

# FLIGHT STRIP PRINTER



## MAINTENANCE AND USERS MANUAL

**FSP 960-300B**

Document No. A422632

Revised 7.30.04



***Boca Systems***

Follow best commercial established practices while operating and maintaining the Flight Strip Printer. This includes, but it is not limited to, electrostatic discharge (ESD), power and personal safety.

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# Revisions

| Date     | Comments  |
|----------|---|
| 08.10.99 | Renamed Section 9.0 and added additional cleaning procedures.<br>Added this Revisions page.                                     |
| 02.29.00 | Updated Section 7.1.7 to Reflect Software Revision FSP40G.<br>Added a qualifying sentence to the introduction of Section 7.1.7. |
| 04.17.00 | Updated Section 10.0 and Section 11.0 to include a functional test of<br>the printer whenever maintenance is performed.         |
| 12.07.00 | Updated Section 10.0 to include Field Calibration of Cutter Motor Ar  |
| 2.28.02  | Edited 10.2.1, updated table of contents  |
| 07.30.04 | Updated Section 11.0 to require a minimum thirty second power down period<br>prior to initiating any printer maintenance.       |

## 1.0 Introduction

The Flight Strip Printer (FSP) Model FSP-960-300B has been developed by Boca Systems, Inc. for the air traffic control environment.

Using direct thermal technology, the printer prints a flight strip 1.33 inches wide by 6.375 inches long. After printing, the flight strips are cut and ejected into a hopper.

This printer accepts commands in accordance with Boca's FGL programming language (as described in Boca's FGL 40 programming guide) via an RS-422 interface. Additional features and characters have been added and are described in this manual.

The FSP is divided into a Print Head Module and a Power Supply Module, which are connected by an interconnect cable.

## 2.0 Getting Started

Open the shipping carton and remove the contents. Packing material should be kept for later use. You will find these items in the box:

- Print Head Module—see Figure 1
- Power Supply Module—see Figure 2
- Interconnect cable—see Figure 1
- An ac power cord (220 V)—not shown
- Hopper—see Figure 5
- Locator tab—not shown
- Two bags containing miscellaneous hardware—not shown.

If your printer was damaged in shipping, or if any items are missing, notify Boca Systems, Inc. immediately at the address below:

1065 South Rogers Circle  
Boca Raton, FL 33487

(561) 998-9600 / (561) 998-9609 (fax)

### 3.0 A Tour of the Flight Strip Printer

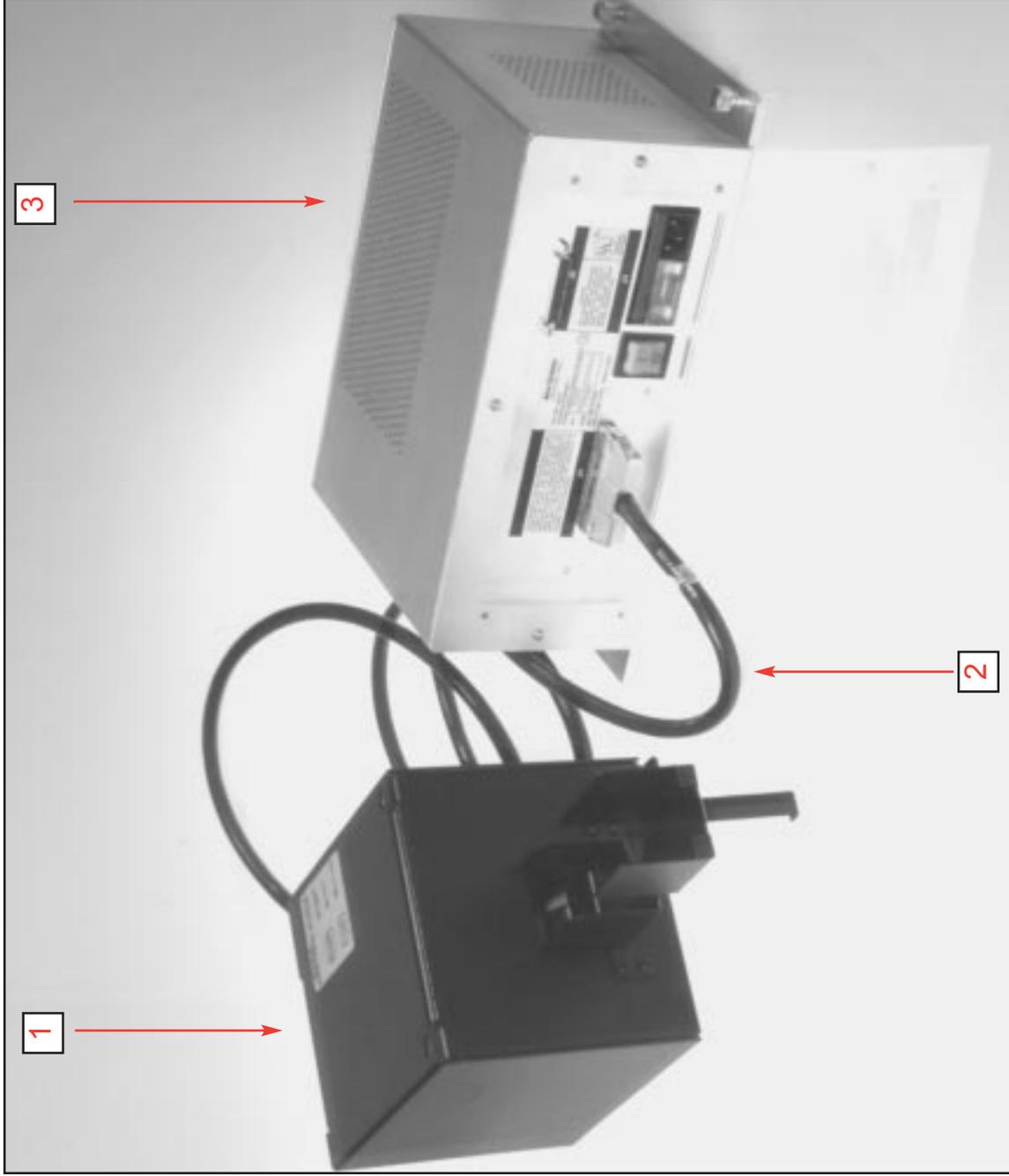


Figure 1

## Flight Strip Printer (FSP) 960-300B

- 1 - Print Head Module
- 2 - Interconnect Cable
- 3 - Power Supply Module

Figure 2

## Power Supply Module (Cover Removed)

- 1 - Connector Board, Interconnect Cable (Power Supply Module)
- 2 - AC Switch
- 3 - AC Filter Fuse Holder
- 4 - Fuse, 2 amp SLOW BLOW
- 5 - Interface Board RS-422

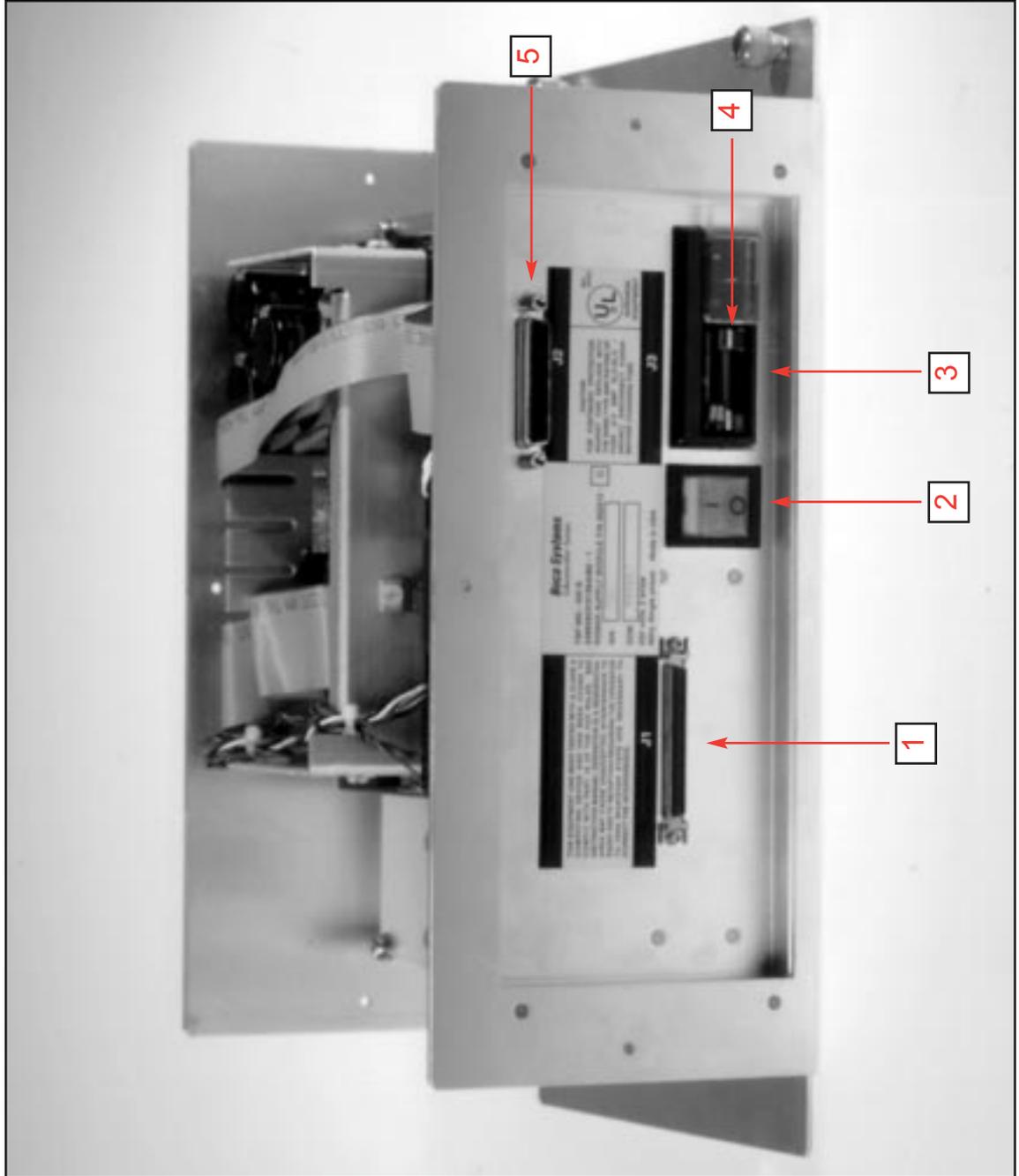


Figure 3  
**Print Head Module  
(Top View)**

1 - Control Panel Assembly  
(Mounted under Cover)

2 - Touch Panel

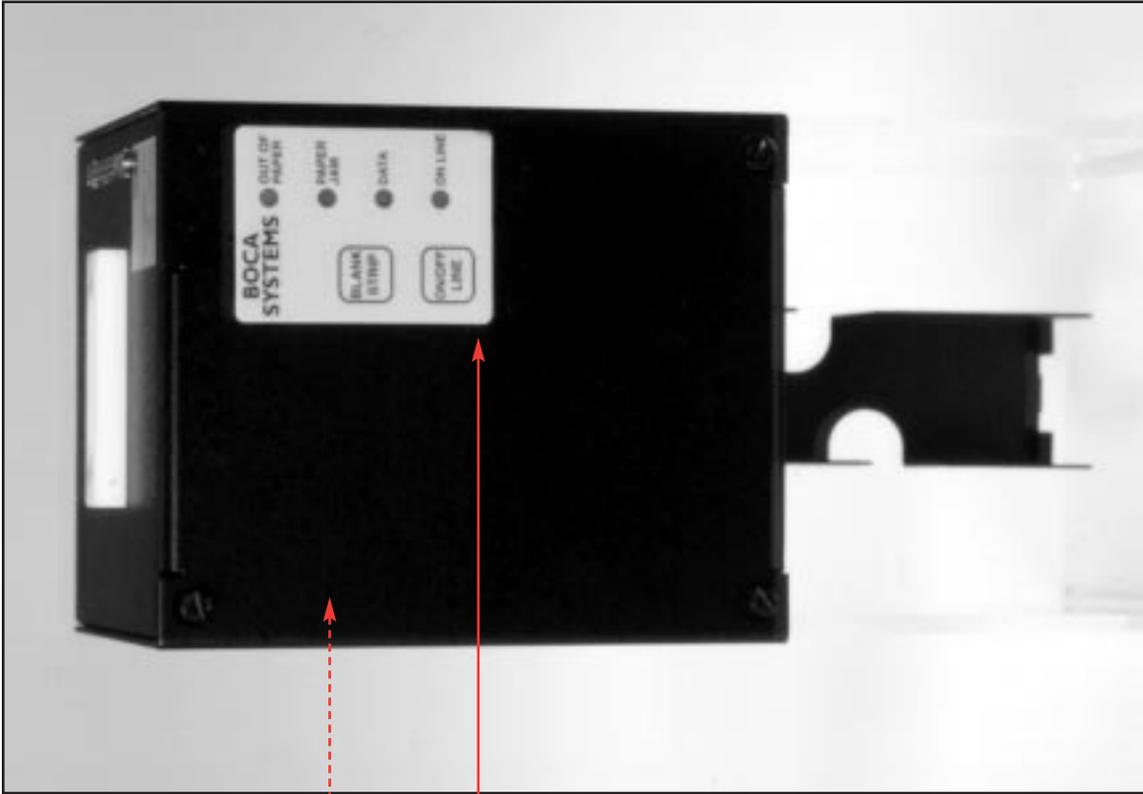


Figure 4  
**Print Head Module  
(Rear)**

1 - Connector Board,  
Interconnect Cable  
(Print Head Module)

