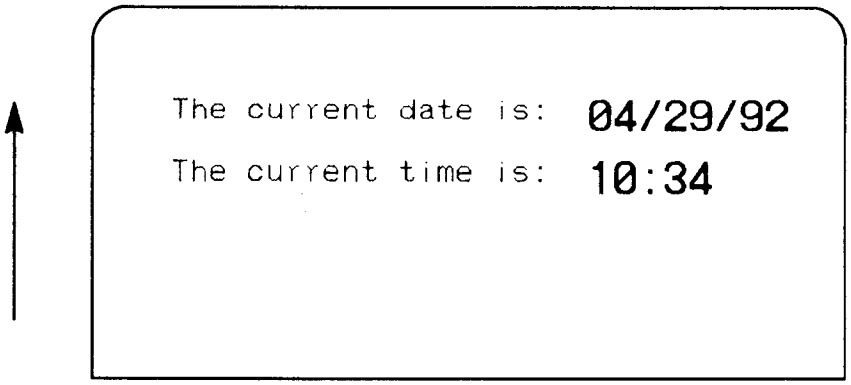
To specify the printing of a date and/or time field from the printer's internal clock. This may be used to date/time stamp your labels.

How to Use

Input to Printer:

```
<ESC>A
<ESC>%0
<ESC>L0202<ESC>P02
<ESC>H400<ESC>V150<ESC>MThe current date is:
<ESC>WB1<ESC>WAMM/DD/YY
<ESC>%0
<ESC>L0202<ESC>P02
<ESC>H400<ESC>V250<ESC>MThe current time is:
<ESC>WB1<ESC>WAhh:mm
<ESC>Q1
<ESC>Z
```

Printer Output:



Special Notes

- The maximum data sent within the calendar print command is 16 characters.
- The calendar print command may be specified up to 6 times per label.
- The calendar print field cannot be copied to another part of the label.
- The calendar print data cannot be specified as a reverse image.
- The date and time elements may be placed in any order for printing.
- Use a slash (/) to separate date elements and a colon (:) to separate time elements.
- The printer's internal clock may be set through the operator panel (see Mode W of the Printer Configuration in Section 2 of the M–8450 Operator's Manual) or through the Calendar Set command (see Page 1–21).
- In order for the calendar to print properly, the following commands must be included in the data stream:

<ESC>%	Rotation – Fixed Base (see Page 1–65)
<ESC>V	Vertical Positioning (see Page 1–55)
<ESC>H	Horizontal Positioning (see Page 1–55)
<ESC>L	Character Expansion (see Page 1–22).
<ESC>P	Character Pitch (see Page 1–24)
<ESC>U,S,M	Fonts U, S, M (see Page 1–42)
<ESC>WB,WL	Fonts WB & WL (see Page 1–44)
<ESC>$=	Vector Font (see Page 1–77).

- The <ESC>% must be sent before every <ESC>WA command.

Calendar Set

Command Structure

<ESC>**WTaabbccddee**

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

Example: <ESC>**WT9101311200**
Placement: Anywhere within the data stream
Default: None

Command Function

To set the time and date of the M–8450's internal clock.

How to Use

Input to Printer:

<ESC>A
<ESC>**WT9204010800**
<ESC>Z

Printer Output:

No printer output. Sets the current date to April 1, 1992 and the current time to 8:00 a.m. on the printer.

Special Notes

- You can also set the internal clock through the operator panel (see Mode W of the Printer Configuration in Section 2 of the M–8450 Operator's Manual).

Character Expansion

Command Structure

<ESC>**Laabb**

aa = Multiple to expand horizontally (01–12)
bb = Multiple to expand vertically (01–12)

Example: <ESC>**L0305**
Placement: Preceding the data to be expanded
Default: <ESC>L0101

Command Function

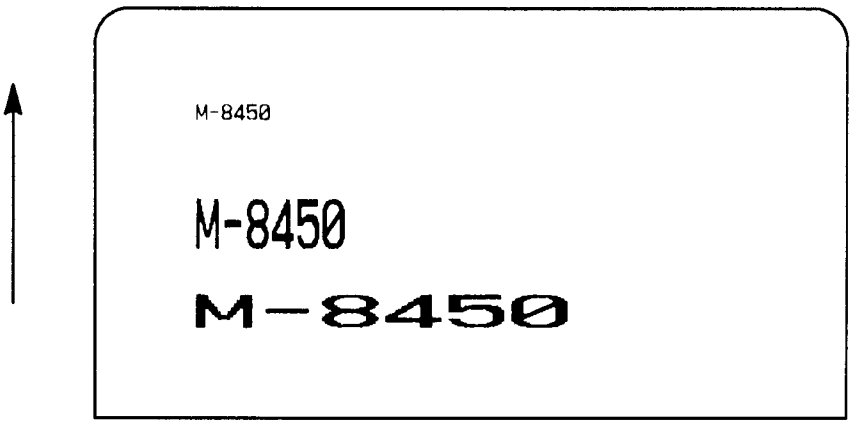
To expand characters independently in both the horizontal and vertical directions. The command allows you to enlarge the base size of each font (except the vector font) up to 12 times in either direction. Expanded characters are typically used for added emphasis or for long distance readability.

How to Use

Input to Printer:

```
<ESC>A
<ESC>H450<ESC>V150<ESC>WB0M-8450
<ESC>H450<ESC>V300<ESC>L0203<ESC>WB0M-8450
<ESC>H450<ESC>V450<ESC>L0502<ESC>WB0M-8450
<ESC>Q1
<ESC>Z
```

Printer Output:



Special Notes

- This command will expand the following fonts:
  - Fonts U, S, M, OA & OB (see Page 1–42)
  - Fonts WB & WL (see Page 1–44)
- This command will also affect the following commands:
  - Character Pitch (see Page 1–24)
  - Custom–Designed Characters (see Page 1–32)
- The Character Expansion value is in effect for the current print job until a new expansion command is specified.
- 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 <ESC>Q.

Character Pitch

Command Structure

<ESC>**Paa**

aa = Number of dots between characters (01–99)

Example: <ESC>**P03**
Placement: Preceding the text to be printed
Default: <ESC>P02

Command Function

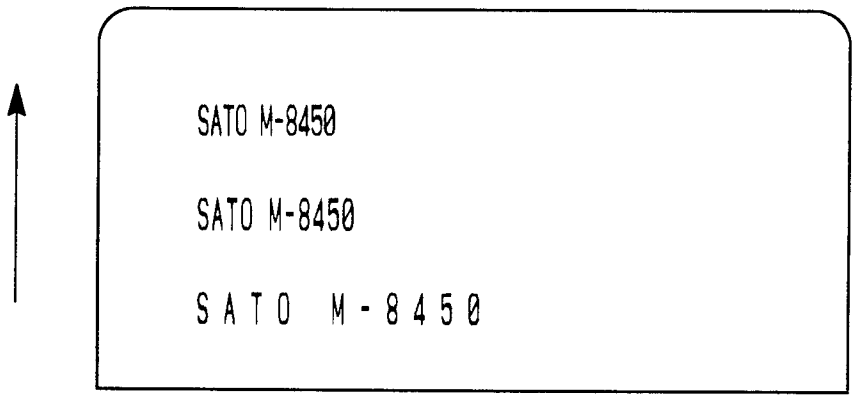
To designate the amount of spacing (in dots) between characters. This command provides a means of altering character spacing for label constraints or to enhance readability.

How to Use

Input to Printer:

```
<ESC>A
<ESC>H450<ESC>V150<ESC>L0102<ESC>WB0SATO M-8450
<ESC>P05<ESC>H150<ESC>V300<ESC>L0102<ESC>WB0SATO M-8450
<ESC>P25<ESC>H150<ESC>V450<ESC>L0102<ESC>WB0SATO M-8450
<ESC>Q1
<ESC>Z
```

Printer Output:



Special Notes

- This command is affected by the Character Expansion command (see Page 1–22). 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

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

- This command affects Fonts U, S, M, OA & OB (see Page 1–42), Fonts WB & WL (see Page 1–44), and the Vector Font (see Page 1–77).

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

Character Tables

Command Structure

<ESC>**Wa**

a =	0	IBM 850 Character Table
	1 – 7	SATO International Character Tables
	8	*reserved*
	9	SATO Character Table

Example: <ESC>**W1**
Placement: Anywhere within the data stream
Default: <ESC>W0

Command Function

To select one of the SATO International Character Tables.

How to Use

Input to Printer:

```
<ESC>A
<ESC>L0202
<ESC>H450<ESC>V150<ESC>MBackslash char "\"
<ESC>H525<ESC>V300<ESC>W0Table 0: \
<ESC>H525<ESC>V450<ESC>W4Table 4: \
<ESC>H525<ESC>V600<ESC>W6Table 6: \
<ESC>Q1
<ESC>Z
```

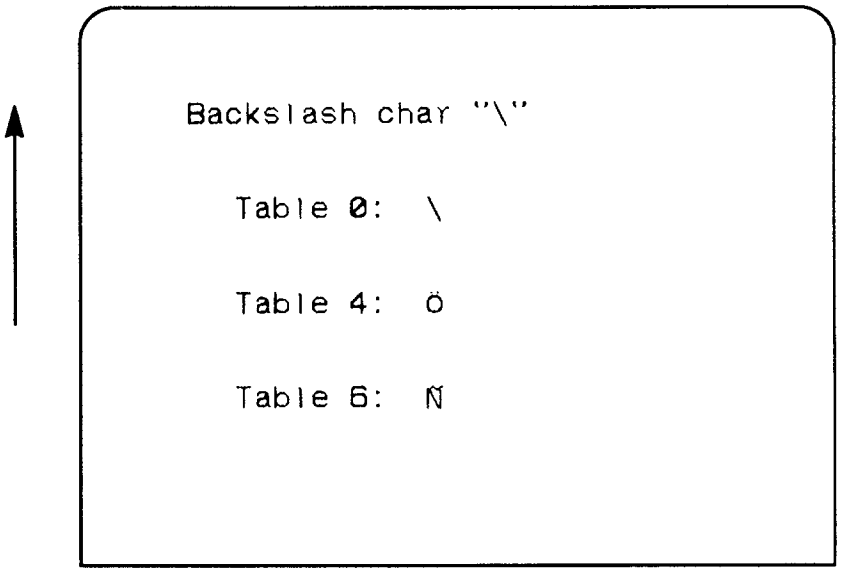
NOTE: "\" represents the character $5C_H$ in ASCII.

(Continued on the next page...)

How to Use

(Continued from previous page...)

Printer Output:



Special Notes

- International Character Tables (a = 1 – 7) are available for the U, S, and M fonts only.
- The IBM 850 character table is the default table if this command is not specified in the data stream.
- See Appendix F for a description of each of the character tables available.

Clear Printer Memory & Buffers

Command Structure

<ESC>* To clear the receiving buffer and compiling buffer
<ESC>*T To clear the custom character memory
<ESC>*, To clear formats stored in the memory card
<ESC>*& To clear the form overlay memory
<ESC>*G To clear graphics stored in the memory card
<ESC>*X To clear all of the above

Example: See above
Placement: In a separate data stream, immediately after <ESC>A and immediately before <ESC>Z
Default: None

Command Function

To clear individual memory or buffer areas of the M–8450.

How to Use

Input to Printer:

```
<ESC>A
<ESC>*
<ESC>Z
```

Printer Output:
No printer output. This example clears the receiving buffer and the compiling buffer.

Special Notes

- The <ESC>* command may be used in conjunction with the multi buffer mode (Mode I, Receive Buffer options) to clear a print job currently printing along with any jobs that are buffered and ready to print.
- A "CARD ERROR" will occur if you try to access the memory card when no card is installed.

Continuous Forms Printing

Command Function

The M–8450 locates the end of an adhesive label by sensing the backing between labels or through the use of an I–mark (black rectangle on the reverse side of the backing). It locates the end of a tag from a notch, I–mark, or a hole between tags.

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_H) if necessary. **There is no command code to control label length.**

Special Notes

- In the printer configuration, the option for Setup Sensor under Mode S (Sensors 4,5) **must** be set to "Not Used". See Mode S of the Printer Configuration in Section 2 of the M–8450 Operator's Manual for further information.

Copy Image Area

Command Structure

<ESC>**WDHaaaaVbbbbXccccYdddd**

aaaa = Horizontal position of the top left corner of the image area to be copied
bbbb = Vertical position of the top left corner of the image area to be copied
cccc = Horizontal length of the image area to be copied (1–max*)
dddd = Vertical length of the image area to be copied (1–max*)

Example: <ESC>**WDH0100V0050X0600Y0400**
Placement: Anywhere within the data stream, after specifying the location of the duplicate image
Default: None

* The maximum value for horizontal and vertical print positions are based on the dot density as follows:

Dot Density	Maximum Horizontal	Maximum Vertical
300 DPI (1x)	1536 dots	2136 dots
150 DPI (2x)	768 dots	1068 dots [1]
100 DPI (3x)	512 dots	712 dots [2]

1 Maximum vertical offset is 2136 with Expanded Print Length
2 Maximum vertical offset is 1424 with Expanded Print Length

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.

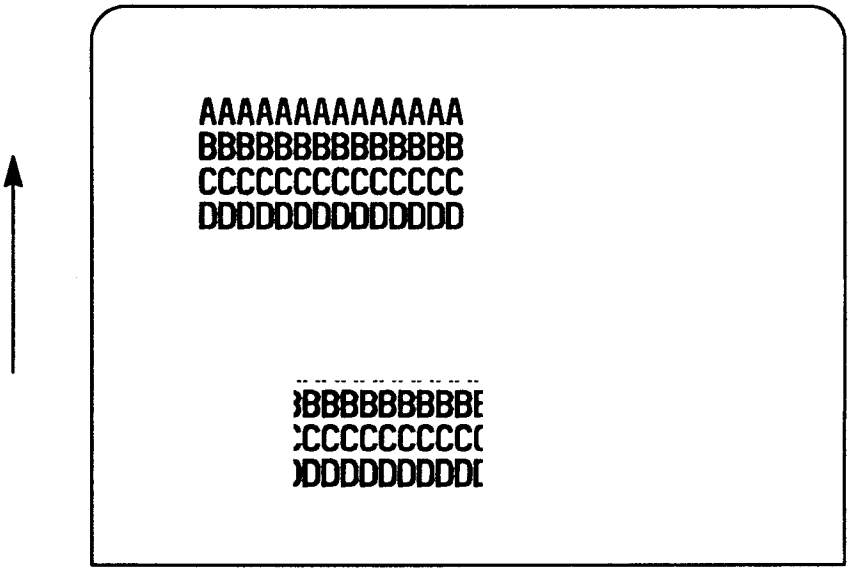
How to Use

Input to Printer:

```
<ESC>A
<ESC>H450<ESC>V150<ESC>E003<ESC>WL1
AAAAAAAAAAAAA
BBBBBBBBBBBBB
CCCCCCCCCCCCC
DDDDDDDDDDDDD
<ESC>H600<ESC>V600<ESC>WDH0225V0190X0300Y0225
<ESC>Q1
<ESC>Z
```

(Continued on next page...)

Printer Output:



Special Notes

- The Copy Image Area command cannot be used when the <ESC>AX (Expanded Print) command is specified in 300 DPI mode (1X dot expansion).
- Use the print position commands to locate the new area for the duplicate image.

Custom–Designed Characters

Command Structure

Store Command: <ESC>**TaHbb(data)**

Recall Command: <ESC>**KaH90bb**

a = 1 16x16 matrix
2 24x24 matrix

H = Specifies a Hex data stream is to follow

bb = Memory location to store/recall the character. Valid memory locations are 21 hex to 52 hex

(data) = Hex data to describe the character

Example: See Appendix C

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.

How to Use

See Appendix C for a detailed example.

Special Notes

- When printing the custom character using the **Recall** command, the character is affected by the following commands:
  - Character Expansion (see Page 1–22)
  - Character Pitch (see Page 1–24)
  - Line Feed (see Page 1–51)
  - Rotation – Fixed Base Reference Point (see Page 1–65)
  - Rotation – Moving Base Reference Point (see Page 1–67)
- The characters are stored in volatile memory and thus must be reloaded if the printer power is lost.
- 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.

Custom Graphics

Command Structure

<ESC>**GHaaabbb(data)**

H	=	Specifies a Hex data stream is to follow
aaa	=	Number of horizontal 8 x 8 blocks (001–104)
bbb	=	Number of vertical 8 x 8 blocks (001–177; 001–354 for 14" label)
(data)	=	Hex data to describe the graphic image

Example: See Appendix C

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 hexidecimal format to the printer.

How to Use

See Appendix C for a detailed example.

Special Notes

- 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.
- A custom graphic cannot be enlarged by the Character Expansion command.
- 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.
- The Expanded Print Length command may be used to select the 14–inch label length, but only in 150 DPI mode (2X dot resolution) or 100 DPI mode (3X dot resolution). See Special Notes on Page 1–40.

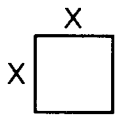
(Continued on the next page...)

Special Notes

(Continued from previous page...)

- To store graphic images in optional battery–backed memory cards, see the Custom Graphics – Battery Backed command (Page 1–35).
- When designing a custom graphic in 300 DPI mode (1X expansion), the dot will be square.

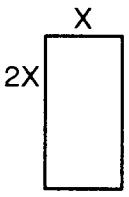
300 DPI 1X mode



X = .0033"

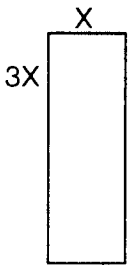
When designing a graphic in the 150 DPI mode (2X expansion) or 100 DPI mode (3X expansion), the dot will be elongated in the vertical direction.

150 DPI 2X mode



X = .0033"

100 DPI 3X mode



X = .0033"

See Page 2–33 of the Sato M–8450 Operator's Manual.

Custom Graphics – Battery Backed

Command Structure

Store Command: <ESC>**GIHaaabbbcc(data)**

Recall Command: <ESC>**GRcc**

H	=	Specifies a Hex data stream is to follow
aaa	=	Number of horizontal 8 x 8 blocks (001 – 104)
bbb	=	Number of vertical 8 x 8 blocks (001 – 177; 001–354 for 14" label)
cc	=	Register number (01–99)
(data)	=	Hex data to describe the graphic image

Example: See Appendix C

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 graphic, and follows any necessary position or size commands.

Default: None

Command Function

To provide similar functionality to the Custom Graphic command (see Page 1–33), but allows for the graphic image to be stored in battery–backed memory.

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.

Use the Recall command any time you want to print a graphic image on one of your labels along with other printed data.

How to Use

See Appendix C for a detailed example.

Special Notes

- **You must have the optional Extended Memory Card installed to use this command.**
- The memory card must be configured to store Formats/Graphics or Graphics Only. See Mode M of the Printer Configuration in Section 2 of the M–8450 Operator's Manual for configuration details.
- The maximum storage capacity is 64K bytes (8K bytes per block) when the memory card is set for Graphics Only.
- The graphic images currently stored on the memory card can be verified through Mode T of the Printer Configuration.
- A "CARD ERROR" will occur in the following situations:
  - Graphic data stream is incorrect
  - Accessiong a memory card with no card installed
- Each graphic to be stored must be sent in its own data stream.

  Example of **correct** data stream:

```
<ESC>A
<ESC>GIHaaabbb01(DATA)
<ESC>Z

<ESC>A
<ESC>GIHaaabbb02(DATA)
<ESC>Z
```

  Example of **incorrect** data stream:

```
<ESC>A
<ESC>GIHaaabbb01(DATA)
<ESC>GIHaaabbb02(DATA)
<ESC>Z
```

- 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.

Cutter Command

Command Structure

<ESC>**<NUL>aa**

aa = Number of labels to print between each cut (00–99)

Example: <ESC>**<NUL>02**
Placement: Following the Print Quantity command (<ESC>Q)
Default: <ESC><NUL>01 (if cutter enabled)

Command Function

To control the cutting of labels when using the optional SATO cutter unit with the M–8450 printer. This command allows the cutting of a multi–part tag or label at a specified interval within a print job.

How to Use

Input to Printer:

<ESC>A
<ESC>H450<ESC>V150<ESC>WB0123456
<ESC>H450<ESC>V225<ESC>WL1123456
<ESC>Q20
<ESC>**<NUL>02**
<ESC>Z

Printer Output:

This set of commands will print **40** labels (20 x 2) with two labels printing between each cut.

Special Notes

- **You must have the optional M–8402 Cutter to use this command.** Contact your SATO representative for more information.
- To use this command, the printer configuration must have the cutter option enabled. See Mode S of the Printer Configuration in Section 2 of the M–8450 Operator's Manual.
- If the cutter option has been enabled in the printer configuration and the cut value (aa) = 00, the cutter is inactive.
- The <NUL> represents the ASCII 00_H character.
- When using the Cutter command, the total number of labels printed is the product of the cut value and the print quantity. For example, if the cut value is 02, and the print quantity is 20, then 40 labels will be printed.

  This command cannot be used in conjunction with the endless print quantity command <ESC>Q9999 (see Page 1–57).

Dot Expansion

Command Structure

<ESC>**#Da**

a = Dot expansion factor
- 1 = 1X, 300 DPI, 1 dot = 0.0033"
- 2 = 2X, 150 DPI, 1 dot = 0.0067"
- 3 = 3X, 100 DPI, 1 dot = 0.0100"

Example: <ESC>#D1

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

Default: As set in the printer configuration

Command Function

To specify a dot expansion factor through software for a particular label. This allows host control for specific dot resolution requirements on the M–8450 printer.

How to Use

Input to Printer:

<ESC>A
<ESC>**#D1**
<ESC>Z

Printer Output:

No printer output. Printer will now be in 300 DPI mode.

Special Notes

- The horizontal dot size for the <ESC>G command (Custom Graphics) is 0.0033" regardless of the current dot expansion.

Expanded Print Length

Command Structure

<ESC>**AX** Sets the maximum 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 1–71)

Default: <ESC>AR

Command Function

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

How to Use

Input to Printer:

```
<ESC>A
<ESC>AX
<ESC>H450<ESC>V300<ESC>M123456
<ESC>H450<ESC>V2700<ESC>MABCDEF
<ESC>Q1
<ESC>Z
```

Printer Output:

If you are using 10–inch long labels, the above code would print "123456" one inch from the top of the label and "ABCDEF" nine inches from the top of the label.

Special Notes

- The <ESC>AX command works only in the 150 and 100 DPI printer resolutions (dot expansion of 2X or 3X). With 300 DPI dot resolution, a 7–inch label is the longest that can be printed.
- AX is effective until AR is sent to reset the M–8450 to its standard print length, or until the printer is repowered.
- It may be helpful to use an independent data stream to specify the size of the maximum print area:
  - <ESC>A<ESC>**AX**<ESC>Z for 14"L (4272 dots)
  - <ESC>A<ESC>**AR**<ESC>Z for 7"L (2136 dots)

Special Notes (cont'd)

- If you have a long label (longer than 7 inches) that **also contains a graphic**, and you used the <ESC>AX command to lengthen the print area, you will not be able to use the <ESC>AR to reset to the shorter length. To reset the length, you must repower the printer.

  NOTE: If the label does not contain a graphic, the <ESC>AR command will work.

- This command cannot be used in conjunction with the Forms Overlay command (Page 1–73).

