



Industrial Bar Code Printers

SATO XL-400/410 Service Manual



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Sunnyvale, CA 94089***

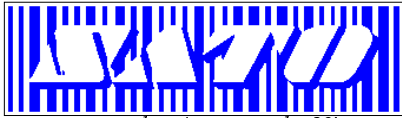
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Warning: This equipment complies with the requirements in Part 15 of FCC rules for a Class A computing device. Operation of this equipment in a residential area may cause unacceptable interference to radio and TV reception requiring the operator to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

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Bar Code Printers For the 90's

CAUTION

For your protection, Sato Printers have been tested and listed by Underwriters Laboratories. The tests include the printer and certain electrical components which are an integral part of the printer as approved.

These important electrical parts include the PRINT HEAD, PCB ASSEMBLIES, POWER SUPPLY AND MOTOR.

It is a violation of the UL listing to replace any of these parts with parts other than those approved as part of the UL listing.

PLEASE NOTE THAT IF A PART OTHER THAN THESE GENUINE SATO PARTS IS INSTALLED IN THE PRINTER, THE UL LISTING IS VOID AND THE APPROVAL LABEL MUST BE REMOVED FROM THE PRINTER.

We strongly suggest that if someone attempts to install such a part on your Sato printer or sell you such a part, that you have a written statement from them indicating that they are aware that installation of the part in question voids the UL listing and requires removal of the indication of this listing from the printer.

Finally, we call your attention to the fact that many legal jurisdictions, cities and/or counties, in the United States prohibit the installation of products such as Sato printers without a listing by an agency such as UL.

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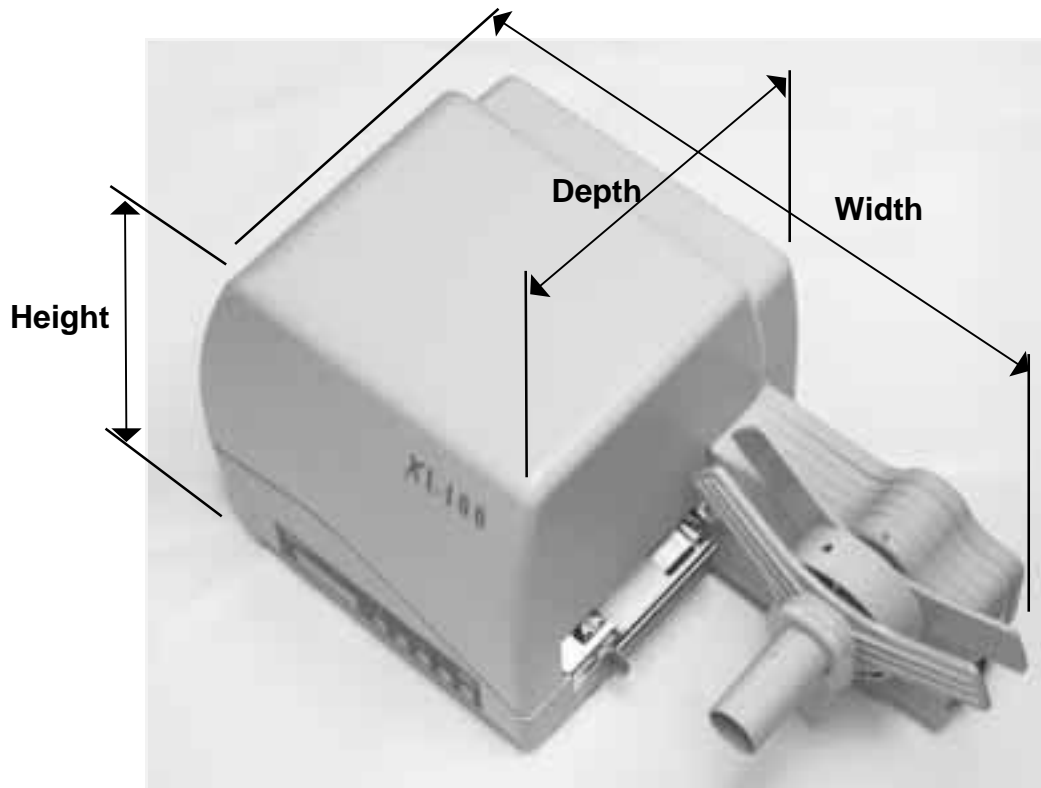
Overview and Specifications

1-1 Overview

The SATO XL400/410 Printer Service Manual provides information for installing and maintaining the SATO XL400/410 printer. Example diagrams and step-by-step maintenance instructions are included in this manual. It is recommended that you become familiar with each section in this manual before installing and maintaining the printer. This manual is divided into the following ten sections:

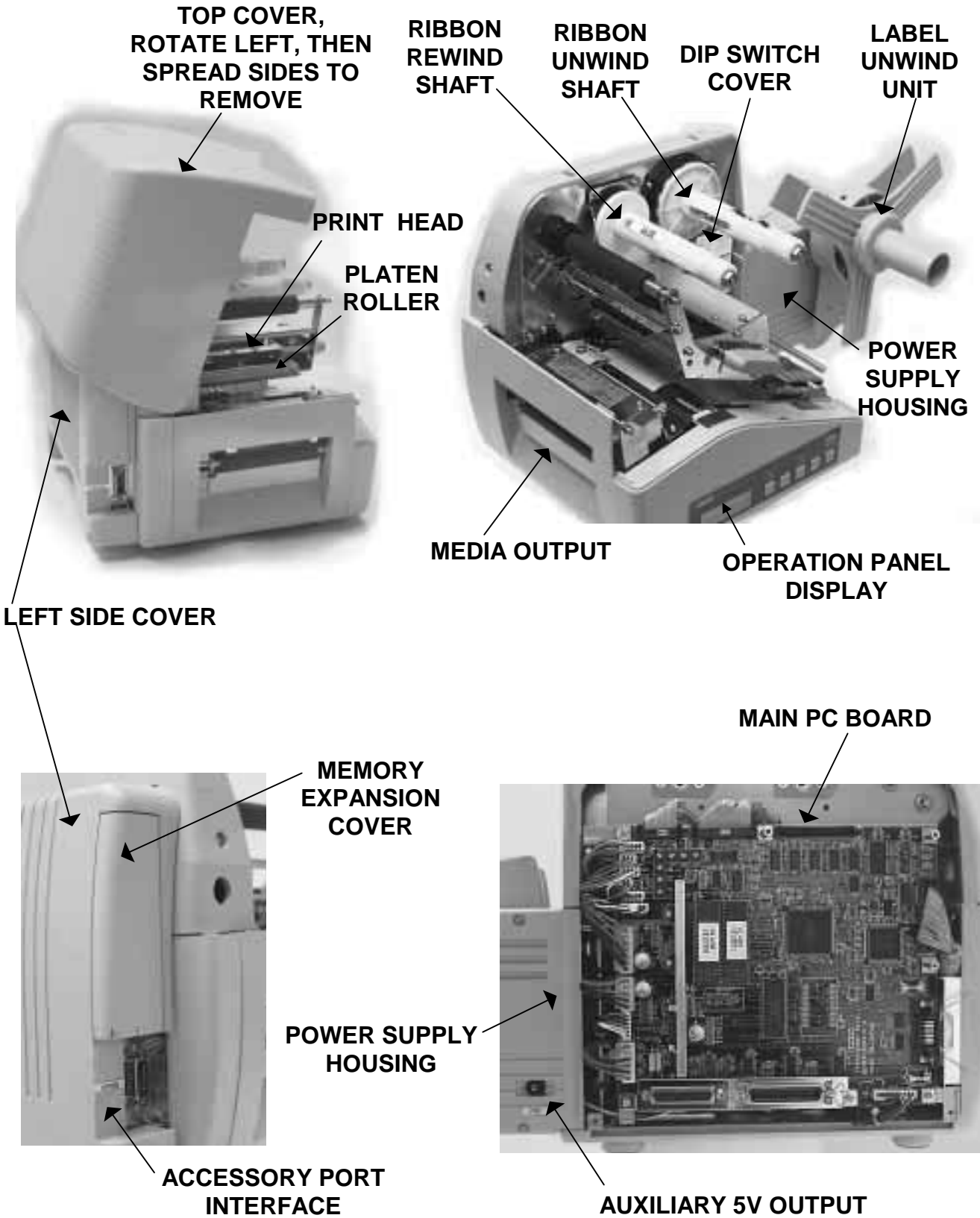
- *SECTION 1 - OVERVIEW AND SPECIFICATIONS*
- *SECTION 2 - CONFIGURATION*
- *SECTION 3 - INTERFACE SPECIFICATIONS*
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- *SECTION 8 - FACTORY RESETS*
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The major difference in the XL400 and the XL410 printers is the resolution of the head. The XL400 with its 203 dpi head provides an economical labeling solution for most applications. The XL410 provides a higher print resolution, 305 dpi, to give laser quality printing. It is useful when higher resolution is needed for detailed graphic images. Both printers can print labels up to 4.0 inches wide and 9.4 inches long using internal memory. If longer labels are required, a PCMCIA memory card option is available allowing 203 dpi labels up to 49.2 inches (32.8 inches for 305 dpi).

1-2 Physical Characteristics

SPECIFICATION	XL400	XL410
DIMENSIONS		
Width	19.6 in. (302 mm)	
Depth	11.8 in. (552 mm)	
Height	11.5 in. (294 mm)	
Weight	30.8 lbs (14 Kg)	
POWER REQUIREMENTS		
Voltage	100 - 115 V (+/- 10 %) 220 V (+/- 10 %) 50/60 Hz (+/- 1%)	
Power Consumption	300 Watts Operating	

1-3 Components



1-4 Ribbon

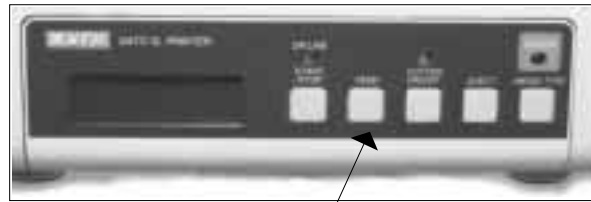
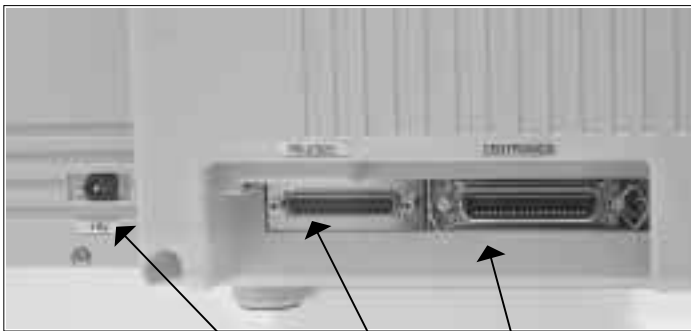
Use only SATO thermal transfer ribbons which were formulated expressly for use in all SATO printers. Use of other than approved ribbons may result in unsatisfactory print quality and/or damage to the print head and may void your warranty.