2 - Input Bezel



1

2

Figure 5  
**Print Head Module Profile  
(Cover Removed)**

- 1 - Stepper Motor  
(Mounted behind Plate)
- 2 - Pulley, 20T
- 3 - Pulley, 30T
- 4 - Cutter Assembly
- 5 - Hopper
- 6 - Belt, Timing 102T
- 7 - Print Head Cable

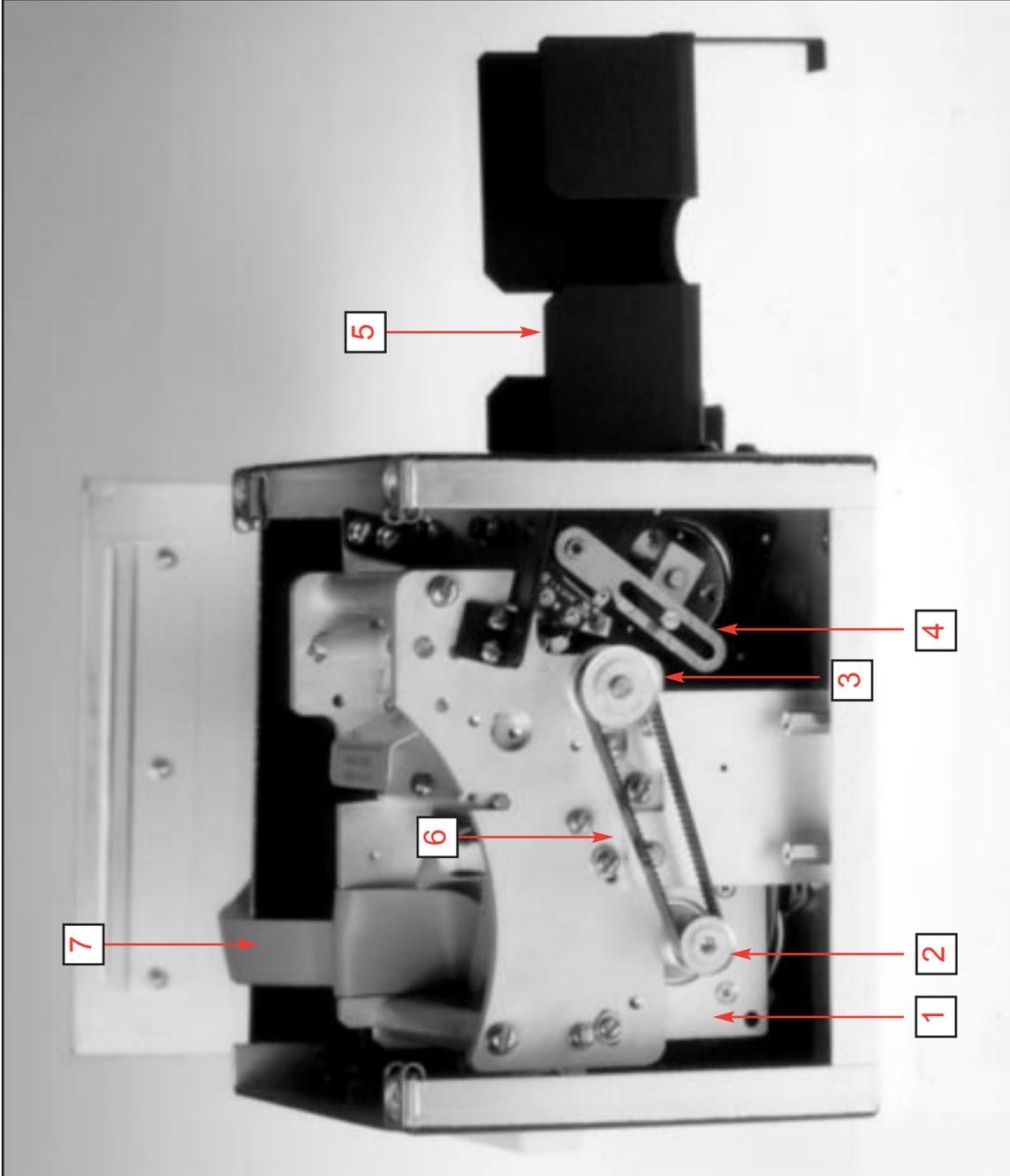


Figure 6  
**Print Head Module  
(Cover Removed)**

- 1 - Print Head
- 2 - Head Release Lever

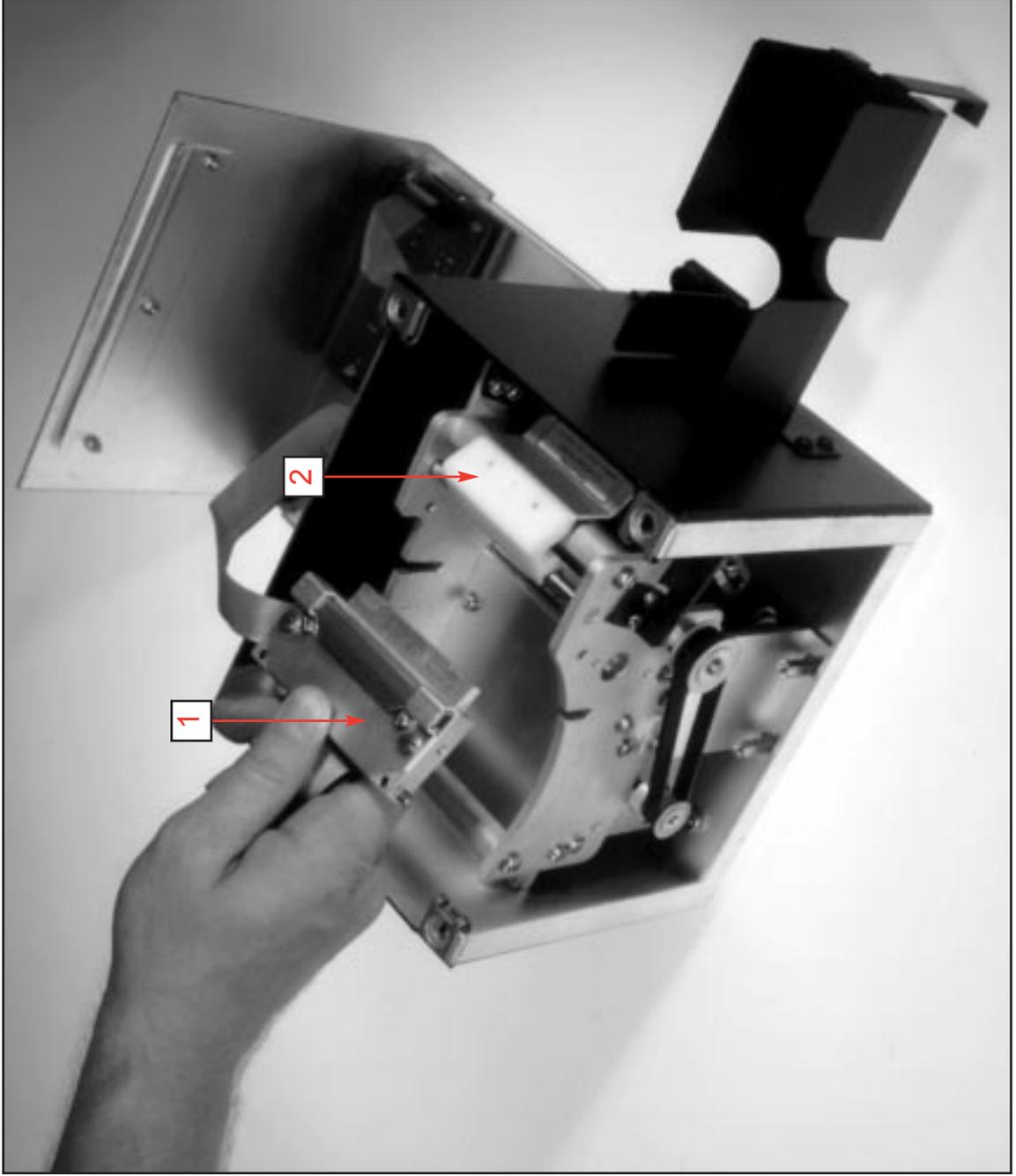


Figure 7  
**Print Head Module**

- 1 - Cutter
- 2 - Cutter Opto  
(Mounted to Opto Bracket)
- 3 - Input Bezel
- 4 - Outboard Support Plate
- 5 - Paper Feed Opto