Fonts U, S, M, OA & OB

Command Structure

<ESC>**U**

<ESC>**S**

<ESC>**M**

<ESC>**OA**

<ESC>**OB**

Example: See above
Placement: Preceding the data to be printed
Default: <ESC>S

Command Function

To print text images on a label. These are five of the built–in fonts available on the M–8450:

U	5W x 7L dot matrix (5 x 9 includes descenders)
S	8W x 12L dot matrix (8 x 15 includes descenders)
M	13W x 17L dot matrix (13 x 20 includes descenders)
OA	OCR–A font with 22W x 32L dot matrix
OB	OCR–B font with 21W x 30L dot matrix

How to Use

Input to Printer:

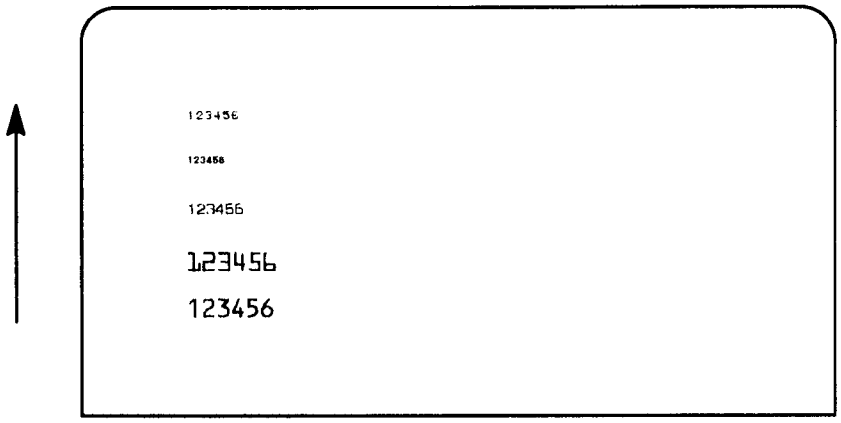
```
<ESC>A
<ESC>H450<ESC>V150<ESC>L0202<ESC>S123456
<ESC>H450<ESC>V225<ESC>L0101<ESC>U123456
<ESC>H450<ESC>V300<ESC>M123456
<ESC>H450<ESC>V375<ESC>OA123456
<ESC>H450<ESC>V450<ESC>OB123456
<ESC>Q1
<ESC>Z
```

(Continued on next page...)

How to Use

(...Continued from previous page)

Printer Output:



Special Notes

- Characters may be enlarged through the use of the Character Expansion command (see Page 1–22).
- Character spacing may be altered through the use of the Character Pitch command (see Page 1–24). The default is 2 dots between characters.
- Once a font type is specified, all subsequent text will print in that style until another font is specified or until the end of the print job.
- You may also create custom characters or fonts. See the Custom–Designed Characters command (Page 1–32).
- The current character table selection may affect your text output. See the Character Tables command (Page 1–26).
- The Line and Box command, if used within the data stream, may return all subsequent text data to the default S font. Therefore, either send, a Font command before all printed data, or send Line and Box commands last, preceding <ESC>Q.

Fonts WB & WL

Command Structure

Font WB: <ESC>**WBa**

Font WL: <ESC>**WLa**

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 (Font S is used if no font command is specified)

Auto–smoothing will function only under the following expansion conditions (using <ESC>L):

Dot Density	Horizontal Expansion	Vertical Expansion
300 DPI (1x)	3 – 12 times	3 – 12 times
150 DPI (2x)	2 – 6 times	3 – 12 times
100 DPI (3x)	1 – 4 times	3 – 12 times

Command Function

To print text images on a label. These are the two auto–smoothing fonts available on the M–8450:

WB 18W x 26L dot matrix (18 x 30 includes descenders)
WL 28W x 44L dot matrix (28 x 52 includes descenders)

How to Use

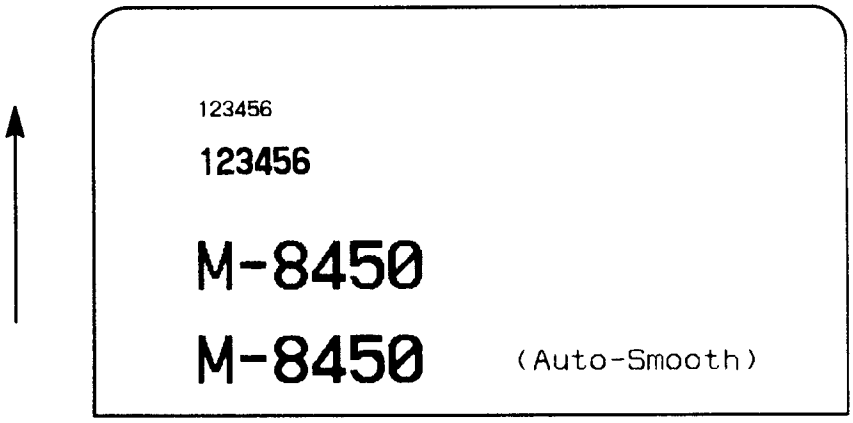
Input to Printer:

```
<ESC>A
<ESC>H450<ESC>V150<ESC>WB0123456
<ESC>H450<ESC>V225<ESC>WL1123456
<ESC>L0303<ESC>H450<ESC>V375<ESC>WB0M-8450
<ESC>L0303<ESC>H450<ESC>V525<ESC>WB1M-8450
<ESC>L0202<ESC>H950<ESC>V525<ESC>M(Auto-Smooth)
<ESC>Q1
<ESC>Z
```

How to Use

(...Continued from previous page)

Printer Output:



Special Notes

- Characters may be enlarged through the use of the Character Expansion command (see Page 1–22), but only up to a multiple of 12 in either direction.
- Character spacing may be altered through the use of the Character Pitch command (see Page 1–24).
- Once WB or WL is specified, all subsequent text will print as that type until another font is specified or until the end of the print job.
- The current character table selection may affect your text output. See the Character Tables command (Page 1–26).
- The Line and Box command, if used within the data stream, may return all subsequent text data to the default S font. Therefore, either send, a Font command before all printed data, or send Line and Box commands last, preceding <ESC>Q.

Form Feed

Command Structure

<ESC>**A (space)** <ESC>**Z**

Example: See above
Placement: Separate data stream sent to printer
Default: None

Command Function

To print a blank tag or label, which is the equivalent of a "form feed".

How to Use

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

Printer Output:
Blank label or tag.

Special Notes

- The hex value for the (space) shown above is 20_H.

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 using a minimum amount of commands. This command automatically establishes a character pitch of 2 dots. The selected font, character expansion, and line pitch are based on the dot expansion as follows:

Dot Density	Font	Character Exp	Line Pitch	Base Ref. Horz	Vert
300 DPI (1X)	S	3 x 3	24 dots	96	2
150 DPI (2X)	M	1 x 1	12 dots	48	2
100 DPI (3X)	S	1 x 1	8 dots	32	2

How to Use

Input to Printer:

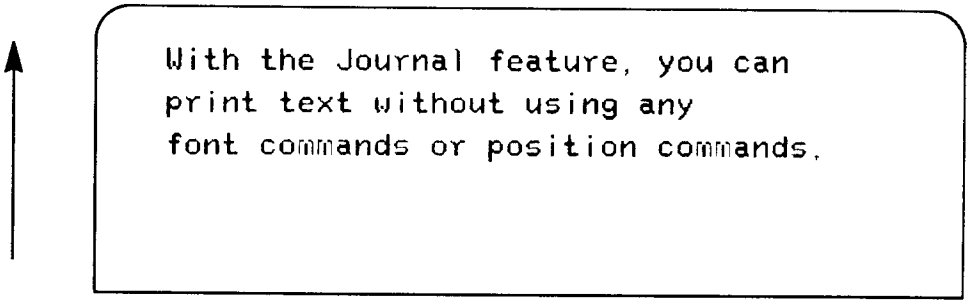
<ESC>A
<ESC>**J**
<CR>
(10 spaces) With the Journal feature, you can <CR>
(10 spaces) print text without using any <CR>
(10 spaces) font commands or position commands. <CR>
<ESC>Q1
<ESC>Z

(Continued on next page...)

How to Use

(...Continued from previous page)

Printer Output:



Special Notes

- Journal mode assumes a minimum label width of 5.0 inches. Otherwise, you may print where there is no label and damage your print head. **Note that the above example is shown on a 5–inch wide label.**
- It is effective only for the current print job.

Lines and Boxes

Command Structure

Horizontal line: <ESC>**FWaaHb**

Vertical Line: <ESC>**FWccVd**

Box: <ESC>**FWaaccHbVd**

aa = Width of horizontal line in dots (01–99)
b = Length of horizontal line in dots (1–*)
cc = Width of vertical line in dots (01–99)
d = Length of vertical line in dots (1–*)

* The maximum value for length of horizontal and vertical lines are based on the dot density as follows:

Dot Density	Max. Length of Horizontal / Vertical Lines
300 DPI (1X)	2136 dots
150 DPI (2X)	1068 dots (2136 with Expanded Print Length)
100 DPI (3X)	712 dots (1424 with Expanded Print Length)

Example: <ESC>**FW02H200**
Placement: Following the necessary positioning commands
Default: None

Command Function

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

How to Use

Input to Printer:

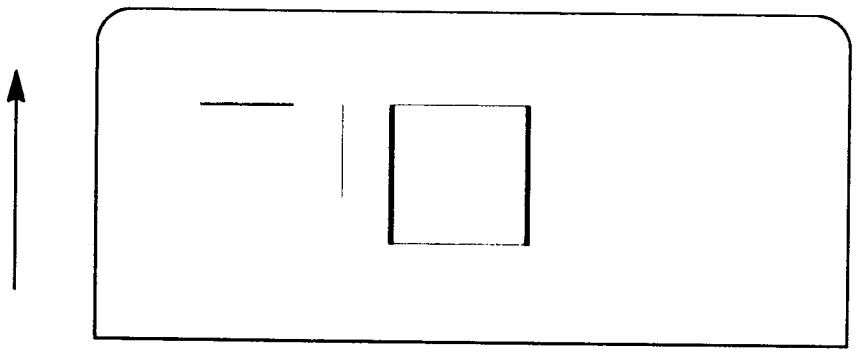
<ESC>A
<ESC>H450<ESC>V150<ESC>**FW06H150**
<ESC>H675<ESC>V150<ESC>**FW03V150**
<ESC>H750<ESC>V150<ESC>**FW0409H225V225**
<ESC>Q1
<ESC>Z

(Continued on next page...)

How to Use

(...Continued from previous page)

Printer Output:



Special Notes

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

Line Feed

Command Structure

<ESC>**Ea**

a = Number of dots (1–999) between the bottom of the characters on one line to the top of the characters on the next line

Example: <ESC>**E5**
Placement: Preceding the text that will use the line feed function
Default: None

Command Function

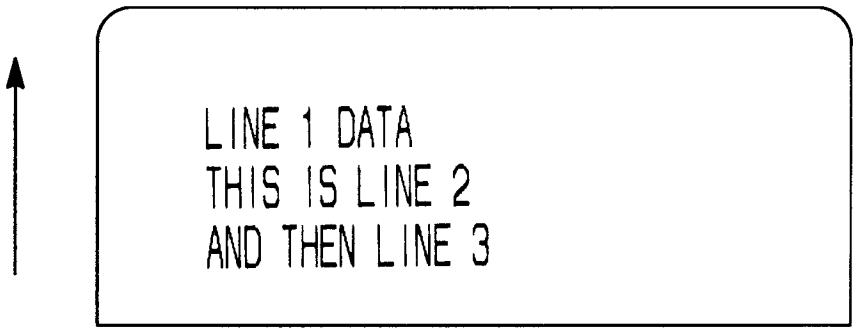
To print multiple lines of the same character size without specifying a new print position for each line. With the Line Feed command, specify the number of dots you want between each line. Then, send an ASCII <CR> at the end of each line of text. The printer automatically identifies the size of the last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

How to Use

Input to Printer:

```
<ESC>A
<ESC>E15
<ESC>H450<ESC>V150<ESC>L0204<ESC>MLINE 1 DATA<CR>
THIS IS LINE 2<CR>
AND THEN LINE 3
<ESC>Q1
<ESC>Z
```

Printer Output:



Special Notes

- This command can be used for text and for bar codes.
- It is effective only for the current data stream.
- 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 <ESC>Q.

Off–Line

Command Structure

<ESC>@

Example: See above
Placement: Anywhere in the print job between <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.

How to Use

Input to Printer:

<ESC>A
<ESC>@
<ESC>Z

Printer Output:

No printer output. The printer goes off–line.

Special Notes

- 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 the M–8450 Operator's Manual).
- Remember when using this command that if the print job specifies <ESC>Q10, all ten labels will print before the printer will go off–line.
- If using Non–Standard Proto Codes (Mode I), the off–line command will change to <ESC>] (5D).

Print Darkness

Command Structure

<ESC>**#Ea**

a = Print darkness value (1–5)

Example: <ESC>**#E2**

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

Default: As set in the printer configuration

Command Function

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

How to Use

Input to Printer:

<ESC>A
<ESC>**#E4**
<ESC>Z

Printer Output:

No printer output.

Special Notes

- This becomes the new setting in the printer configuration for all subsequent print jobs, unless changed.

Print Position

Command Structure

Horizontal Position: <ESC>**Ha**

Vertical Position: <ESC>**Vb**

a = Number of dots horizontally from the base reference point (1 – max*)

b = Number of dots vertically from the base reference point (1 – max*)

* The maximum value for horizontal and vertical print positions are based on the dot density as follows:

Dot Density	Maximum Horizontal	Maximum Vertical
300 DPI (1x)	1536 dots	2136 dots
150 DPI (2x)	768 dots	1068 dots [1]
100 DPI (3x)	512 dots	712 dots [2]

1 Maximum vertical offset is 2136 with Expanded Print Length
2 Maximum vertical offset is 1424 with Expanded Print Length

Example: <ESC>**H20** <ESC>**V150**

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

Default: <ESC>H1
<ESC>V1

Command Function

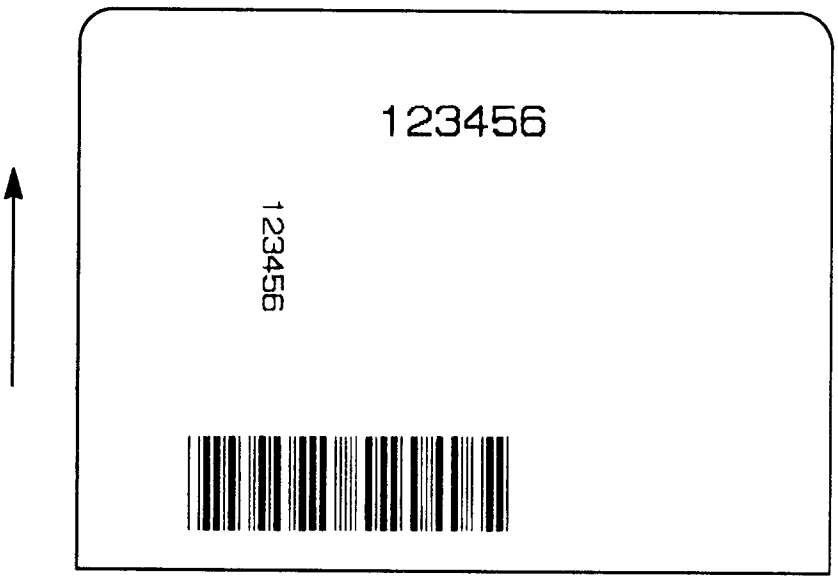
The Horizontal and Vertical commands specify the top left corner of a field on a label, using the current base reference point as an origin. They also establish a reference point for subsequent fields until the next horizontal and/or vertical print position command is issued.

How to Use

Input to Printer:

```
<ESC>A
<ESC>H750<ESC>V150<ESC>L0303<ESC>M123456
<ESC>H450<ESC>V675<ESC>B104150*123456*
<ESC>%3<ESC>H600<ESC>V300<ESC>L0202<ESC>M123456
<ESC>Q1
<ESC>Z
```

Printer Output:



Special Notes

- The print position of a field is affected by both the <ESC>R and <ESC>A3 commands.
- If any part of an image is placed past the maximum vertical position, that part of the image will be lost.
- If any part of an image is placed past the maximum horizontal position, that part of the image will wrap around.
- **If you attempt to print where there is no paper, you will damage the print head.**

Print Quantity

Command Structure

<ESC>**Qa**

a = Total number of labels to print (1–9999)

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. This command must be present in every print job.

Command Function

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

How to Use

Input to Printer:

<ESC>A
<ESC>H450<ESC>V300<ESC>MSATO
<ESC>**Q50**
<ESC>Z

Printer Output:
50 labels with the SATO name.

Special Notes

- To pause during a print job, you must press the LINE key on the Operator Panel.
- A print job may be cancelled in one of the following ways:
  - Turn off the printer
  - Send the <CAN> code if using Bi–Directional RS232 mode
  - Send the <ESC>* command if using the Multi Buffer mode
- When used with Sequential Numbering (see Page 1–69), the Print Quantity value should be equal to the total number of labels to be printed.
- If a print quantity of 9999 is sent to the printer, the printer will go into an "endless print mode".

Print Speed Selection

Command Structure

<ESC>**CSa**

a = Designates the speed selection

1	=	4 in/sec (100 mm/sec)
2	=	5 in/sec (125 mm/sec)
3	=	6 in/sec (150 mm/sec)
4	=	7 in/sec (175 mm/sec)
5	=	8 in/sec (200 mm/sec)*
6	=	9 in/sec (225 mm/sec)*
7	=	10 in/sec (250 mm/sec)*

Example: <ESC>**CS1**

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

Default: As set in the printer configuration

*For use in 150 DPI mode (2X dot expansion) and 100 DPI mode (3X dot expansion) only.

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.

How to Use

Input to Printer:

<ESC>A
<ESC>**CS4**
<ESC>Z

Printer Output:

No printer output.

Special Notes

- At 300 DPI, the maximum speed allowed is 7 inches per second.
- When using this command, the print speed will remain as specified while the printer remains powered on.

Recall Form Overlay

Command Structure

<ESC>/

Example: See above
Placement: Must be preceded by all other data and placed just before the Print Quantity command (<ESC>Q)
Default: None

Command Function

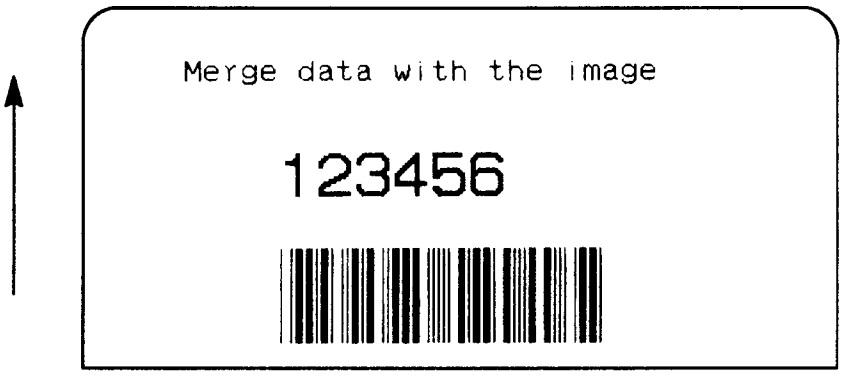
To recall the label image from the form overlay memory for printing. With the Recall command, you may also print other images on the same label.

How to Use

Input to Printer:

```
<ESC>A
<ESC>H450<ESC>V75<ESC>L0202<ESC>MMerge data with the image
<ESC>/
<ESC>Q1
<ESC>Z
```

Printer Output:



Special Notes

- The overlay is stored using the Store Form Overlay command (see Page 1–73).

Recall Format

Command Structure

Specify Format Recall: <ESC>**YR,aa**

Specify Variable Data: <ESC>**/D,bb,(data)**

aa	=	Format number 01 – 07 Format and Graphic Mapping 01 – 15 Format Only Mapping
bb	=	Field Number (01–99)
(data)	=	Variable data for specified field

Example: <ESC>**YR,01**
<ESC>**/D,01,ABCDEFGH**

Placement: <ESC>YR command must follow <ESC>A and precede all variable data assignments

Default: None

Command Function

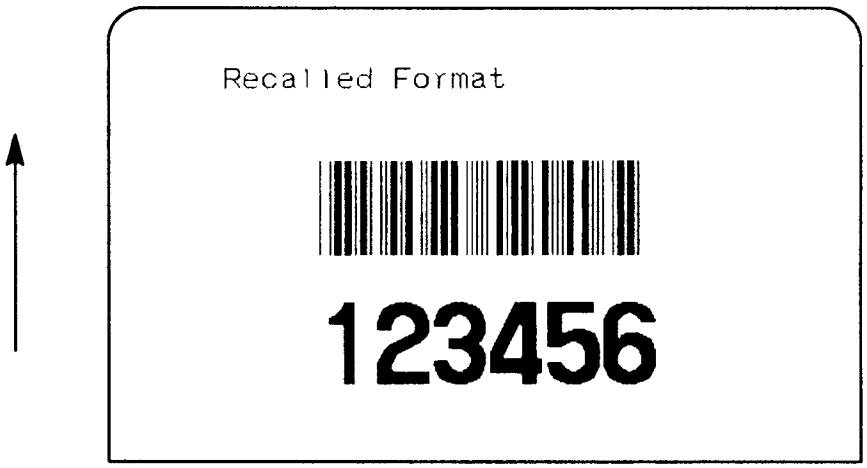
To recall a label format, which is stored on the optional extended memory card, and specify variable data for each of the designated fields of the format. This command is used to send a minimal amount of data for applications where the format(s) may be standard, but the information changes. Refer to the Store Format command (see Page 1–74) for information on storing label formats with specified field parameters.

How to Use

Input to Printer:

<ESC>A
<ESC>**YR,01**
<ESC>**/D,01,**Recalled Format
<ESC>**/D,02,***123456*
<ESC>**/D,03,**123456
<ESC>Q1
<ESC>Z

Printer Output:



Special Notes

- **You must have the optional Extended Memory Card installed to use this command.**
- Use the Store Format command (see Page 1–74) to store the label format and specify field parameters.
- Only one Recall Format command may be specified within a print job.
- If the length of the variable data is less than the length specified for that field in the stored format, the variable data will print as sent.
- If the length of the variable data is greater than the length specified for that field in the stored format, the variable data will be truncated to the specified length.
- A "CARD ERROR" will occur in the following situations:
  - Accessing a memory card without a card installed
  - Recalling a format with an incorrect format number
  - Recalling a format number that has not been stored
- When recalling a format, no commands other than <ESC>YR, <ESC>D, and <ESC>Q can be used.

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 a duplicate of the last label printed.

How to Use

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

Printer Output:
A duplicate of the previous label.

Special Notes

- This command will have no effect if the M–8450 was repowered since printing the previous label.

Reverse Image

Command Structure

<ESC>**(a,b**

a = Horizontal length in dots of reverse image area (8–999)
b = Vertical length in dots of reverse image area (8–999)

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

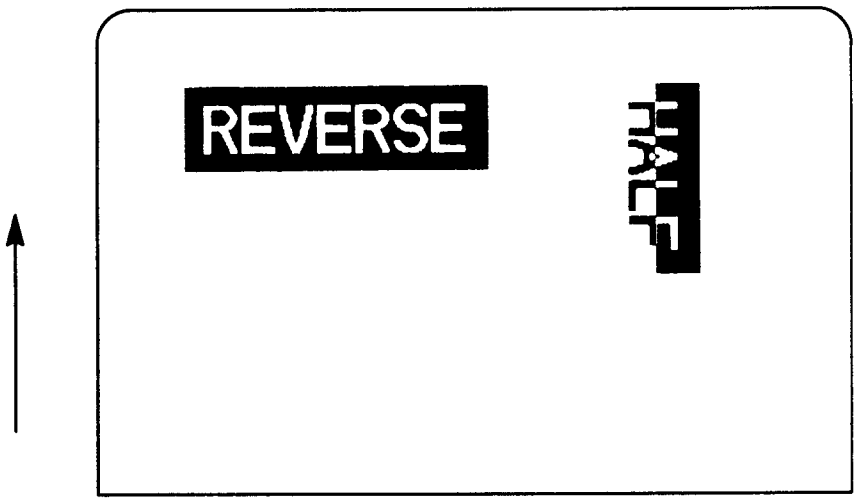
To reverse an image area from black to white and vice versa. Use the Print Position commands (<ESC>H and <ESC>V) to locate the top left corner of the reverse image area.

How to Use

Input to Printer:

```
<ESC>A
<ESC>H450<ESC>V150<ESC>L0303<ESC>WB1REVERSE
<ESC>%3<ESC>H1200<ESC>V150<ESC>L0303<ESC>WB1HALF
<ESC>H420<ESC>V120<ESC>(480,135
<ESC>H1165<ESC>V120<ESC>(70,300
<ESC>Q1
<ESC>Z
```

Printer Output:



Special Notes

- A reverse image area is not affected by either of the rotation commands. Therefore, always assume the printer is in the normal print orientation when designing and sending the Reverse Image command.
- If using reverse images with the form overlay, place this command before the Form Overlay command in the data stream.