1-5 Installation Considerations

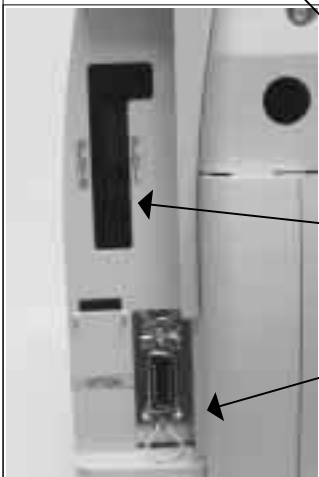
Printer operation can be affected by the printer environment. The location of the printer should be free from dust, humidity and sudden vibrations. To obtain optimum results from the printer module, avoid locations influenced by:

- Direct or bright sunlight since bright light will make the label sensor less responsive and may cause the label to be sensed incorrectly.
- Warm temperatures which can cause electrical problems within the printer. (See Section 3 - Specifications).

1-6 Interface Connections

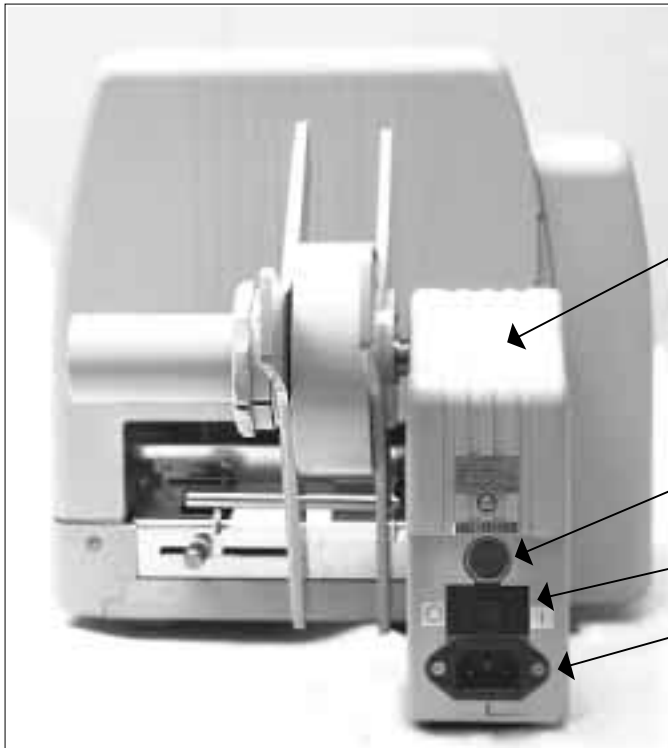


**OPERATION PANEL
DISPLAY**



- CENTRONICS CONNECTOR** For printer using parallel connection
- RS232 CONNECTOR** For printer using serial connection
- AUXILIARY 5V OUTPUT**
- MEMORY CARD SLOT 1 & 2** - Connectors for Optional PCMCIA Memory Cards
- OPTION CONNECTOR** This is an external signal connector for synchronizing and powering external accessories

1-6 Interface Connections



POWER SUPPLY HOUSING

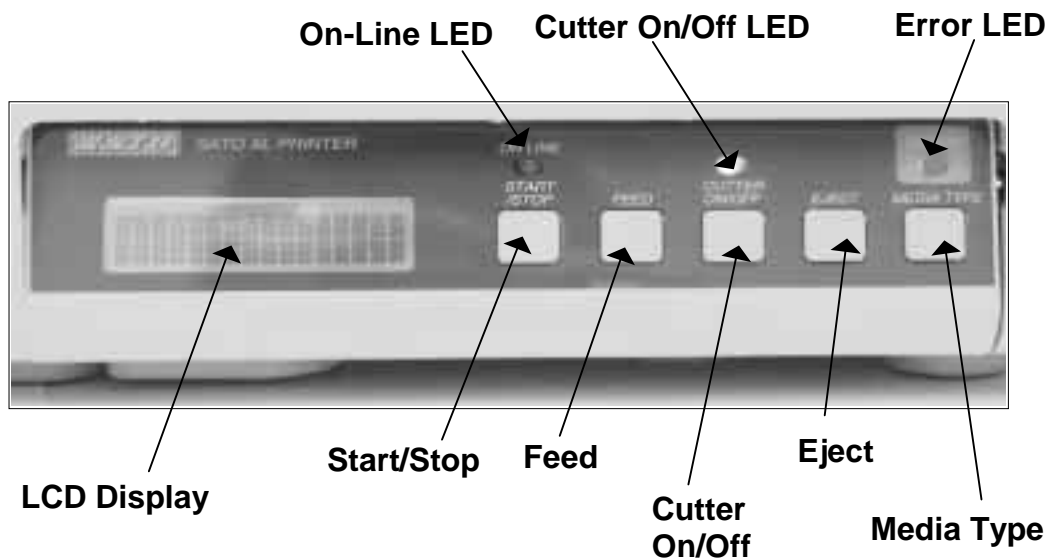
AC FUSE

POWER ON/OFF SWITCH

AC INPUT CONNECTOR

1-7 Operator Panel/Display

The Operator Panel is used by the user to manually enter printer configuration settings. Refer to Section 2 for method.



On-Line LED

Cutter On/Off LED

Error LED

LCD Display

Start/Stop

Feed

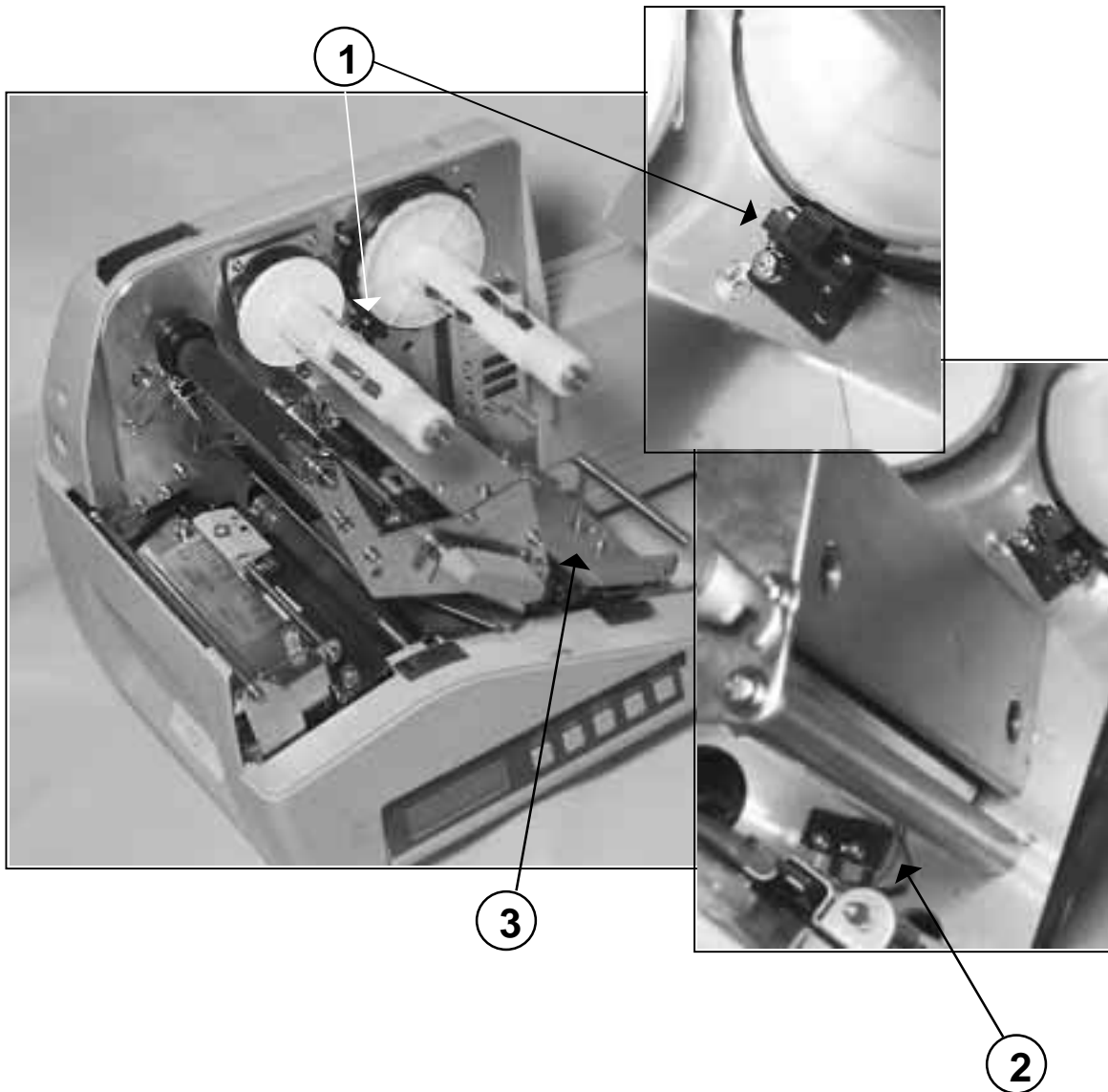
Cutter On/Off

Eject

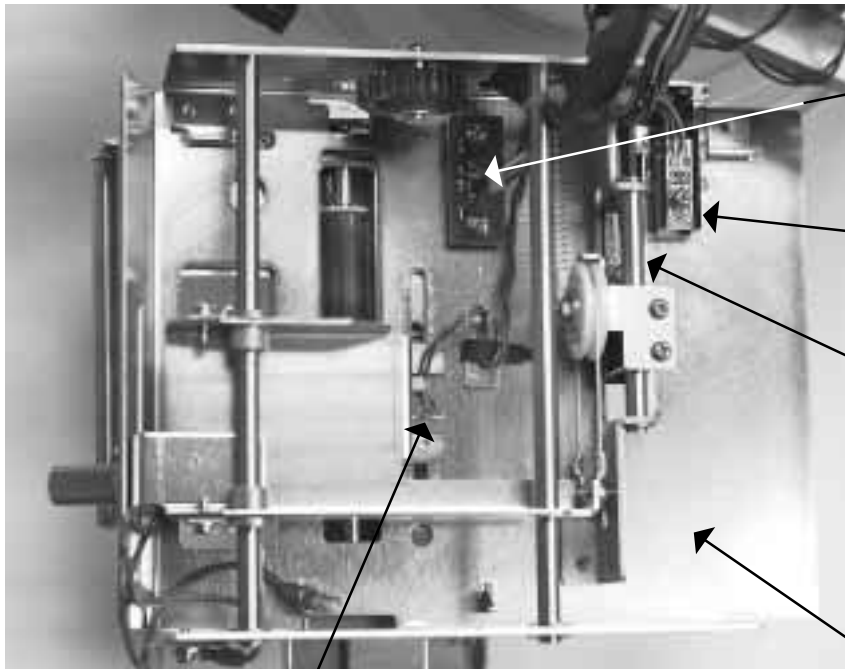
Media Type

1-8 Sensors

ITEM	DESCRIPTION
1	Ribbon Motion Sensor
2	Head Open Switch
3	Label Ramp - LED Array



1-8 Sensors



"R" CORNER
RECEIVING SENSOR (D)

"I-MARK" SENSORS (C)

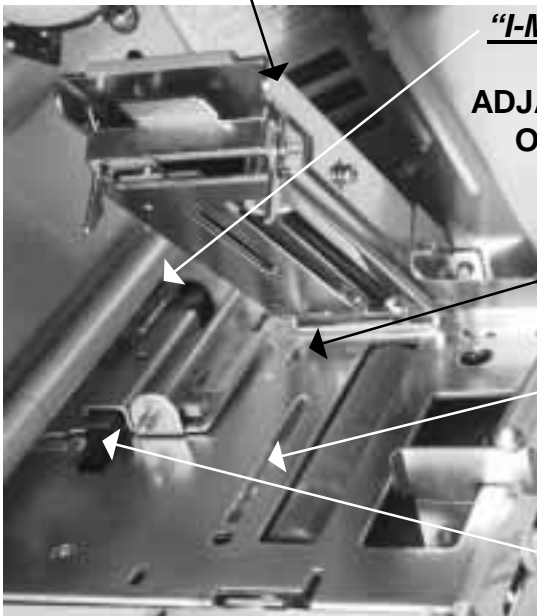
CENTER HOLE AND
GAP SENSORS (B)