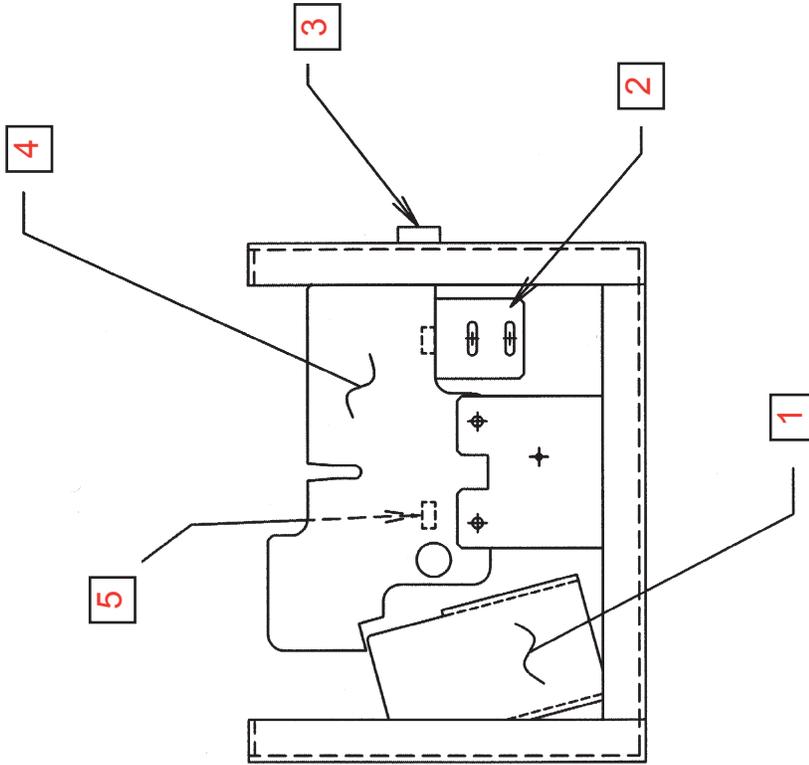


Figure 8  
**Top View of Optos  
and Platen**

- 1 - Optical Detector, Feed
- 2 - Platen
- 3 - Optical Detector, Cutter

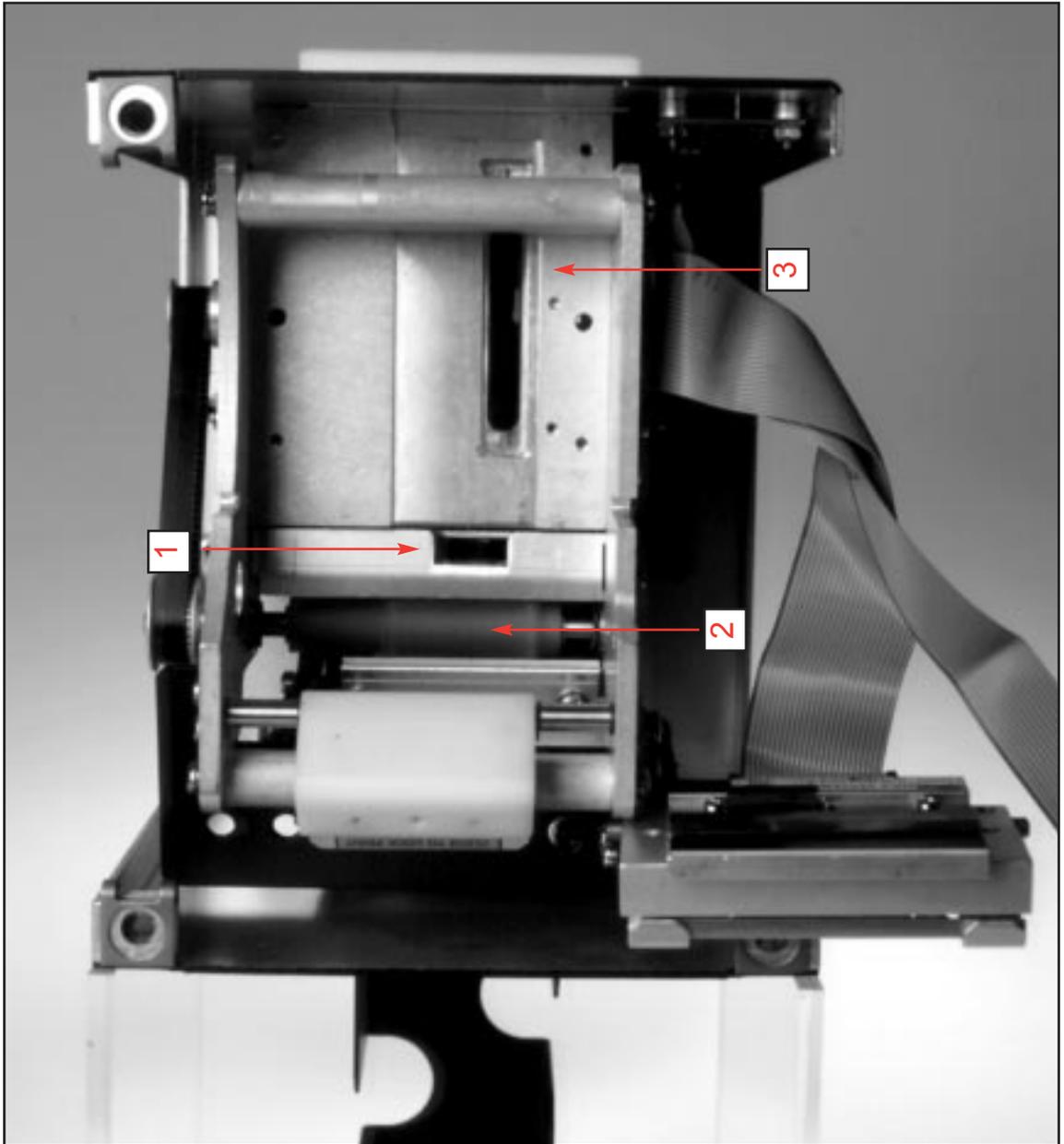
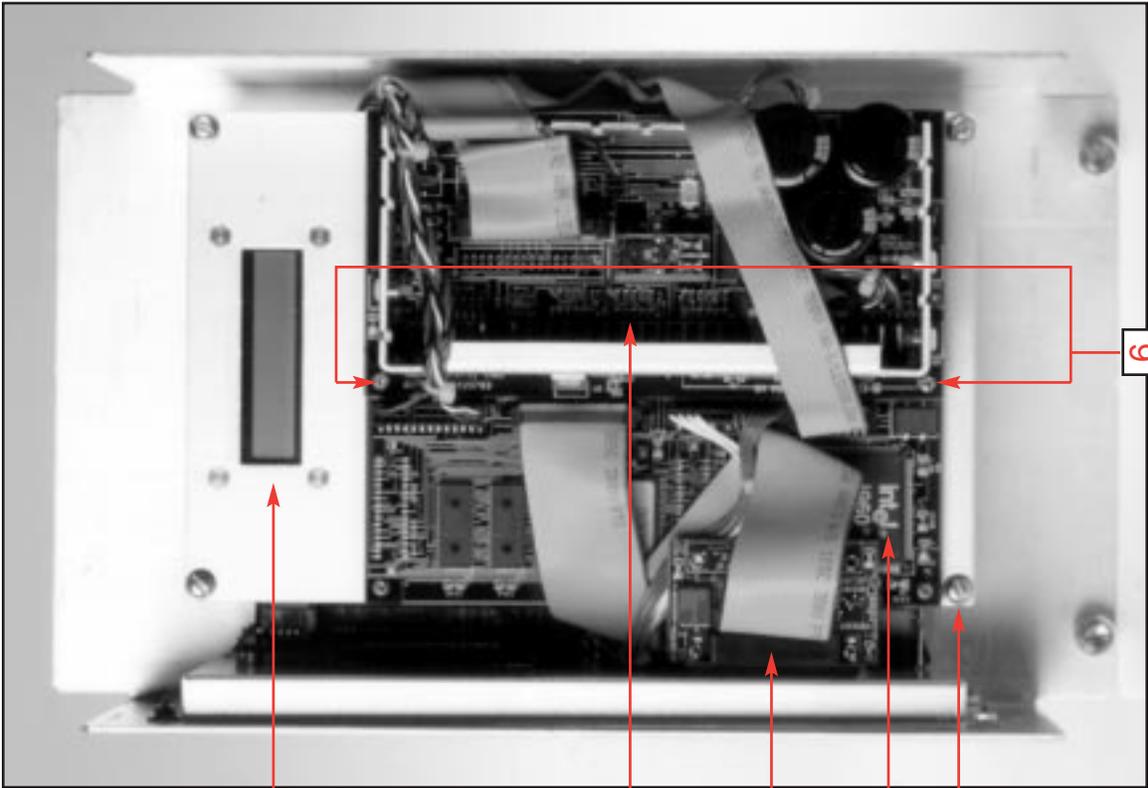


Figure 9  
**Power Supply Module  
(Cover Removed)**

- 1 - LCD Display
- 2 - Power Supply Board
- 3 - Interface Board RS-422
- 4 - Logic Board
- 5 - Pan Head Screw (x4)
- 6 - Brass Alignment Fastener



1

2

3

4

5

6

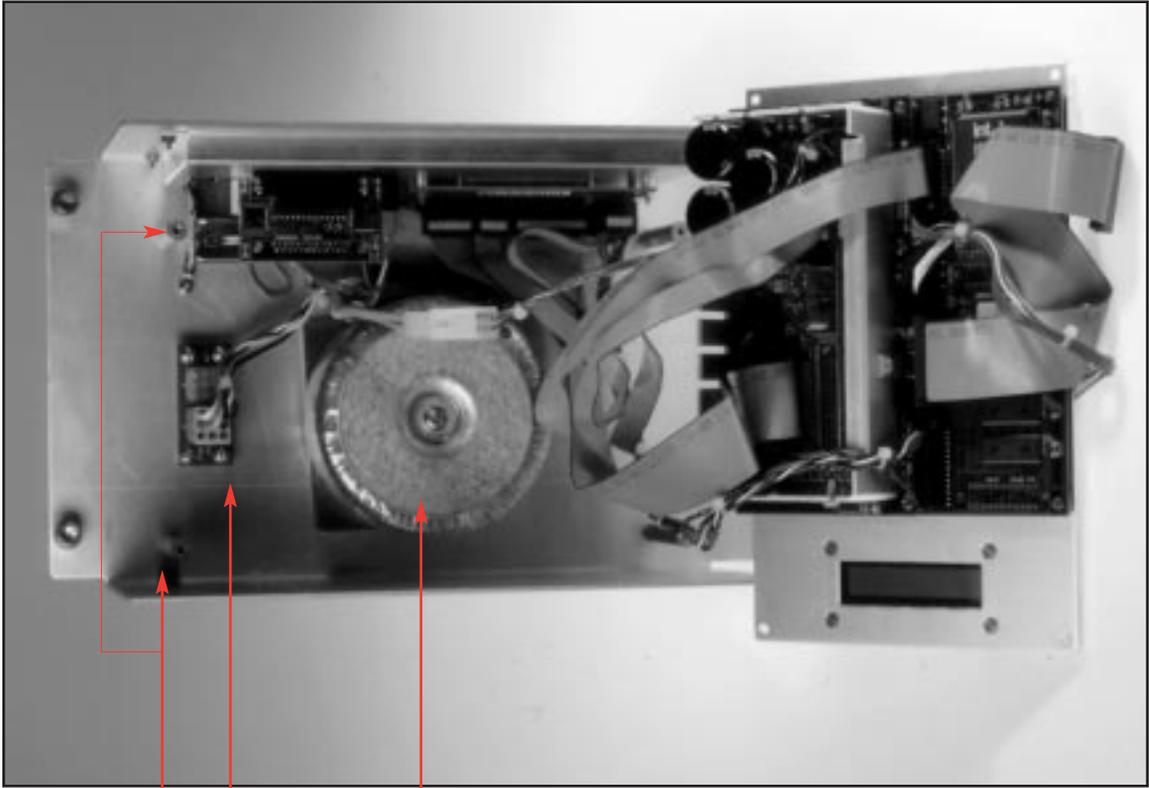


Figure 10  
**Power Supply Module  
(Logic and Power Supply  
Boards Removed)**

- 1 - Mounting Post (x4)
- 2 - 110/220 V Voltage Selector
- 3 - Transformer, Toroid

1  
2  
3

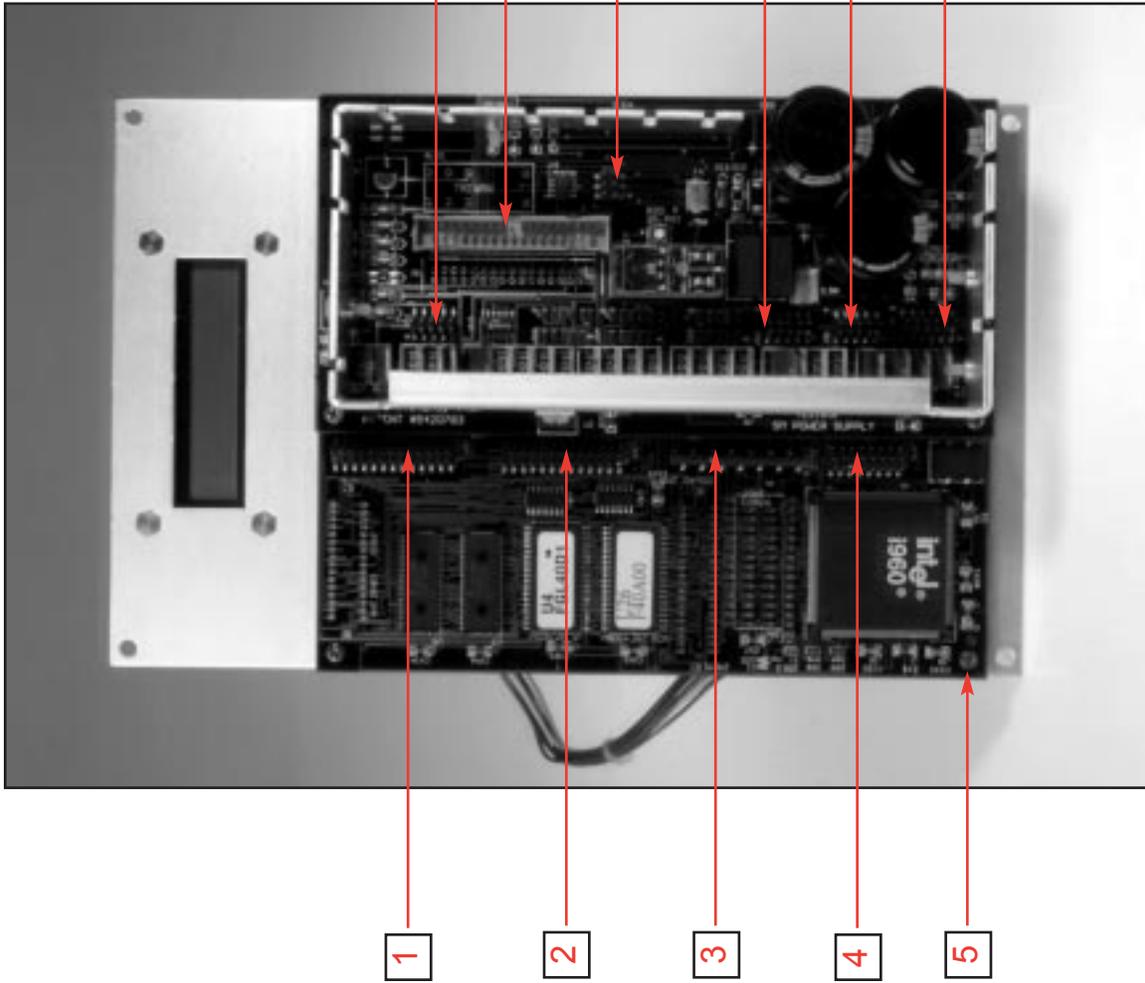
Figure 11

## Logic and Power Supply Board Connectors

| Logic Board                   |  |
|-------------------------------|--|
| 1 - JDC                       |  |
| 2 - JINT                      |  |
| 3 - JLCD                      |  |
| 4 - JCTL                      |  |
| 5 - Logic Board Fastener (x4) |  |

| Power Supply Board |  |
|--------------------|--|
| 6 - JXFRM          |  |
| 7 - JS1            |  |
| 8 - JS2            |  |
| 9 - JCUT           |  |
| 10 - J5            |  |
| 11 - JCD           |  |



## 4.0 Where to Locate Your Printer

When selecting a printer location, please consider the following guidance:

- Place it in a cool, clean, dry, well ventilated area that allows you to freely load the flight strips, connect cables, and open the printer housing (should this become necessary).
- Make sure there's enough room below or behind the printer for storing and feeding flight strips.
- Mount the printer in the appropriate location.

**CAUTION: THIS UNIT SHOULD BE INSTALLED ON A TABLE TOP OR INSIDE A COUNTER. IT SHOULD NEVER BE INSTALLED ON THE FLOOR.**

## 5.0 Printer Installation

To install the flight strip printer, perform the following steps:

1. Position the printer components in the desired location. Make sure that the Power Supply Module and the Print Head Module have the same serial number.
2. Make sure the power switch, located on the Power Supply Module, is in the OFF position.
3. Using the supplied hardware (6-32 screws, flat washers, and lock washers), attach the hopper to the Print Head Module.
4. Connect the 208 V ac cord, interface cable, and interconnect cable to the appropriate unit.