Rotation – Fixed Base Reference Point

Command Structure

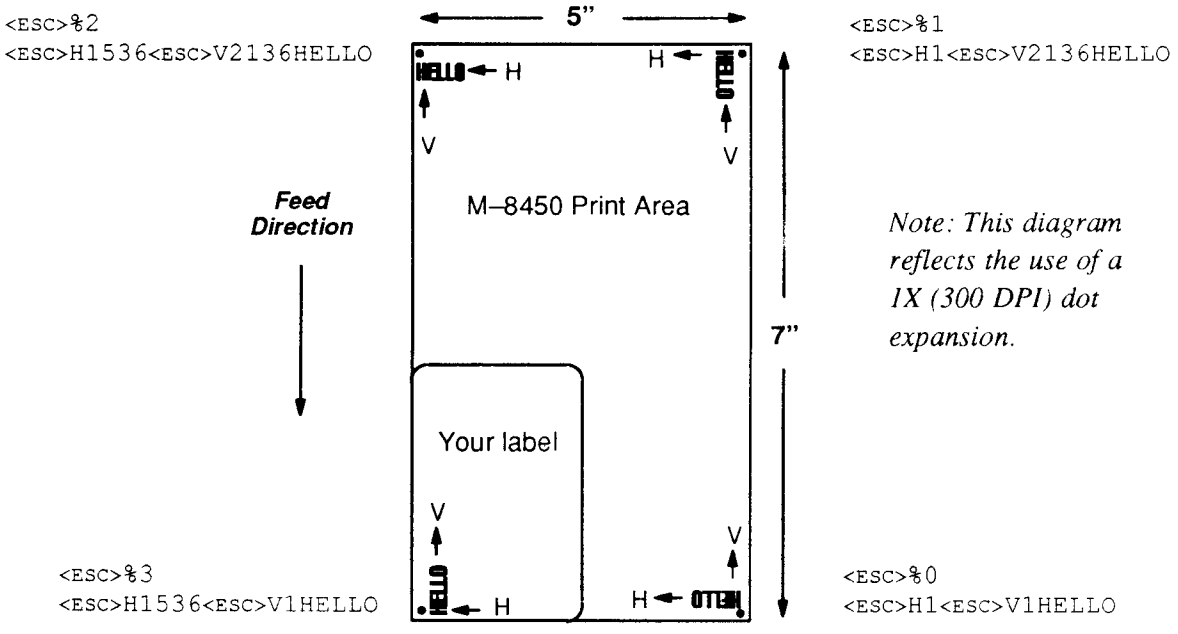
<ESC>%a

a = 0 Sets print to normal direction
1 Sets print to 90° counterclockwise
2 Sets print to 180° rotated (upside down)
3 Sets print to 270° counterclockwise (90° clockwise)

Example: <EXC>%3
Placement: Preceding any printed data to be rotated
Default: None

Command Function

To rotate the print direction in 90 degree increments without changing the location of the base reference point. The diagram below illustrates the use of the <ESC>% command. Note that the entire M–8450 print area is shown, but your label may not be as large as the entire area.

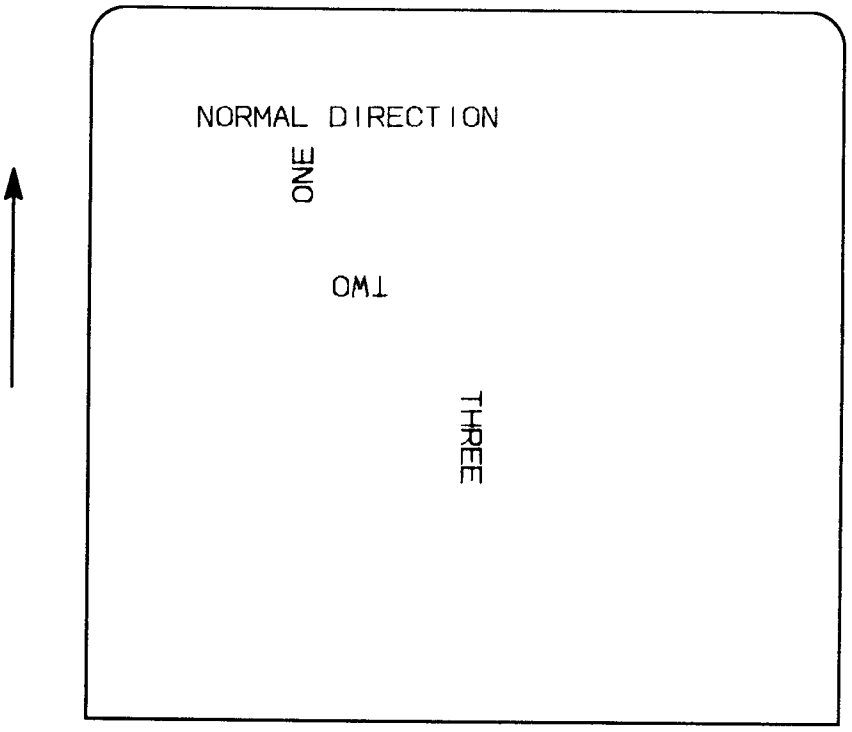


How to Use

Input to Printer:

```
<ESC>A
<ESC>L0202
<ESC>%0<ESC>H450<ESC>V150<ESC>MNORMAL DIRECTION
<ESC>%1<ESC>H600<ESC>V300<ESC>MONE
<ESC>%2<ESC>H750<ESC>V450<ESC>MTWO
<ESC>%3<ESC>H900<ESC>V600<ESC>MTHREE
<ESC>Q1
<ESC>Z
```

Printer Output:



Special Notes

- Do not combine the <ESC>% command and the <ESC>R command (see Page 1–67) in the same data stream.
- A custom graphic is not affected by the <ESC>% command. Therefore, always design and locate your graphic image to print in the appropriate orientation.

Rotation – Moving Base Reference Point

Command Structure

Normal Direction: <ESC>**N**

Rotated Direction: <ESC>**R**

Example: See above
Placement: Preceding any printed data to be rotated
Default: <ESC>N

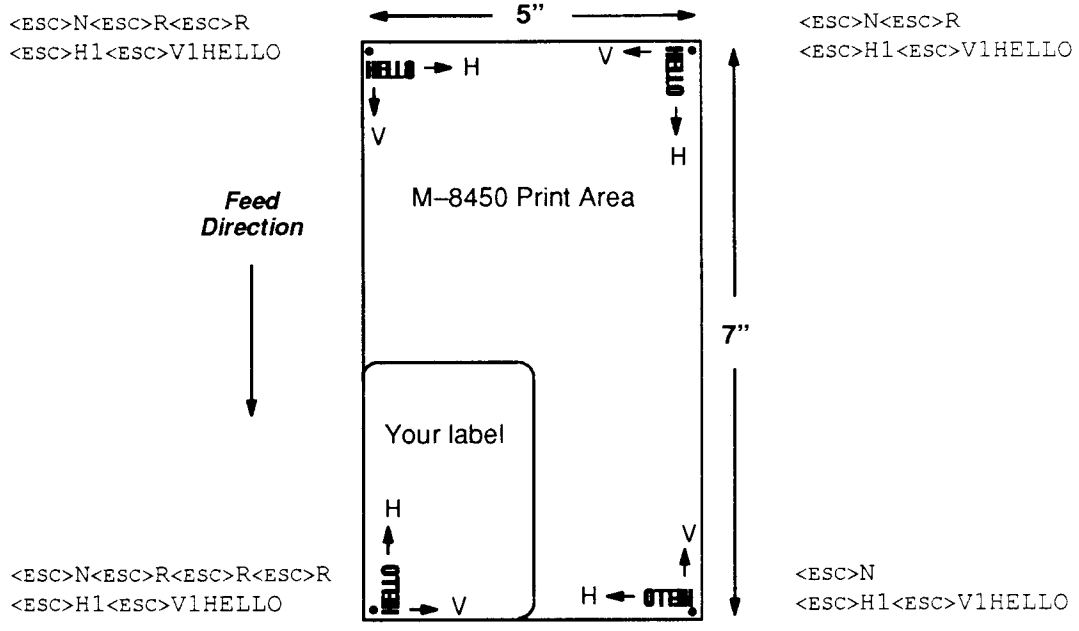
Command Function

The <ESC>R command rotates the printing of all subsequent images in a print job by 90 degrees counterclockwise each time it is used. It also moves the base reference point to a different corner of the M–8450 print area.

The <ESC>N command returns to the original base reference point and returns printing to the normal orientation.

<ESC>N	Normal Direction
<ESC>N<ESC>R	90° CC Rotation
<ESC>N<ESC>R<ESC>R	180° Rotation (Upside Down)
<ESC>N<ESC>R<ESC>R<ESC>R	270° CC Rotation (90° C)

The diagram below illustrates the use of the <ESC>R command. Note that the entire M–8450 print area is shown, but your label may not be as large as the entire print area.

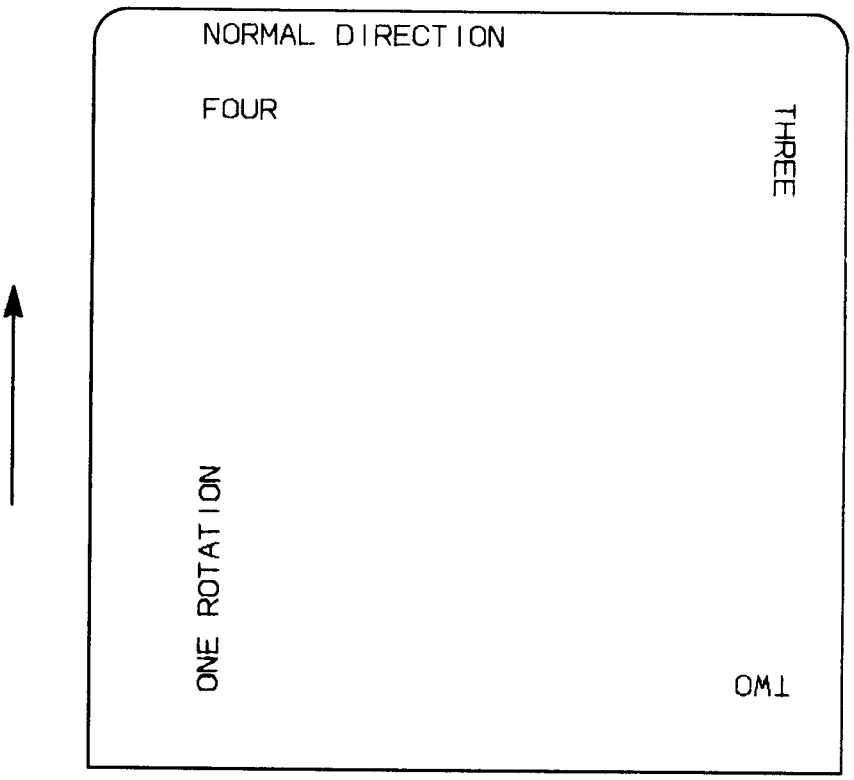


How to Use

Input to Printer:

```
<ESC>A
<ESC>N<ESC>H450<ESC>V30<ESC>MNORMAL ORIENTATION
<ESC>R<ESC>H1050<ESC>V450<ESC>MONE ROTATION
<ESC>R<ESC>H150<ESC>V1050<ESC>MTWO
<ESC>R<ESC>H150<ESC>V150<ESC>MTHREE
<ESC>R<ESC>H450<ESC>V150<ESC>MFOUR
<ESC>Q1
<ESC>Z
```

Printer Output:



Special Notes

- Do not combine the <ESC>R command and the <ESC>% command (see Page 1–65) in the same data stream.
- A custom graphic is not affected by the <ESC>R command. Therefore, always design and locate your graphic image to print in the appropriate orientation.

Sequential Numbering

Command Structure

<ESC>**Faaabccc**

aaa = Number to repeat the same data (001–999)
b = Plus or minus symbol (+ for increments; – for decrements)
ccc = Value of step for sequence (001–999)

Example: <ESC>**F002–005**
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 8–digit numeric data within each field.

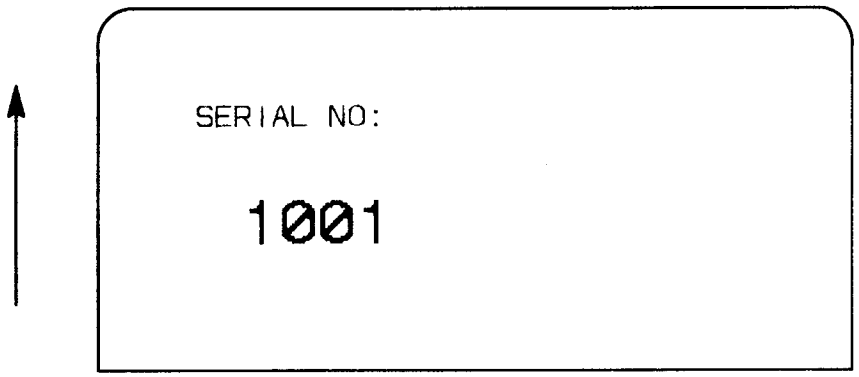
How to Use

Input to Printer:

```
<ESC>A
<ESC>H450<ESC>V150<ESC>L0202<ESC>MSERIAL NO:
<ESC>H525<ESC>V300<ESC>L0404<ESC>F001+002<ESC>M1001
<ESC>Q2
<ESC>Z
```

How to Use

Printer Output:

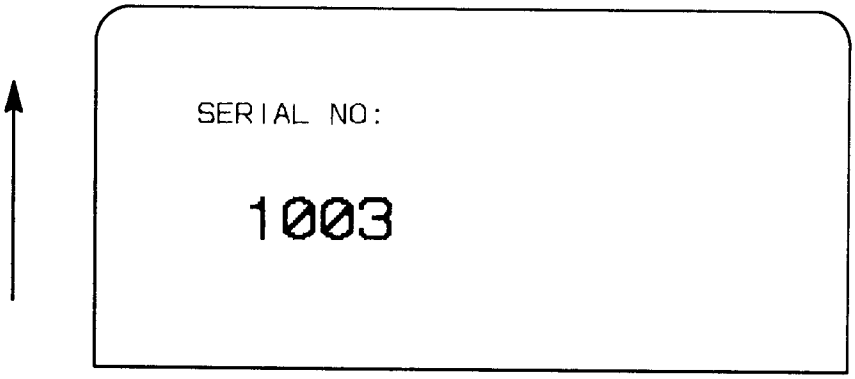


(Continued on the next page...)

How to Use

Printer Output:

(...Continued from previous page)



Special Notes

- The value specified for Print Quantity (see Page 1–57) 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>H450<ESC>V150<ESC>**F002+001**<ESC>M1001
  <ESC>Q50
  <ESC>Z

- It is necessary to specify the print position for each sequential field on a label.
- Copy Image command is not effective.
- Character Expansion command (<ESC>L) must precede this command.
- Reverse Image command (<ESC>(a,b) is not effective.
- Line Feed command (<ESC>E) is not effective.

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

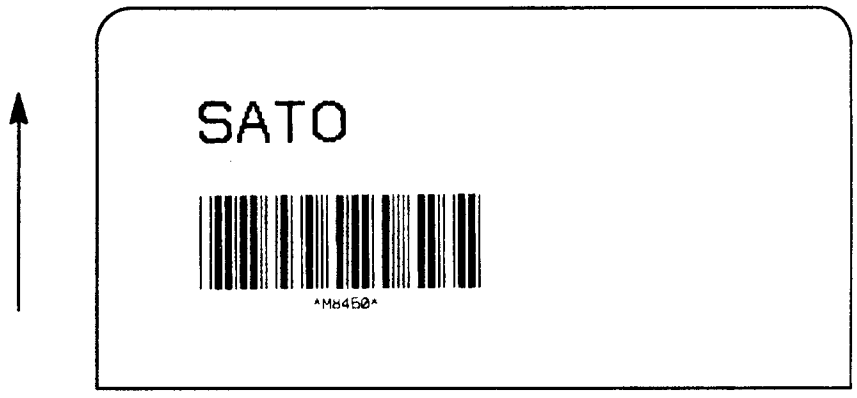
For all print jobs, the Start command must precede the data, and the Stop command must follow. The print job will not run if these are not in place.

How to Use

Input to Printer:

```
<ESC>A
<ESC>H450<ESC>V150<ESC>L0404<ESC>MSATO
<ESC>H450<ESC>V300<ESC>B104150*M8450*
<ESC>H630<ESC>V465<ESC>L0101<ESC>M*M8450*
<ESC>Q1
<ESC>Z
```

Printer Output:



Special Notes

- When using the RS232 Serial interface or the 10–job buffer with the Centronics Parallel interface, **<STX>** and **<ETX>** must frame the entire print job (see Section 2 – Interface Specifications).
- When using the 10–job buffer option, <ESC>A will only be used once, while <ESC>Z will end each of the 10 jobs (see Section 2 – Interface Specifications).

Store Form Overlay

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 specified label image in the volatile form overlay memory. Only one label image may be stored in this memory area at a time. Form overlays are not compiled when they are called to be printed. Therefore, labels may print somewhat faster than if you are using the Print Job method.

How to Use

Input to Printer:

```
<ESC>A
<ESC>H600<ESC>V225<ESC>L0404<ESC>M123456
<ESC>H600<ESC>V375<ESC>B104150*123456*
<ESC>&
<ESC>Z
```

Printer Output:

No output from this command. Above images will be stored in the form overlay image area. See the Recall Form Overlay command example (Page 1–59) to see the resulting printed output.

Special Notes

- Remember that this storage is volatile. Therefore, if the printer loses power, the overlay must be sent again.
- The overlay is recalled using the Recall Form Overlay command (see Page 1–59).
- This form overlay memory must be cleared before trying to store another form. Use the <ESC>*& command (see Page 1–28).
- To store multiple print jobs in battery–backed memory, use the Store/Recall Format commands (see Pages 1–74 and 1–60).
- This command cannot be used in conjunction with the Expanded Print Length command (Page 1–40).

Store Format

Command Structure

Specify Format Storage: <ESC>**YS,aa**

Specify Field Parameters: <ESC>**/N,bb,cc**

aa = Format number
- 01 – 07 Format and Graphic Mapping
- 01 – 15 Format Only Mapping

bb = Field Number (01–99)

cc = Field Length (01–99)

Example: <ESC>**YS,01**
<ESC>**/N,01,08**

Placement: <ESC>YS command must follow <ESC>A and precedes all field designations

Default: None

Command Function

To store a label format into the optional extended memory card of the M–8450 printer. Based on the memory card mapping, up to 15 formats may be stored at a time, with each format having an 8K byte data limitation. Up to 99 fields may be specified per label format. The memory card will not lose data even with printer power loss because of a separate battery backup provision.

How to Use

Input to Printer:

<ESC>A
<ESC>**YS,01**
<ESC>**/N,01,15**<ESC>%0<ESC>H450<ESC>V75<ESC>L0202<ESC>M
<ESC>**/N,02,08**<ESC>%0<ESC>H600<ESC>V225<ESC>B104150
<ESC>**/N,03,06**<ESC>%0<ESC>H600<ESC>V450<ESC>L0303<ESC>WL1
<ESC>Z

Printer Output:

No output will result unless the command was incorrectly specified. If correct, the format number and field parameters will be stored on the extended memory card. Use the Recall Format command (see Page 1–60) to recall and print the stored format.

Special Notes

- **You must have the optional Extended Memory Card installed to use this command.**
- Use the Recall Format command (see Page 1–60) to recall the label format and merge variable data for printing.
- Only one Store Format command may be specified within a print job.
- Formats will automatically overwrite existing stored formats if the same format number is specified.
- Each field parameter must designate print position (<ESC>V, H), character expansion (<ESC>L), character pitch (<ESC>P), font type (<ESC>U, S, M, WB, WL), and fixed base rotation (<ESC>%).
- If the field parameter command is incorrect, the field will not be part of the stored label format.
- Invalid commands when specifying format storage include:

<ESC>#G	User Default Data Stream Download
<ESC>AR	Expanded Print Length – 7"
<ESC>AX	Expanded Print Length – 14"
<ESC>CS	Print Speed Selection
<ESC>E	Line Feed
<ESC>GI	Store Custom Graphics
<ESC>GR	Recall Custom Graphics
<ESC>J	Journal Print
<ESC>N	Normal Rotation – Moving Base
<ESC>Q	Print Quantity
<ESC>R	Rotation – Moving Base
<ESC>WA	Character Tables
<ESC>WP	Calendar Increment
<ESC>WT	Calendar Set
<ESC>YR	Recall Format
<ESC>#E	Print Darkness
<ESC>&	Store Form Overlay
<ESC>/	Recall Form Overlay
<ESC>/D	Variable Data for Format Recall
<ESC>*	Clear Receiving / Compiling Buffer
<ESC>@	Off–line
<ESC><NUL>	Cutter Command
<ESC>#D	Dot Expansion
<ESC>C	Repeat Label
<ESC>T	Store Custom Design Character
<ESC>GH	Custom Graphics
<ESC>F	Sequential Numbering

Special Notes (cont'd)

- A "CARD ERROR" will occur with the following situations:
  - Accessing a memory card without a card installed
  - Storing a format with an incorrect format number

Vector Font

Command Structure

Specify Vector Font: <ESC>**$a,b,c,d**

Data for Vector Font: <ESC>**$=(data)**

a = A Helvetica Bold (proportional spacing)
B Helvetica Bold (fixed spacing)
b = Font width (see range below)
c = Font height (see range below)
d = Font style (see below)

Font Style (d)	Min. Font Width & Height	Max. Font Width & Height		
		100 DPI	150 DPI	300 DPI
0 Standard	24	285	350	490
1 Standard open (outlined)	24	285	350	490
2 Gray (mesh) pattern 1	24	285	350	490
3 Gray (mesh) pattern 2	24	285	350	490
4 Gray (mesh) pattern 3	24	285	350	490
5 Standard open, lt. shadow	32	285	350	490
6 Standard open, dk. shadow	68	285	350	490
7 Standard mirror image	24	285	350	490
8 Italic	24	285	350	490
9 Italic open (outlined)	68	285	350	490

Example: <ESC>**$A,100,200,0**<ESC>**$=123456**
Placement: Immediately preceding data to be printed
Default: None (Font S is used if no font command is specified)

Command Function

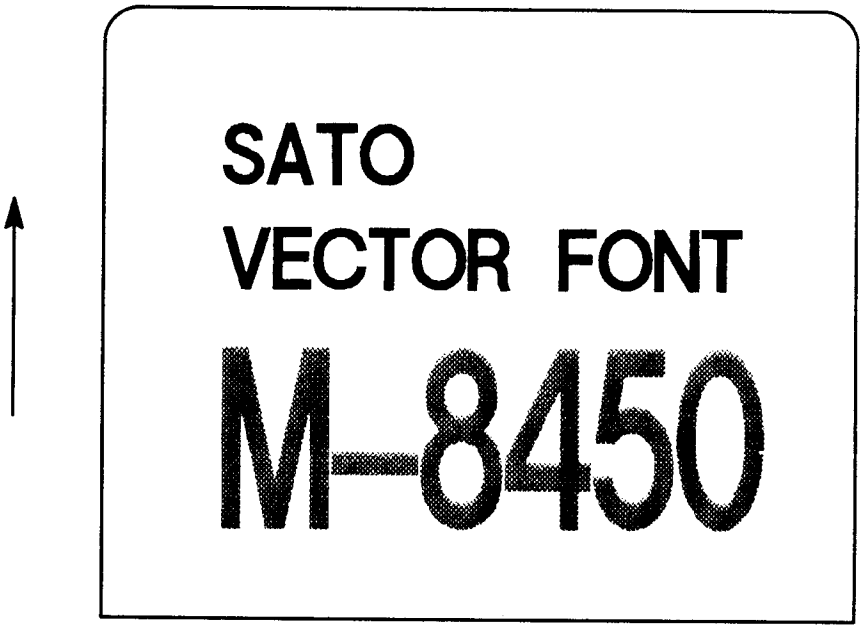
To specify printing of the unique SATO vector font. The vector font allows large characters to be printed with smooth, round edges. Each character is made of a number of vectors (or lines), and will require slightly more printer compiling time.