UNDERSIDE OF
LABEL RAMP

SIDE HOLE TAG
RECEIVING SENSOR (A)
(BOTTOM 1/2)

LED ARRAY CONTAINS
(TOP 1/2) OF SIDE HOLE TAG
SENSOR AND "R" CORNER
SENSOR PANEL

LABEL LID COVER

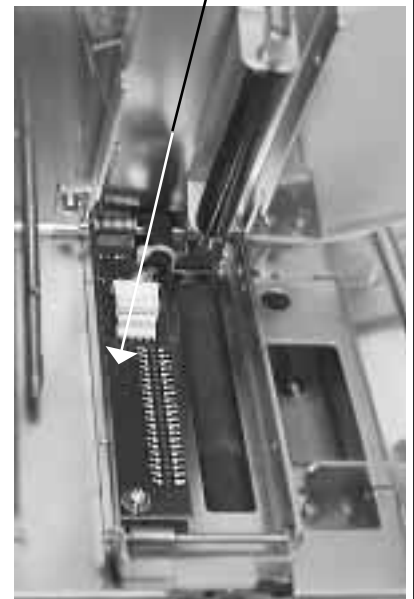


"I-MARK" SENSORS
(90 DEG. &
ADJACENT TO HEAD
OPEN SWITCH)

"R" CORNER
SENSOR

SIDE HOLE TAG
SENSOR

CENTER HOLE AND
GAP SENSORS



1-9 Optional Accessories:

ACCESSORY	XL400/410
Memory Expansion	Two slots for PCMCIA Memory Cards (up to 2MB each) that can be used for Graphic File storage, print buffer expansion, format storage and downloaded TrueType fonts.
Calendar	An internally mounted Date/Time clock that can be used to date/time stamp labels at the time of printing. Firmware upgrade may be required.
Integrated Stacker	Allows cut labels to be stacked. Interfaces to EXT Accessory Port connector.
Label Rewinder	External option rewinds labels onto a roll after they are printed.

1-10 Environment & Approvals

ENVIRONMENTAL	
Operating Temperature	41 ⁰ to 104 ⁰ F (5 ⁰ to 40 ⁰ C)
Storage Temperature	-0 ⁰ to 104 ⁰ F (-20 ⁰ to 40 ⁰ C)
Operating Humidity	15-85 % RH, non-condensing
Storage Humidity	Max 90% RH, non-condensing
Electrostatic Discharge	8KV
REGULATORY APPROVALS	
Safety	UL, CSA
RFI/EMI	FCC Class A

SECTION 1 - OVERVIEW AND SPECIFICATIONS

1-11 Print

SPECIFICATION	XL400	XL410
PRINT		
Method	Direct or Thermal Transfer	
Speed (User Selectable)	5 to 8 ips 125 to 200 mm/s	4 to 6 ips 100 to 150 mm/s
Print Module (Dot Size)	.0049 in. .125 mm	.0033 in. .083 mm
Resolution	203 dpi 8 dpmm	305 dpi. 12 dpmm
Maximum Print Width	3.94 in. 100 mm	
Maximum Print Length (Standard)	9.45 in. 356 mm	
Maximum Print Length with 2MB Memory Card	49.2 in. 1249 mm	32.8 in. 833 mm

1-12 Media , Sensing and Ribbons

SPECIFICATION	XL400	XL410
MEDIA		
Minimum Width	1.26 in. (32 mm)	
Minimum Length	.75 in. (19 mm) Labels 1.0 in. (25 mm) Tags	
Maximum Width	4.0 in. (102 mm)	
Type	Die Cut Labels, Fan Fold, Tag Stock	
Caliper (thickness)	Maximum .012 in. (.3 mm) including backing paper	
Roll OD (max)	9.8 in. (249 mm)	
Core ID (min)	4.0 in. (102 mm) (Standard)	

1-12 Media , Sensing and Ribbons

SENSING (Refer to Operation/Technical Manual For Tag/Label Specifications and Sensor Locations)	
See-Thru Label Gap/Center Hole R-Corner Tag Side Hole Tag (Hole Location)	Adjustable 0.4 in. (16 mm) to 2.0 in. (50 mm) 0.1 in. (2.5 mm) Fixed 1.3 in. (34 mm) to 3.7 in. (94 mm) Fixed at 6 mm from edge for Side Hole Tag
Reflective "I"-Mark "I" Mark Label or Tag	Fixed 0.28 in. (7 mm)
RIBBON	
Maximum Width	4.0 in. (102 mm)
Length	1475 ft. (450 m)
Wind	Ink-In
Thickness	4.5 micron

1-13 Controls and Signals, Adjustments

SPECIFICATION	XL400	XL410
On-Line LED	Status =Green	
Cutter	Status = Green	
Error LED	Status =Red	
LCD Panel	2 Line x 16 Character	
Media Out LED	Status =Red	
Start/Stop Switch	Front Panel	
Feed Switch	Front Panel	
Cutter	Front Panel	
Eject (End of Job)	Front Panel	
Media	Front Panel	
Configuration	3 x 8 DIP, Inside Cover	
Power On/Off Switch	Rear Panel	

1-13 Controls and Signals, Adjustments

POTENTIOMETER ADJUSTMENTS	
Print Darkness	VR1 Inside Cover
Cut Position	VR2 Inside Cover
Print Position	VR3 Inside Cover
Display	VR4 Inside Cover

1-14 Interface Connections

INTERFACE CONNECTIONS	
Parallel (AMP 36 pin)	Centronics Compatible
Serial (DB25S)	RS232C (2400 to 19.2K bps)
Serial Protocol	Hardware Flow Control (Ready/Busy) Software Flow Control (X-On/X-Off) Bi-directional (ENQ/Response)
Data Transmission	ASCII Format

1-15 Processing

SPECIFICATION	XL400	XL410
PROCESSING		
CPU	32 BIT RISC	
EPROM	4 Mbyte X 2	
DRAM	2 MByte	

1-16 Character Fonts

SPECIFICATION	XL400	XL410
MATRIX FONTS		
XU Font	(5 dots W x 9 dots H) Helvetica	
XS Font	(17 dots W x 17 dots H) Univers Condensed Bold	
XM Font	(24 dots W x 24 dots H) Univers Condensed Bold	

1-16 Character Fonts

SPECIFICATION	XL400	XL410
OA Font	(15 dots W x 22 dots H) OCR-A	(22 dots W x 33 dots H) OCR-A
OB Font	(20 dots W x 24 dots H) OCR-B	(30 dots W x 36 dots H) OCR-B
XCS Font	(24 dots W x 24 dots H) Care Symbol	
XCL Font	(36 dots W x 36 dots H) Care Symbol	
AUTO SMOOTHING FONTS		
XB Font	(48 dots W x 48 dots H) Univers Condensed Bold	
XL Font	(48 dots W x 48 dots H) Sans Serif	
VECTOR FONT		
	Proportional or Fixed Spacing Font Size 50 x 50 dots to 999 x 999 dots 10 Font Variations	
DOWNLOADABLE FONTS		
	TrueType Fonts with Optional Memory Card *	
CHARACTER CONTROL		
	Expansion up to 12 x in either the X or Y coordinates Character Pitch control Line Space control Journal Print facility 0 ⁰ , 90 ⁰ , 180 ⁰ and 270 ⁰ Rotation	

* If internal font storage is desired. TrueType Fonts will print if supported by the application software being used.

1-17 Bar Codes and Other Features

SPECIFICATION	XL400	XL410
SYMBOLOLOGIES		
	Bookland (UPC/EAN Supplemental) EAN-8, EAN-13 CODABAR Code 39 Code 93 Code 128 Interleaved 2 of 5 POSTNET UCC/EAN-128 UPC-A and UPC-E Data Matrix Maxicode Ver 3 STD. PDF417	
Ratios (if applicable)	1:2, 1:3, 2:5 User definable bar widths	
Bar Height	4 to 600 dots, User programmable	
Rotation	0 ⁰ , 90 ⁰ , 180 ⁰ and 270 ⁰	
OTHER FEATURES		
Sequential Numbering	Sequential numbering of both numerics and bar codes	
Custom Characters	RAM storage for special characters	
Graphics	Full dot addressable graphics, SATO Hex/Binary or .PCX formats	
Form Overlay	Form overlay for high-speed editing of complex formats	

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Section 2

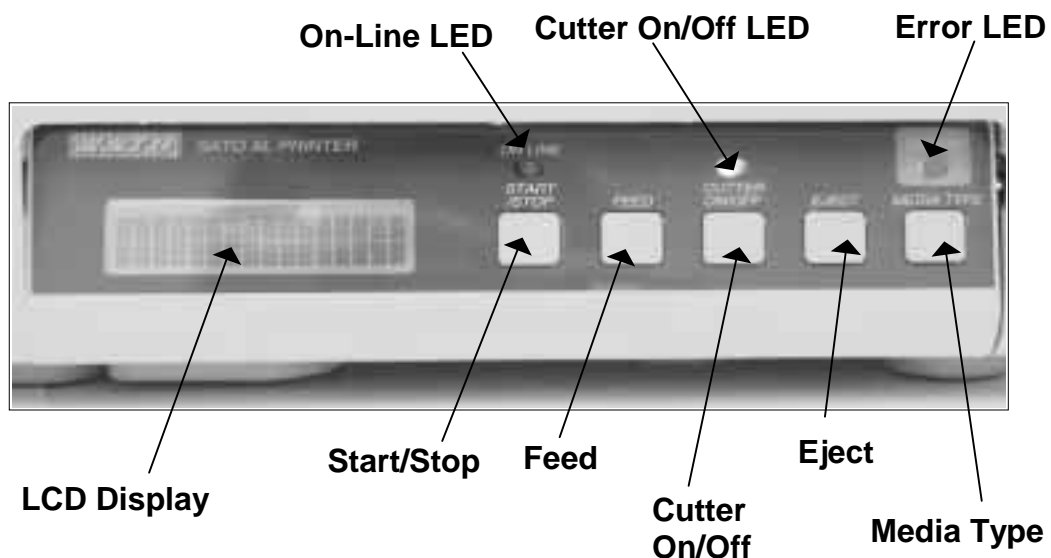
Configuration

The printer is configured in two ways.

- By Operator Panel
- By Dip switch settings

2-1 Operator Panel/Dip Switch Settings

The Operator Panel is used by the user to manually enter printer configuration settings. Many of the settings can also be controlled by software commands and in case of conflict between software and control panel settings, the printer will always use the last valid setting. If you load a label job that includes software settings and then enter a new setting by the Operator Panel, the manually set values will be used by the printer. If you set the values manually and then download a job with software settings, the software settings will be used.



2-1 Operator Panel/Dip Switch Settings (Cont.)