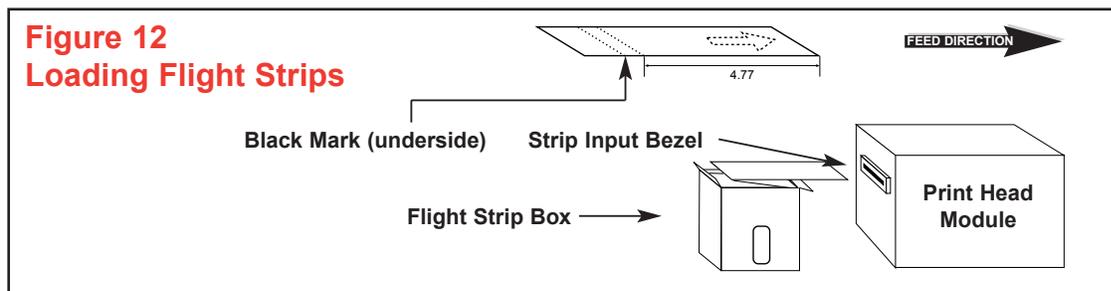
## 6.0 Loading Paper into the Printer

To load the flight strip into the printer, perform the following steps:

1. Move the ac switch to the ON position.
2. The OUT OF PAPER LED lights on the control panel and an audible alarm sounds for several seconds.
3. Remove all strips from the hopper, if present.
4. Remove the last strip from the printer, if present.
5. Remove the long flag on top of the box and leave the two top end tabs on the box. The end tabs act as guides for the strips as they exit the box.
6. Insert the strip box into the box holder behind the printer with the green paper side up and the black mark on the bottom side (refer to Figure 12). **The red arrow on the bottom of the ticket shows direction.**
7. With a smooth motion, insert the leading edge of the flight strips (green thermal side up, black mark 4.77 inches from leading edge) into the bezel until it is automatically positioned by the printer.

**CAUTION:** The printer may jam if paper is inserted prior to printer power-up.

8. Press the BLANK STRIP switch to process a blank strip.
9. Press and hold the ON/OFF LINE switch while pressing the BLANK STRIP switch to produce a diagnostic strip.
10. Press the ON/OFF LINE switch and verify that the ON LINE light is illuminated. The printer is now online and ready for use.



NOTE: The loading sequence should be followed on a step-by-step basis as listed above. If flight strips do not automatically load, remove the cover from the printer module by turning the three captive screws 1/4 turn counterclockwise. Ensure that the print head lever is snapped closed. Replace the cover.

**NOTE:** Hopper holds a maximum of 35 strips. Strips will fall onto the floor after 35 strips.

## 7.0 Features of the Flight Strip Printer

**Figure 13**  
**Control Panel**

### 7.1 Control Panel Operation

The control panel contains four LED indicators and three switches, which are used to control the printer's operation and report its status. The following paragraphs describe the use of the controls and the meaning of the indicators.

#### 7.1.1 ON/OFF LINE Switch

The ON/OFF LINE switch is used to change the current state of the printer between offline and online. The state of the printer is indicated by the ON LINE LED. When the LED is illuminated, the printer is online, and when the LED is off, the printer is offline.

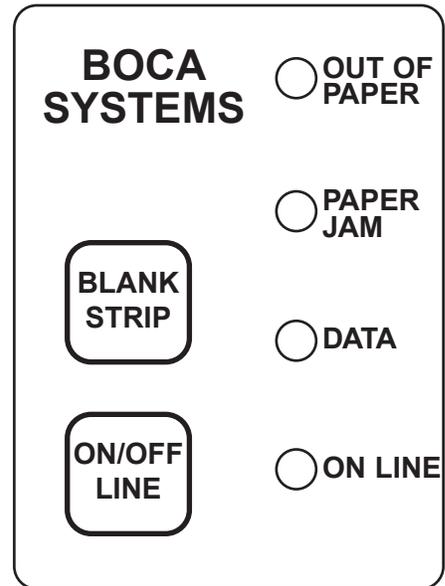
When powered on, the printer initializes to the offline state and remains there until an operator places the printer online. The printer is placed online by pressing the ON/OFF LINE switch on the control panel. The printer remains in the online state until an operator switches the printer offline or a printer error occurs, such as Out of Paper or Paper Jam. While off line, the printer responds only to status requests from the host computer. All other data sent to the printer is ignored.

#### 7.1.2 BLANK STRIP Switch

The control panel switches are used to print two different types of blank test strips depending on the combination of the switches pressed. When the BLANK STRIP switch is pressed and the printer is offline, a blank strip (no lines) is ejected and cut (see Figure 14). When the printer is online and the BLANK STRIP switch is pressed, a blank flight strip (with lines) is printed (see Figure 15). This blank strip with lines contains the horizontal and vertical lines that partition the different areas of a normal flight strip.

#### 7.1.3 Diagnostic Strip

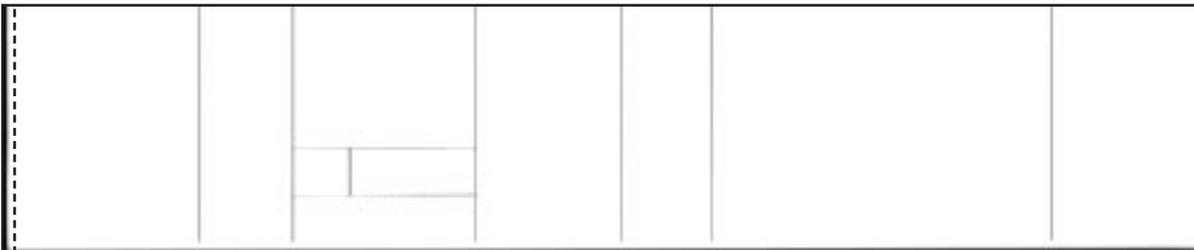
A diagnostic strip may be printed by first pressing and holding the ON/OFF LINE switch while pressing the BLANK STRIP switch. The diagnostic strip can be printed when the printer is either online or offline. The diagnostic strip contains four lines of text showing the printer character sets for both the large and small font (see Figure 16). One line for each font size is printed with highlighted text, and the other lines are printed with normal text. The printer firmware level is shown at the bottom of the strip.



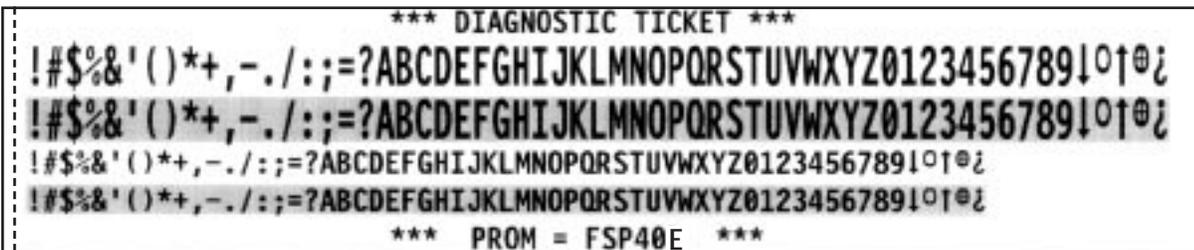
**Figure 14**  
**Blank Strip**



**Figure 15**  
**Blank Strip with Lines**



**Figure 16**  
**Diagnostic Strip**



#### 7.1.4 Control Panel Indicators

Paper jams and out-of-paper conditions are errors that are indicated on the control panel. Paper jams occur when the paper stock fails to properly progress through the printer. This error is reported by the steady illumination of the red Paper Jam LED. Once the source of the paper jam has been corrected, the printer can be restarted by pressing the BLANK STRIP switch, which re-initializes the printer and leaves it in the offline state. The operator then presses the ON/OFF LINE switch, so that the printer can be put into the online state.

An out-of-paper condition occurs when the printer no longer detects the presence of paper stock. This condition is indicated by the yellow Out of Paper LED. To resume operation, replace the paper stock by feeding the paper into the paper guide from the rear of the printer. Once the printer detects the paper, it starts the paper advance and feeds the paper forward to its normal top-of-form position.

The Data LED is a diagnostic indicator that turns on while the printer is receiving data from the host computer. The indicator can be used to confirm communications between the host computer and the printer.

When the On Line LED is illuminated, it indicates that the printer is ready to receive data from the host computer. When the printer is offline, it responds only to status requests; all other data sent to the printer is disposed of. The printer is placed online by pressing the ON/OFF LINE switch on the control panel.

### **7.1.5 Diagnostic Errors**

Each time the printer is placed online, the printer diagnostics are executed. Execution of these tests is indicated by the cycling of the cutter and illumination of the control panel LEDs. Once the diagnostic tests have been successfully completed, the printer status is online. If any of the diagnostic tests fail, the printer reports the error by flashing the appropriate control panel LEDs on and off.

The diagnostic errors are cutter jam, ROM test failure, and RAM test failure. These errors cannot be cleared or reset until the printer is serviced. Figures 17 and 18 show various error conditions and the state of the control panel LEDs.

The flight strip printer has an LED panel that is used to display the present status of the printer. The panel contains the following LEDs: Online, Data, Paper Jam, and Out of Paper. The LED stays on as long as that status remains valid. Additional error status conditions can be indicated by flashing or flickering of the LED panel. The flashing LEDs usually last about 3 seconds, and then the printer tries to resume normal operation. If the LEDs are flickering constantly, then the error is nonrecoverable without operator intervention. Sometimes the operator can fix the problem and resume operation by pressing the ON/OFF LINE button. However, most flickering errors require that the printer be reset in order to recover. Note: The LCD display located in the Power Supply Module (see Figure 9) often shows the error message along with the LEDs.

**Figure 17 Status Patterns (Flashing).** Flashing errors have equal on and off time.

| Error No. | Description                        | Online | Data | Paper Jam | Out of paper |
|-----------|------------------------------------|--------|------|-----------|--------------|
| 1         | Flash erase operation incomplete   | ON     | OFF  | OFF       | OFF          |
| 2         | Flash Vpp problem                  | OFF    | ON   | OFF       | OFF          |
| 3         | Flash byte erase error             | ON     | ON   | OFF       | OFF          |
| 4         | Flash Sequence error               | OFF    | OFF  | ON        | OFF          |
| 5         | Flash block erase error            | ON     | OFF  | ON        | OFF          |
| 6         | Bad flash                          | OFF    | ON   | ON        | OFF          |
| 7         | Flash program operation incomplete | ON     | ON   | ON        | ON           |
| 8         | Flash byte program error           | OFF    | OFF  | OFF       | ON           |
| 9         | Memory is full                     | ON     | OFF  | OFF       | ON           |
| 10        | Need a reclaim                     | OFF    | ON   | OFF       | ON           |
| 11        | Soft font download error           | ON     | ON   | OFF       | ON           |
| 12        | Delete file error                  | OFF    | OFF  | ON        | ON           |
| 13        | Not assigned                       | ON     | OFF  | ON        | ON           |
| 14        | Not assigned                       | OFF    | ON   | ON        | ON           |
| 15        | Not assigned                       | ON     | ON   | ON        | ON           |

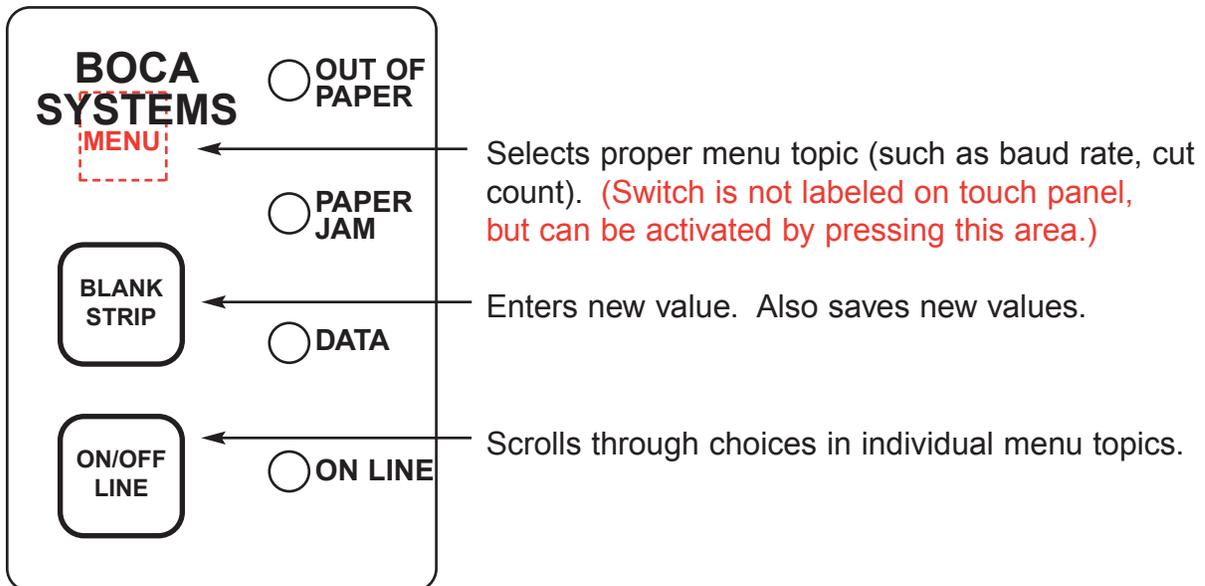
**Figure 18 Status Patterns (Flickering).** Flickering errors have much longer on time than off time.

| Error No. | Description                      | Online | Data | Paper Jam | Out of paper |
|-----------|----------------------------------|--------|------|-----------|--------------|
| 1         | Ribbon problem                   | ON     | OFF  | OFF       | OFF          |
| 2         | Processor fault                  | OFF    | ON   | OFF       | OFF          |
| 3         | Stepper timeout error            | ON     | ON   | OFF       | OFF          |
| 4         | Paper jam                        | OFF    | OFF  | ON        | OFF          |
| 5         | Not assigned                     | ON     | OFF  | ON        | OFF          |
| 6         | Not assigned                     | OFF    | ON   | ON        | OFF          |
| 7         | Not assigned                     | ON     | ON   | ON        | ON           |
| 8         | Not assigned                     | OFF    | OFF  | OFF       | ON           |
| 9         | Not assigned                     | ON     | OFF  | OFF       | ON           |
| 10        | RAM failure                      | OFF    | ON   | OFF       | ON           |
| 11        | ROM failure                      | ON     | ON   | OFF       | ON           |
| 12        | Cutter failure                   | OFF    | OFF  | ON        | ON           |
| 13        | Check optos                      | ON     | OFF  | ON        | ON           |
| 14        | Not assigned                     | OFF    | ON   | ON        | ON           |
| 15        | Power-up initialization problems | ON     | ON   | ON        | ON           |

## 7.1.6 Menu Options

Various printer options may be adjusted through the control panel switches. A list of the options is shown in Section 7.1.7.