How to Use

Input to Printer:

```
<ESC>A
<ESC>H450<ESC>V150<ESC>$A,150,150,0<ESC>$=SATO
<ESC>H450<ESC>V315<ESC>$=VECTOR FONT
<ESC>H450<ESC>V450<ESC>$A,300,450,2<ESC>$=M-8450
<ESC>Q1
<ESC>Z
```

Printer Output:



Special Notes

- If the vector font width or height is outside the proper range, vector data will print at 100 dots by 100 dots.
- Once the vector font is specified, all subsequent text will print as that type until another font is specified or until the end of the print job.

SECTION 2
INTERFACE SPECIFICATIONS

INTRODUCTION

This section presents the interface specifications for the M–8450. These specifications include detailed information on how to properly interface your printer with your host system.

The following information is presented in this section:

- M–8450 Interface Types
- Using the Receive Buffer
- RS232C Serial Interface
  - General Specifications
  - Electrical Specifications
  - Pin Assignments
  - Ready/Busy Protocol
  - X–ON/X–OFF Protocol
  - Bi–Directional Communication Protocol
  - Loop Back Test
- Centronics Parallel Interface
- Accessory (EXT) Connector

M–8450 INTERFACE TYPES

In order to provide flexibility in communicating with a variety of host computer systems, the M–8450 comes 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 M–8450 for either of these interface types, see the Printer Configuration in Section 2 of the M–8450 Operator's Manual.

USING THE RECEIVE BUFFER

The M–8450 has the ability to receive a data stream from the host in one of three ways. The receive buffer may be configured to accept one (1) print job at a time, up to ten (10) print jobs at a time, or in a multi–buffer mode. See Mode I of the Printer Configuration in Section 2 of the M–8450 Operator's Manual for instructions on how to set the receive buffer size.

1 Job Buffer

The printer receives and prints one job at a time. Each job must not exceed 8K bytes (not including graphic data).

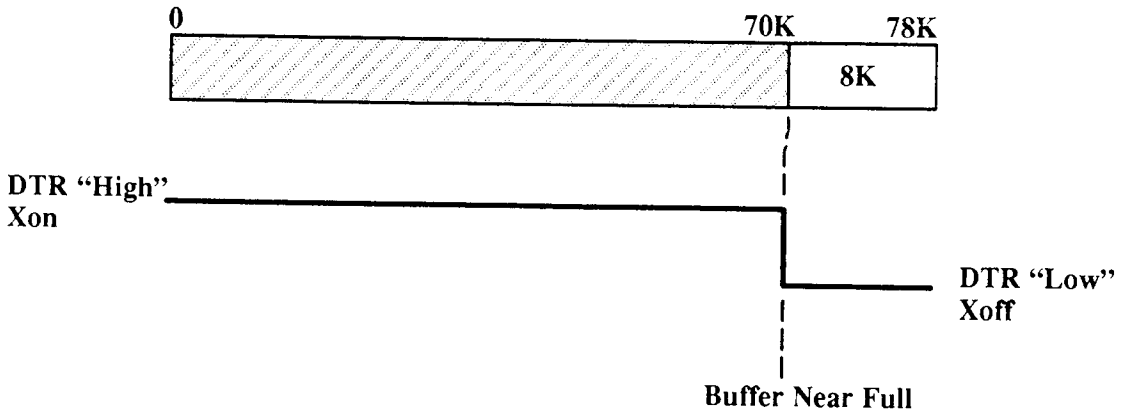
10 Job Buffer

The printer receives up to 10 jobs at a time and starts printing after the receipt of the last job. Each job must not exceed 8K bytes (graphic data cannot be used when using a 10 job buffer).

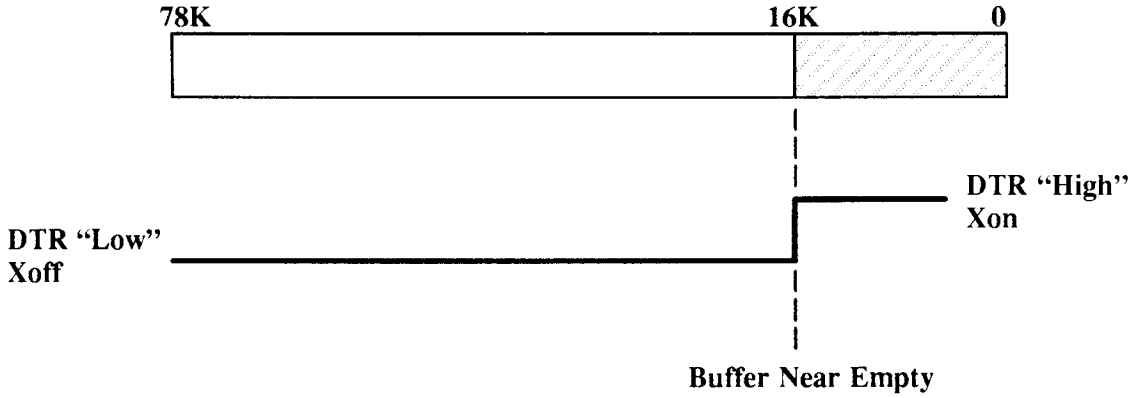
Multi Job Buffer

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 printer. The Multi Buffer is 78K bytes and can only be used with either the RS232 Serial Interface or the Centronics Parallel Port.

When using the RS232 Serial Interface, the Multi Buffer uses either Ready/Busy protocol with DTR (pin 20) for flow control or Xon/Xoff protocol for flow control. See these sections for more details. With an empty receiving buffer, the status of DTR is "High" (or an Xon status is present if using Xon/Xoff), meaning the printer is ready to receive data. When the receive buffer is holding 78K bytes of data (8K bytes from being full), DTR will go "low" (or an Xoff is sent) indicating the printer can no longer receive data. This condition is called "Buffer Near Full" (see figure below). If the receive buffer is holding 70K bytes of data, yet is still receiving data, the printer will not go busy (DTR "Low" or Xoff) until the current print job has been received.



The receiving buffer will not be able to receive more data again until a "Buffer Near Empty" condition occurs. This takes place when the receiving buffer has emptied so that only 16K bytes of data are now being held (62K bytes from being full). At this time, DTR will go "High" or an Xon 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 Xoff) until the problem is corrected and the printer is set on–line. The printer will also be busy if taken off–line from the front panel.

The Clear Receiving Buffer and Compiling Buffer command (<ESC>*) may be used to clear all print jobs that are currently in the receive buffer. After this command is sent, **the host must wait 1 full second before sending new data or the new data may be lost.**

RS232C SERIAL INTERFACE

RS232C General Specifications

Asynchronous ASCII Half–duplex communication.

Protocol

Ready/Busy (Pin 20, DTR Hardware Flow Control, Pin 4, RTS Error Condition)
X–ON/X–OFF (Software Flow Control)
Bi–Directional Communication (ENQ/Response)

Data Transmission Rate 300 – 19,200 bps

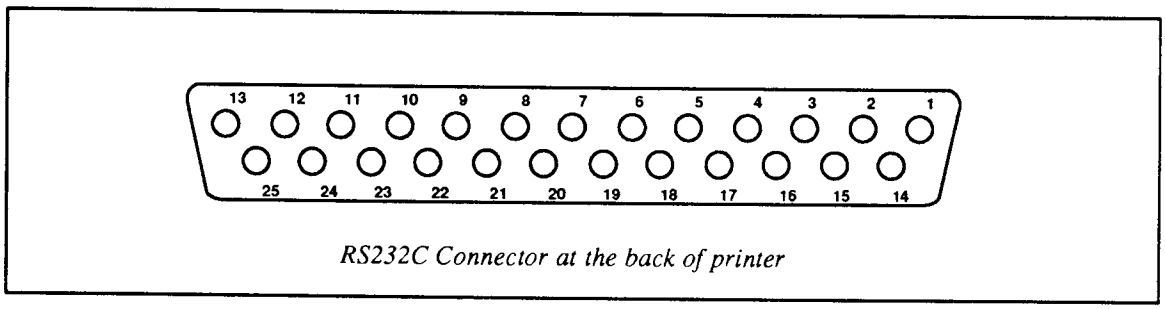
Character Breakdown
- 1 start bit (Fixed)
- 7 or 8 data bits (Selectable)
- Odd, Even, No Parity (Selectable)
- 1 or 2 Stop Bits (Selectable)

RS232C Electrical Specifications

Connector on Printer DB–25S (Female)

Cable Required DB–25P (Male, Printer End, 50' Max Length). For cable configuration, refer to *Cable Requirements* appropriate to the RS232C protocol chosen.

RS232C Pin Assignments



RS232C Connector at the back of printer

Grounds:

Pin #1 **FG (Frame Ground)**

Pin #7 **SG (Signal Ground)**

Input Signals:

Pin #3 **RD (Receive Data)** Data to the printer from the host computer

Pin #5 **CTS (Clear to Send)** When this line is high, the printer assumes that data is ready to be transmitted. The printer will not receive the data when this line is low. If you are not using this line as specified, tie it high (to Pin # 4).

Pin #6

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. Do not leave this line free (open). If you are not using this line as specified, tie it to Pin #20.

Output Signals:

Pin #2

TD (Transmit Data) Data from the printer to the host computer. Sends X–ON/X–OFF characters or status data (Bi–Directional Protocol).

Pin #4

RTS (Request to Send) There are two possible ways to use the RTS signal, both of which apply to the Ready/Busy protocol. Refer to Section 2 of the Operator's Manual (Mode I) to set RTS to do one of the following:

1. ***PCI RS On*** RTS is high when the printer is on, even during an error status (e.g., paper out, etc.).
2. ***PCI RS On/Off*** RTS is high and remains high unless either the print head is opened during a non–error condition (in this instance, RTS would return to high after the print head is closed and the printer is put back on–line) or an error condition occurs during printing (e.g., ribbon out, stock out).

Pin #20

DTR (Equipment Ready) This signal applies to the Ready/Busy protocol. The printer is ready to receive data when this pin is high. It goes low during any of the following:

- Off–line
- During printing

RS232C Ready/Busy Protocol

The Ready/Busy protocol is the hardware flow control method on the M–8450. 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 protocol. The host computer hardware and application program must be capable of supporting this flow control method for it to function properly.

Cable Requirements

Host		Printer
FG	----------	1 FG (Frame Ground)
TD	---------→	3 RD (Receive Data)
**	----┬-----	4 RTS (Request to Send)
	└----	5 CTS (Clear to Send)
	┌----	6 DSR (Data Set Ready)
*	←---┴----	20 DTR (Equipment Ready)
SG	----------	7 SG (Signal Ground)

* *This connection at the host side of the interface would depend upon the pin that is being used as the Ready/Busy signal by the driving software. On a 25–pin RS232 connector of a PC, it would be either CTS (pin #5) or DSR (pin #6). On a 9–pin RS232 connector of a PC, it would be either CTS (pin #8) or DSR (pin #6). Check the manual of the software being used for this information.*

** *This connection at the host side of the interface would depend upon the pin that is being used for the error detection signal by the driving software.*

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 must now frame the data stream. For the 10 Job Buffer, note how the <ESC>A is only sent once.

Buffer Size	Data Stream
1 Job Buffer	<STX><ESC>A..Job#1..<ESC>Z<ETX>
10 Job Buffer	<STX><ESC>A..Job#1..<ESC>Z..Job#2..<ESC>Z.....Job#10..<ESC>Z<ETX>
Multi Buffer	<STX><ESC>A..Job..<ESC>Z<ETX>

NOTE: All characters, including STX, ESC, and ETX, are in ASCII.

Note: Since the printer will not buffer any characters after the DTR goes low, it is necessary to transmit "pad" characters (approximately five capital X characters) after the <ETX> of each data stream to ensure the <STX> of the next data stream is not lost. The inclusion of these characters will have no effect on printing.

Example: <STX><ESC>A . . JOB#1<ESC>Z<ETX>XXXXX

RS232C X–ON/X–OFF Protocol

X–ON/X–OFF flow control is used whenever hardware (Ready/Busy) flow control is not available or desirable. Instead of a voltage going high/low at Pin #20, characters representing "Printer Ready" (X–ON = ASCII 11_H) or "Printer Busy" (X–OFF = ASCII 13_H) are transmitted by the printer on Pin #2 (TD) to the host. In order for this protocol 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 explained previously. When the printer is first powered up and goes on–line, an X–ON is sent out. When the printer receives a viable job, it sends out an X–OFF and begins printing. When it is done printing, it transmits an X–ON. When the printer is set on–line/off–line manually, the printer sends out X–ON/X–OFF. If an error occurs during the printing (paper out, ribbon out), the printer sends nothing, since the last character sent was 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.

Cable Requirements

Host		Printer
FG	----------	1 FG (Frame Ground)
RD	<---------	2 TD (Transmit Data)
TD	--------->	3 RD (Receive Data)
	┌-----	4 RTS (Request to Send)
	└-----	5 CTS (Clear to Send)
	┌-----	6 DSR (Data Set Ready)
	└-----	20 DTR (Data Terminal Ready)
SG	----------	7 SG (Signal Ground)

Data Streams

The data streams for X–ON/X–OFF are constructed the same as they are for the Ready/Busy protocol.

Buffer Size	Data Stream
1 Job Buffer	<STX><ESC>A..Job#1..<ESC>Z<ETX>
10 Job Buffer	<STX><ESC>A..Job#1..<ESC>Z..Job#2..<ESC>Z.....Job#10..<ESC>Z<ETX>
Multi Job Buffer	<STX><ESC>A..Job..<ESC>Z<ETX>

NOTE: All characters, including STX, ESC, and ETX, are in ASCII.

Note: Since the printer will not buffer any characters after the X–OFF is issued, it is necessary to transmit "pad" characters (approximately five capital X characters) after the <ETX> of each data stream to ensure the <STX> of the next data stream is not lost. The inclusion of these characters will have no effect on printing.

Example: <STX><ESC>A ...JOB#1<ESC>Z<ETX>XXXXX

RS232C Bi–Directional Communication Protocol

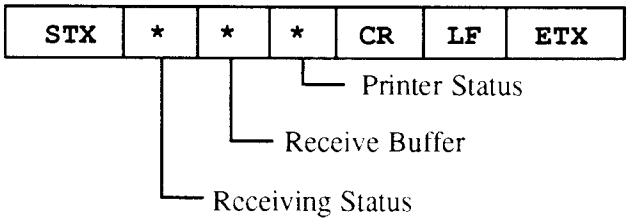
This protocol allows two–way half–duplex communication between the host computer and the printer, thus enabling the host to check printer status. When this protocol is selected, there is no hardware busy signal from the printer (DTR, Pin #20, is always high). The host **must** request the complete status from the printer, including ready/busy. Whenever the host requests a printer status, it transmits ENQ to the printer and the printer will then respond with its status within 1 – 100 milliseconds. If printing, it will respond upon finishing the current label or tag, then resume printing. In order for this protocol to function properly, verify that Pins #6 (DSR) and # 5 (CTS) are held high, as shown on the previous page.

Cable Requirements

The cable requirements are the same as those for X–ON/X–OFF. *See page 2–8.*

Printer Status

The form of the status response from the printer will be:



CR = Carriage Return
LF = Line Feed

The message is framed with STX/ETX.

The first character after STX gives the following **received message** status:

0 = Data stream received with no errors
1 = Error in data stream (e.g., interface error; data stream greater than 8K)

The second character after STX gives the state of the receiving buffer:

0 = Receive Buffer Empty
9 = Receive Buffer Full

The third character after STX gives the printer status:

E = Print Head Open
@ = Ribbon Out
A = Paper Out
B = Cutter Error (Jam, etc.)
E = Print Head Open
G = Print Head Element Failure
0 = Printer On–Line
1 = Printer Off–line

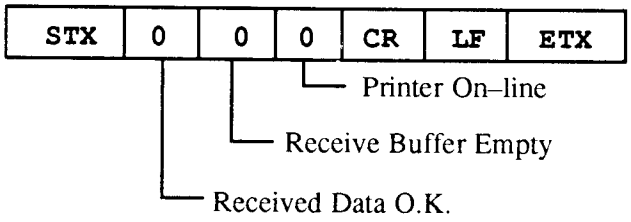
There is a certain priority given to this printer status as follows:

Priority		Status
1	E	= Print Head Open
2	@	= Ribbon Out
3	A	= Paper Out
4	G	= Print Head Element Failure
5	B	= Cutter Error

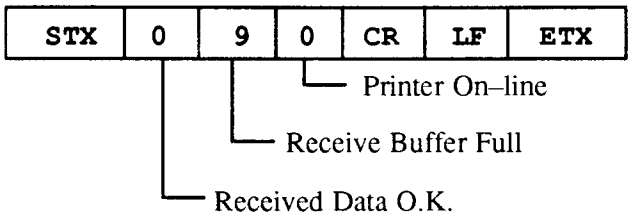
This priority is given so that if the head is open and there is a cutter error, only 45_H will be sent back as a printer status, etc.

Printer Ready/Busy

With the Bi–Directional protocol, as mentioned earlier, the host must request the complete printer status including ready/busy. When the host sends ENQ to the printer, and receives back the following message, the printer is ready to receive new data.



If the response to the ENQ is as follows, then the printer is busy.



In effect, the receive buffer status defines whether the printer is ready to receive data or is busy printing.

The situation is similar when using the 10 job buffer. The receive buffer will show full when it receives ETX, whether ETX follows 3 jobs or 10 jobs. For example:

```
<STX><ESC>A--Job#1--<ESC>Z----Job#2--<ESC>Z----Job#3--<ESC>Z<ETX>
```

Once these three jobs are terminated by ETX and an ENQ is sent, the above "busy" message will be returned to the host.

Software Reset Command

A software reset or "cancel" command is available only in this Bi–Directional mode. This command allows the host computer to clear the job buffer of the current job being printed (1 job buffer in use). It clears the way for the printer to accept a new job or jobs. If the printer is printing, it will stop and clear the current job (1 job buffer).

In order to clear the buffer, the host transmits only the cancel command at any time:

PROTOCODES

Standard	Non–standard
CAN = 18_H	CAN = 21_H = !

This will reset the printer as described.

RS232C Loop Back Test

This serial loop back test is accessed from Mode S on the front panel and is intended to thoroughly exercise the RS232 serial port for correct operation. In order to perform this test, a single DB–25P serial connector configured as shown below is required.

	Printer
┌------	2 TD (Transmit Data)
└------	3 RD (Receive Data)
┌------	4 RTS (Request to Send)
└------	5 CTS (Clear to Send)
┌------	6 DSR (Data Set Ready)
└------	20 DTR (Equipment Ready)

NOTE: Once this loop back test is initiated, it requires 7 minutes and 10 seconds to complete. If an error occurs during the test, the display will read "LOOP BACK FAILED". The test is completed successfully if ENTER or F1 is pressed and the printer comes out of loop back test mode.

This test will check all combinations of the following:

A. Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19,200
B. Parity: Odd, Even, None
C. Data Bits: 7, 8
D. Stop Bits: 1, 2
E. The data transferred during the test will be the following ASCII characters:

8 bit data: 00 ⟶ FF_H

7 bit data: 00 ⟶ $7F_H$

CENTRONICS PARALLEL INTERFACE

Centronics Electrical Specifications

Connector on Printer AMP 57–40360 (DDK) (Standard IBM Compatible Parallel Printer Connector)

Cable Required Standard IBM Parallel Printer Cable, 6' Max Length

Data Streams

Buffer Size	Data Stream
1 Job Buffer	<ESC>A..Job#1..<ESC>Z
10 Job Buffer	<STX><ESC>A..Job#1..<ESC>Z..Job#2..<ESC>Z.....Job#10..<ESC>Z<ETX>

NOTE: All characters, including STX, ESC, and ETX, are in ASCII.

Note that for parallel communications, the STX and ETX characters are only required for the 10–Job Buffer Mode. However, in the 1 Job Buffer, if STX / ETX frame one data stream, these two control characters will be disregarded.

ACCESSORY (EXT) CONNECTOR

The accessory (or EXT) connector on the M–8450 rear panel is intended for use with external printer accessories such as label rewinders or applicators. The 14–pin Centronics–type connector provides a choice of (4) different output signals along with various error conditions.

Pin Assignments

Pin #1

Label Out The signal on Pins 1, 3, and 4 each have an open collector output (see Figure A). This pin normally measures +0.7V maximum when no error condition exists. If a label out occurs, the voltage will drop to 0V. To achieve a maximum of +5V, you must add a 1KΩ, 1/4 W "pull–up" resistor between Pin 1 and Pin 13 (see Figure B). This will provide +5V for no error condition and 0V when a label out condition exists.

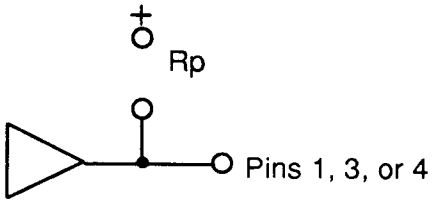


Figure A

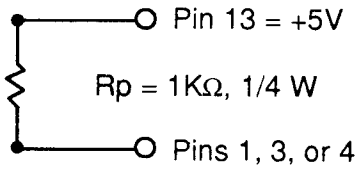


Figure B

Pin #2

~~**Frame Ground**~~ – SIGNAL GROUND

Pin #3

Ribbon Out Normally measures +0.7V maximum for no error condition, but will drop to 0V when a ribbon out condition exists. May be increased to a maximum of +5V for a no error condition (see Figure B).

Pin #4

Head Open Normally measures +0.7V maximum for no error condition, but will drop to 0V when a head open condition exists. May be increased to a maximum of +5V for a no error condition (see Figure B).

Pin #5

Print Start If a switch is connected between Pin 5 and Pin 14 (see Figure C), you will be able to control the ability of the M–8450 to print. When S1 is closed, printing is enabled. If S1 is left open, printing is disabled.

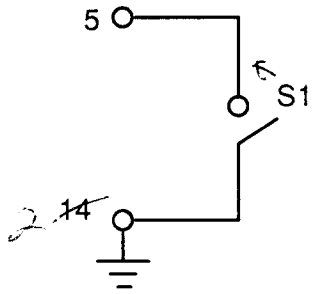


Figure C

Pin #6

External Signal This signal is used to drive an applicator or other external device requiring synchronization to the print cycle. Use a 1KΩ, 1/4 W pull–up resistor to achieve a range from 0V to +5V. You may choose between different types of output signals from the Operator Panel. See Mode S of the Printer Configuration in Section 2 of the M–8450 Operator's Manual. The output signals are shown on the next page.

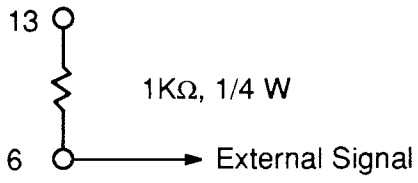


Figure D

Pin #12

+24V This signal is used to power the optional automatic label rewinder.

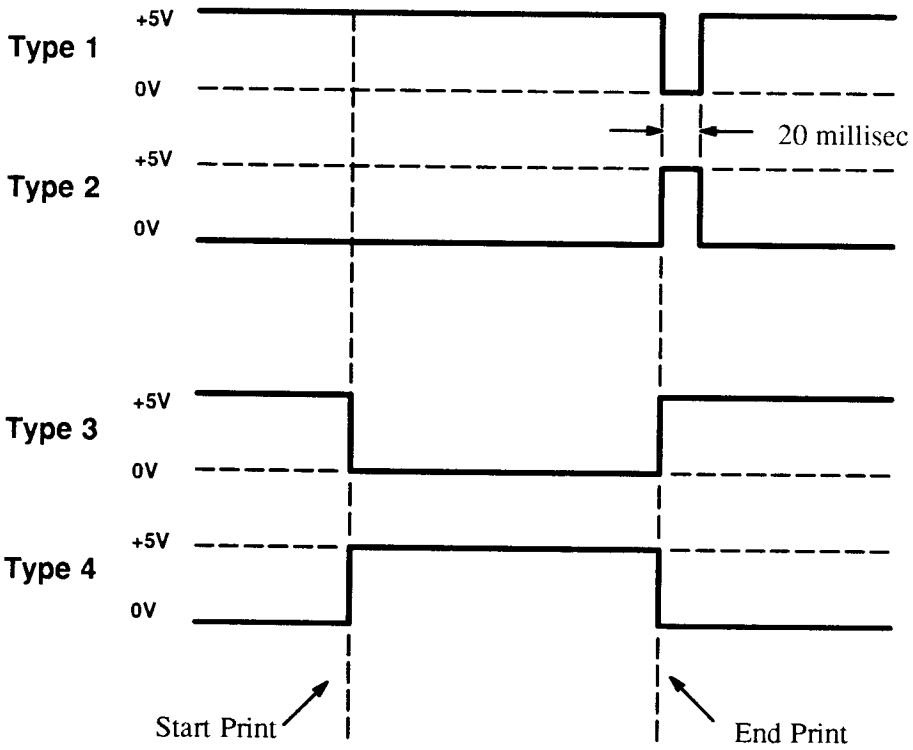
Pin #13

+5V

Pin #14

Signal Ground

External Output Signals



NOTE: +5V is available on the "EXT" connector at Pin 6 only if a 1KΩ pull–up resistor is installed as shown in Figure D on the previous page. Otherwise, the maximum voltage will be 0.7V.