Three DIP switches DSW1, DSW2, and DSW3 are located inside the printer underneath an access panel. These switches are used to set:

- RS232 transmit/receive parameters
- Thermal Transfer or Direct Thermal mode
- Head check mode
- Hex dump mode
- Receive buffer size
- Operation mode

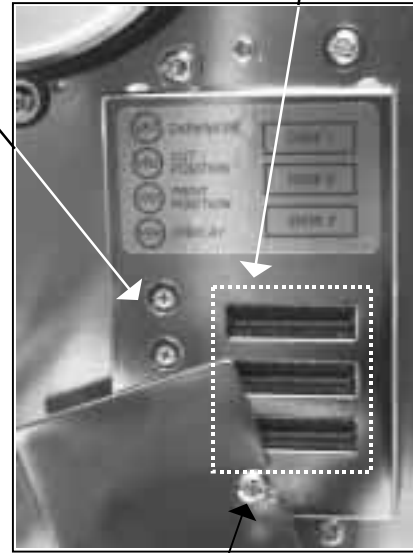
DIP SWITCHES ARE LOCATED UNDER ACCESS PANEL INSIDE PRINTER

(4) POTENTIOMETERS

Loosen the screw to access the switches.

Refer to Section 2-5 to adjust potentiometers.

DIP SWITCH TABLE IS LOCATED ON BACK SIDE OF PRINTER COVER



LOOSEN SCREW

DIP SWITCH TABLE

	DIP1			DIP2			DIP3	
1.1 Data Bits	On	Off	Reserved	Transfer Enable	On	Transfer Disable	Reserved	Off
1.2 Parity	On	Off	None	PTM Size	On	W/No Check	Reserved	Off
	On	Off	Even	Print Cycle	On	W/No Pattern	Reserved	Off
1.3 Paper Sensor	On	Off	Reserved	Print Cycle	On	Default	Reserved	Off
	On	Off	Reserved	Print Cycle	On	High	Reserved	Off
1.4 Head Mode	On	Off	Reserved	Reserved	Off		Reserved	Off
	On	Off	Reserved	Reserved	Off		Reserved	Off
1.5 Head Mode	On	Off	Reserved	Reserved	Off		Reserved	Off
	On	Off	Reserved	Reserved	Off		Reserved	Off
1.6 Head Mode	On	Off	Reserved	Reserved	Off		Reserved	Off
	On	Off	Reserved	Reserved	Off		Reserved	Off
1.7 Protocol	On	Off	Reserved	Protocol	On	Standard	Reserved	Off
	On	Off	Reserved	Protocol	On	Non-standard	Reserved	Off
1.8 Protocol	On	Off	Reserved	Print Size	On	Standard	Reserved	Off
	On	Off	Reserved	Print Size	On	Standard	Reserved	Off

WARNING
Remove all tags, labels, and ribbon before shipping.

QC6761500

2-1 Operator Panel/Dip Switch Settings (Cont.)

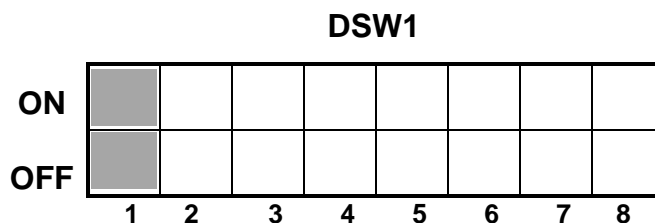
Each switch is an eight position “toggle” switch. The On position is always to the top. To set the switches, first power the unit Off, then position the DIP switches. After placing the switches in the desired positions, power the printer back on. The switch settings are read by the printer electronics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

RS232 Transmit/Receive Setting

Data Bit Selection (DSW1-1)

This switch sets the printer to receive either 7 or 8 bit data bits for each byte transmitted.

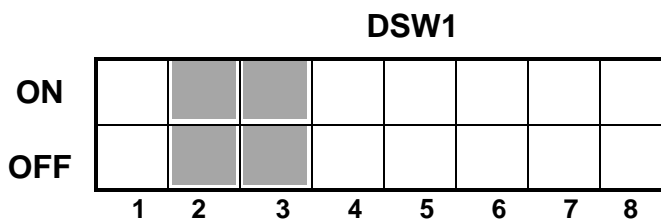
DSW1-1	SETTING
Off	8 Data Bits
On	7 Data Bits



Parity Selection (DSW1-2, DSW1-3)

These switches select the type of parity used for error detection.

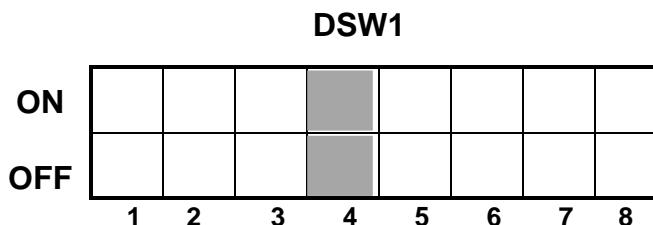
DSW1-2	DSW1-3	SETTING
Off	Off	NO PARITY
Off	On	EVEN
On	Off	ODD
On	On	NOT USED



Stop Bit Selection (DSW1-4)

Selects the number of stop bits to end each byte.

DSW1-4	SETTING
Off	1 Stop Bit
On	2 Stop Bits

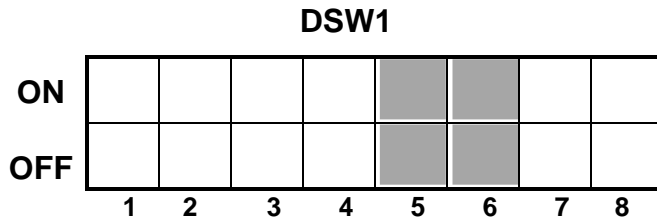


SECTION 2 - PRINTER CONFIGURATION

Baud Rate Selection (DSW1-5, DSW1-6)

Selects the data rate (bps) for the RS232 port.

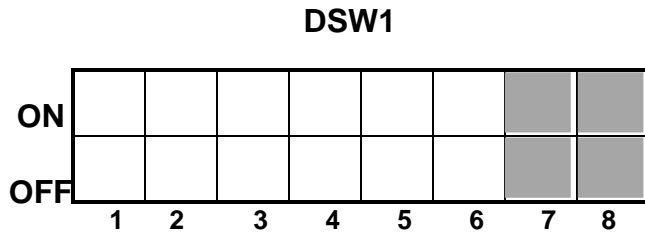
DSW1-5	DSW1-6	SETTING
Off	Off	9600
Off	On	19200
On	Off	4800
On	On	2400



Communication Protocol Selection (DSW1-7, DSW1-8)

Selects the flow control and status reporting.

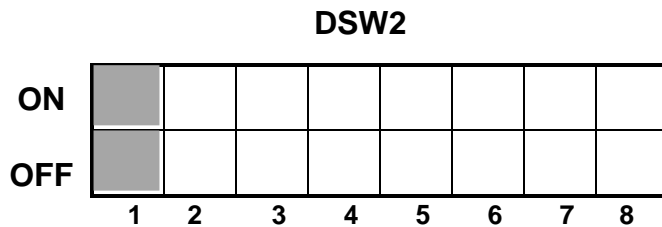
DSW1-7	DSW1-8	SETTING
Off	Off	Ready/Busy
Off	On	X-on/X-Off
On	Off	Bi-Directional
On	On	Reserved



Print Mode Selection (DSW2-1)

Selects between direct thermal printing on thermally sensitive paper and thermal transfer printing using a ribbon.

DSW2-1	SETTING
Off	Thermal Transfer
On	Direct Thermal

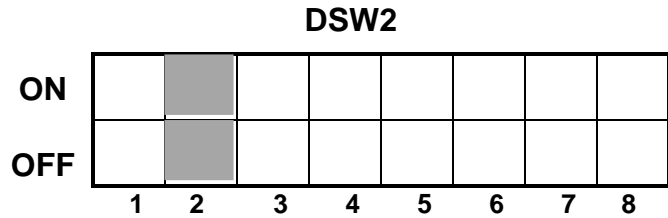


SECTION 2 - PRINTER CONFIGURATION

Print Size (DSW2-2)

Selects the maximum print area. When set to On, maximum size is 3.1' x 4.7". Used for compatibility with older model tag printers.

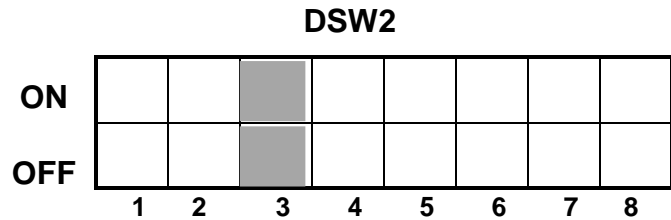
DSW2-2	SETTING
Off	4" Wide x 240 mm
On	3.1" Wide x 120 mm



Head Check Selection (DSW2-3)

When selected, the printer will check for head elements that are electrically malfunctioned.

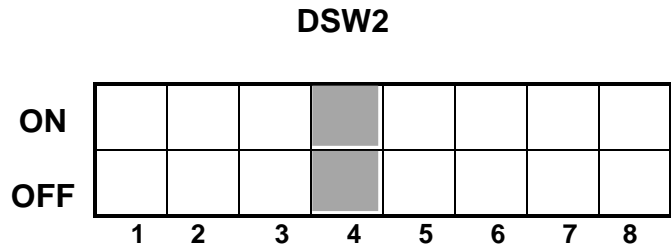
DSW2-3	SETTING
Off	Disabled
On	Enabled



Reserved (DSW2-4)

Reserved for future use.

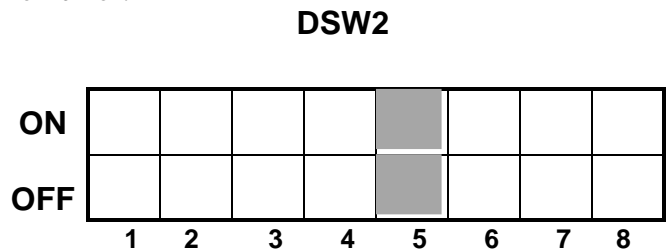
DSW2-4	SETTING
Off	
On	



Receive Buffer Selection (DSW2-5)

Selects the operating mode of the receive buffer.

DSW2-5	SETTING
Off	Single Job
On	Multi Job

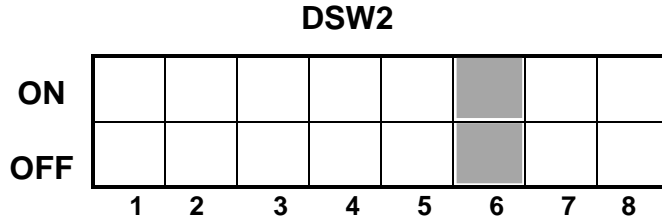


SECTION 2 - PRINTER CONFIGURATION

Reserved (DSW2-6)

Reserved for future use.

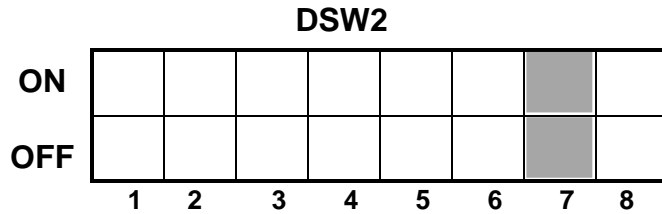
DSW2-6	SETTING
Off	
On	



Protocol Control Code Selection (DSW2-7)

Selects the command codes used for protocol control.