**Figure 19**  
**Control Panel Menu Options**



To access and use the FACTORY MENU, follow these steps:

1. Remove the Power Supply Module cover.
2. Strip Ticket stock should be loaded into the printer. The LCD displays FSP40E; E represents the software (firmware) release level.
3. Press the MENU, ON/OFF LINE, and BLANK STRIP switches simultaneously for 3 seconds. The LCD displays FACTORY MENU!
4. To scroll through the menu topic, use the MENU switch, stopping on the topic you wish to change.
5. Press the ON/OFF LINE switch to scroll through choices in the selected topic.  
Note: The LCD displays a blinking cursor for the values currently stored in the printer.

6. Once you have found the new value you want, press the BLANK STRIP switch. The LCD displays EXIT AND SAVE? If you wish to save the new value, press the BLANK STRIP switch again.
7. If you do not wish to save the new value, press the MENU switch. The LCD displays JUST EXIT? Press the BLANK STRIP switch to exit the FACTORY MENU without saving new values, or press the MENU switch to return to the FACTORY MENU.
8. Reinstall the Power Supply Module cover.

Note: A blinking frame appears next to the current set value for each field where applicable.

## 7.1.7 FACTORY MENU SETTINGS

Figure 20 lists the menu topics and factory settings (defaults). It should be noted that not all menu topics and factory settings are applicable to the FSP.

**FIGURE 20**  
**FACTORY MENU TOPICS AND SETTINGS**

| MENU              | FACTORY SETTINGS |
|-------------------|------------------|
| BAUD RATE?        | 9600, 0, 8, 1    |
| MIN/MICRO?        | Mini             |
| PRINT SPEED?      | 3                |
| DIAGNOSTIC MODE?  | No               |
| TICKET TYPE?      | ATM              |
| STATUS ENABLED?   | No               |
| TRANSPARENT MODE? | No               |
| PAPER MODE?       | No               |
| HEAD DPI?         | 300              |
| SPECIAL HEAD?     | No               |
| PATH TYPE?        | Path 1           |
| BUFFER MODE?      | Multiple mode    |
| CLEAR DOWNLOAD?   | No               |
| DEFAULT SETTINGS? | N/A              |
| INC CUT1 COUNT?   | Selectable*      |
| DEC CUT1 COUNT?   | Selectable*      |
| INC CUT2 COUNT?   | N/A              |
| DEC CUT2 COUNT?   | N/A              |
| 2-SIDED PRINTER?  | No               |
| PARK TICKET?      | Yes              |
| TICKET MODE?      | Single           |
| PRINT MODE?       | Thermal          |
| PRINT INTENSITY?  | Normal           |
| SKI MODE?         | No               |
| FLASH ACK MODE?   | No               |
| SOFTWARE BUSY?    | No               |
| INC MINI REV?     | Selectable**     |
| DEC MINI REV?     | Selectable**     |
| EXIT AND SAVE?    | Yes or No        |
| JUST EXIT         | Yes or No        |

\* Service personnel only: See Section 10.1.

\*\*Service personnel only: See Section in 10.3.

### 7.1.8 Serial Connector Interface

The printer uses an RS-422 interface for communicating with the host computer. The interface connector has the following pinouts:

|               | DB-25S |
|---------------|--------|
| Frame ground  | 1      |
| Signal ground | 7      |
| Receive (+)   | 15     |
| Receive (-)   | 17     |
| Transmit (+)  | 19     |
| Transmit (-)  | 25     |

### 7.1.9 Serial Communication Protocol

Serial data is transmitted and received at 9600 baud using 8 data bits, 1 stop bit, and odd parity. Parity errors are reported through the status messages and by replacing any bad characters with an upside-down question mark that appears on the flight strip. When the printer is offline, any data received from the host computer is ignored with the exception of a status request (<S1>) command. Anytime the status command is received, a five-byte status message is returned with the printer's current status.

### 7.1.10 Status Messages

Solicited and unsolicited status messages are returned by the printer. Unsolicited responses are generated when the printer's status changes because of a printer error, when the ON/OFF line state changes, or when a flight strip is printed. A solicited response is returned when the host computer requests the printer's current status by issuing an <S1> command.

The status response is five bytes long, starting with two consecutive SOH (hex value 0x01) characters. The next three bytes contain the actual printer status. Three of the status conditions reported are temporary and are cleared as soon as they are transmitted to the host computer. These are invalid text, parity error, and power on. The remaining errors are cleared after the condition causing the error has been corrected.

## 7.2 Special Commands

Character background shading is available through six resident logos. Each font size has three logos depending on the shade density required. The logos are printed by first locating the cursor position using the special position command <SP#,#> and then issuing the FGL logo command <LO#>. The special position command must have

valid row and column coordinates as parameters, and the logo command must specify a valid logo number. Logo numbers 2, 3, and 4 have been designated for the small font and represent 12%, 17%, and 25% dot coverage respectively; logo numbers 5, 6, and 7 are for the large font and represent 12%, 17%, and 25% dot coverage. Each character background must be shaded individually, sending both position commands and logo for each character to be shaded.

**Shading Commands:** A second method of highlighting text with shading is to use the Enable Shade <ES> and Disable Shade <DS> commands. This method allows a string of text to be shaded by issuing the Enable Shade command at the start of the text to be shaded and a Disable Shade command at the end of that text (example: <ES> this text will be shaded<DS>). The <ES> command uses the current cursor position and the current font size to determine the size of the shaded area.

**Bounding Box Commands:** Another form of highlighting text is to use a bounding box. This method uses a box drawn around the outside edge of the text string. The Enable Bounding Box <EBB> command is followed by the text string to be highlighted and is terminated with the Disable Bounding Box <DBB> command (example: <EBB> this text has a box around it <DBB>). The line width of the box is set using the line thickness <LT> command. The box starts slightly above and to the left of the current cursor position and ends slightly below and to the right of the last character.

**Multiple Ticket Command:** This command allows multiple flight strips to be sent to the printer while suppressing the normal acknowledge message until the last flight strip has been printed. The Multiple Ticket <MT#> command must have a numeric parameter to indicate the number of flight strips to be printed before returning an acknowledgment. Any errors that occur while processing the group of flight strips are accumulated and reported after the last one has been printed. After each group has been printed, the printer returns to its normal operating mode.

## 8.0 Paper Jam Clearing Procedure

To clear a paper jam from the Print Head Module, perform the following steps:

1. Remove the strip stock from the Print Head Module.
2. Set the Power Supply Module AC switch to the Off position. Refer to Figure 2.
3. Remove the Printer Head Module cover by loosening the three 1/4-turn captive screws.
4. Remove the Print Head assembly. Refer to Section 11.11.
5. Remove all jammed flight strips from the Print Head Module.
6. Re-install the Print Head assembly. Refer to Section 11.12.
7. Re-install and secure the Print Head Module cover by tightening the three 1/4-turn captive screws.
8. Set the Power Supply Module AC switch to the On position.
9. Reload flight strip stock into the Print Head Module.

## 9.0 Maintenance and Cleaning

Your ticket printer is solidly constructed and has been designed for high volume use. It requires minimal care to provide maximum services.

This section provides an overview of printer maintenance and cleaning.

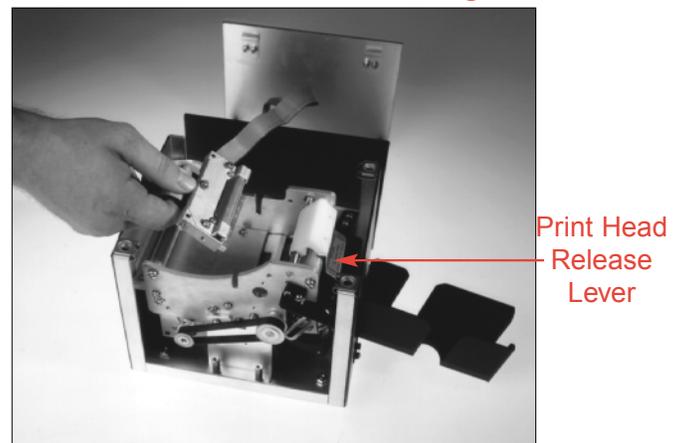
### 9.1 Thermal Print Head

The print head should be cleaned periodically to prevent debris from building up on the print element. The required cleaning interval varies greatly depending on the quality of the ticket stock and the amount of dust entering the print area. Excessive dirt buildup on the print head results in reduced print quality. Using the print head in a dirty condition reduces life expectancy, as it is unable to diffuse its heat properly. The print head should initially be cleaned approximately every month until a cleaning schedule is established based upon usage.

The thermal print head can be removed for cleaning or replacement as follows:

1. Make sure power is off.
2. Remove the cover from the print head module (PHM) and set it next to the PHM as shown. The cover is attached to the PHM via a ribbon cable, so care should be taken.
3. Lift up the Head Release Lever (located above the head mounting block) to remove pressure from the thermal head. See Figure 20.
4. Lift up on the head mounting block/thermal head and remove it from the printer.

**Figure 21**  
**Removal of Print Head for Cleaning**



**CAUTION: DO NOT UNPLUG  
CABLE FROM PRINT HEAD**

5. Clean the thermal print head surface (the side that makes contact with the paper) using a Q-tip or soft cloth with isopropyl alcohol.
6. Install the head by reversing steps 2-4.
7. Restore pressure to the head by pushing down on the Print Head release lever.
8. Replace the cover on the Print Head Module.
9. The printer is now ready for operation. If print quality is still poor, the thermal head needs to be replaced. See Section 12.9.

## 9.2 Rubber Drive Roller (Platen)

The rubber drive roller, platen, should be cleaned periodically to prevent paper dust from building up on the platen. The platen should initially be cleaned every month until a cleaning interval is established based upon FSP usage. Clean the platen with a Q-tip and isopropyl alcohol or water.

1. Unlock the thermal head and remove it from the printer to gain access to the platen.

**CAUTION: DO NOT UNPLUG  
CABLE FROM PRINT HEAD**

2. Clean the full length of the platen.
3. Rotate the platen clockwise and repeat step 2, continue in the same manner for one full revolution of the platen.
4. Replace and lock the thermal head. Printer is now ready for normal operation.

## 9.3 Optical Device (see figure 8 - item 1)

The opto shown in figure 8 - item 1 should be cleaned using a dry Q-tip, or a small vacuum, periodically to prevent ticket dust from building up on it. The opto should initially be cleaned every month until a cleaning schedule is established based upon usage.

1. Unlock the thermal head and remove it from the printer to gain access to the opto.

**CAUTION: DO NOT UNPLUG  
CABLE FROM PRINT HEAD**

2. Use a dry Q-tip, or a small vacuum, to clean the opto.
3. Replace and lock the thermal head. Printer is now ready for normal operation.

## 9.4 General Cleaning

The interior of the printer should be cleaned whenever there is a visible accumulation of dust. Use a small vacuum for cleaning. Be careful not to jar any of the printer's parts loose.