SECTION 3
TROUBLESHOOTING

This section has been devised to help you if you are unable to produce output on the M–8450 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 five parts:

- Initial Checklist
- Using the Centronics (Parallel) Interface
- Using the RS232C (Serial) Interface
- If the Password is Lost

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/tags or ribbons may be loaded incorrectly. For instructions on how to load them correctly, see Section 2 of the M–8450 Operator's Manual.

4. Is the label sensor adjusted appropriately for the label/tag stock you're using? Make sure the sensor is mechanically adjusted to cover an I–Mark or feed slot if your stock has one or the other. Verify that you've chosen the appropriate sensor: Sensor 4 is used with label backing; Sensor 5 is used with I–Marks on labels or tags; "Not Used" is for continuous form labels; Sensors 1, 2, 3, and 6 are used for holes/feed slots in tags. (See Mode S of the Printer Configuration in Section 2 of the M–8450 Operator's Manual.)

5. Make sure you've configured the appropriate interface type in Mode I, RS232C or CENTRONICS, consistent with the interface you're intending to use. (See Mode I of the Printer Configuration in Section 2 of the M–8450 Operator's Manual.)

6. If you've been changing the settings on the printer and cannot figure out what you may have done, you can always return to the SATO Factory Defaults or User Defaults from Mode S of the configuration. (See the Mode S *Factory Default option* and *User Default option* of the Printer Configuration in Section 2 of the M–8450 Operator's Manual.)

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 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's 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 are needed.
      - Your Proto–Codes are set for Standard or Non–Standard (Mode I) and your data stream is consistent with these.

   D. Verify that your Receive Buffer Size is configured for 1–Item or 10–Items and your data stream is consistent with this choice. Remember for the 10–Item Buffer, your data stream should look like:

      <STX><ESC>A--JOB#1--<ESC>Z--JOB#2--<ESC>Z--JOB#10--<ESC>Z<ETX>

5. If you've checked all of the above and the printer still isn't printing, you may want to use the Print Receive Buffer feature (Hex Dump) to determine what (if anything) the printer is receiving from your host computer.

   A. Select Mode T from the operator panel (see Section 2 of the Operator's Manual).
   B. Choose the appropriate label size.
   C. Choose "Print Receive Buffer"
   D. Press ENTER.
   E. Press F1.
   F. Press LINE.
   G. The printer display panel should show:

   The Centronics port is now listening for incoming data. Send your print job. The M–8450 will now print (only once) a Hex Dump of everything it received from the host computer. Each 2–digit Hex character represents a character the M–8450 received. It may be tedious, but now you can analyze and troubleshoot the data stream. If you need another Hex Dump, you'll need to repeat Steps A–G above. After printing the Hex dump, the M–8450 is ready to receive a print job in the normal printing mode.

6. While checking the Hex Dump printout, if you notice 0D 0A (Carriage Return and Line Feed) characters throughout, and you are using BASIC, you may need to add a statement to your program. The "WIDTH" statement helps to suppress these extra 0D 0A characters. See the beginning of Section 1 – M–8450 Programming for details 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.

7. There is a light on the front panel labeled "DATA". This light indicates that the printer has received valid data and is compiling this data to print. Usually this light is on for only a short time, unless the label to be printed contains a large amount of non–graphic data.

USING THE RS232C (SERIAL) INTERFACE

1. Is the RS232C Serial cable connected securely to your serial port on the PC (DB–25P Male or DB–9P Male) and to the RS232C (DB25S) 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 M–8450 to print. But we recommend that you eventually use a cable built to the specifications as described in Section 2 – 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 2 if necessary.

4. If after sending your job to the printer, it only "beeps" and displays 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 to achieve 9600 baud, no parity, 8 databits, and 1 stop bit. Then you may select Mode I from the front panel to change any of the parameters accordingly.

5. If you still are unable to get printer output, try the Print Receive Buffer feature as described in the above Centronics Interface Troubleshooting section or see Mode T of the Printer Configuration in the M–8450 Operator's Manual. In this case, the M–8450 monitors its RS232C interface for incoming data.

6. From the Hex Dump, if you are seeing extra 0D 0A characters, and are using BASIC, refer to the beginning of the M–8450 Programming section. It provides hints for writing a SATO 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.

7. There is a light on the front panel labeled "DATA". This light indicates that the printer has received valid data and is compiling this data to print. Usually this light is on for only a short time, unless the label to be printed contains a large amount of non–graphic data.

IF THE PASSWORD IS LOST

If the password has been set to a value that has been forgotten or lost, the user will not be able to get past Mode U in the Printer Configuration. To find the current password or to change the password, do the following:

1. Place printer off–line.
2. Press ENTER to get to Mode U.
3. Press an arrow key to get to "Press Enter to Continue".
4. Press ENTER.
5. At the prompt for "Enter Password", enter 999.
6. Press ENTER twice.
7. At the second prompt for "Enter Password", enter 001.
8. Proceed to Mode S options to view or change the current password.

For more information, see Mode S of the Printer Configuration in Section 2 of the M–8450 Operator's Manual.

APPENDIX A
COMMAND CODES QUICK REFERENCE CHART

This section contains a Quick Reference Chart of the M–8450 command codes, for use by those already somewhat familiar with the programming language. The codes are listed in alphabetical order by the first letter or symbol that follows the <ESC> control character (this assumes use of the Standard Proto–Code set). With each command code, you will find a brief description, the command structure, and a reference page for a full description of the command in Section 1.

Instruction	Description	Page
<ESC>:		
A	**Start code.** Begins all print jobs.	**1–71**
A(space)<ESC>Z	**Form Feed.** Creates a blank tag or label.	**1–46**
AR	**Expanded Print Length.** Resets the maximum print length to 7" (178mm) from the print length set by <ESC>AX.	**1–40**
AX	**Expanded Print Length.** Sets the maximum print length to 14" (356mm).	**1–40**
A3HaaaVbbbb	**Base Reference Point.** Establishes a new base reference point for the current label. **aaa** = Horizontal Print Offset (001–832 dots) **bbbb** = Vertical Print Offset (0001–1424 dots)	**1–15**
Babbccc	**Bar Codes.** Prints a 1:3 ratio bar code. **a** = 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 Code 128 A MSI B *reserved* C Code 93 D *reserved* E UPC–E F Bookland G Code 128 P Post Net **bb** = Number of dots (01–12) for narrow bar and narrow space **ccc** = Bar height in dots (001–600)	**1–8**

Instruction	Description	Page
<ESC>:		
BDabbccc	**Bar Codes.** Prints a 2:5 ratio bar code, except for UPC and EAN symbols, which are fixed width bar codes. *For values a, bb, and ccc, see instructions for* <ESC>Babbccc.	**1–8**
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)	**1–11**
BWaabbb	**Bar Codes – Variable Ratio.** Works together with the <ESC>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)	**1–13**
C	**Repeat Label.** Prints a duplicate of the last label printed.	**1–62**
CSa	**Print Speed Selection.** Specifies a unique print speed through software for a particular label. **a** = Designates the speed selection: **1** = 4 in/sec (100 mm/sec) **5** = 8 in/sec (200 mm/sec) **2** = 5 in/sec (125 mm/sec) **6** = 9 in/sec (225 mm/sec) **3** = 6 in/sec (150 mm/sec) **7** = 10 in/sec (250 mm/sec) **4** = 7 in/sec (175 mm/sec)	**1–58**
Dabbccc	**Bar Codes.** Prints 1:2 ratio bar code. For UPC and EAN bar codes, this will add descender bars. *For values a, bb, and ccc, see instructions for* <ESC>Babbccc.	**1–8**

Instruction	Description	Page
<ESC>:		
Ea	**Line Feed.** Provides the ability to print multiple lines of the same character size without specifying a new print position for each line. **a** = Number of dots (1–999) between the bottom of the characters on one line to the top of the characters on the next line	1–51
Faaabccc	**Sequential Numbering.** Allows the printing of sequencing fields (text, bar codes) where all incrementing is done within the printer. **aaa** = Number to repeat the same data (001–999) **b** = Plus or minus symbol (+ for increments; – for decrements) **ccc** = Value of step for sequence (001–999)	1–69
FWaaHb	**Horizontal Line.** Prints a horizontal line. **aa** = Width of the horizontal line in dots (01–99) **b** = Length of horizontal line in dots (1–832)	1–49
FWaaccHbVd	**Box.** Prints a box. *For values aa, b, cc, and d, see instructions for horizontal and vertical lines.*	1–49
FWccVd	**Vertical Line.** Prints a vertical line. **cc** = Width of vertical line in dots (01–99) **d** = Length of vertical line in dots (1–2136)	1–49
	Dot Density / **Max. Length of Horizontal / Vertical Lines** **300 DPI (1X)** — **2136 dots** **150 DPI (2X)** — **1068 dots (2136 with Expanded Print Length)** **100 DPI (3X)** — **712 dots (1424 with Expanded Print Length)**	
GHaaabbb(data)	**Custom Graphics.** Allows the creation and printing of graphic images using a dot–addressable matrix. **H** = Specifies a Hex data stream is to follow **aaa** = Number of horizontal 8 x 8 blocks (001–104) **bbb** = Number of vertical 8 x 8 blocks (001–177; 001–354 for 14" label) **(data)** = Hex data to describe the graphic image	1–33

<table>
<tr><th>Instruction</th><th>Description</th><th>Page</th></tr>
<tr><td><ESC>:</td><td></td><td></td></tr>
<tr><td>GIHaaabbbcc (data)</td><td>Store Custom Graphics – Battery Backed Memory Card. Stores a graphic image in the optional memory card to be called later for printing on a label.

H = Specifies a Hex data stream is to follow
aaa = Number of horizontal 8 x 8 blocks (001–104)
bbb = Number of vertical 8 x 8 blocks (001–177; 001–354 for 14" label)
cc = Register number (01–99)
(data) = Hex data to describe the graphic image</td><td>1–35</td></tr>
<tr><td>GRcc</td><td>Recall Custom Graphics – Battery Backed Memory Card. Recalls for printing the graphic image stored by the <ESC>GI command.

cc = Register number (01–99)</td><td>1–35</td></tr>
<tr><td>Ha</td><td>Horizontal Position. Specifies a field's horizontal location from the current base reference point.

a = Number of dots horizontally from the base reference point (1–max*)
* The maximum will be 1536 dots across the width of the label and 2136 dots down the length of a label.

<table><tr><th>Dot Density</th><th>Maximum Horizontal</th><th>Maximum Vertical</th></tr><tr><td>300 DPI (1x)</td><td>1536 dots</td><td>2136 dots</td></tr><tr><td>150 DPI (2x)</td><td>768 dots</td><td>1068 dots [1]</td></tr><tr><td>100 DPI (3x)</td><td>512 dots</td><td>712 dots [2]</td></tr></table>
1 Maximum vertical offset is 2136 with Expanded Print Length
2 Maximum vertical offset is 1424 with Expanded Print Length</td><td>1–55</td></tr>
<tr><td>J</td><td>Journal Print. Provides the ability to print text line by line.</td><td>1–47</td></tr>
</table>

Instruction	Description	Page
<ESC>:		
KaH90bb	**Recall Custom–Designed Characters.** Recalls for printing a custom character stored by the `<ESC>Tabcc(data)` command. **a** = 1 16 x 16 matrix 2 24 x 24 matrix **H** = Indicates that a hex data stream was stored **bb** = Memory location where the character was stored. Valid locations are 21 hex to 52 hex.	**1–32**
Laabb	**Character Expansion.** Expands characters in both directions. **aa** = Multiple to expand horizontally (01–12) **bb** = Multiple to expand vertically (01–12)	**1–22**
M	**Font type.** Specifies the 13W x 17L dot matrix font (13 x 20 with descenders).	**1–42**
N	**Rotation – Moving Base Reference Point.** Sets the original base reference point and returns printing to normal orientation.	**1–67**
OA	**Font type.** Specifies the OCR–A font with 22W x 32L dot matrix.	**1–42**
OB	**Font type.** Specifies the OCR–B font with 21W x 30L dot matrix.	**1–42**
Paa	**Character Pitch.** Designates the number of dots between characters **aa** = Number of dots between characters (01–99)	**1–24**
Qa	**Print Quantity.** Specifies the total number of labels to print. **a** = Total number of labels to print for the job (1–9999)	**1–57**
R	**Rotation – Moving Base Reference Point.** Rotates the printing of all subsequent images by 90° counterclockwise each time it is used. Also moves the base reference point.	**1–67**
S	**Font type.** Specifies the 8W x 12L dot matrix font (8 x 15 with descenders).	**1–42**

Instruction	Description	Page
<ESC>:		
TaHbb(data)	**Store Custom–Designed Characters.** To create and store custom characters or images in the printer's volatile memory. See <ESC>Kab90cc to recall the character for printing. **a** = 1 16 x 16 matrix 2 24 x 24 matrix **H** = Specifies a Hex data stream is to follow **bb** = Memory location to store the character. Valid locations are 21 hex to 52 hex **(data)** = Hex data to describe the character	1–32
U	**Font type.** Specifies the 5W x 7L dot matrix font (5 x 9 with descenders).	1–42
Vb	**Vertical Position.** Specifies a field's vertical location from the current base reference point. **b** = Number of dots vertically from the base reference point (1–max*) * The maximum will be 1536 dots across the width of a label and 2136 dots down the length of a label.	1–55
Wa	**Character Tables.** Specifies one of the nine SATO International Character Tables. **a** = 0 IBM 850 Character Table 1–7 SATO International Character Tables 8 *reserved* 9 SATO Character Table	1–26

Dot Density	Maximum Horizontal	Maximum Vertical
300 DPI (1x)	1536 dots	2136 dots
150 DPI (2x)	768 dots	1068 dots [1]
100 DPI (3x)	512 dots	712 dots [2]

1 Maximum vertical offset is 2136 with Expanded Print Length
2 Maximum vertical offset is 1424 with Expanded Print Length

Instruction	Description	Page
<ESC>:		
WA(elements)	**Calendar Print.** Specifies the printing of a date and/or time field from the printer's internal clock. **(elements)** = YY Year MM Month DD Day hh Hour mm Minute	1–19
WBa	**Font type.** Specifies the 18W x 26 L dot matrix (including descenders) font (18 x 30 with descenders). **a** = 0 Disables auto–smoothing of font 1 Enables auto–smoothing of font	1–44
WDHaaaVbbbb XcccYdddd	**Copy Image Area.** To copy an image to another location of the label. **aaa** = Horizontal position of the top left corner of image area **bbbb** = Vertical position of the top left corner of image area **ccc** = Horizontal length of image area **dddd** = Vertical length of image area	1–30
WLa	**Font type.** Specifies the 28W x 44L dot matrix font (28 x 52 with descenders). **a** = 0 Disables auto–smoothing of font 1 Enables auto–smoothing of font	1–44
WPab	**Calendar Increment.** Specifies a value to be added to the printer's current date and/or time for printing. **a** = Y Years M Months D Days h Hours **b** = Numeric data: Years (1–9), Months (01–99), Days (001–999), Hours (001–999)	1–17

Instruction	Description	Page
<ESC>:		
WTaabbccddee	**Calendar Set.** To set the date and time in the printer's internal clock. **aa** = Year (01–99) **bb** = Month (01–12) **cc** = Day (01–31) **dd** = Hour (00–23) **ee** = Minute (00–59)	1–21
YR	**Recall Format.** Recalls format from optional Extended Memory Card for sending variable data.	1–60
YS	**Store Format.** Stores format in optional Extended Memory Card with field parameters.	1–74
Z	**Stop code.** Ends all print jobs.	1–71
%a	**Rotation – Fixed Base Reference Point.** Rotates printing in 90 degree increments without changing the base reference point. **a** = 0 Sets print to normal direction 1 Sets print to 90° counterclockwise 2 Sets print to 180° rotated (upside down) 3 Sets print to 270° counterclockwise (90° clockwise)	1–65
$a,b,c,d	**Vector font.** Specifies printing of the unique SATO vector font.	1–77

Font Style (d)	Min. Font Width & Height	Max. Font Width & Height		
		100 DPI	150 DPI	300 DPI
0 Standard	24	285	350	490
1 Standard open (outlined)	24	285	350	490
2 Gray (mesh) pattern 1	24	285	350	490
3 Gray (mesh) pattern 2	24	285	350	490
4 Gray (mesh) pattern 3	24	285	350	490
5 Standard open, lt. shadow	32	285	350	490
6 Standard open, dk. shadow	68	285	350	490
7 Standard mirror image	24	285	350	490
8 Italic	24	285	350	490
9 Italic open (outlined)	68	285	350	490

Instruction	Description	Page
<ESC>:		
$=(data)	**Data for Vector font.**	**1–77**
#Da	**Dot Expansion.** Specifies a new dot expansion factor.	**1–39**
#Ea	**Print Darkness.** Specifies a new print darkness setting. **a** = Print darkness value (1–5)	**1–54**
(a,b	**Reverse Image.** Reverses image from black to white and vice versa. **a** = Horizontal length (in dots) of reverse image area (8–832) **b** = Vertical length (in dots) of reverse image area (8–999)	**1–63**
&	**Store Form Overlay.** Stores a specified label image in the volatile form overlay memory.	**1–73**
/	**Recall Form Overlay.** Recalls the label image from the form overlay memory for printing.	**1–59**
*****	**Clear the Receiving Buffer and Compiling Buffer.**	**1–28**
***T**	**Clear the Custom Character Memory.**	**1–28**
***,**	**Clear Formats Stored in the Memory Card.**	**1–28**
***&**	**Clear the Form Overlay Memory.**	**1–28**
***G**	**Clear Graphics Stored in the Memory Card.**	**1–28**
***X**	**Clear all buffers and memory areas.**	**1–28**
@	**Off–Line.** Signals the printer to go off–line after the completion of a print job.	**1–53**
<NUL>aa	**Cutter Command.** Controls the cutting of labels when using the optional SATO cutter unit. **aa** = Number of labels to print between each cut (00–99)	**1–37**

APPENDIX B
BAR CODE SPECIFICATIONS

This section contains detailed information on the printing of bar codes on your M–8450:

- Rotated Bar Codes
- Bar Code Symbologies

ROTATED BAR CODES

On the M–8450, "picket fence" bar codes (normal orientation or 180° rotation) will print at the height specified in the bar code command. For "ladder" bar codes, (90° or 270° rotation), the actual printed height of the bar code may not reflect the height specified in your bar code command. The following table shows the relationship between the specified bar code height and the actual printed height for 90° or 270° rotation.

HEIGHT FOR ROTATED (90° OR 270°) BAR CODES

SPECIFIED (DOTS)	ACTUAL (DOTS)	SPECIFIED (DOTS)	ACTUAL (DOTS)
001–015	16	304–319	320
016–031	32	320–335	336
032–047	48	336–351	352
048–063	64	352–367	368
064–079	80	368–383	384
080–095	96	384–399	400
096–111	112	400–415	416
112–127	128	416–431	432
128–143	144	432–447	448
144–159	160	448–463	464
160–175	176	464–479	480
176–191	192	480–495	496
192–207	208	496–511	512
208–223	224	512–527	528
224–239	240	528–543	544
240–255	256	544–559	560
256–271	272	560–575	576
272–287	288	576–591	592
288–303	304	592–600	600

BAR CODE SYMBOLOGIES

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

Codabar Character Set:

0–9, –, $, :, /, ., +
A, B, C, D (Start/Stop characters)

Codabar Density Table

Narrow/Wide Ratio	Value of 'bb'	Density (char/in)		
		300 DPI	150 DPI	100 DPI
1:3	01	25.0	12.5	8.3
1:3	02	12.6	6.3	4.2
2:5	01	13.6	6.8	4.5
1:2	02	15.1	7.5	5.0

Example

<ESC>H450<ESC>V150**<ESC>B004150A$12345B**
<ESC>H600<ESC>V305<ESC>$12345

Code 39

Command Structure

1:3 ratio: <ESC>**B1bbccc*(data)***
2:5 ratio: <ESC>**BD1bbccc*(data)***
1:2 ratio: <ESC>**D1bbccc*(data)***

bb = Width of narrow element in dots (01–12)
ccc = Bar height in dots (001–600)
***** = Required Start and Stop character (asterisk)
(data) = Bar code data

Code 39 Character Set:

0–9, A–Z, space, $, %, +, –, ., /
* (Start/Stop character)

NOTE: Start/Stop characters (*) must be manually inserted into the data stream. Printer will not print a scannable bar code if these are left out.

Code 39 Density Table

Narrow/Wide Ratio	Value of 'bb'	Density (char/in)		
		300 DPI	150 DPI	100 DPI
1:3	01	18.8	9.4	6.3
1:3	02	9.5	4.7	3.2
2:5	01	10.3	5.2	3.4
1:2	01	23.1	11.5	7.7
1:2	02	11.5	5.8	3.8

Example

<ESC>H450<ESC>V150**<ESC>B104150*P1234-01***
<ESC>H710<ESC>V305<ESC>MP1234-01

Interleaved Two of Five (I 2/5)

Command Structure

1:3 ratio: <ESC>**B2bbccc(data)**
2:5 ratio: <ESC>**BD2bbccc(data)**
1:2 ratio: <ESC>**D2bbccc(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

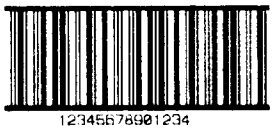
I 2/5 Character Set: 0–9 (numeric only)

I 2/5 Density Table

Narrow/Wide Ratio	Value of 'bb'	Density (char/in)		
		300 DPI	150 DPI	100 DPI
1:3	01	33.4	16.7	11.1
1:3	02	16.7	8.3	5.6
2:5	01	18.8	9.4	6.3
1:2	01	21.4	10.7	7.1
1:2	03	14.3	7.2	4.8

Example

```
<ESC>H440<ESC>V140<ESC>FW09H420
<ESC>H440<ESC>V300<ESC>FW09H420
<ESC>H450<ESC>V150<ESC>B203150123456789012 34
<ESC>H525<ESC>V315<ESC>M12345678901234
```



Notes

- To add horizontal guard bars to the top and bottom of the bar code, use the Line and Box command (see Page 1–49).

UPC–A/EAN–13

Command Structure

<ESC>**B3bbccc(data)**	Standard Length – No Interpretation
<ESC>**BD3bbccc(data)**	Descender Bars – Auto Interpretation
<ESC>**D3bbccc(data)**	Descender Bars – No Interpretation

bb = Width of narrow element in dots (01–12)
ccc = Bar height in dots (001–600)
(data) = Bar code data (numeric); maximum of 13 digits.

To select UPC–A with automatic check digit calculation, send 11 digits only.

To select EAN–13 with automatic check digit calculation, send 12 digits only.

If 13 digits is sent, the M–8450 will print the data in the bar code as sent. (If the first digit is a zero, a UPC–A bar code will print.)

UPC–A/EAN–13 Character Set: 0–9 (numeric only)

UPC–A/EAN–13 Density Table

Value of 'bb'	% of Nominal (100%)		
	300 DPI	150 DPI	100 DPI
02	—	100%	150%
03	75%	150%	—
04	100%	200%	—

Example

```
<ESC>H410<ESC>V330<ESC>OB0
<ESC>H860<ESC>V330<ESC>OB5
<ESC>H450<ESC>V150<ESC>D3043000012345678905
<ESC>H490<ESC>V440<ESC>OB12345   67890
```

Notes

- <ESC>BD3 and <ESC>D3 provides guide bars that extend longer than the rest of the bar code.