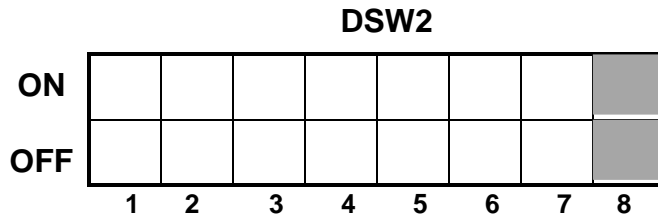
DSW2-7	SETTING
Off	Standard
On	Non - Std.



Pitch Size Check (DSW2-8)

Checks the length on the installed media against the size loaded via software (<ESC>) A1 .

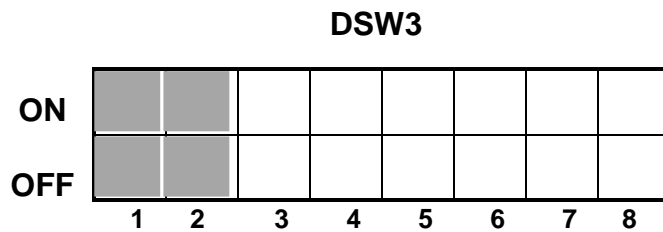
DSW2-8	SETTING
Off	Disabled
On	Enabled



Reserved (DSW3-1 and DSW3-2)

Reserved for future use.

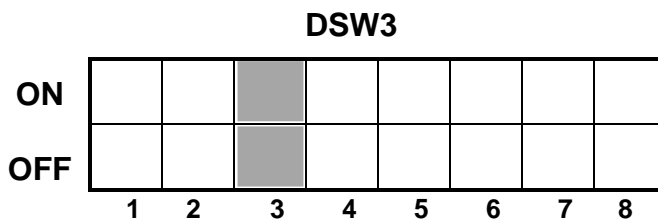
DSW3-1	DSW3-2	SETTING
Off	OFF	
Off	ON	
On	OFF	



Reserved (DSW3-3)

Reserved for future use.

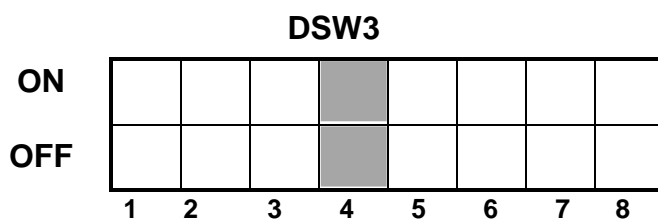
DSW3-3	SETTING
Off	
On	



Reserved (DSW3-4)

Reserved for future use.

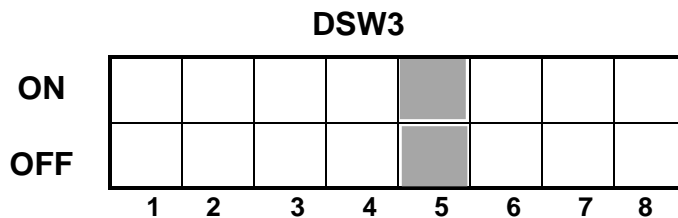
DSW3-4	SETTING
Off	
On	



Reserved (DSW3-5)

Reserved for future use.

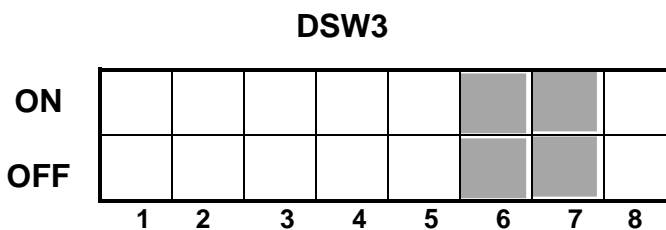
DSW3-5	SETTING
Off	Disabled
On	Enabled



Reserved (DSW3-6, DSW3-7)

Reserved for future use.

DSW3-6	DSW3-7	SETTING
Off	Off	
Off	On	
On	Off	
On	On	

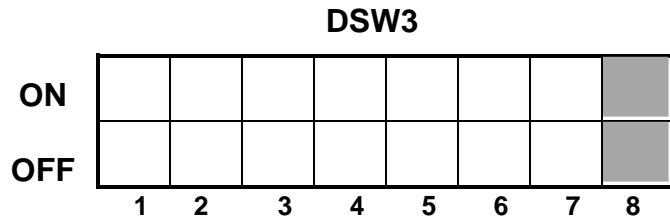


SECTION 2 - PRINTER CONFIGURATION

Reserved (DSW3-8)

Reserved for future use.

DSW3-8	SETTING
Off	
On	



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

Note: *The DIP Switch functions listed incorporate the latest firmware revisions at the time of printing.*

2-2 Default Settings

Switch Selections

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

Communications:	8 data bits, no parity, 1 Stop bit, 9600 Baud
Protocol:	Ready/Busy, Standard Protocol Codes
Mode:	Thermal Transfer
Head Check	Disabled
Receive Buffer:	Single Job
Pitch Check:	Disabled

Software Default Settings

The XL400/410 stores the software settings upon receipt and uses them until they are again changed by receipt of a command containing a new setting. These settings are stored in non-volatile RAM and are not affected by powering the printer off. The printer may be reset to use the default software settings by pressing the **FEED** and **START/STOP** key while powering the printer on. This will result in the following default configuration:

	XL400	XL410
Print Darkness	2	2
Print Speed	6 inches per second	5 inches per second
Print Reference	Vertical = 001 Horizontal = 001	Vertical = 001 Horizontal = 001
Media Type	Center Hole Tag	Center Hole Tag
Cutter	Enabled	Enabled
Zero	Slash	Slash

Once the default operation is completed, a "SATO DEFAULT COMPLETED" message will be displayed on the LCD panel. The printer should be powered off while this message is being displayed. This saves the default settings in the EEPROM where they will be automatically loaded the next time the printer is powered on.



SATO DEFAULT
COMPLETED

2-3 Printer Settings

Normal Mode:

When the printer is powered on, the ON-LINE LED will be illuminated and the readout should display the following message:



The LCD display shows the word "ONLINE" on the top line. The bottom line is split into two sections: "000000" on the left and "00000000" on the right.

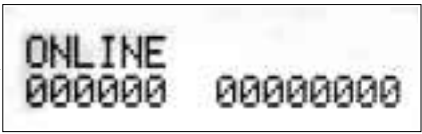

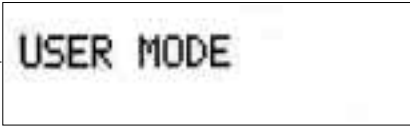
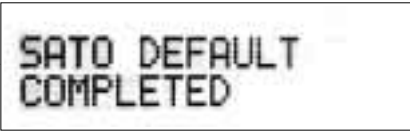
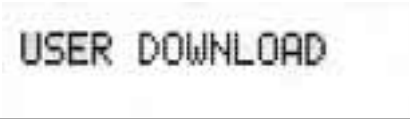
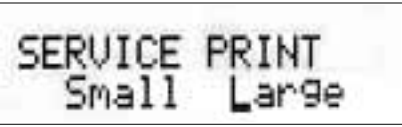
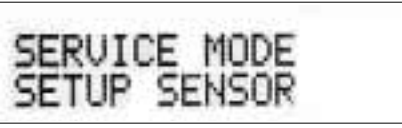
The LCD Panel will display the ON-LINE status on the top line of the display and the bottom line will contain the label quantity status. The ON-LINE message will be changed to OFF-LINE whenever the printer is switched OFF-LINE by depressing the **START/STOP** key. As soon as the label job begins to print, the display will indicate the number of labels remaining in the print job that remain to be printed. As each label in the print job is printed, the quantity to be printed (shown left side), will decrement and quantity printed (shown right side), will increment.

When the printer is first taken off-line by pressing the **START/STOP** key once, the ON-LINE LED will go off and the display will change to:




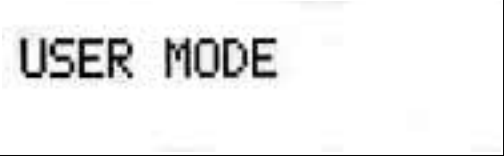
The LCD display shows the words "CENTER HOLE" on the top line. The bottom line is split into two sections: "000000" on the left and "00000000" on the right.

SECTION 2 - PRINTER CONFIGURATION

POWER ON		
Normal/Operating Mode	POWER	Refer to Page 24
		
Print Test Labels	POWER+FEED	Refer to Page 39
		
User Mode	START/STOP+FEED	Refer to Page 26
(While in Normal Mode)		
		
Load SATO Default Settings	POWER + START/STOP +FEED	Refer to Page 23
		
Download User Defined Protocol Codes	POWER+START/STOP + DSW2-7 =ON	Refer to Page 44
		
Print Service Label	POWER +MEDIA TYPE + FEED	Refer to Page 39
		
Service Mode	POWER + START/STOP + MEDIA TYPE	Refer to Page 29
		

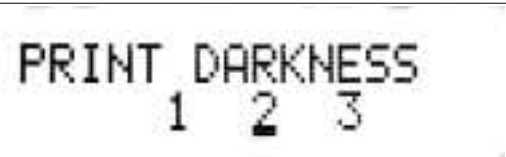
User Mode

To access this setting perform the following steps:

STEP	PROCEDURE
1.	Turn the printer on to display the following screen. Then press START/STOP key to go OFFLINE.
	
2.	Press the START/STOP and FEED keys simultaneously for two seconds. Release the keys and the following screen will be displayed.
	
3.	Press the FEED key to go through the settings.

Print Darkness Setting

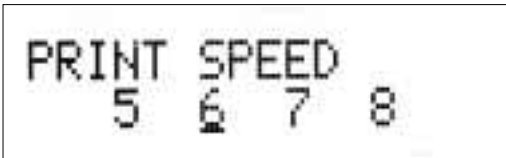
There are three **Darkness** (or heat range) settings on the XL400/410, (1, 2, and 3). The higher numbers represent darker settings. The current setting is indicated by an underline under one of the range settings.

STEP	PROCEDURE
1.	Use the START/STOP key to step the underlined cursor to the desired setting.
	
2.	Once the correct setting is underlined, press the FEED key to accept the setting and advance to the next adjustment. <i>Note: This setting may be overridden by your application software.</i>

After setting the heat range with this command, finer adjustments can be made using the PRINT potentiometer VR1 adjustment under the access panel inside the printer and described in Section 2-5.

Print Speed Adjustment

There are four SPEED settings on the XL400, (5 ips, 6 ips, 7 ips, and 8 ips) and three on the EX410, (4 ips, 5 ips, and 6 ips). The setting is listed on the bottom line of the display. The current setting is indicated by an underline under one of the speed settings.

STEP	PROCEDURE
1.	Use the LINE key to step the underlined cursor to the desired setting.
	
2.	Once the correct setting is underlined, press the FEED key to accept the setting and advance to the next adjustment. <i>Note: This setting may be overridden by your application software.</i>

NOTE: Refer to Darkness Potentiometer, Section 2-5 for additional options.

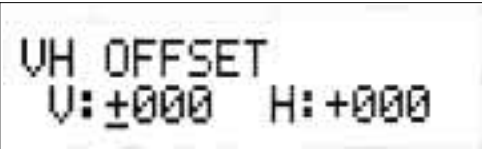
VH Offset

The Vertical and Horizontal offset allows you to move the label image both horizontally and vertically to position a label format correctly on a label. This allows you to use smaller label formats on media which is larger than the original format called for without having to individually correct each H and V field positions in the command stream. It has the same effect as using the <ESC> A3 Base Reference Point command.