## 10.0 Adjustments

### 10.1 Adjusting Cut Position

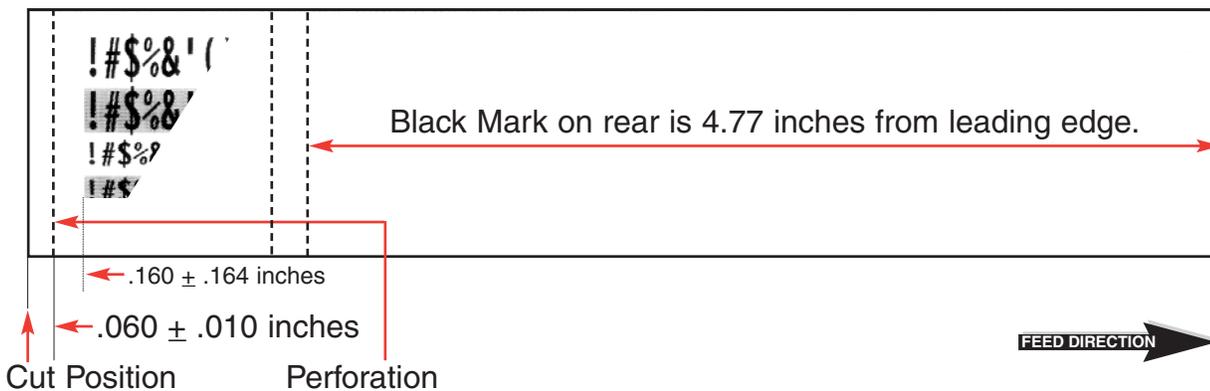
The printer is factory-set to cut the strips at a nominal position of .060 inches behind the perforation. The acceptable variation in cut position is shown in Figure 22.

To adjust the cut position, refer to the menu as discussed in Section 7.1.6 and Section 7.1.7.

Increasing cut count (INC cut 1 count) increases the stub after the perforation, and decreasing cut count (DEC cut 1 count) does the opposite. Cut counts are in increments of .003 inches.

Scroll to increase or decrease cut count, depending on the adjustment needed.

**Figure 22**  
**Cut Position on Flight Strip**



### 10.2 Calibration of the Cutter Assembly

#### 10.2.1 Factory Calibration of Cutter Motor Arm

##### NOTE

The cutter guide is factory set to the minimum range position to make allowances for wear throughout its life cycle. As long as the cut is correct and not moving or causing jams, the cutter is within acceptable operating parameters.

Figure 23 shows the factory calibration for the cutter motor arm.

#### 10.2.2 Field Calibration of Cutter Motor Arm

The Cutter Motor Arm is calibrated with the following procedure:

1. Turn Power off to the printer.
2. Remove the cover from the Printer Module and observe the position of the Guide in relation to the Cutter Guide Bar Range Markers (Refer to Figure 23 of the Flight Strip Printer Maintenance and Users Manual).

3. If the Guide falls within the range of the Range Markers, no adjustment is required.
4. If the Guide falls outside of the range of the Range Markers, proceed as follows:
  - a. Loosen the two socket head screws on the Switch Transfer Plate.
  - b. The Switch Transfer Plate should be positioned as follows:
    - 1) If the Motor Arm, as indicated by the Guide, is cycling to a position beyond the upper Range Marker on the Cutter Guide Bar, rotate the Switch Transfer Plate in a CCW direction.
    - 2) If the Motor Arm, as indicated by the Guide, is cycling to a position below the lower Range Marker, rotate the Switch Transfer Plate in a CW direction.
  - c. Tighten the Switch Transfer Plate into position.
  - d. Turn power on to the printer and verify that the Motor Arm, as indicated by the Guide, cycles to the desired position as indicated by the Range Markers on the Cutter Guide Bar.
5. Repeat steps 1 through 4, as required, until the proper calibration is set.

### **10.3 Adjusting Text Position**

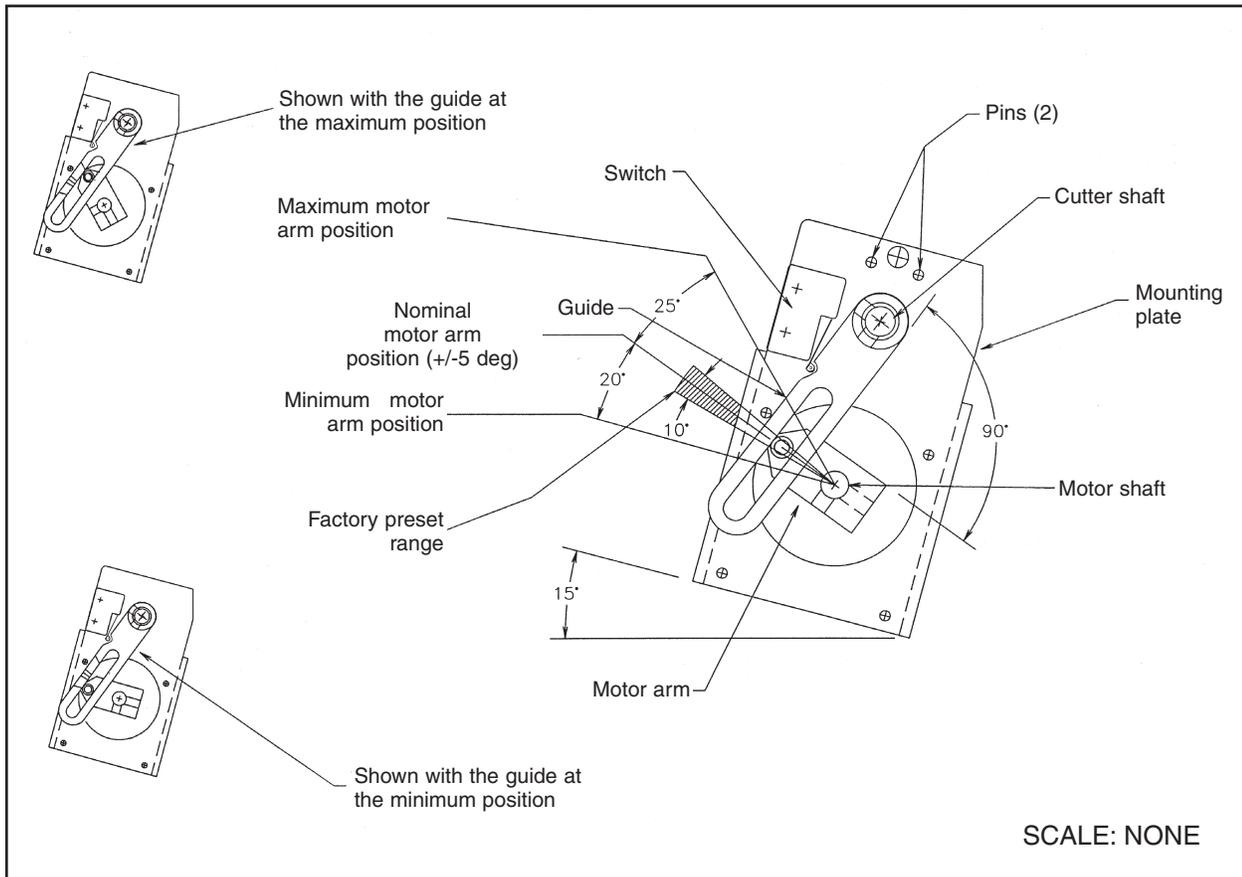
Prior to adjusting the text position, verify that the cut position is correct.  
Refer to Section 10.1

To adjust the text position, refer to the menu as discussed in Section 7.1.7.

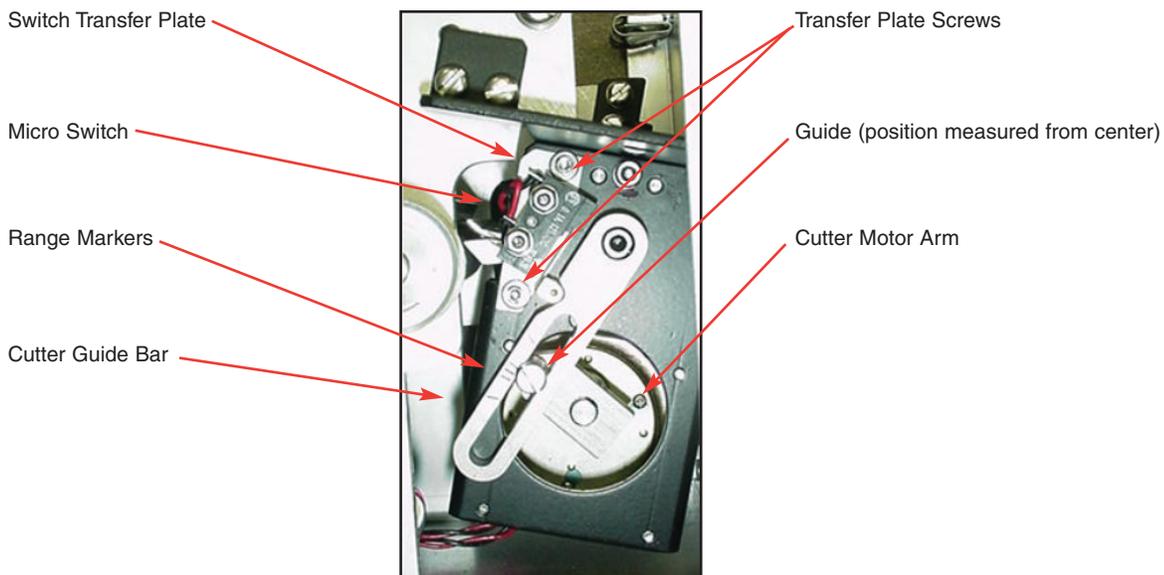
Increase the text count (INC MINI REV) increases the space after the perforation, and decrease text count (DEC MINI REV) does the opposite.

Adjusting the space to .160-.164 inches between the perforation and the beginning of the shaded diagnostic text. Refer to Figure 22.

**Figure 23a**  
**Factory Calibration of Cutter Motor Arm**



**Figure 23b**  
**Field Calibration of Cutter Motor Arm**



## 11.0 Printer Maintenance

Remove AC power at least 30 seconds before performing any maintenance.

The FSP 960-300B has been designed using a modular approach that provides for ease of parts replacement. The printed circuit boards used in this product have been manufactured using surface mount technology. The printed circuit boards cannot be effectively repaired in the field and should be returned to the manufacturer if repair is required. This section describes basic troubleshooting, part removal, and proper installation of new modules.

Upon completion of any maintenance procedure, the printer must be functionally tested and have its calibration verified. All maintenance and testing should be performed by trained personnel. Areas of concern that will need testing and/or calibration verified are:

- Print Quality, See Section 7.1.3.
- Diagnostic Errors, See Section 7.1.5.
- Cut Position and Text Position verification, See Section 10.1 thru 10.3.

### 11.1 Power Supply Board Removal

To remove the power supply board, perform the following steps:

1. Remove the Power Supply Module cover.
2. Remove and label connectors going to power supply board. They are marked on the board as J5, JCUT, JS2, JS1, and JXFRM. See Figure 11 and 24.
3. Disconnect cable JCTL from logic board. See Figure 11 and 24.
4. Unlock power supply logic board by pulling up and away from the two brass fasteners. See Figure 9.
5. Lift board and remove power supply board.

### 11.2 Power Supply Board Installation

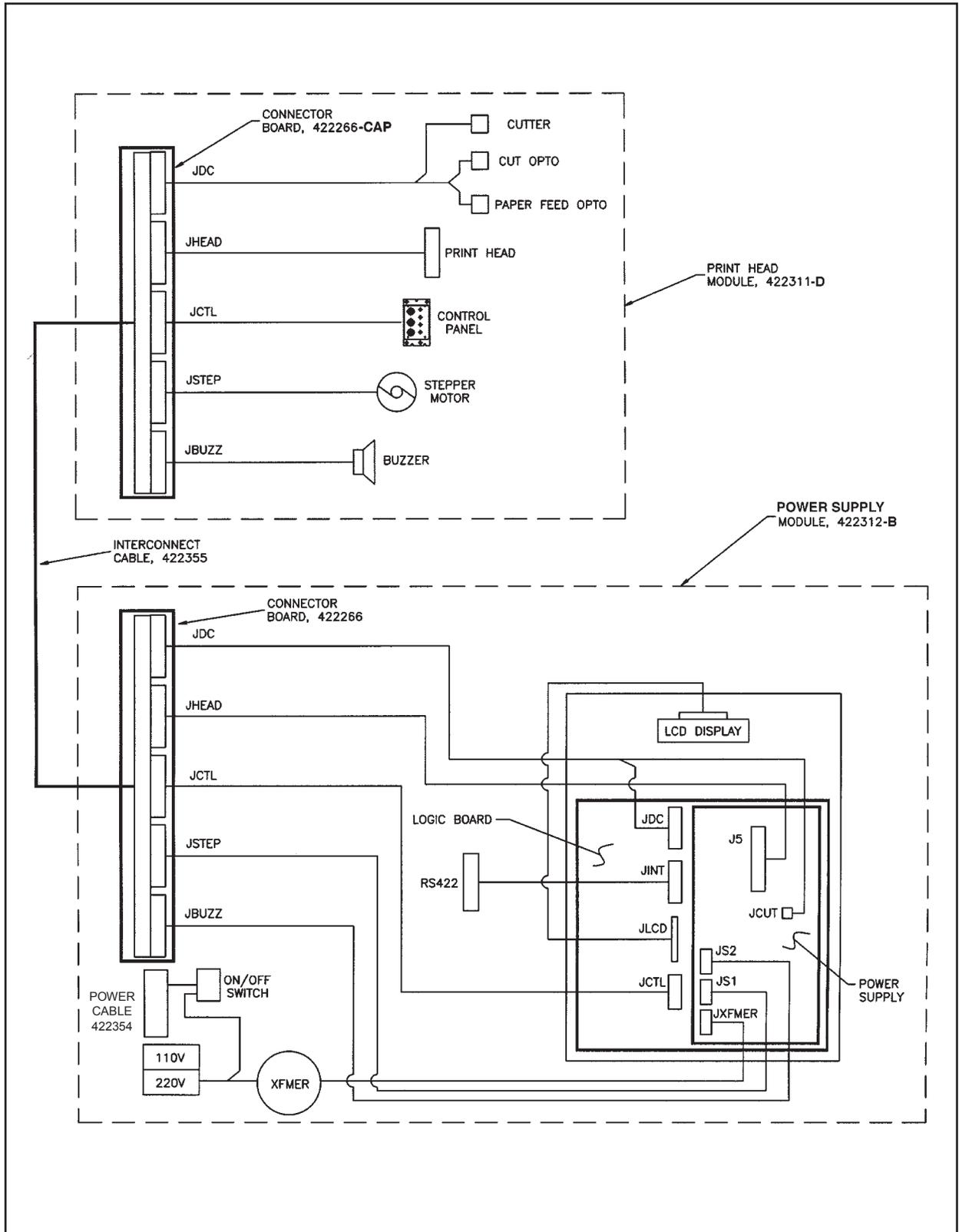
To install a power supply board, perform the following steps:

1. Align the holes on the power supply board with the brass fasteners and press straight down. See Figure 9.
2. Press down in the area of connector JCUT to properly seat the board connector. See Figure 11.
3. Attach the keyed ribbon cables to corresponding connectors. Do not force connectors.