EAN–8

Command Structure

<ESC>**B4bbccc(data)**
<ESC>**D4bbccc(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.

The last digit is a Mod 10 check digit, which must be supplied by the programmer. The printer does not calculate this check digit.

EAN–8 Character Set: 0–9 (numeric only)

EAN–8 Density Table

Value of 'bb'	% of Nominal (100%)		
	300 DPI	150 DPI	100 DPI
02	—	100%	150%
03	75%	150%	—
04	100%	200%	—

Example

```
<ESC>H410<ESC>V330<ESC>OB0
<ESC>H740<ESC>V330<ESC>OB5
<ESC>H450<ESC>V150<ESC>D40430040153476
<ESC>H480<ESC>V440<ESC>OB4015 3476
```

Notes

- <ESC>D4 provides guide bars that extend longer than the rest of the bar code.

Calculating the Mod10 Check Digit for EAN–8

If you wish to encode the (EAN–8) data "0123456", follow these steps to find the proper check digit:

1. Starting from the left, sum all the characters in the odd positions (that is, first, third, fifth, and so on), the number system character being the first position.

   Example: 0 + 2 + 4 + 6 = 12

2. Multiply the sum obtained in Step 1 by the number 3.

   Example: 12 x 3 = 36

3. Again starting from the left, sum all the characters in the even positions.

   Example: 1 + 3 + 5 = 9

4. Add the product of Step 2 to the sum of Step 3.

   Example: 36 + 9 = 45

5. The mod10 check value is the smallest number that when added to the sum of Step 4 produces a multiple of 10.

   Example: If you add 5 to 45, the result is a multiple of 10. Therefore the check digit is 5.

6. The EAN–8 bar code data should be specified as: 01234565.

NOTE: If the wrong check digit is put into the data stream and sent to the printer, the bar code will print but it will be unreadable by a scanner, since bar code scanners look for the Mod 10 check digit as shown.

Industrial Two of Five

Command Structure

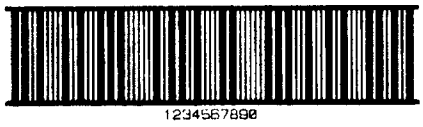
1:3 ratio: <ESC>**B5bbccc(data)**
2:5 ratio: <ESC>**BD5bbccc(data)**
1:2 ratio: <ESC>**D5bbccc(data)**

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

Industrial 2 of 5 Character Set: 0–9 (numeric only)

Example

```
<ESC>H440<ESC>V150<ESC>FW09H655
<ESC>H440<ESC>V300<ESC>FW09H655
<ESC>H450<ESC>V150<ESC>B5041501234567890
<ESC>H690<ESC>V315<ESC>M1234567890
```



Notes

- To add horizontal guard bars to the top and bottom of the bar code, use the Line and Box command (see Page 1–49).

Matrix Two of Five

Command Structure

1:3 ratio: <ESC>**B6bbccc(data)**
2:5 ratio: <ESC>**BD6bbccc(data)**
1:2 ratio: <ESC>**D6bbccc(data)**

bb = Width of narrow element in dots (01–12)
ccc = Bar height in dots (001–600)
(data) = Bar code data (numeric only); must be an even number of digits or else the printer will add a leading zero

Matrix 2 of 5 Character Set: 0–9 (numeric only)

Example

```
<ESC>H440<ESC>V150<ESC>FW09H485
<ESC>H440<ESC>V300<ESC>FW09H485
<ESC>H450<ESC>V150<ESC>B6041501234567890
<ESC>H600<ESC>V315<ESC>M1234567890
```

Notes

- To add horizontal guard bars to the top and bottom of the bar code, use the Line and Box command (see Page 1–49).

Code 128 – Method 1

Command Structure

<ESC>**B9bbcccdeff[eff...eff]**

bb	=	Width of narrow element in dots (01–12)
ccc	=	Bar height in dots (001–600)
d	=	Number of changes from subset to subset to be made (1–9)
e	=	Subset type (A, B, C)
ff	=	Number of data characters to be sent for subset type specified by "e" parameter *Note: Based on the number of subsets you select in parameter "d", parameters "e" and "ff" must be repeated that many times.*
(data)	=	Bar code data (alphanumeric); number of characters must equal the sum of the "ff" parameters; data must be specified in same order as subsets are specified, and be legal characters for that subset type; maximum of **30** characters; Mod103 check digit supplied by printer.

Code 128 Character Set:

See Code 128 Character Table on Page B–14.

Code 128 Density Table

Value of 'bb'	Density (char/in)					
	Subsets A, B			Subset C		
	300 DPI	150 DPI	100 DPI	300 DPI	150 DPI	100 DPI
01	27.3	13.7	9.1	54.7	27.3	18.2
02	13.6	6.8	4.5	27.2	13.6	9.1
03	9.2	4.6	3.1	18.3	9.2	6.1

Example

The following will select Subset A for the characters "AB", Subset B for "789", and Subset C for "123456":

```
<ESC>H450<ESC>V150<ESC>B9041503A02B03C06AB789123456
<ESC>H660<ESC>V305<ESC>MAB789123456
```

Notes

- When subset C is chosen, you must specify an even number of data characters because of its interleaved nature. If this rule is not observed, the bar code will not print.
- The length of the bar code data must equal the sum of the "ff" parameters. Also, the order of the subsets must match the order the bar code data is specified.
- To encode ASCII control codes (unprintable characters), you must use Code 128 – Method 2 (see below).

Code 128 – Method 2

Command Structure

<ESC>**BGbbcccdd(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
- >G Subset A Start code
- >H Subset B Start code
- >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:
- >E Subset A Shift code
- >D Subset B Shift code
- >C Subset C Shift code

Code 128 Character Set: See Code 128 Character Table on Page B–14.

Code 128 Density Table

Value of 'bb'	Density (char/in)					
	Subsets A, B			Subset C		
	300 DPI	150 DPI	100 DPI	300 DPI	150 DPI	100 DPI
01	27.3	13.7	9.1	54.7	27.3	18.2
02	13.6	6.8	4.5	27.2	13.6	9.1
03	9.2	4.6	3.1	18.3	9.2	6.1

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":

```
<ESC>H450<ESC>V150<ESC>BG04150>GAB>D789>C123456
<ESC>H660<ESC>V305<ESC>MAB789123456
```

Code 128 Character Table

VALUE	SUBSET A	SUBSET B	SUBSET C
0	SP	SP	00
1	!	!	01
2	"	"	02
3	#	#	03
4	$	$	04
5	%	%	05
6	&	&	06
7	'	'	07
8	(	(	08
9	)	)	09
10	*	*	10
11	+	+	11
12	,	,	12
13	–	–	13
14	.	.	14
15	/	/	15
16	0	0	16
17	1	1	17
18	2	2	18
19	3	3	19
20	4	4	20
21	5	5	21
22	6	6	22
23	7	7	23
24	8	8	24
25	9	9	25
26	:	:	26
27	;	;	27
28	<	<	28
29	=	=	29
30	>	>	30
31	?	?	31
32	@	@	32
33	A	A	33
34	B	B	34
35	C	C	35

Code 128 Character Table

VALUE	SUBSET A	SUBSET B	SUBSET C
36	D	D	36
37	E	E	37
38	F	F	38
39	G	G	39
40	H	H	40
41	I	I	41
42	J	J	42
43	K	K	43
44	L	L	44
45	M	M	45
46	N	N	46
47	O	O	47
48	P	P	48
49	Q	Q	49
50	R	R	50
51	S	S	51
52	T	T	52
53	U	U	53
54	V	V	54
55	W	W	55
56	X	X	56
57	Y	Y	57
58	Z	Z	58
59	[	[	59
60	\	\	60
61	]	]	61
62	^	^	62
63	_	_	63
64	NUL >(space)	` >(space)	64
65	SOH >!	a >!	65
66	STX >"	b >"	66
67	ETX .#	c .#	67
68	EOT >$	d >$	68
69	ENQ >%	e >%	69
70	ACK >&	f >&	70

Code 128 Character Table

VALUE	SUBSET A	SUBSET B	SUBSET C
71	BEL >'	g >'	71
72	BS >(	h >(	72
73	HT >)	i >)	73
74	LF >*	j *	74
75	VT >+	k >+	75
76	FF >,	l >,	76
77	CR >–	m >–	77
78	SO >.	n >.	78
79	SI >/	o >/	79
80	DLE >0	P >0	80
81	DC1 >1	q >1	81
82	DC2 >2	r >2	82
83	DC3 >3	s >3	83
84	DC4 >4	t >4	84
85	NAK >5	u >5	85
86	SYN >6	v >6	86
87	ETB >7	w >7	87
88	CAN >8	x >8	88
89	EM >9	y >9	89
90	SUB >:	z >:	90
91	ESC >;	{ >;	91
92	FS ><	| ><	92
93	GS >=	} >=	93
94	RS >>	~ >>	94
95	US >?	DEL >?	95
96	FNC3 >@	FNC3 >@	96
97	FNC2 >A	FNC2 >A	97
98	SHIFT >B	SHIFT >B	98
99	Subset C >C	Subset C >C	99
100	Subset B >D	FNC4 >D	Subset B >D
101	FNC4 >E	Subset A >E	Subset A >E
102	FNC1 >F	FNC1 >F	FNC1 >F
103	SUBSET A START CODE >G		
104	SUBSET B START CODE >H		
105	SUBSET C START CODE >I		

How To Use Code 128 Character Table

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 desired output.
- 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 Code 128 Table:

  - If you are currently using Subset A or Subset B, you can change to Subset C by encoding **>C** (i.e., two ASCII characters; ">" and "C").

VALUE	SUBSET A	SUBSET B	SUBSET C
99	Subset C >C	Subset C >C	99
100	Subset B >D	FNC4 >D	Subset B >D
101	FNC4 >E	Subset A >E	Subset A >E
102	FNC1 >F	FNC1 >F	FNC1 >F

Notes

- When Subset C is chosen, you must specify an even number of data positions because of its interleaved encodation method.
- ASCII Control Codes (unprintable characters) **pertain to Code 128 – Method 2 only**.

MSI

Command Structure

1:3 ratio: <ESC>**BAbbccc(data)d**
2:5 ratio: <ESC>**BDAbbccc(data)d**
1:2 ratio: <ESC>**DAbbccc(data)d**

bb = Width of narrow element in dots (01–12)
ccc = Bar height in dots (001–600)
(data) = Bar code data (numeric); maximum of 15 digits
d = Required check digit

MSI Character Set: 0–9 (numeric only)

Code 93

Command Structure

1:3 ratio: <ESC>**BCbbcccdd(data)**

bb = Width of narrow element in dots (01–12)
ccc = Bar height in dots (001–600)
dd = Length of data (number of digits)
(data) = Bar code data (alphanumeric); length must match value of parameter "dd"; check digit is supplied by printer.

Code 93 Character Set: 0–9, A–Z, –, ., (space), $, /, +, %

Code 93 Density Table

Narrow/Wide Ratio	Value of 'bb'	Density (char/in)		
		300 DPI	150 DPI	100 DPI
1:3	01	33.3	16.6	11.1
1:3	02	16.7	8.3	5.6
1:3	03	11.1	5.5	3.7

Example

```
<ESC>H450<ESC>V150<ESC>BC041501234ABCD
<ESC>H600<ESC>V305<ESC>M1234ABCD
```

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

UPC–E Character Set: 0–9 (numeric only)

UPC–E Density Table

Value of 'bb'	% of Nominal (100%)		
	300 DPI	150 DPI	100 DPI
02	—	100%	150%
03	75%	150%	—
04	100%	200%	—

Example

```
<ESC>H410<ESC>V330<ESC>OB0
<ESC>H450<ESC>V150<ESC>DE04300123456
<ESC>P01<ESC>H475<ESC>V440<ESC>OB123456
```

Notes

- <ESC>DE provides guide bars that extend longer than the rest of the bar code.

Bookland (UPC Supplements)

Command Structure

<ESC>**BFbbccc(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 2 or 5 digits

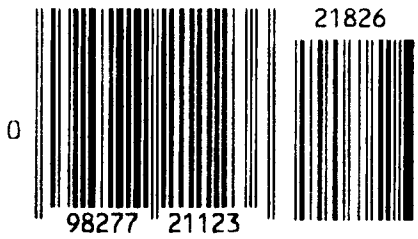
Bookland Character Set: 0–9 (numeric only)

Bookland Density Table

Value of 'bb'	% of Nominal (100%)		
	300 DPI	150 DPI	100 DPI
02	—	100%	150%
03	75%	150%	—
04	100%	200%	—

Example

```
<ESC>H480<ESC>V330<ESC>OB0
<ESC>H525<ESC>V150<ESC>D3043330098277211236
<ESC>H575<ESC>V475<ESC>OB98277  21123
<ESC>H965<ESC>V150<ESC>OB21826
<ESC>H935<ESC>V200<ESC>BF0428521826
<ESC>H705<ESC>V930<ESC>OB0
<ESC>H750<ESC>V750<ESC>D3043330006338952608
<ESC>H800<ESC>V1075<ESC>OB06338  95260
<ESC>H1190<ESC>V750<ESC>OB24
<ESC>H1160<ESC>V800<ESC>BF0428524
```



POST NET

Command Structure

<ESC>**BP (data)**

(data) = Post Net bar code data (numeric); must be 5, 6, or 9 digits only; hyphens are allowed but will not be encoded

5 digits	32 bit format
6 digits	69 bit format 2
9 digits	52 bit format

Post Net Character Set: 0–9 (numeric only)

Notes

- Bar width is fixed at 6 dots (0.5 mm).
- Full bar height is fixed at 38 dots (3.167 mm).
- Half bar height is fixed at 15 dots (1.25 mm).
- Correction character is automatically generated.

APPENDIX C
CUSTOM CHARACTERS AND GRAPHICS

CUSTOM–DESIGNED CHARACTERS EXAMPLE

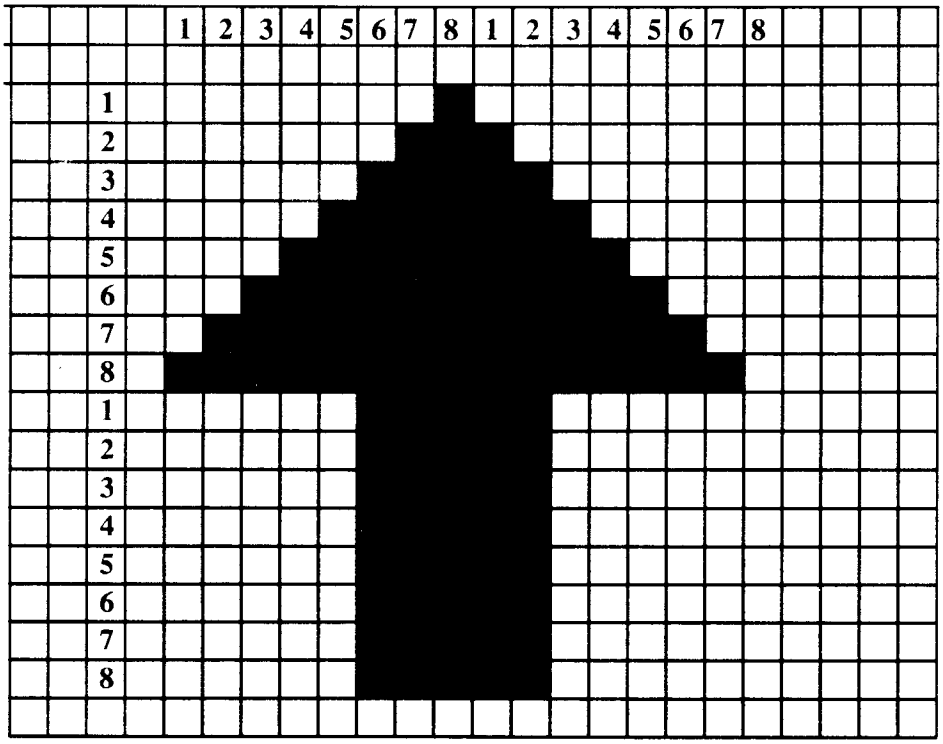
The following example is presented to help you understand the use of the Custom–Designed Characters command. It demonstrates the design and printing of an "arrow" in a 16 x 16 matrix.

STEP 1: Determine which matrix size to use:

- 16 dots x 16 dots
- 24 dots x 24 dots

STEP 2: Lay out a grid and draw the image on the grid.

- Each square represents one dot
- Blacken squares for each printed dot



STEP 3: Transfer the image into a binary representation, and then into hexidecimal data.

Binary:		**Hex:**
00000001 00000000		01 00
00000011 10000000		03 80
00000111 11000000		07 C0
00001111 11100000		0F E0
00011111 11110000		1F F0
00111111 11111000		3F F8
01111111 11111100		7F FC
11111111 11111110		FF FE
00000111 11000000		07 C0
00000111 11000000		07 C0
00000111 11000000		07 C0
00000111 11000000		07 C0
00000111 11000000		07 C0
00000111 11000000		07 C0
00000111 11000000		07 C0
00000111 11000000		07 C0

STEP 4: Store the custom character in the printer memory using the hexidecimal data stream in Step 3.

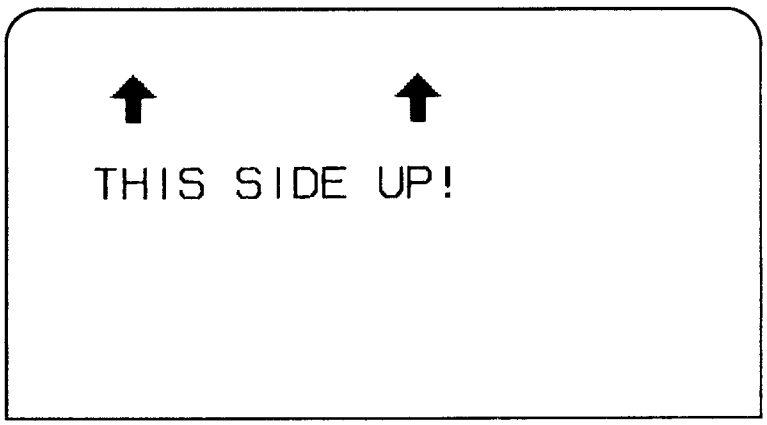
```
<ESC>A
<ESC>T1H3F
0100038007C00FE01FF03FF87FFCFFFE
07C007C007C007C007C007C007C007CO
<ESC>Z
```

NOTE: Do not use ASCII <CR> or <LF> characters (carriage return or line feed) as line delimeters within the graphic data, or the actual image will not be printed as specified, since <SPACE>, <CR> or <LF> are legitimate graphics hex values.

STEP 5: To recall the custom character from memory to be printed on the label, send the following code to the M–8450. Note that you can print other data as well. Also note how we expanded the size of our character with <ESC>L.

```
<ESC>A
<ESC>L0505<ESC>H150<ESC>V100<ESC>K1H903F
<ESC>L0505<ESC>H600<ESC>V100<ESC>K1H903F
<ESC>L0303<ESC>H125<ESC>V250<ESC>MTHIS SIDE UP!
<ESC>Q1
<ESC>Z
```

Printer Output:



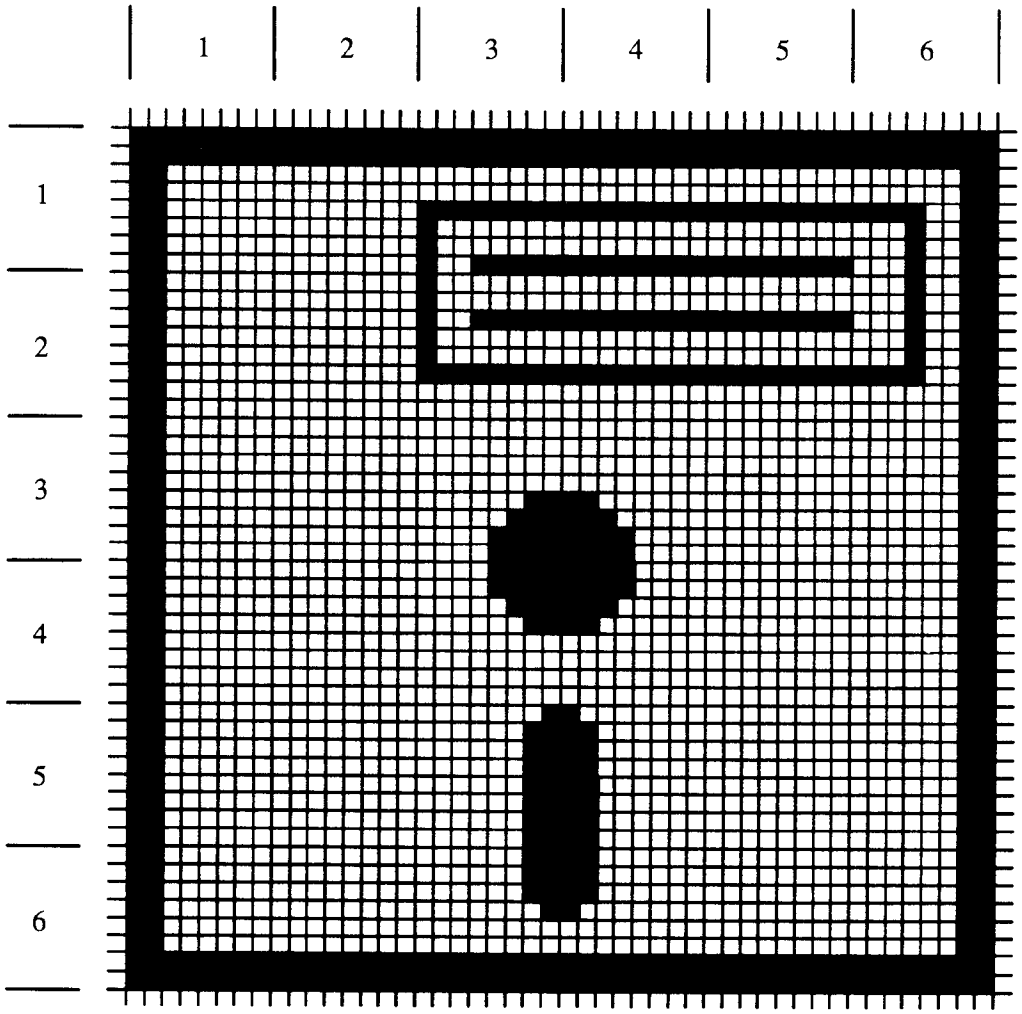
CUSTOM GRAPHICS EXAMPLE

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.

STEP 1: Determine the matrix size of the graphic. It must be in 8 dot x 8 dot blocks. The example here has 6 blocks horizontally and 6 blocks vertically.

STEP 2: Lay out a grid and draw the image on the grid:

- Each square represents one dot
- Blacken squares for each printed dot



STEP 3: Transfer the image into binary representation, and then into hexidecimal data.