To change the setting perform the following steps:

STEP	PROCEDURE
1.	Use the START/STOP key to step the underlined cursor to either the positive (+) or the negative (-) selection. A positive selection increases the label pitch while a negative selection decreases the label pitch.
2.	Once the correct setting is underlined, press the FEED key to accept the setting and advance to the next vertical adjustment.
3.	The underline cursor is now positioned under the least significant digit of the V offset setting. The vertical offset will increase each time the START/STOP key is pressed. If the START/STOP key is pressed and held down, the value will count up rapidly.
4.	Once the correct vertical offset is displayed, press the FEED key to accept the setting and advance to the horizontal setting adjustment.

VH Offset (Cont.)

STEP	PROCEDURE
5.	Use the START/STOP key to select the horizontal direction (“+” or “-”).
6.	Once the correct direction is displayed, press the FEED key to accept the setting advance to the horizontal setting adjustment.
	
7.	The underline cursor is now positioned under the least significant digit of the H offset setting. The horizontal offset will increase each time the START/STOP key is pressed. If the START/STOP key is pressed and held down, the value will count up rapidly.
8.	Once the correct setting is displayed, press the FEED key to accept the setting and advance to the next adjustment.

Zero Slash Setting

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



To access this setting, perform the following steps:

STEP	PROCEDURE
1.	Use the START/STOP key to step the underlined cursor to either YES or NO .
2.	Once the correct setting is underlined, press the FEED key to accept the setting and exit user mode and return to normal mode. At this time the values selected will be stored in non-volatile memory.

Service Mode

Service Mode is provided to make adjustments that require only occasional changes. Since they affect the basic operation of the printer, the procedure for entering this mode is designed to prevent someone from accidentally changing the settings.

To access this setting perform the following steps:

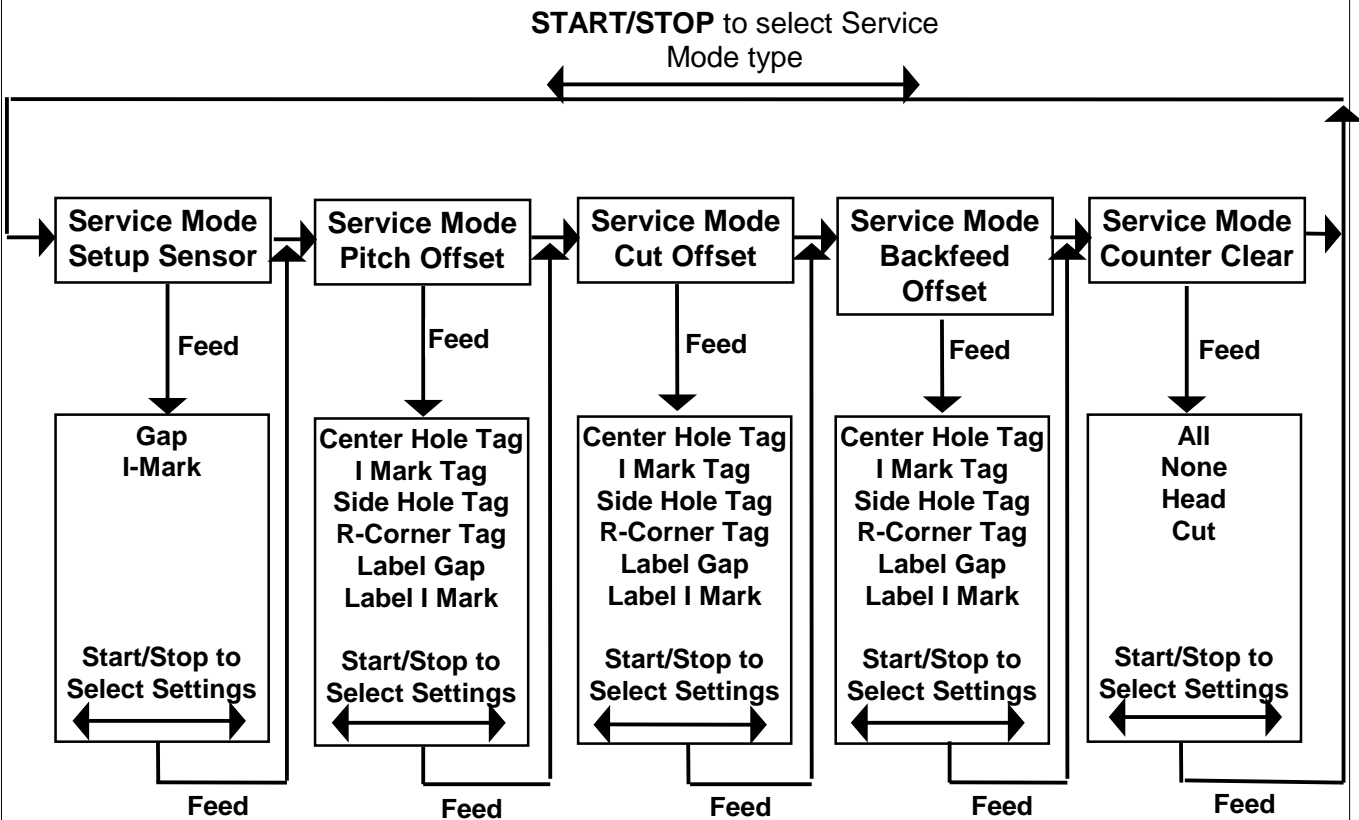
STEP	PROCEDURE
1.	Turn the printer on while pressing the START/STOP and the MEDIA TYPE keys simultaneously and the following screen will be displayed. <div data-bbox="1019 613 1498 760" style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px auto; width: fit-content;"> SERVICE MODE SETUP SENSOR </div>
2.	The printer will “beep” one time and display the first configuration selection on the LCD panel.
3.	Press the START/STOP key to select the type of adjustment.
4.	Each time the START/STOP key is pressed, the Service Mode display will be cycled to the next selection.

The type of adjustments that can be made in the Service Mode are:

- Sensor Setup
- Pitch Offset
- Cut Offset
- Backfeed Offset
- Clear Counter

Service Mode (Cont.)

From the Service Mode type display, the settings are accessed in sequence by pressing the **FEED** key. Once you have cycled through all the adjustments for the Service Mode you are currently in, press the **FEED** key to sequence to the next Service Mode type.



Set-up Sensor

The XL Series printers determine the location of the leading edge of the label or tag by measuring the difference between light levels when it sees either a media edge or a black “I-Mark”. This adjustment allows you to manually set the threshold voltage level, between the maximum and minimum light levels. The type of sensor is automatically selected by the Media type setting. (Note: GAP is also used for tags.) The LCD will display either **GAP** or “I-Mark” on the top line along with the current setting. If the value is “0.0V”, the printer will automatically calculate the setting when the first label is fed after the printer is powered on or the head is closed. There are some instances where the automatically calculated value must be adjusted to ensure reliable label feeding, such as when the backing opacity or the reflectance of the I-mark varies significantly within a roll of labels or between label rolls. In these instances the value should be set using the following procedures.



GAP: When setting the “gap” threshold, the voltage must be measured with nothing (or nothing but the backing if labels are used) in the sensor and then again with labels in the sensor. The smaller value is added to the larger and the result multiplied by 0.5 and added to the smaller value. This is the starting point to be used. The formula for this is:

$$(High\ Voltage\ Level + Low\ Voltage\ Level) \times 0.5 = Start\ Value$$

To access this setting perform the following steps: Refer to Section 1-8 for sensor locations.

STEP	PROCEDURE				
1.	<p>Insert a tag/label into the sensor and close the Media hold down. Record the voltage shown on the top line of the LCD panel. This line should have the message “GAP” on the top line . Make sure the label is all the way under the sensor.</p>				
2.	<p>If labels are used, strip the label from the backing and insert the backing strip under the sensor. If tags are used, remove the tag from the sensor. Close the Media hold down. Record the voltage shown on the top line of the LCD panel. The voltage measured should be within the following ranges:</p> <table border="1" data-bbox="656 1520 1398 1703"> <thead> <tr> <th data-bbox="656 1520 1016 1629">Tag or Label with Backing</th> <th data-bbox="1021 1520 1398 1629">No Tag or Label Backing Only</th> </tr> </thead> <tbody> <tr> <td data-bbox="656 1635 1016 1703">2.0V to 3.5V</td> <td data-bbox="1021 1635 1398 1703">Less than 1.0V</td> </tr> </tbody> </table> <p>If the measured values are outside this range, you may have trouble finding a value that will work properly under all conditions. If this is the case, a higher quality label may be needed to get adequate performance.</p>	Tag or Label with Backing	No Tag or Label Backing Only	2.0V to 3.5V	Less than 1.0V
Tag or Label with Backing	No Tag or Label Backing Only				
2.0V to 3.5V	Less than 1.0V				

Set-up Sensor (Cont.)

STEP	PROCEDURE
3.	Calculate the starting point voltage using the formula.
4.	Use the Start/Stop key to step the counter to the desired setting. The display will increment one step for each time the Start/Stop key is pressed. If the Start/Stop key is held down for more than two seconds, it will automatically go into the fast scroll mode. The reading will advance to a setting of 4.9 (the maximum voltage) after which it will automatically wrap and start at " 0.0 " again. <i>If a value of "0.0" is set, the printer will automatically set the level between the two measured voltages each time the printer is powered on with labels loaded.</i>
5.	Repeat this procedure using values slightly higher or lower until the optimum performance is obtained. Refer to 4-11 Pitch Sensor Adjustment.
6.	Once the setting is correct, press the FEED key to accept the setting and advance to the next display.

"I-Mark": When setting the "I Mark" threshold, the voltage must be measured with nothing but the label or tag under the sensor and then again with the printed "I-Mark" under the sensor. The smaller value is added to the larger and the result multiplied by 0.5. This is the starting point to be used. The formula for this is:

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

Refer to Section 1-8 for sensor locations.