**CAUTION:** Cable JS1 can be incorrectly connected to position JS2.

4. Reinstall the PowA

**Figure 24**  
**Simplified Wiring Diagram**



### **11.3 Logic Board Removal**

To remove the logic board, perform the following steps:

1. Remove the Power Supply Module cover.
2. Connector JCTL must be removed to gain access to the main logic board. All other connectors on the power supply board should stay attached. Remove the JCTL connector.
3. Remove the power supply board and lay it on its side.
4. Disconnect cables JDC, JINT, and JLCD from the logic board. See Figures 11 and 24.
5. Use a screwdriver to separate the logic board from the fasteners. See Figure 9.
6. Slide the board out of the unit.

### **11.4 Logic Board Installation**

To install a logic board, perform the following steps:

1. Align the logic board so that the four mounting holes are above the four fasteners. Orient the board so that microprocessor (I960) is under the RS-422 interface board. Refer to Figure 9.
2. Press the logic board down until all fasteners snap.
3. Attach the ribbon cables into the corresponding connectors.
4. Align the holes on the power supply board with the brass fasteners and press straight down. See Figure 9.
5. Press down in the area of connector JCUT to properly seat the board connector. See Figure 11.
6. Attach ribbon cable JCTL to the mating connector on the logic board.
7. Re-install the Power Supply Module cover.

### **11.5 LCD Display Removal**

To remove the LCD display, perform the following steps:

1. Remove the Power Supply Module cover.
2. Remove the four panhead screws that hold the mounting plate to the chassis of the Power Supply Module. See Figures 9 and 10.
3. Remove connector JINT for easier access to the underside.
4. Slide and lift the entire assembly from the chassis and turn it over to gain access.
5. Remove the LCD connector from the LCD display.
6. Remove the four panhead screws to remove and replace the LCD display.

### **11.6 LCD Display Installation**

To install an LCD display, perform the following steps:

1. Install the LCD display to the mounting plate.
2. Connect the LCD connector to the LCD display.
3. Slide the mounting plate and position it over the four mounting posts and secure it.
4. Re-install connector JINT to the logic board.
5. Re-install the Power Supply Module cover.

### **11.7 Toroid Transformer Removal**

To remove the toroid transformer, perform the following steps:

1. Remove the Power Supply Module cover.
2. Remove the four panhead screws that hold the mounting plate to the chassis of the Power Supply Module. See Figures 9 and 10.
3. Remove connector JINT for easier access to the underside.
4. Slide and lift the entire assembly from the chassis and turn it over to gain access.

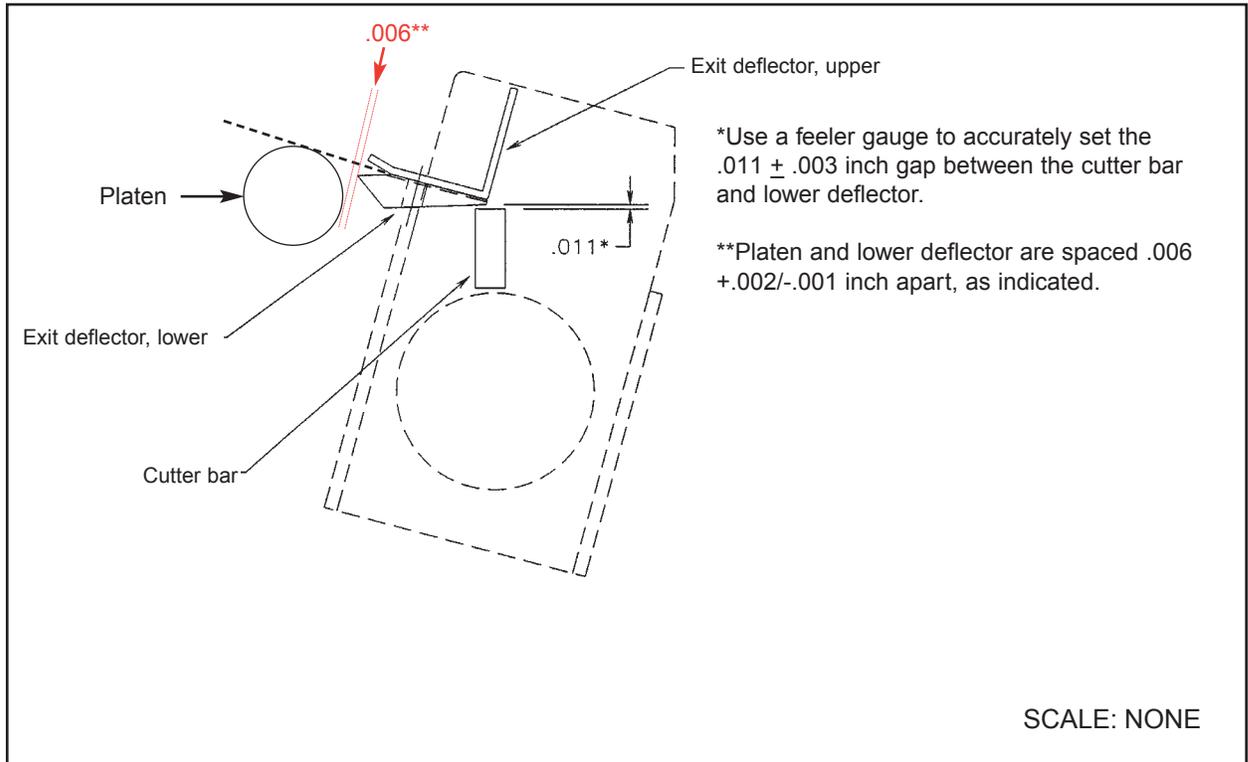
5. Dress the wires away to gain access to the toroid transformer.
6. Do not disconnect cables from the logic board or power supply board.
7. Disconnect the connector from the Voltage Selector (220 V) and disconnect the black and white cable from the black/orange cable going to the ac filter. See Figure 10.
8. Remove the connector going to the power supply board at the junction point between the blue/gray wires and the blue/red wires.
9. Remove the 10-32 panhead screw holding the toroid in place.
10. Remove the washer and rubber insulator and lift the toroid from the unit.

### **11.8 Toroid Transformer Installation**

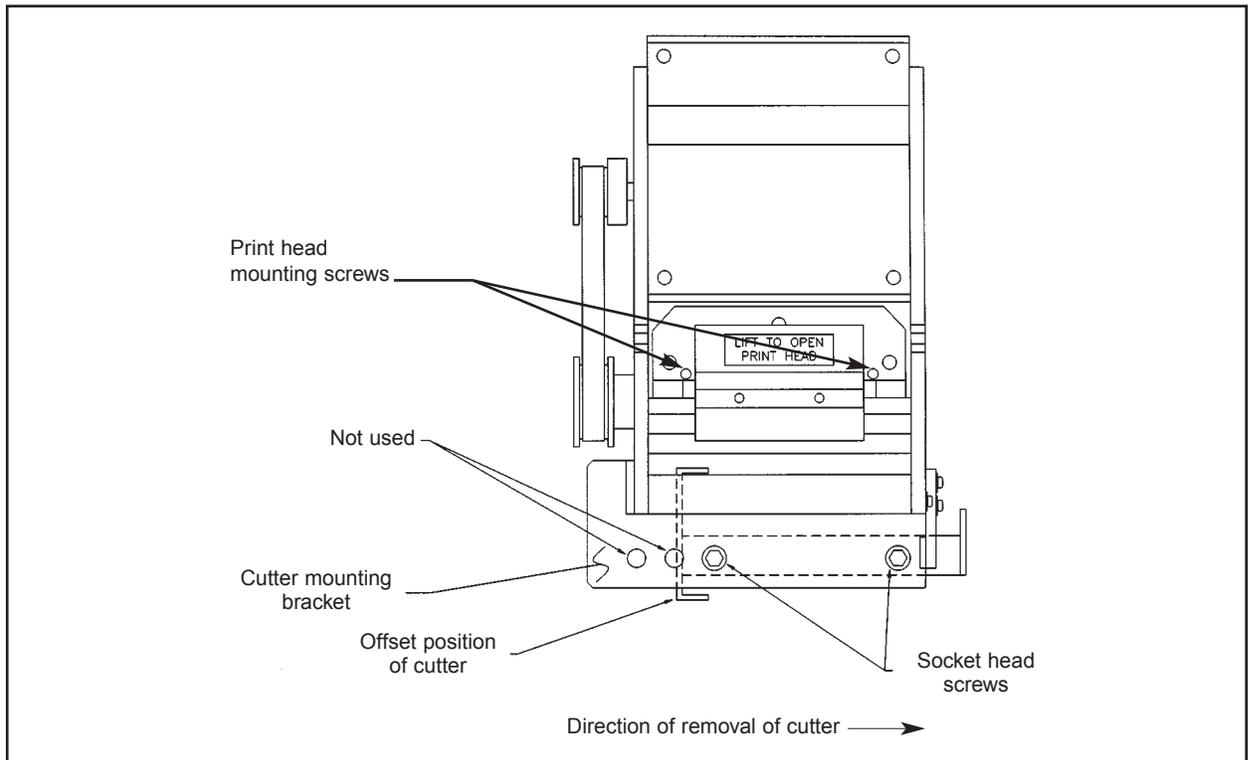
To install a toroid transformer, perform the following steps:

1. Position the toroid on the mounting post so the wires protrude from the top and are oriented as shown in Figure 10.
2. Replace the voltage jumper cable (yellow and orange/black and white) to the 220 V position as shown in Figure 10.
3. Rejoin the black and white connector to the black and orange connector going to the ac filter.
4. Rejoin the blue/gray to the blue/red connector.
5. Replace the toroid washer, rubber insulator, and 10-32 panhead screw and secure the toroid in place.
6. Dress wires to allow installation of the mounting plate. Position the mounting plate holes above the mounting posts (refer to Figure 10) with the orientation shown in Figure 9, and secure the mounting plate in place.
7. Re-install connector JINT to the logic board.
8. Re-install the Power Supply Module cover.

**Figure 25**  
**Factory Calibration of Cutter Deflectors**



**Figure 26**  
**Print Head Module, Top View**



## **11.9 Cutter Assembly Removal**

To remove the cutter assembly, perform the following steps:

1. Remove the Print Head Module cover.
2. Locate the two 6/32 panhead screws and remove the hopper. See Figure 6.
3. Locate the two socket-head screws on the cutter mounting bracket and remove them. See Figure 26.
4. Lower the cutter assembly into the base of the unit.
5. Slowly slide the cutter assembly to the side of the unit.
6. Disconnect the cable holding the cutter assembly to the harness and remove the cutter assembly.

## **11.10 Cutter Assembly Installation**

To install a cutter assembly, perform the following steps:

1. Attach the cutter assembly connector.
2. Slide the cutter assembly into position, armature first.
3. Place the cutter assembly under the bracket into an offset position as shown in Figure 26.
4. While tightening hardware, position the cutter assembly left and toward the print head, providing a .006-inch clearance between the platen and the lower exit deflector. Refer to Figure 25.
5. Verify proper alignment by printing test strips and confirming that the cut is parallel to perforations on strips. If not properly aligned, loosen hardware and adjust.
6. Re-install the hopper.
7. Re-install the Print Head Module cover.