Binary:

```
1    11111111 11111111 11111111 11111111 11111111 11111111
2    11111111 11111111 11111111 11111111 11111111 11111111
3    11000000 00000000 00000000 00000000 00000000 00000011
4    11000000 00000000 00000000 00000000 00000000 00000011
5    11000000 00000000 11111111 11111111 11111111 11110011
6    11000000 00000000 10000000 00000000 00000000 00010011
7    11000000 00000000 10000000 00000000 00000000 00010011
8    11000000 00000000 10011111 11111111 11111111 00010011
1    11000000 00000000 10000000 00000000 00000000 00010011
2    11000000 00000000 10000000 00000000 00000000 00010011
3    11000000 00000000 10011111 11111111 11111111 00010011
4    11000000 00000000 10000000 00000000 00000000 00010011
5    11000000 00000000 10000000 00000000 00000000 00010011
6    11000000 00000000 11111111 11111111 11111111 11110011
7    11000000 00000000 00000000 00000000 00000000 00000011
8    11000000 00000000 00000000 00000000 00000000 00000011
1    11000000 00000000 00000000 00000000 00000000 00000011
2    11000000 00000000 00000000 00000000 00000000 00000011
3    11000000 00000000 00000000 00000000 00000000 00000011
4    11000000 00000000 00000000 00000000 00000000 00000011
5    11000000 00000000 00000011 11000000 00000000 00000011
6    11000000 00000000 00000111 11100000 00000000 00000011
7    11000000 00000000 00001111 11110000 00000000 00000011
8    11000000 00000000 00001111 11110000 00000000 00000011
1    11000000 00000000 00001111 11110000 00000000 00000011
2    11000000 00000000 00001111 11110000 00000000 00000011
3    11000000 00000000 00000111 11100000 00000000 00000011
4    11000000 00000000 00000011 11000000 00000000 00000011
5    11000000 00000000 00000000 00000000 00000000 00000011
6    11000000 00000000 00000000 00000000 00000000 00000011
7    11000000 00000000 00000000 00000000 00000000 00000011
8    11000000 00000000 00000000 00000000 00000000 00000011
1    11000000 00000000 00000001 10000000 00000000 00000011
2    11000000 00000000 00000011 11000000 00000000 00000011
3    11000000 00000000 00000011 11000000 00000000 00000011
4    11000000 00000000 00000011 11000000 00000000 00000011
5    11000000 00000000 00000011 11000000 00000000 00000011
6    11000000 00000000 00000011 11000000 00000000 00000011
7    11000000 00000000 00000011 11000000 00000000 00000011
8    11000000 00000000 00000011 11000000 00000000 00000011
1    11000000 00000000 00000011 11000000 00000000 00000011
2    11000000 00000000 00000011 11000000 00000000 00000011
3    11000000 00000000 00000011 11000000 00000000 00000011
4    11000000 00000000 00000001 10000000 00000000 00000011
5    11000000 00000000 00000000 00000000 00000000 00000011
6    11000000 00000000 00000000 00000000 00000000 00000011
7    11111111 11111111 11111111 11111111 11111111 11111111
8    11111111 11111111 11111111 11111111 11111111 11111111
```

Hex:

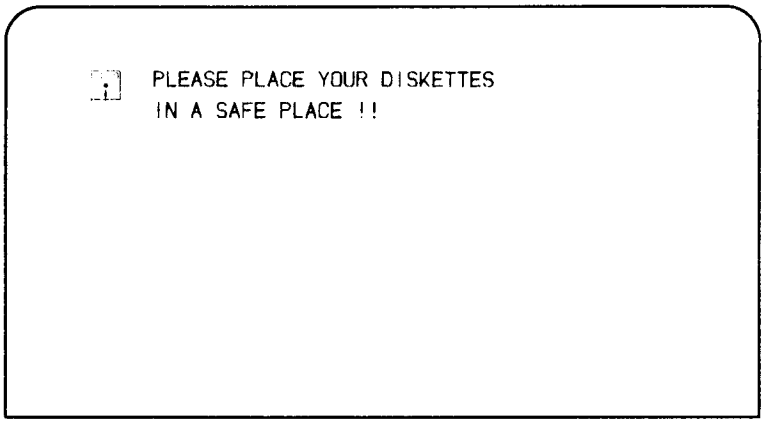
```
1    FF FF FF FF FF FF
2    FF FF FF FF FF FF
3    C0 00 00 00 00 03
4    C0 00 00 00 00 03
5    C0 00 FF FF FF F3
6    C0 00 80 00 00 13
7    C0 00 80 00 00 13
8    C0 00 9F FF FF 13
1    C0 00 80 00 00 13
2    C0 00 80 00 00 03
3    C0 00 9F FF FF 13
4    C0 00 80 00 00 13
5    C0 00 80 00 00 13
6    C0 00 FF FF FF F3
7    C0 00 00 00 00 03
8    C0 00 00 00 00 03
1    C0 00 00 00 00 03
2    C0 00 00 00 00 03
3    C0 00 00 00 00 03
4    C0 00 00 00 00 03
5    C0 00 03 C0 00 03
6    C0 00 07 E0 00 03
7    C0 00 0F F0 00 03
8    C0 00 0F F0 00 03
1    C0 00 0F F0 00 03
2    C0 00 0F F0 00 03
3    C0 00 07 E0 00 03
4    C0 00 03 C0 00 03
5    C0 00 00 00 00 03
6    C0 00 00 00 00 03
7    C0 00 00 00 00 03
8    C0 00 00 00 00 03
1    C0 00 01 80 00 03
2    C0 00 03 C0 00 03
3    C0 00 03 C0 00 03
4    C0 00 03 C0 00 03
5    C0 00 03 C0 00 03
6    C0 00 03 C0 00 03
7    C0 00 03 C0 00 03
8    C0 00 03 C0 00 03
1    C0 00 03 C0 00 03
2    C0 00 03 C0 00 03
3    C0 00 03 C0 00 03
4    C0 00 01 80 00 03
5    C0 00 00 00 00 03
6    C0 00 00 00 00 03
7    FF FF FF FF FF FF
8    FF FF FF FF FF FF
```

STEP 4: Using the hex data, send the following code to print the graphic image as designed:

```
<ESC>A
<ESC>H100<ESC>V100
<ESC>GH006006
FFFFFFFFFFFF FFFFFFFFFFFF C00000000003
C00000000003 C000FFFFFFF3 C00080000013
C00080000013 C0009FFFFF13 C00080000013
C00080000013 C0009FFFFF13 C00080000013
C00080000013 C0009FFFFFF3 C00000000003
C00000000003 C00000000003 C00000000003
C00000000003 C00000000003 C00003C00003
C00007E00003 C0000FF00003 C0000FF00003
C0000FF00003 C0000FF00003 C00007E00003
C00003C00003 C00000000003 C00000000003
C00000000003 C00000000003 C00001800003
C00003C00003 C00003C00003 C00003C00003
C00003C00003 C00003C00003 C00003C00003
C00003C00003 C00003C00003 C00003C00003
C00003C00003 C00001800003 C00000000003
C00000000003 FFFFFFFFFFFF FFFFFFFFFFFF
<ESC>H200<ESC>V100<ESC>WB1PLEASE PLACE YOUR DISKETTES
<ESC>H200<ESC>V150<ESC>WB1IN A SAFE PLACE !!
<ESC>Q1
<ESC>Z
```

NOTE: Spaces in the example above are for emphasis only. Spaces must not be encoded within the graphic portion of the printer data stream. Also, do not use ASCII <CR> or <LF> characters (carriage return or line feed) as line delimeters within the graphic data, or the actual image will not be printed as specified, since <SPACE>, <CR> or <LF> are legitimate graphics hex values.

Printer Output:



BATTERY–BACKED CUSTOM GRAPHICS EXAMPLE

The following description will refer to the same image as designed in the Custom Graphics example (see Page C–4). The difference is that two (2) data streams must be sent to the printer (as opposed to one) for printer output.

STEPS 1, 2, and 3 are the same steps followed for the Custom Graphics Example (see Page C–4).

STEP 4: Using hex data, send the following code to store the graphic image on the optional memory card:

```
<ESC>A
<ESC>GIH00600601
FFFFFFFFFFFF FFFFFFFFFFFF C00000000003
C00000000003 C000FFFFFFF3 C00080000013
C00080000013 C0009FFFFF13 C00080000013
C00080000013 C0009FFFFF13 C00080000013
C00080000013 C0009FFFFFF3 C00000000003
C00000000003 C00000000003 C00000000003
C00000000003 C00000000003 C00003C00003
C00007E00003 C0000FF00003 C0000FF00003
C0000FF00003 C0000FF00003 C00007E00003
C00003C00003 C00000000003 C00000000003
C00000000003 C00000000003 C00001800003
C00003C00003 C00003C00003 C00003C00003
C00003C00003 C00003C00003 C00003C00003
C00003C00003 C00003C00003 C00003C00003
C00003C00003 C00001800003 C00000000003
C00000000003 FFFFFFFFFFFF FFFFFFFFFFFF
<ESC>Z
```

STEP 5: Send the following code to recall the graphic image from the optional memory card and generate printer output:

```
<ESC>A
<ESC>H100<ESC>V100<ESC>GR01
<ESC>H200<ESC>V100<ESC>WB1PLEASE PLACE YOUR DISKETTES
<ESC>H200<ESC>V150<ESC>WB1IN A SAFE PLACE !!
<ESC>Q1
<ESC>Z
```

NOTE: Spaces in the example above are for emphasis only. Spaces must not be encoded within the graphic portion of the printer data stream. Also, do not use ASCII <CR> or <LF> characters (carriage return or line feed) as line delimeters within the graphic data, or the actual image will not be printed as specified.

Printer Output:

APPENDIX D
SETTING THE USER DEFAULTS

This section contains information on creating a data stream to send to the printer, which sets the User Defaults on the M–8450 printer. The User Defaults depend on the application and allow you to maintain desirable settings on the printer if the configuration is accidentally changed. The User Default data stream begins with a unique command code followed by 48 fields of data as explained below.

User Default Command Code. The following command tells the M–8450 that you will be sending User Default information: **<ESC>#G,**

1. Fixed 2B000000

2. Pitch Size – dots (4 positions). This field allows you to define the pitch (length) of your label to the printer. It is used when the Pitch Detection value (#41) is set to "02 – dot Scale". Refer to Page 2–27 of the M–8450 Operator's Manual to calculate the pitch size in dots. Then convert this number to the hexidecimal representation of dots. The allowable range is 0 – 3000 dots.

Example: If the pitch is measured as 195 dots:

195 dots = $C3_H$ dots
Pitch Size = $00C3_H$ dots

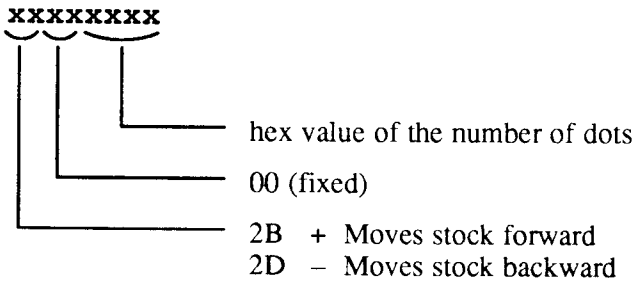
3. Head Check Interval Quantity (4 positions). If Head Check (#29) is enabled, this field provides the ability to choose how often the print head is checked after a specified number of labels. The allowable values for the number of labels are: 0001 – 9999

4. Multi–drop Printer Address (4 positions).

1 = 3031
. .
. .
9 3039
10 3130
. .
. .
16 = 3136

5. Password (4 positions). This field allows you to set a password for allowing users into the Password Protected Configuration Modes. The allowable values are: 0000 – 0999.

6. Pitch Offset (8 positions). On the M–8450, the length (pitch) of a label is either detected automatically by the printer or is entered by the user. Once the pitch is known, the Pitch Offset allows you to adjust this value for unique label stock considerations. It may be adjusted in a positive or negative direction, based on the value you select for the Pitch Offset Scale (#37). The printer's front panel configuration may be set to mm or dot offset, but this value must be the hex value of dots. The range is 0 – 2000 dots. Following is a breakdown on how to find this offset value:



Example 1: If you need a Pitch Offset of –38 mm

(–38 mm) (12 dots/mm) = –456 dots
= $-1C8_H$ dots

Pitch Offset = 2D0001C8

Example 2: If you need a Pitch Offset of 1 1/4 inch:

(1.25 in) (25.4 mm/in) = 31.75 mm
(31.75 mm) (12 dots/mm) = 381 dots
= $17D_H$ dots

Pitch Offset = 2B00017D

7. Pitch Size – mm (4 positions). This field allows you to define the pitch (length) of your label to the printer. It is used when the Pitch Detection value (#41) is set to "00 – mm Scale". Measure the pitch, convert this number to dots, and then send the Hex value of the number of dots. The allowable range is 0 – 178 mm.

Example: If the label pitch is measured as 3 inches:

(3 in) (25.4 mm/in) = 76.2 mm
(76.2 mm) (12 dots/mm) = 914 dots
= 392_H dots

Pitch Size = 0392

Note: If your pitch is greater than 178 mm, use 178 mm as the value in your calculations.

8. Horizontal Offset (4 positions). This field and the Vertical Offset field allow the entire print area of the label to be moved to "fine tune" for tolerances in preprinted labels, etc. The allowable range is 0 – 128 mm (0 – 832 dots).

Example: If you need a Horizontal Offset of 1/2 inch

(0.5 in) (25.4 mm/in) = 12.7 mm
(12.7 mm) (2 dots/mm) = 152 dots
= 98_H dots

Horizontal Offset = 0098

9. Vertical Offset (4 positions). The allowable range is 0 – 178 mm (0–1424 dots). Calculate the value as shown for the Horizontal Offset field.

10. Fixed 2B000000

11. Auto On–line

00 = No
01 = Yes

12. Cutter Backfeed

00 = No
01 = Yes

13. Dispenser Backfeed

00 = No
01 = Yes

14. Fixed 00

15. Baud Rate (Serial Interface)

00 = 300 Baud
01 = 600
02 = 1,200
03 = 2,400
04 = 4,800
05 = 9,600
06 = 19,200

16. Backfeed Generated By:

00 = Trigger (Dispenser Attached)
01 = Automatic (Cutter Attached)

17. CAN

18 = CAN (Standard)
21 = ! (Non–Standard)

18. Memory Card Configuration (2 positions). This informs the printer how the optional memory card is configured.

00 = Formats & Graphics (1:1)
01 = Formats Only
02 = Graphics Only
03 = Fonts Only

19. Cutter Installed

00 = No
01 = Yes

20. Print Darkness

00 = 1 (light)
01 = 2
02 = 3
03 = 4
04 = 5 (dark)

21. Data Bits (Serial Interface)

00 = 8 Data Bits
01 = 7 Data Bits

22. Dispenser Installed

00 = No
01 = Yes

23. Dot Expansion

00 = 1X
01 = 2X
02 = 3X

24. ENQ

05 = ENQ (Standard)
40 = @ (Non–Standard)

25. ESC

1B = ESC (Standard)
5E = ^ (Non–Standard)

26. ETX

03 = ETX (Standard)
7D = } (Non–Standard)

27. External Output Signal (2 positions). This signal is available as an output to drive an applicator or some external accessory requiring a signal synchronized to the print cycle. Four types of signals are available at the "EXT" connector on the printer rear panel.

See the Accessory Connector of the Interface Specifications in Section 2.

00 = Type 1 Signal
01 = Type 2 Signal
02 = Type 3 Signal
03 = Type 4 Signal

28. Gap Threshold Voltage (2 positions). When using stock with label backing or a feed slot and the See–Thru Sensor selected in field #43, this is the Sensor Threshold voltage input. To determine the value of this voltage, go to Mode S via the operator panel (see Section 2 of the M–8450 Operator's Manual); select "Setup Sensor" from the Mode S options, then select "See–Thru". It will show "1st Threshold = x.x V". Move the stock until the I–Mark is beneath the sensor. You will know this because you'll see a jump in the voltage shown on the display. Press ENTER. Move the I–Mark out from beneath the Sensor. The display reads "2nd Threshold = x.x V". Press ENTER. The threshold voltage then appears. Make note of it. Cursor to "yes" and press ENTER. Now, in order to enter this voltage into the Data Stream you'll need to make a simple calculation.

Suppose you measured the threshold voltage as 2.3 V. Multiply this value by 51 and find the hex value of the result. This is the input value for this field.

2.3 x 51 = 117.3
= 75 (Hex)

Voltage = 75

29. Head Check

00 = Disabled
01 = Enabled

Note: See also #3 (Head Check Interval Quantity)

30. I–Mark Threshold Voltage (2 positions). When using stock with an I–Mark and the Reflective Sensor selected in field #43, this is the Sensor Threshold voltage input. Find the threshold voltage in the same way as shown in #28 (Gap Threshold Voltage), except select "Reflective" as the sensor type from the operator panel.

31. Interface Type

00 = Serial
01 = Parallel

32. Ribbon Saver Installed

00 = No
01 = Yes

33. Sensor Group

00 = Sensor 4, 5
01 = Sensor 1, 2, 3
02 = Sensor 6

34. Fixed 00

35. NUL

00 = NUL (Standard)
7E = ~ (Non–Standard)

36. Parity (Serial Interface)

00 = None
01 = Even
02 = Odd

37. Pitch Offset Scale

00 = mm
01 = Dots

38. Printer Mode

00 = Thermal Transfer
01 = Direct Thermal

39. Flow Control (Serial Interface)

00 = PC1 RS On (Ready/Busy)
01 = PC1 RS On/Off (Ready/Busy)
02 = X–On/X–Off
03 = Status 1 (Reserved, Do Not Use)
04 = Status 2 (Bi–Directional)

Note: See Section 2 – Interface Specifications for details on these protocols.

40. Proto–Codes. This field defines whether the Standard or Non–Standard Proto–Codes are being used.

00 = Standard
01 = Non–Standard

41. Pitch Detection

00 = mm Scale Detection

Upon power up, the Pitch Size value entered in field #7 is used to move the label to the top of form.

01 = Auto Detection

Upon power up, the printer will pass 2–3 labels (to automatically measure the pitch) and stop at the top of form.

02 = Dot Scale Detection

Upon power up, the Pitch Size value entered in field #7 is used to move the label to the top of form.

42. Receive Buffer Size

00 = 1 Job Buffer
01 = 10 Job Buffer
02 = Multi Buffer

43. Sensor Type

00 = Reflective Sensor (for use with I–Mark)
01 = See–thru Sensor (for use with Backing Paper or Feed–Slot)
02 = Sensor not used (for Continuous Form Printing)
03 = Reserved (Do Not Use)

Note: See also #7 (Pitch Size–mm), #41 (Pitch Detection) and #7 (Pitch Size – dots)

44. Print Speed

00 = 4 in/sec
01 = 5 in/sec
02 = 6 in/sec
03 = 7 in/sec
04 = 8 in/sec
05 = 9 in/sec
06 = 10 in/sec

45. Fixed 00

46. Stop Bits (Serial Interface)

00 = 1 Stop Bit
01 = 2 Stop Bits

47. STX

02 = STX (Standard)
7B = { (Non–Standard)

48. X–ON

11 = DC1 (Standard and Non–Standard Protocodes)

49. X–OFF

13 = DC3 (Standard and Non–Standard Protocodes)

50. User Check Sum (2 positions). The final 2 positions of the data stream must be a check sum of all the data being sent. It is calculated by taking the summation of the Hex values of each position from fields 1 through 49. Although fields #3 and #5 are decimal values, treat them as if they were hexidecimal values for this calculation. If the result of the summation is greater than 2 digits, use the two right–most digits as the User Check Sum (i.e., if the result is 019C, use 9C).

Example:

After determining the value for each of the fields 1 – 49, you may have the following data:

```
 2+B+0+0+0+0+0+0+0+2+D+0+0+0+0+0
+3+0+3+1+0+0+0+0+2+B+0+0+0+0+0+0
+0+8+5+5+0+0+0+0+0+0+0+0+2+B+0+0
+0+0+0+0+0+0+0+0+0+0+0+0+0+5+0+0
+1+8+0+0+0+0+0+0+0+0+0+0+0+0+0+5
+1+B+0+3+0+0+6+6+0+0+6+6+0+0+0+0
+0+0+0+0+0+0+0+0+0+0+0+0+0+2+0+0
+0+0+0+0+0+1+0+0+0+0+0+0+0+2+1+1
+1+3 = 148 94H
```

The User Check Sum value is 94 (Hex). Thus, the last 2 positions of the data stream will be 94.

Example in BASIC

```
1    E$ = CHR$(27)
2    OPEN "COM1:9600,N,8,1,CS,DS" AS #1
3    PRINT #1, CHR$(2);
4    PRINT #1, E$;"A";
5    PRINT #1, E$;"#G,"
10   PRINT #1, "2B000000";  'Fixed (8)
20   PRINT #1, "02D0";      'Pitch Size - dots (4)
30   PRINT #1, "0000";      'Head Check Interval Qty (4)
40   PRINT #1, "3031";      'Multi-Drop Printer Address (4)
50   PRINT #1, "0000";      'Password (4)
60   PRINT #1, "2B000000";  'Pitch Offset (8)
70   PRINT #1, "0855";      'Pitch Size - mm (4)
80   PRINT #1, "0000";      'Horz Offset (4)
90   PRINT #1, "0000";      'Vert Offset (4)
100  PRINT #1, "2B000000";  'Fixed (8)
110  PRINT #1, "00";        'Auto On-line (2)
120  PRINT #1, "00";        'Cutter Backfeed (2)
130  PRINT #1, "00";        'Dispenser Backfeed (2)
140  PRINT #1, "00";        'Fixed (2)
150  PRINT #1, "05";        'Baud Rate (2)
160  PRINT #1, "00";        'Backfeed Generated By (2)
170  PRINT #1, "18";        'CAN (2)
180  PRINT #1, "00";        'Memory Card (2)
190  PRINT #1, "00";        'Cutter (2)
200  PRINT #1, "00";        'Print Darkness (2)
210  PRINT #1, "00";        'Data Bits (2)
220  PRINT #1, "00";        'Dispenser (2)
230  PRINT #1, "00";        'Dot Expansion (2)
240  PRINT #1, "05";        'ENQ (2)
250  PRINT #1, "1B";        'ESC (2)
260  PRINT #1, "03";        'ETX (2)
270  PRINT #1, "00";        'External Output Signal (2)
280  PRINT #1, "66";        'Gap Threshold Voltage (2)
290  PRINT #1, "00";        'Head Check (2)
300  PRINT #1, "66";        'I-Mark Threshold Voltage (2)
310  PRINT #1, "00";        'Interface Type (2)
320  PRINT #1, "00";        'Ribbon Saver (2)
330  PRINT #1, "00";        'Sensor Group (2)
340  PRINT #1, "00";        'Fixed (2)
350  PRINT #1, "00";        'NUL (2)
360  PRINT #1, "00";        'Parity (2)
370  PRINT #1, "00";        'Pitch Offset Scale (2)
380  PRINT #1, "00";        'Printer Mode (2)
390  PRINT #1, "02";        'Flow Control (2)
```

```
400 PRINT #1, "00";          'Proto-Codes (2)
410 PRINT #1, "00";          'Pitch Detection Method (2)
420 PRINT #1, "00";          'Receive Buffer Size (2)
430 PRINT #1, "01";          'Sensor Type (2)
440 PRINT #1, "00";          'Print Speed (2)
450 PRINT #1, "00";          'Fixed (2)
460 PRINT #1, "00";          'Stop Bits (2)
470 PRINT #1, "02";          'STX (2)
480 PRINT #1, "11";          'X-ON (2)
490 PRINT #1, "13";          'X-OFF (2)
500 PRINT #1, "94";          'User Check Sum (2)
510 PRINT #1, E$; "Z";
520 PRINT #1, CHR$(3);
```

Although the above example assumes use of the RS232C Serial interface, either interface type can be used to send this data stream. Upon sending the data stream, you should see no reaction on the printer.

NOTE: If the printer goes off–line when the user default data stream is being transmitted, then the user check sum in the data stream is probably incorrect.

IMPORTANT: After sending the User Default data stream, the settings are stored in a battery–backed memory area on the printer. To make these settings effective, you must place them into the printer's current configuration by selecting the "Set User Default" option from Mode S of the Printer Configuration (see Section 2 of the M–8450 Operator's Manual). This process will change the current configuration to the settings sent in your User Default data stream. This also is the method to bring back your desired User settings if the current configuration is accidentally changed.

APPENDIX E
USING THE M–8450 OPTIONAL FEATURES

This section contains instructions for using the following M–8450 optional features:

- Ribbon Saver
- Label Rewinder
- Label Cutter
- Label Dispenser

RIBBON SAVER

The ribbon saver consists of internal mechanisms and special firmware that enables the printer to halt ribbon movement when gaps occur between print fields within the label or tag. These gaps or "white space" areas are automatically detected by the intelligence of the ribbon saver. The white space must be a continuous linear area of non–printing, though it may contain preprinted information such as a company name or logo.

(NOTE: The Ribbon Saver cannot be used with the Label Cutter.)