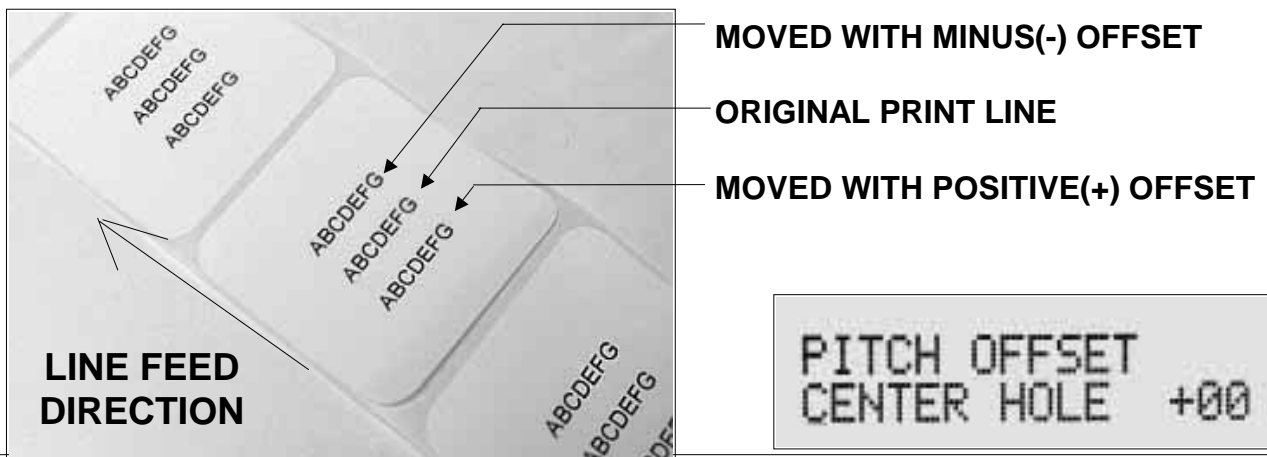
STEP	PROCEDURE				
1.	Insert a label or tag into the sensor and close the Media hold down. Make sure the printed "I-Mark" is not under the sensor. Record the voltage shown on the top line of the LCD panel. This line should have the message "I-Mark" on the top line.				
2.	Now pull the label or tag forward until the "I-Mark" is positioned under the sensor (the voltage reading should be at its highest point). Record the voltage shown on the top line of the LCD panel. The voltage measured should be within the following ranges:				
<table border="1"> <thead> <tr> <th>Label or Tag Only</th> <th>I-Mark</th> </tr> </thead> <tbody> <tr> <td>Less than 1.0V</td> <td>2.5v to 3.5V</td> </tr> </tbody> </table>		Label or Tag Only	I-Mark	Less than 1.0V	2.5v to 3.5V
Label or Tag Only	I-Mark				
Less than 1.0V	2.5v to 3.5V				

Set-up Sensor (Cont.)

STEP	PROCEDURE
2. Cont.	If the measured values are outside this range, you may have trouble finding a value that will work properly under all conditions. If this is the case, a higher quality label may be needed to get adequate performance.
3.	Calculate the starting point voltage using the formula.
4.	Use the START/STOP key to step the counter to the desired setting. The display will increment one step for each time the START/STOP key is pressed. If the START/STOP key is held down for more than two seconds, it will automatically go into the fast scroll mode. The reading will advance to a setting of 4.9 (the maximum voltage) after which it will automatically wrap and start at "0.0" again. If a value of "0.0" is set, the printer will automatically set the level each time the printer is powered on with labels/tags loaded or the head is closed.
5.	Repeat this procedure using values slightly higher or lower until the optimum performance is obtained. Refer to 4-11 Pitch Sensor Adjustment.
6.	Once the setting is correct, press the FEED key to accept the setting and advance to the next display.

Pitch Offset and Direction

The pitch is the distance from the leading edge (the edge that comes out of the printer first) of a label or tag to the leading edge of the next label or tag. It is used to position the first print line of the label or tag under the print head. This position can be adjusted relative to the "000" reference line +/- 99 dots in increments of 1 dot using the following procedure (1 dot = "005" for the XL400 and .0033" for the XL410). Once the position is set, it can be adjusted +/- 3.75 mm using the PRINT POSITION potentiometer on the control panel.



Pitch Offset and Direction (Cont.)

To access the setting perform the following steps:

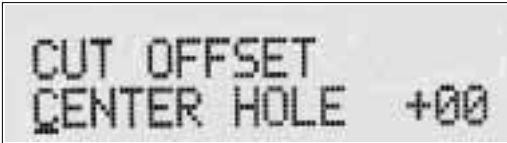
STEP	PROCEDURE
1.	Press the FEED key to enter the desired Service mode type.
2.	Use the START/STOP key to select the type of media to be used.
3.	Once the correct media type is shown in the display, press the FEED key to advance to the Pitch Direction adjustment.
4.	Use the START/STOP key to step the underline cursor to either the positive (+) or negative (-) selection. A positive selection increases the label pitch (or label length) while a negative selection decreases the label pitch.
5.	Once the setting is correct, press the FEED key to accept the setting and advance to the Pitch Offset adjustment.
6.	Use the START/STOP key to step the counter to the desired position. The display will increment one step for each time the START/STOP key is pressed. If the START/STOP key is pressed for more than two seconds, it will automatically go into the fast scroll mode. The reading will advance to a setting of 99 dots after which it will automatically wrap and start at "00" again. The Pitch direction set in the previous step will be displayed in front of the Offset setting.
7.	You may wish to check your settings by printing a test label after you have completed the adjustments to ensure that they are correct.
8.	Once the correct is correct, press the FEED key to advance to the Cut offset display.

Cut Offset

The Cut Offset is the distance from the reference line of a label or tag to the desired cut position. The cut position of the label or tag can be adjusted relative to the reference line +/- 99 dots in increments of 1 dot using the following procedure (1 dot = .005" for the XL400 and .0033" for the XL410). Once the position is set, it can be adjusted +/- 3.75 mm using the Cut Position potentiometer on the control panel.

NOTE:

Your application software may override these settings.



CUT OFFSET
CENTER HOLE +00

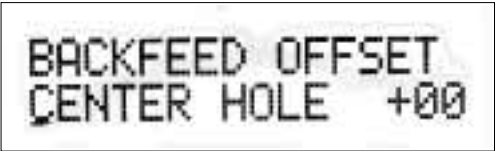
Cut Offset (Cont.)

To access the setting perform the following steps:

STEP	PROCEDURE
1.	Press the FEED key to enter the desired Service Mode type.
2.	Use the START/STOP key to select the type of media to be used.
3.	Once the correct media type is shown in the display, press the FEED key to advance to the Cut Offset direction adjustment.
4.	Use the START/STOP key to step the underline cursor to either the positive (+) or negative (-) selection. A positive selection moves the cut position toward the top of the tag while a negative selection moves the cut position toward the bottom of the tag.
5.	Once the desired direction setting is underlined, press the FEED key to advance to the Cut Offset adjustment.
6.	Use the START/STOP key to step the counter to the desired position. The display will increment one step for each time the START/STOP key is pressed. If the START/STOP key is pressed for more than two seconds, it will automatically go into the fast scroll mode. The reading will advance to a setting of 99 dots after which it will automatically wrap and start at "00" again. The Cut Offset direction set in the previous step will be displayed in front of the Cut Offset setting.

Backfeed Offset

The Backfeed Offset is the distance the label or tag is to be retracted after it is cut. It aligns the print and cut position of the first tag after tags have been ejected from the printer. The backfeed distance can be adjusted relative to the reference line +/- 12 dots (+/- 18 dots for the XL410) in increments of 1 dot using the following procedure, (1 dot = .005" for the XL400 and .0033" for the XL410). A minus value retracts the tag less and a positive value pulls the tag further back into the printer. If a value greater than 12 (or 18) is entered, an error will occur.



To access the setting perform the following steps:

STEP	PROCEDURE
1.	Press the FEED key to enter the desired Service Mode type.
2.	Use the START/STOP key to select the type of media to be used.

Backfeed Offset (Cont.)

STEP	PROCEDURE
3.	Once the correct media type is shown in the display, press the FEED key to advance to the Backfeed Offset direction adjustment.
4.	Use the START/STOP key to step the underline cursor to either the positive (+) or negative (-) selection.
5.	Once the desired direction setting is underlined, press the FEED key to advance to the Backfeed Offset adjustment.
6.	Use the START/STOP key to step the counter to the desired position. The display will increment one step for each time the START/STOP key is pressed. If the START/STOP key is pressed for more than two seconds, it will automatically go into the fast scroll mode. The reading will advance to a setting of 99 dots after which it will automatically wrap and start at "00" again. The Backfeed Offset direction set in the previous step will be displayed in front of the Backfeed Offset setting.

Calendar Set

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



CALENDAR
00/00/00 00:00

To access this setting perform the following steps:

STEP	PROCEDURE
1.	Press the FEED key to enter the desired Service mode type.
2.	Use the START/STOP key to select the type of media to be used.
3.	Once the correct media type is shown in the display, press the FEED key to advance to the Calendar direction adjustment.
4.	Year: The first display shown will have the two digit year selection underlined. Press the FEED key to scroll through the dates. The year number will increase by one each time the LINE key is pressed until it reaches its maximum legal value (i.e., "99" for the year digits) at which point it will wrap around to the "00" setting.

Calendar Set (Cont.)

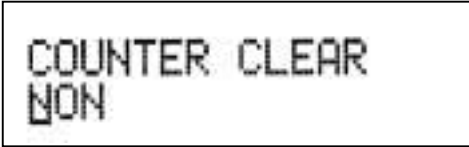
STEP	PROCEDURE
5.	Month: After you have set the correct year, press the FEED key to advance the underline cursor to the two digit Month position. Press the LINE key to scroll through the numbers corresponding to the month. The month number will increase by one each time the LINE key is pressed until it reaches a value of "12" at which point it will wrap around to the "01" setting.
6.	Day: After you have set the correct, press the FEED key to advance the underline cursor to the two digit Day position. Press the LINE key to scroll through the numbers corresponding to the month date. The date number will increase by one each time the LINE key is pressed until it reaches a value of "31" at which point it will wrap around to the "01" setting.
7.	Hour: After you have set the correct date, press the FEED key to advance the underline cursor to the tow digit Hour position. Press the LINE key to scroll through the numbers corresponding to the hour (using a 24 hour clock). The hour number will increase by one each time the LINE key is pressed until it reaches a value of "24" at which point it will wrap around to the "01" setting.
8.	Minute: After you have set the correct hour, press the FEED key to advance the underline cursor to the two digit minute position. Press the LINE key to scroll through the numbers corresponding to the minute. The minute number will increase by one each time the LINE key is pressed until it reaches a value of "60" at which point it will wrap around to the "01" setting.
9.	After you have set the calendar, press the FEED key to accept the setting and advance to the Clear Head Counter display.

Exit

To exit the Service mode, remove power from the printer and the settings will be stored in non-volatile memory.

Counter Clear/Factory Reset

The Counter Clear/Factory Reset Service Mode is used to reset the internal printer counters to zero. This allows the user to keep track of the number of kilometers of label material that has passed through the printer, or how many labels have been cut.



COUNTER CLEAR
NON

The Counters are identified in the display as:

NON: None (default)
ALL: Clears all counters
HEAD: Head Counter
CUT: Cutter Counter

To access this setting perform the following steps:

STEP	PROCEDURE
1.	Press the FEED key to enter the desired Service mode type.
2.	Use the START/STOP key to step the underline cursor to the counter(s) to be reset. The default position reset NONE (NON) of the counters. Use the START/STOP key to advance the underline cursor to the desired selection.
3.	Once the correct media type is displayed, press the FEED key to accept the setting and advance the display back to the SETUP SENSOR display.

2-4 Printing Test Labels

User Test Print:

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

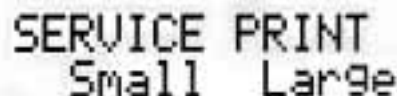


To access this setting perform the following steps:

STEP	PROCEDURE
1.	Press the START/STOP key to start printing test labels.
2.	To pause the printer after it starts printing test labels, press the START/STOP key to place it Off-Line. Press the START/STOP key again to place the printer back On -Line and resume printing test labels.
3.	To stop the test label print, pause the printer and turn the power off without placing it On-Line.

Service Test Print:

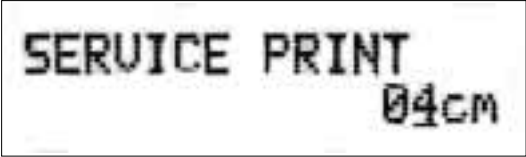
This option allows you to print a Service Test Label. It is recommended that you print a test label after you have changed any of the settings in the Service Mode. The test label allows you to verify that you indeed did make the desired changes. To enter the Service Test Print Mode, power the printer on while pressing the **FEED** and **MEDIA TYPE** keys simultaneously. The printer will “beep” one time and display the following message on the LCD panel.