### **11.11 Print Head Removal**

To remove the print head, perform the following steps:

1. Remove the Print Head Module cover.
2. Open the print head release lever.
3. Lift the print head assembly from the housing as shown in Figure 6.
4. Unplug the ribbon cable from the rear of the print head.
5. Remove the two print head mounting screws as shown in Figure 26. **DO NOT REMOVE SCREWS MARKED WITH RED PAINT.**

### **11.12 Print Head Installation**

To install a print head, perform the following steps:

1. Mount the print head to the mounting block using the two screws.
2. Insert the ribbon cable into the rear print head.
3. Slide the print head assembly into the housing.
4. Close the print head release lever.
5. Re-install the Print Head Module cover.

### **11.13 RS-422 Interface Board Removal**

To remove the RS-422 interface board, perform the following steps:

1. Remove the Power Supply Module cover.
2. Remove the RS-422 interface board cable connector.
3. Remove the two standoff screws securing the RS-422 interface board to the Power Supply Module frame.

### **11.14 RS-422 Interface Board Installation**

To install an RS-422 interface board, perform the following steps:

1. Install and secure the replacement interface board with two standoff screws.
2. Connect the RS-422 interface board cable connector.
3. Re-install the Power Supply Module cover.

### **11.15 AC Switch Removal**

To remove the ac switch, perform the following steps:

1. Verify that ac power has been removed from the unit.
2. Remove the Power Supply Module cover.
3. Remove the four panhead screws that hold the mounting plate to the chassis of the Power Supply Module. See Figures 9 and 10.
4. Remove the connector JINT for easier access to the underside.
5. Slide and lift the entire assembly from the chassis and turn it over to gain access.
6. Press the tabs on the top and bottom of the ac switch.
7. Push the ac switch out of the unit.

### **11.16 AC Switch Installation**

To install an ac switch, perform the following steps:

1. Install the replacement ac switch by pushing it into the unit and locking it.
2. Slide the mounting plate and position it over the four mounting posts and secure it.
3. Re-install connector JINT to the logic board.
4. Re-install the Power Supply Module cover.

### **11.17 AC Filter Removal**

To remove the ac filter, perform the following steps:

1. Verify that ac power has been removed from the unit.
2. Remove the Power Supply Module cover.
3. Remove the four panhead screws that hold the mounting plate to the chassis of the Power Supply Module. See Figures 9 and 10.
4. Remove connector JINT for easier access to the underside.
5. Slide and lift the entire assembly from the chassis and turn it over to gain access.
6. Use a flat-tip screwdriver to pry off the two metal mounting clips from the ac filter.
7. Push the ac filter out of the Power Supply Module.

### **11.18 AC Filter Installation**

To install an ac filter, perform the following steps:

1. Push the ac filter into the Power Supply Module.
2. Secure the ac filter to the frame by using the two metal mounting clips.
3. Slide the mounting plate and position it over the four mounting posts and secure it.
4. Re-install connector JINT to the logic board.
5. Re-install the Power Supply Module cover.

### **11.19 Cutter Optical Detector Removal**

To remove the cutter optical detector, perform the following steps:

1. Remove the Print Head Module cover.
2. Disconnect the control panel connector from the Print Head Module and set the cover aside.
3. Remove the input bezel by taking out the two mounting screws. See Figure 4.

4. Remove the four mounting posts (see Figure 10) and attaching hardware to gain access to the underside of the print cage assembly.
5. Mark the approximate location of the cutter opto board (refer to Figures 7 and 8) on the board bracket.
6. Remove the cutter optical detector board.

### **11.20 Cutter Optical Detector Installation**

To install a cutter optical detector, perform the following steps:

1. Position the cutter optical detector board and secure it in the approximate location of the previous board by friction-tightening the screws.
2. Re-install the print cage assembly into the cover, but do not secure it.
3. Align and re-install the input bezel with the two mounting screws.
4. Align the print cage assembly and secure it to the cover with the four mounting posts and attaching hardware.
5. Re-install the control panel connector to the print head module board.
6. Apply power to the unit.
7. Align the cutter optical board left to right so that the opto is perpendicular to the paper and the strip cut is .060 inches from the perforation (see Figure 22), and secure the cutter optical board in place.
8. Remove power from the unit.
9. Re-install the Print Head Module cover.

### **11.21 Feed Optical Detector Removal**

To remove the feed optical detector, perform the following steps:

1. Remove the Print Head Module cover.
2. Disconnect the control panel connector from the Print Head Module and set the cover aside.
3. Remove the input bezel by taking out the two mounting screws. See Figure 4.

4. Remove the four mounting posts (see Figure 10) and the attaching hardware to gain access to the underside of the print cage assembly.
5. Remove the feed optical bracket mounting screw. Refer to Figure 8 for the feed optical detector location.
6. Disconnect the connector from the feed optical board.
7. Remove the bracket mounting screw from the feed optical board.

## **11.22 Feed Optical Detector Installation**

To install a feed optical detector, perform the following steps:

1. Align the feed optical detector to the mounting bracket by placing the board flush with the mounting bracket edge. Secure the detector in place with the mounting screw.
2. Re-install the connector to the feed optical board.
3. Mount the feed optical bracket and secure it to the print cage assembly.
4. Re-install the print cage assembly into the cover, but do not secure it.
5. Align and re-install the input bezel with the two mounting screws.
6. Align the print cage assembly and secure it to the cover with the four mounting posts and attaching hardware.
7. Re-install the control panel connector to the print head module board.
8. Re-install the Print Head Module cover.

## 12.0 Troubleshooting

Use this section to assist in diagnosing FSP 960-300B error symptoms.

### **WARNING**

Power must be off to the printer when performing any procedure that requires access to the internal printer components.

### 12.1 No Operation, Power Indicator Is Out

For this error symptom, perform the following steps:

1. Check the power cord for proper installation at both ends.
2. Check the main fuse and replace if blown (2 amp, 250 volt, SB).
3. Check that there is power at the ac receptacle.
4. If the main fuse keeps blowing, check that the printer's ac voltage board is set for the correct voltage.
5. Check the Power Distribution Unit receptacle output voltage.

### 12.2 Power Is On but No Operation

For this error symptom, perform the following steps:

1. Check all electrical connections on the printer.
2. If the cutter motor does not rotate after power up, See Section 12.7.
3. Unplug the thermal print head and turn on the printer. If the printer works, replace the thermal head.
4. Replace the Power Supply board.
5. Replace the Logic board.

### **12.3 Power Is On but Strip Does Not Load**

For this error symptom, perform the following steps:

1. See Section 12.2.
2. Make sure the print head/cam lock assembly is fully locked in the closed position. Consult the thermal print head information in Section 9.0.
3. Check that the strip stock is loaded correctly.
4. Replace the feed optical detector.
5. Replace the Power Supply board.
6. Replace the Logic board.

### **12.4 Flight Strips Do Not Load**

For this error symptom, perform the following steps:

1. Ensure that the Power Supply Module is plugged in and the ac switch is in the On position.
2. Reseat the cable into the jacks.
3. Ensure that the strip stock is loaded in accordance with Section 6.0.

### **12.5 Flight Strips Are Not Cutting in the Proper Position**

For this error symptom, perform the following step:

1. Adjust the cut position in accordance with Section 10.1.

## **12.6 Erratic Cut/Print Position**

For this error symptom, perform the following steps:

1. Check for defective strip stock. Is the black mark unevenly spaced apart or light in color? Is the strip too wide for the paper path?
2. Clean the optical lenses.
3. Check that the platen is clean.
4. Replace the cutter optical detector.
5. Replace the feed optical detector.
6. Replace the Power Supply board.
7. Replace the Logic board.

## **12.7 Cutter Blade Does Not Rotate**

For this error symptom, perform the following steps:

1. Check for blockage in the cutter area.
2. Replace the cutter assembly.
3. Replace the Power Supply board.
4. Replace the Logic board.

## **12.8 Strip Is Not Cut Completely**

For this error symptom, perform the following step:

1. Adjust the cut position in accordance with Section 10.1.

## **12.9 Flight Strips Are Printing Light**

For this error symptom, perform the following steps:

1. Remove the printer cover and ensure that the head release lever is completely locked closed.
2. Clean the thermal print head.
3. Replace the Logic board.

## **12.10 Printing Blank Flight Strips**

For this error symptom, perform the following steps:

1. Ensure that the print head cable is properly seated at both ends.
2. Remove the printer cover and ensure that the head release lever is completely locked closed.
3. Replace the thermal print head.
4. Replace the Power Supply board.
5. Replace the Logic board.

## **12.11 Flight Strips Are Not Printing in Proper Position**

For this error symptom, perform the following step:

1. Adjust the printing position in accordance with Section 10.3.

### **12.12 Poor Printout (Light Printout)**

For this error symptom, perform the following steps:

1. Make sure the print head/cam lock assembly is fully locked in the closed position.
2. Consult the thermal print head information in Section 9.0.
3. Clean the thermal print head.
4. Replace the thermal print head.

### **12.13 Poor Printout (White Voids in Printout)**

For this error symptom, perform the following steps:

- a. Clean the thermal print head.
- b. Consult the thermal print head information in Section 9.0.
- c. Replace the thermal print head.

### **12.14 Printer Skips Strips**

For this error symptom, perform the following steps:

- a. Check all electrical connections on the printer.
- b. Check the position and quality of the black mark on the strip stock.
- c. Clean the optical lenses.
- d. Replace the cutter optical detector.
- e. Replace the feed optical detector.

### **12.15 Paper Feed Continues**

For this error symptom, perform the following steps:

1. Follow the thermal print head cleaning procedures (Section 9.0) to gain access and clean the feed optical detector.
2. Replace the cutter optical detector (see Section 11.19).

### **12.16 No Communications with the Host System (Test Flight Strips OK)**

For this error symptom, perform the following steps:

1. Set the printer to online (see Section 7.1.1).
2. Ensure that the interface cable is properly seated at both ends.
3. Remove the Power Supply Module cover and ensure that the interface connector and Logic board are properly seated at both ends.
4. Replace the Logic board.

### **12.17 Parity Error**

For this error symptom, perform the following step:

1. Set the baud rate in accordance with Section 7.1.7.

### **12.18 Paper Jam**

For this error symptom, perform the following steps:

1. Ensure that the strips are flat, with no bends except at perforations.
2. Remove all strips from the hopper before loading new paper (see Section 6.0).
3. Inspect the two end tabs of the paper box labeled “Do not remove this tab.”  
If the tab is removed, the paper may catch on the edge of the box while feeding and cause a jam.
4. Turn on the printer without paper loaded. Load paper after the unit is turned on.

5. Ensure that the strip stock is loaded in accordance with Section 6.0.
6. Verify the cutter motor arm position (see Figure 23); if not within minimum and maximum position, replace the cutter assembly.
7. Verify the cut position (see Section 10.1).
8. Verify that the cutter is properly aligned in accordance with Section 11.10.
9. Check strips in the hopper. The maximum number of strips allowed is 35 (see Section 6.0).

### **12.19 Ticket Jam Entering the Cutter Area**

For this error symptom, perform the following steps:

1. Check all electrical connections on the printer.
2. Replace the cutter assembly.

## 13.0 Parts List

Use this list when ordering replacement parts for the FSP 960-300B.

| Description   | Part Number |
|---|-------------|
| AC Filter   | P31-1000    |
| AC Switch   | P28-1013    |
| Bearing, Platen   | P45-1009    |
| Belt, Timing 102T   | P50-1003    |
| Cable assembly, Power (ac) 208 V                          | 422354      |
| Cable, Interconnect (Printer to Power Supply)             | 422355      |
| Connector Board, Interconnect Cable (Power Supply Module) | 422266      |
| Connector Board, Interconnect Cable (Print Head Module)   | 422266-CAP  |
| Control Panel Assembly                                    | 422330      |
| Control Panel Cable, Power Supply Module                  | 422559-16F  |
| Control Panel Cable, Print Head Module                    | 422559-16   |
| Cutter Assembly   | 422241      |
| Data Cable, Power Supply Module                           | 422558-10F  |
| Fuse, 2 A SB  | P29-1001    |
| Head Cable, Power Supply Module                           | 422558-16   |
| Head Cable, Print Module                                  | 422558-10   |
| Head Release Lever  | 421734      |
| Hopper  | 422240-D    |
| Interface Board RS422                                     | 422190-9    |
| LCD Display   | P38-1003    |
| LCD Display Cable   | 422589-12   |
| Logic Board   | 422270      |
| Optical Detector, Cutter                                  | 422264-2    |
| Optical Detector, Feed                                    | 422264-1    |
| PCB, Touch Panel (3sw)                                    | 421671      |
| Platen*   | 422234      |
| Power Cable   | 422354      |
| Power Supply Board  | 422189      |
| Power Supply Module                                       | 422312-B    |
| Print Head  | BS3002      |
| Print Head Module   | 422311-D    |
| Pulley, 20T   | P51-1007    |
| Pulley, 30T   | P51-1011    |
| Stepper Motor   | 422590      |
| Transformer, Toroid                                       | 421500-SM   |
| 110/220 V Voltage Selector                                | 421571      |

\*Order Print Head Module as replacement