Operator Setup

The following steps should be taken to set up the ribbon saver:

Step	Action
1	Have the ribbon saver installed. (Must be factory installed.)
2	The printer must be configured to use the ribbon saver option. See "Carbon Saving" under Mode S of the printer configuration in Section 2 of the Operator's Manual.
3	Load the ribbon as detailed in Section 2 of the Operator's Manual.
4	Load the labels as detailed in Section 2 of the Operator's Manual, taking into account the following differences: – You **must** open the cover (rear of label sensor) over the secondary platen before feeding. – You **must** close this cover before printing. This secondary roller feeds labels/tags when there is "white space" detected.
5	The printer and ribbon saver are ready for use.

General Operation

The ribbon saver will now operate without further user intervention. Based on the format of your label, the ribbon saver will look for a minimum of 0.8 inches of "white space", and if detected, will temporarily lift the print head and halt ribbon movement. (This operation can be viewed if the side and top printer doors are open.)

NOTE: The maximum print speed is 7"/sec if using the ribbon saver.

LABEL REWINDER

The rewinder is an external unit that allows for labels or tags to be rewound in rolls up to 8.5 inches in diameter. It derives its power directly from the printer's EXT connector using a built–in cable. The rewinder provides the capability of rewinding labels/tags from the printer and subsequently being unwound for later use with applicators.

Installation

Step	Action
1	Using a No. 2 Phillips screwdriver, remove the two screws and plate covering the EXT connector at the rear of the printer.
2	Position the rewinder at the front of the printer and align it with the label slot. (The rewind wheel/spindle should be positioned away from the printer.) The optional plate may be attached between the printer and rewinder if necessary.
3	Connect the built–in cable from the rewinder to the EXT connector at the rear of the printer.
4	On the rewinder, remove the metal clamp from the rewind spindle.
5	Feed the lead end of the label stock under the first spindle and onto the rewind spindle. Feed the label stock around the spindle once, then replace the metal clamp over the label stock. Wind another revolution to ensure the labels are secure on the spindle.
6	Select the REWIND option on the rewinder, then set the power switch to ON. (The printer must be powered ON for the rewinder to function).

Removing and Unwinding the Roll

As labels are printed, tension from the rewinder should keep the label stock taut as it wraps onto the rewind spindle.

To remove the roll from the spindle, first set the power switch OFF. Remove the metal clamp, then remove the rewound roll of labels.

To unwind for using with an applicator, first set the power switch OFF. Attach the lead edge of the labels from the rewind spindle to the applicator entry point. Select the WIND option on the rewinder, and when ready to begin, set the power switch to ON.

LABEL CUTTER

The label cutter consists of an internal mechanism that will cut labels or tags as they exit the printer. The cutter can be used to print labels of various lengths using continuous form label/tag stock or to easily separate labels when there is no perforation at the label gap.

(NOTE: The Label Cutter cannot be used with the Ribbon Saver.)

Operator Setup

The following steps should be taken to set up the label cutter:

Step	Action
1	Install the label cutter, following the instructions provided with the unit. Installation time is approximately 20 minutes.
2	Power on the printer.
3	The printer must be configured to use the Label Cutter option. See "Cutter" under Mode S of the Printer Configuration in Section 2 of the Operator's Manual.
4	Also, if you are using continuous form label/tag stock, set the sensor to "Not Used" in Mode S of the Printer Configuration.
5	Open the print head assembly and feed the lead edge of the labels/tags into the cutter assembly and out between the plastic and metal rollers. NOTE: Although the cutting blade is fairly well guarded, be careful as you feed labels into the cutter area. You may want to have the printer powered OFF at this point.
6	Close the print head assembly and place the printer on–line.
7	The label cutter is ready for use.

General Operation

The data stream to be sent to the printer may need to be altered to add the Cutter Command. If this command is not used, the cutter will default to cut after every label assuming it has been enabled in the printer configuration. For more details, see the Cutter Command in Section 2 of this manual. As labels are printed, they will be cut based on your use of this cutter command.

LABEL DISPENSER

The label dispenser is an internal mechanism to the printer that provides the ability to print in a "demand mode". When the dispenser is installed and configured for operation, the printer dispenses one label at a time, peeling the backing from the label, which allows for immediate application to the product by the operator.

Operator Setup

The following steps should be taken to set up the label dispenser:

Step	Action
1	Install the label dispenser following the directions provided with the unit. Installation time is approximately 20 minutes.
2	Power on the printer.
3	The printer must be configured to use the label dispenser option. See "Dispenser" under Mode S of the Printer Configuration in Section 2 of the Operator's Manual.
4	Remove one or two of the lead labels from the backing paper.
5	Open the label dispenser by lifting up its front panel and swinging open the unit such that the knurled roller is easily seen.
6	Open the print head assembly and feed the lead of the backing paper through the print area in the normal manner.
7	At the label exit area, feed the backing paper down and behind the knurled roller, then out the lower exit of the label dispenser.
8	Close the front panel of the label dispenser until it locks into place and again is flush with the front of the printer.
9	Close the print head assembly and place the printer on–line.
10	The label dispenser is ready for use.

General Operation

Send your data stream in the normal manner to the printer. Labels should print one at a time, even if your print quantity command requests more than one label. As labels are printed and presented for the operator to remove, the backing paper will continue to feed out the dispenser's lower exit path. If the dispenser's backfeed option has been set to SENSOR in the printer configuration, the next label will print only after removing the current label from the label exit path. (You may also control the printing of the next label with an external switch attached to the printer's EXT connector as described in Page 2–15 (Pin #5).

Note: The label dispenser will function only if it has been activated through the Mode S configuration process.

APPENDIX F
CHARACTER TABLES

This section shows the character tables available in the SATO M–8450. These tables reflect the various characters and symbols available to print on your labels. You will find 9 International Character Tables listed, with each applying to the fonts U, S, and M. If you do not use the character table command in your data stream to the printer, the printer assumes use of the IBM 850 Character Table (which is the printer default). For more information on the Character Table command, see Page 1–26.

Also in this section you will find the character tables for fonts OA and OB.

How to read the table: $4C_H$ = **L**
62_H = **b**

IBM 850 Character Table

	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		0	@	P	'	p	Ç	É	á			ð	Ó	-
1	!	1	A	Q	a	q	ü	æ	í			Ð	ß	±
2	"	2	B	R	b	r	é	Æ	ó			Ê	Ô	=
3	#	3	C	S	c	s	â	ô	ú			Ë	Ò	¾
4	$	4	D	T	d	t	ä	ö	ñ			È	Õ	
5	%	5	E	U	e	u	à	ò	Ñ	Á			õ	§
6	&	6	F	V	f	v	å	û	ª	Â	ã	Í	µ	÷
7	'	7	G	W	g	w	ç	ù	º	À	Ã	Î		
8	(	8	H	X	h	x	ê	ÿ	¿	©		Ï		°
9	)	9	I	Y	i	y	ë	Ö	®				Ú	¨
A	*	:	J	Z	j	z	è	Ü	¬				Û	·
B	+	;	K	[	k	{	ï	ø	½				Ù	¹
C	,	<	L	\	l	|	î	£	¼			ý	³
D	-	=	M	]	m	}	ì	Ø	¡	¢			Ý	²
E	.	>	N	^	n	~	Ä	×	«	¥		Ì		
F	/	?	O	_	o		Å	ƒ	»				´	

Character Table 1

	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		0	@	P	`	p	Ç	É	á			ð	ó	-
1	!	1	A	Q	a	q	ü	æ	í			Ð	β	±
2	"	2	B	R	b	r	é	Æ	ó			Ê	Ô	=
3	£	3	C	S	c	s	â	ô	ú			Ë	Ò	¾
4	$	4	D	T	d	t	ä	ö	ñ			È	Õ	
5	%	5	E	U	e	u	à	ò	Ñ	Á			õ	§
6	&	6	F	V	f	v	å	û	ª	Â	ã	í	µ	÷
7	'	7	G	W	g	w	ç	ù	º	À	Ã	Î		
8	(	8	H	X	h	x	ê	ÿ	¿	©		ï		°
9	)	9	I	Y	i	y	ë	Ö	®				Ú	¨
A	*	:	J	Z	j	z	è	Ü	¬				Û	·
B	+	;	K	[	k	{	ï	ø	½				Ù	¹
C	,	<	L	\	l	¦	î	£	¼				ý	³
D	-	=	M	]	m	}	ì	Ø	¡	¢			Ý	²
E	.	>	N	^	n	~	Ä	×	«	¥		ì	¯	
F	/	?	O	_	o			Å	ƒ	»				´

Character Table 2

	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		0	§	P	'	p	Ç	É	á			ð	ó	-
1	!	1	A	Q	a	q	ü	æ	í			Ð	ß	±
2	"	2	B	R	b	r	é	Æ	ó			Ê	Ô	=
3	#	3	C	S	c	s	â	ô	ú			Ë	Ò	¾
4	$	4	D	T	d	t	ä	ö	ñ			È	Õ	
5	%	5	E	U	e	u	à	ò	Ñ	Á			õ	§
6	&	6	F	V	f	v	å	û	ª	Â	ã	Í	µ	÷
7	'	7	G	W	g	w	ç	ù	º	À	Ã	Î		
8	(	8	H	X	h	x	ê	ÿ	¿	©		Ï		°
9	)	9	I	Y	i	y	ë	Ö	®				Ú	¨
A	*	:	J	Z	j	z	è	Ü	¬				Û	·
B	+	;	K	Ä	k	ä	ï	ø	½				Ù	¹
C	,	<	L	Ö	l	ö	î	£	¼				ý	³
D	-	=	M	Ü	m	ü	ì	Ø	¡	¢			Ý	²
E	.	>	N	^	n	ß	Ä	×	«	¥		Ì	¯	
F	/	?	O	_	o		Å	ƒ	»				´	

Character Table 3

	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		0	à	P	ë	p	Ç	É	á		ð	ó	-	
1	!	1	A	Q	a	q	ü	æ	í		Ð	ß	±	
2	"	2	B	R	b	r	é	Æ	ó		Ê	ô	=	
3	#	3	C	S	c	s	â	ô	ú		Ë	ò	¾	
4	$	4	D	T	d	t	ä	ö	ñ		È	õ		
5	%	5	E	U	e	u	à	ò	Ñ	Á		õ	§	
6	&	6	F	V	f	v	å	û	ª	Â	ã	í	µ	÷
7	'	7	G	W	g	w	ç	ù	º	À	Ã	î		
8	(	8	H	X	h	x	ê	ÿ	¿	©		ï		°
9	)	9	I	Y	i	y	ë	Ö	®			Ú		¨
A	*	:	J	Z	j	z	è	Ü	¬			Û		·
B	+	;	K	ï	k	é	ï	ø	½			Ù		'
C	,	<	L	ç	l	ù	î	£	¼			ý		³
D	-	=	M	û	m	è	ì	Ø	i	¢		Ý		²
E	.	>	N	î	n	ê	Ä	x	«	¥		ì		¯
F	/	?	O	ô	o		Å	ƒ	»					´

Character Table 4

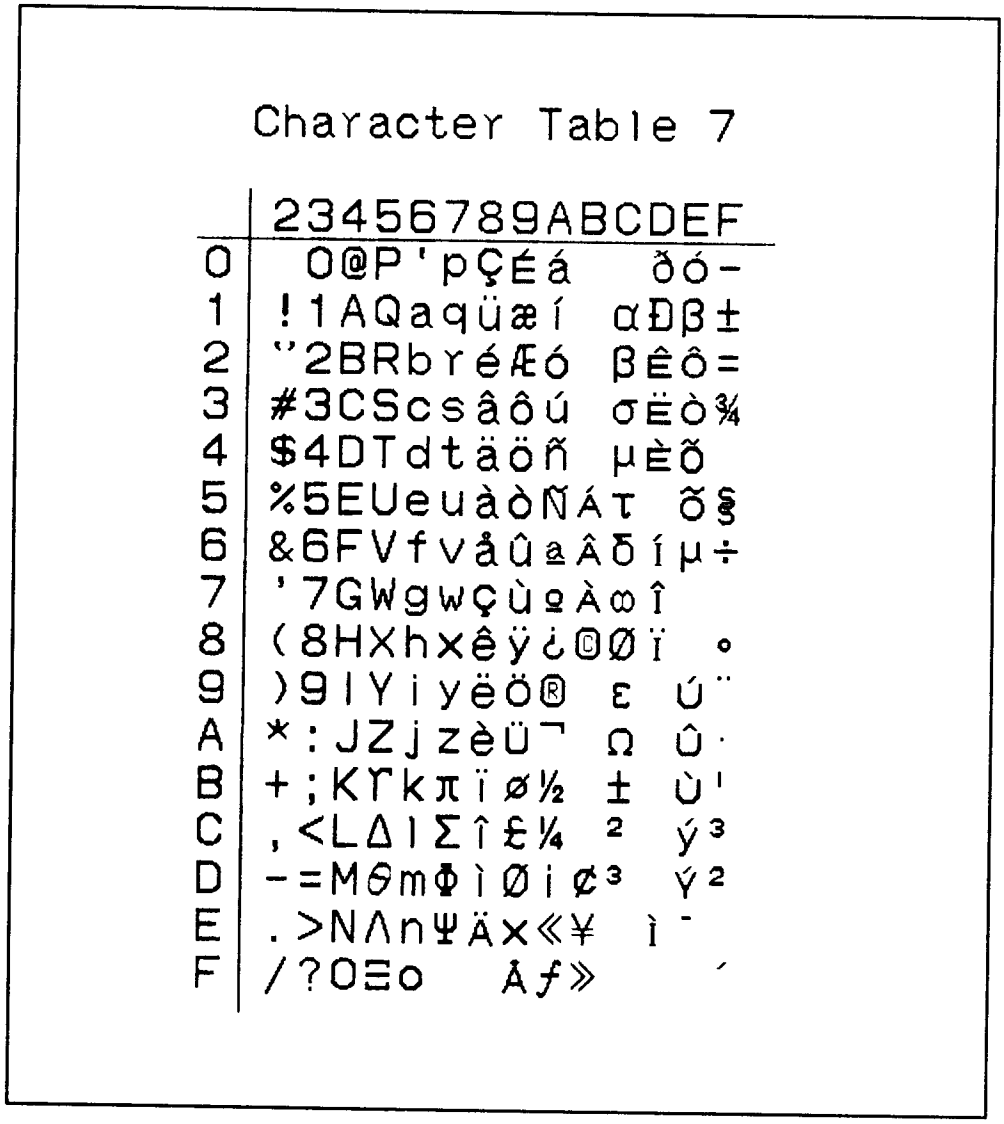
	23456789ABCDEF
0	0ÉPépÇÉá ðó-
1	!1AQaqüæí ÐßÂ±
2	"2BRbréÆó êô=
3	#3CScsâôú ëò¾
4	$4DTdtäöñ èõ
5	%5EUeuàòÑÁ õ§
6	&6FVfvåûªÂãíµ÷
7	'7GWgwçùºÀÃî
8	(8HXhxêÿ¿© ï °
9	)9IYiyëÖ® ú¨
A	*:JZjzèÜ¬ û·
B	+;KÄkäïø½ ù'
C	,<LÖlöî£¼ ý³
D	-=MÅmåìØi¢ ý²
E	.>NÜnüÄ×«¥ ì ¯
F	/?O_o Åƒ» ´

Character Table 5

	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		0	Ä	P	ä	p	Ç	É	á			ð	ó	-
1	!	1	A	Q	a	q	ü	æ	í			Ð	ß	±
2	"	2	B	R	b	r	é	Æ	ó			Ê	Ô	=
3	#	3	C	S	c	s	â	ô	ú			Ë	Ò	¾
4	$	4	D	T	d	t	ä	ö	ñ			È	õ	
5	%	5	E	U	e	u	à	ò	Ñ	Á			õ	§
6	&	6	F	V	f	v	å	û	ª	Â	ã	í	µ	÷
7	'	7	G	W	g	w	ç	ù	º	À	Ã	Î		
8	(	8	H	X	h	x	ê	ÿ	¿	©		Ï		°
9	)	9	I	Y	i	y	ë	Ö	®				Ú	¨
A	*	:	J	Z	j	z	è	Ü	¬				Û	·
B	+	;	K	Æ	k	æ	ï	ø	½				Ù	¹
C	,	<	L	Ø	l	ø	î	£	¼				ý	³
D	-	=	M	Å	m	å	ì	Ø	i	¢			Ý	²
E	.	>	N	Ü	n	ü	Ä	x	«	¥		Ì	¯	
F	/	?	O	_	o		Å	ƒ	»				´	

Character Table 6

	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		0	@	P	'	p	Ç	É	á			ð	ó	-
1	!	1	A	Q	a	q	ü	æ	í			Ð	ß	±
2	"	2	B	R	b	r	é	Æ	ó			Ê	Ô	=
3	#	3	C	S	c	s	â	ô	ú			Ë	Ò	¾
4	$	4	D	T	d	t	ä	ö	ñ			È	Õ	
5	%	5	E	U	e	u	à	ò	Ñ	Á			õ	§
6	&	6	F	V	f	v	å	û	ª	Â	ã	Í	µ	÷
7	'	7	G	W	g	w	ç	ù	º	À	Ã	Î		
8	(	8	H	X	h	x	ê	ÿ	¿	©		Ï		°
9	)	9	I	Y	i	y	ë	Ö	®				Ú	¨
A	*	:	J	Z	j	z	è	Ü	¬				Û	·
B	+	;	K	[	k	¨	ï	ø	½				Ù	¹
C	,	<	L	Ñ	l	ñ	î	£	¼				ý	³
D	-	=	M	]	m	}	ì	Ø	¡	¢			Ý	²
E	.	>	N	^	n	~	Ä	×	«	¥		Ì	¯	
F	/	?	O	_	o		Å	ƒ	»				´	

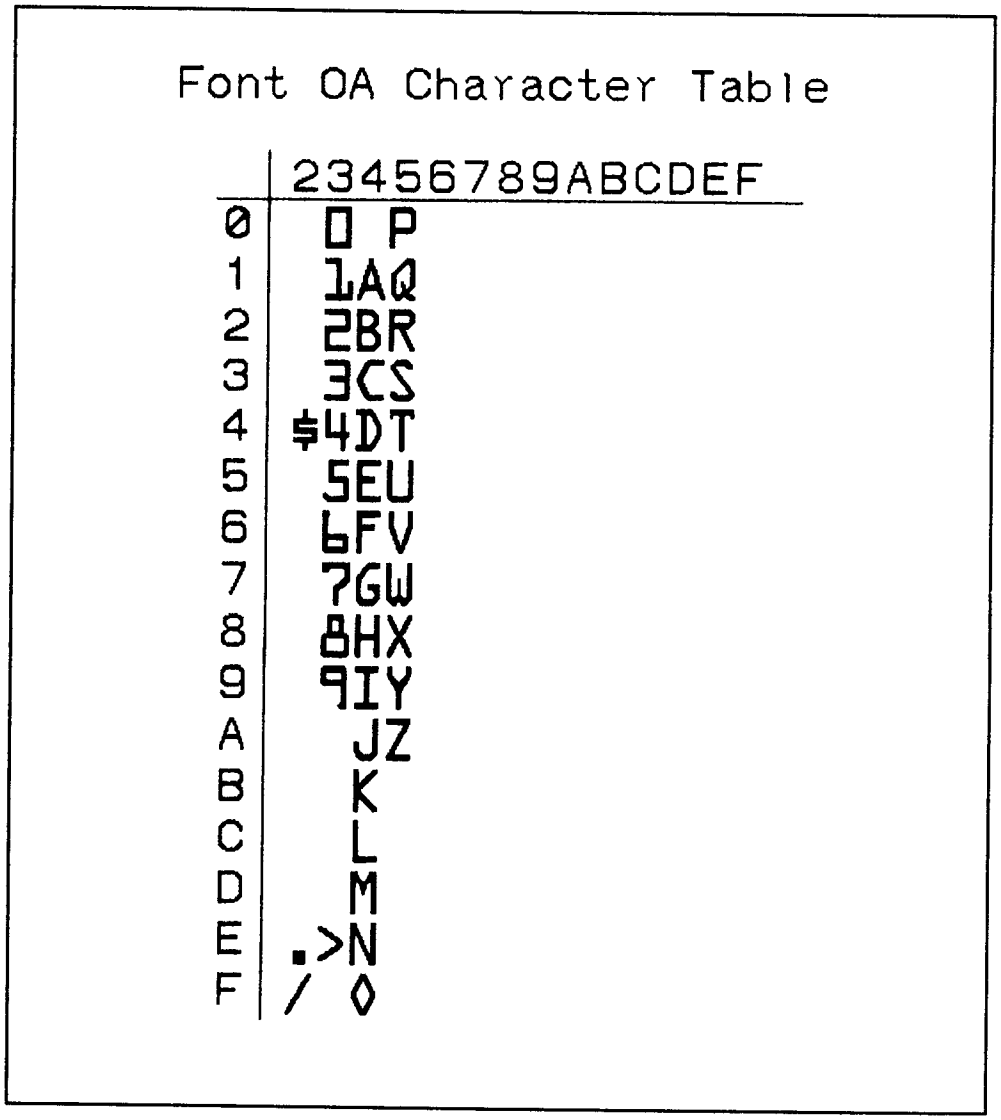


Character Table 7

	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		0	@	P	'	p	Ç	É	á			ð	ó	-
1	!	1	A	Q	a	q	ü	æ	í		α	Ð	β	±
2	"	2	B	R	b	r	é	Æ	ó		β	Ê	ô	=
3	#	3	C	S	c	s	â	ô	ú		σ	Ë	ò	¾
4	$	4	D	T	d	t	ä	ö	ñ		μ	È	õ	
5	%	5	E	U	e	u	à	ò	Ñ	Á	τ		õ	§
6	&	6	F	V	f	v	å	û	ª	Â	δ	í	μ	÷
7	'	7	G	W	g	w	ç	ù	º	À	φ	Î		
8	(	8	H	X	h	x	ê	ÿ	¿	©	Ø	ï		°
9	)	9	I	Y	i	y	ë	Ö	®		ε		Ú	¨
A	*	:	J	Z	j	z	è	Ü	¬		Ω		Û	·
B	+	;	K	Γ	k	π	ï	ø	½		±		Ù	¹
C	,	<	L	Δ	l	Σ	î	£	¼		²		ý	³
D	-	=	M	Θ	m	Φ	ì	Ø	¡		¢	³	Ý	²
E	.	>	N	Λ	n	Ψ	Ä	x	«		¥		ì	¯
F	/	?	O	Ξ	o		Å	ƒ	»					´

Character Table 9

	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		0	@	P	'	p	Ç	É	á			ð	ó	-
1	!	1	A	Q	a	q	ü	æ	í			Ð	ß	±
2	"	2	B	R	b	r	é	Æ	ó			Ê	Ô	=
3	#	3	C	S	c	s	â	ô	ú			Ë	Ò	¾
4	$	4	D	T	d	t	ä	ö	ñ			È	Õ	
5	%	5	E	U	e	u	à	ò	Ñ	Á			õ	§
6	&	6	F	V	f	v	å	û	ª	Â	ã	Í	µ	÷
7	'	7	G	W	g	w	ç	ù	º	À	Ã	Î		
8	(	8	H	X	h	x	ê	ÿ	¿	©		Ï		°
9	)	9	I	Y	i	y	ë	Ö	®				Ú	¨
A	*	:	J	Z	j	z	è	Ü	¬				Û	·
B	+	;	K	[	k	{	ï	ø	½				Ù	¹
C	,	<	L	\	l	¦	î	£	¼				ý	³
D	-	=	M	]	m	}	ì	Ø	¡	¢			Ý	²
E	.	>	N	^	n	~	Ä	×	«	¥		Ì		
F	/	?	O	_	o		Å	ƒ	»				´	


Font 0A Character Table
23456789ABCDEF
0 0 P
1 1AQ
2 2BR
3 3CS
4 $4DT
5 5EU
6 6FV
7 7GW
8 8HX
9 9IY
A JZ
B K
C L
D M
E .>N
F / 0

Font 0B Character Table

	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			0	@	P									
1	!	1	A	Q										
2	"	2	B	R										
3	#	3	C	S										
4	$	4	D	T										
5	%	5	E	U										
6	&	6	F	V										
7	'	7	G	W										
8	(	8	H	X										
9	)	9	I	Y										
A	*	:	J	Z										
B	+	;	K	S_2										
C	,	<	L	¥										
D	−	=	M											
E	.	>	N											
F	/	?	O											

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