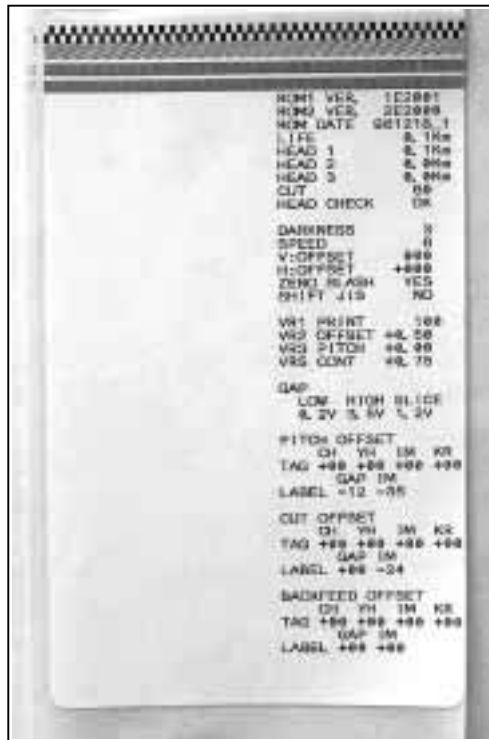


To access this setting perform the following steps:

STEP	PROCEDURE
1.	Select either Small or Large label using the START/STOP key. The Large selection assumes you have labels at least 3.1 inches wide loaded in the printer. If you labels are smaller you must select Small as the head can be easily damaged if nothing is under the print area to dissipate the heat from the print head.

Service Test Print (Cont.)

STEP	PROCEDURE
2.	If Large is selected, pressing the FEED key will cause a complete Service Test label to be printed.
Cont.	If Small is selected, you will get the following screen.
	
3.	Use the START/STOP key to select the correct size label. Each time the START/STOP key is pressed, the indicated label size will increase by 1 cm. The maximum size is 10 cm.
4	Press the FEED key to start the Small Service Print Test label print mode. The printer can be paused by pressing the FEED key again.
5.	To exit the Service Print Test Mode, pause the printer using the FEED key and then remove power.



SERVICE TEST LABEL

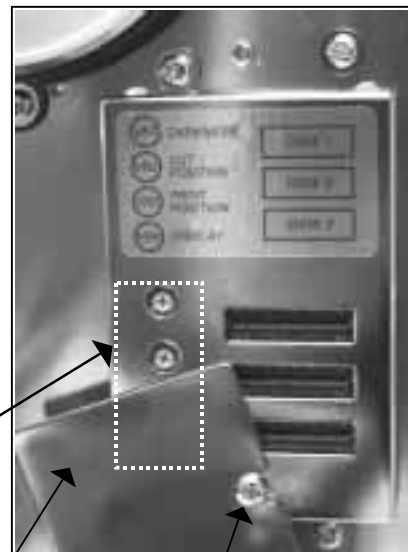
2-5 Potentiometer Adjustments

Four potentiometers are located under the access panel inside the printer and are used to adjust:

- Darkness
- Cut position
- Print position
- Display

Loosen the screw to access the potentiometers.

**POTENTIOMETERS ARE
LOCATED UNDER ACCESS
PANEL INSIDE PRINTER**



ACCESS PANEL

LOOSEN SCREW

Darkness Potentiometer:

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

Another method of controlling print quality is by controlling the speed at which the label is printed. This adjustment is made on an individual label basis using either the Print Speed command code or the LCD display panel. Changing the print speed allows the user to control the amount of time allowed for print element cooling before the media is stepped to the next print position. It is especially critical when printing “ladder” bar codes, (bar codes printed with the bars parallel to the print line). When printing a “ladder” bar code, it is important to allow the head to cool sufficiently before stepping to the next position. If it does not have sufficient time to cool, the bar will be “smeared” on the trailing edge. Refer to Print Speed Adjustment in Section 2-3.

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

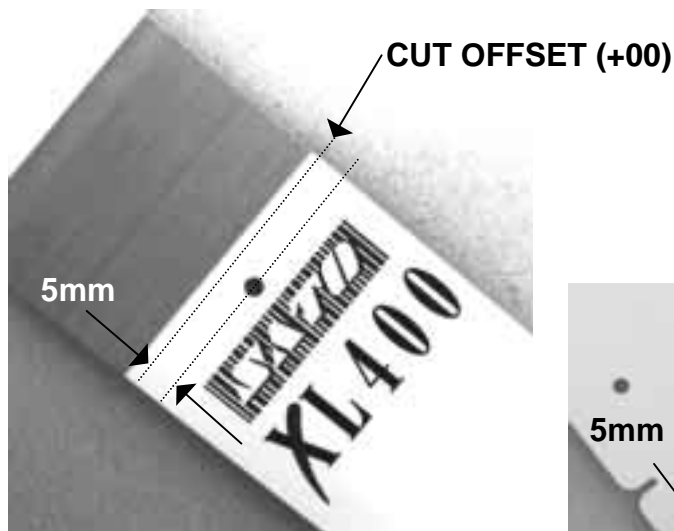
Cut Position Potentiometer:

When the printer is in the Cut mode (cutter enabled), the Cut Offset set using the LCD Service Mode is used to correctly position the label for cutting. Once the correct Cut Offset is obtained, it may be necessary to adjust the position slightly.

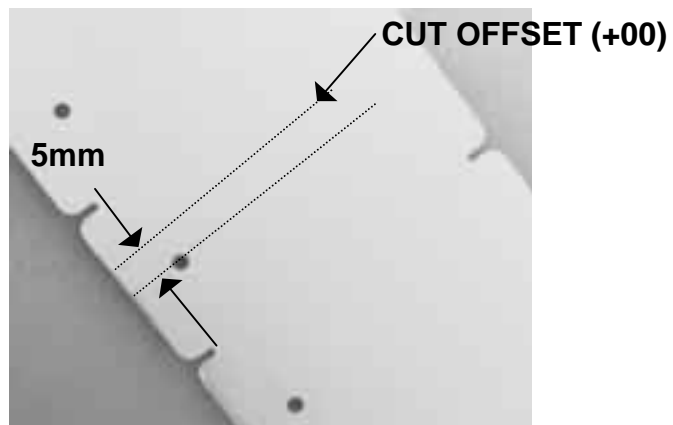
This is done with the CUT POSITION potentiometer. When turned all the way clockwise, the cut position is moved down the tag 3.75mm and when turned all the way counterclockwise, the cut position is moved 3.75mm toward the top of the tag.

To access this setting perform the following steps:

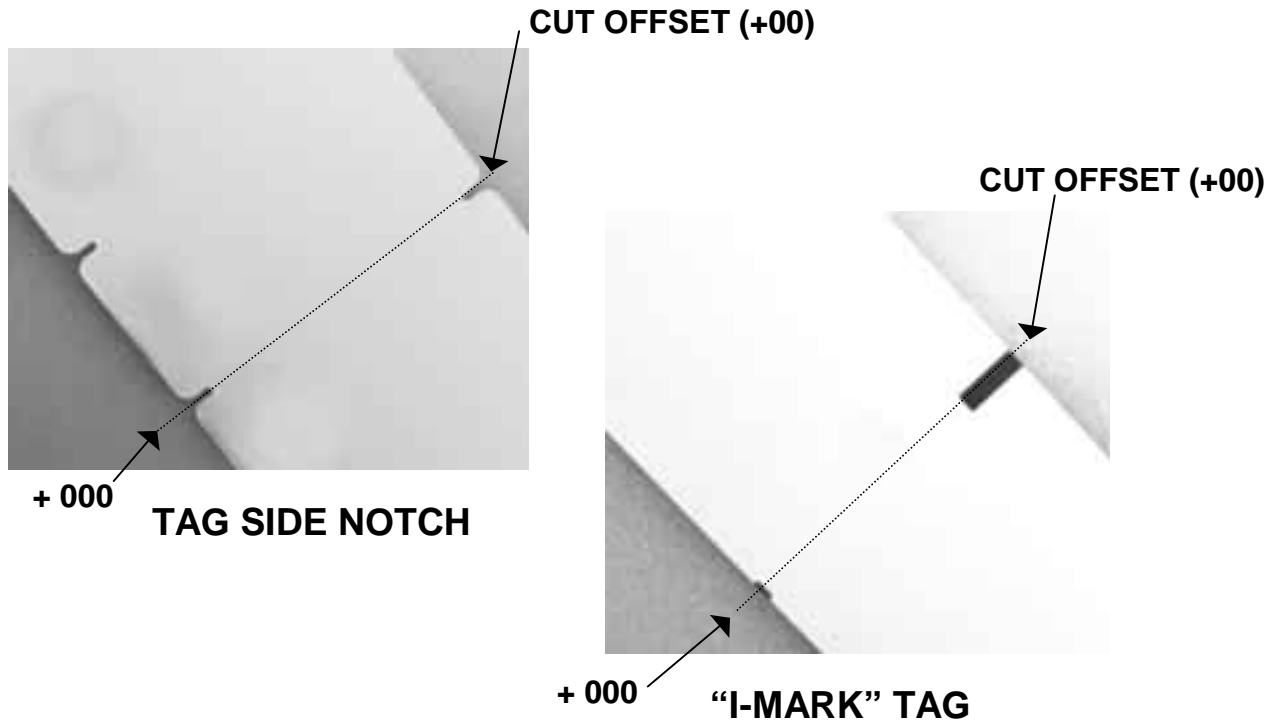
STEP	PROCEDURE
1.	Turn the printer on.
2.	Press the START/STOP key to place the printer in the OFF LINE status.
3.	Press the FEED key to feed out a blank label.
4.	Adjust the position using the Cut Position potentiometer using a small cross-point screwdriver. Feed another label by depressing the FEED key.
5.	When the adjustment is correct, turn off the printer.



CENTER HOLE TAG



SIDE HOLE TAG

Cut Position Potentiometer:***Print Position (Pitch Offset) Potentiometer:***

After the pitch has been set with the LCD panel, it is sometimes necessary to make minor adjustments. This is done with the **PRINT POSITION** potentiometer. This potentiometer is set at the factory so that it has a range of $\pm 3.75\text{mm}$. The midpoint setting should have no effect on the print position. Turning the potentiometer all the way counterclockwise should move the print 3.75mm towards the leading edge of tag or label. Turning it all the way clockwise should move the print position away from the leading edge 3.75mm. This adjustment is best made while printing the actual tags of labels.

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

Adjusting the **PRINT POSITION** potentiometer will not affect the stop position of the label and the cut/tear-off position. It only affects the print position.

Display Position Potentiometer:

Adjusting the **DISPLAY POSITION** potentiometer will improve the readability of the text on your screen. Turn the potentiometer counterclockwise to decrease contrast and clockwise to increase the contrast.

2-6 Protocol Control Codes

Selecting Protocol Control Codes

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

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

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

2-7 Protocol Command Codes

Selecting Protocol Control Codes

This section contains information on creating Protocol Command codes for operating XL400/410 Printers. The Protocol Command codes are used to indicate that a specific type of information is being transmitted to the printer. As an example: The Standard Protocol Command Code specifies the use of an <ESC> character to tell the printer that the following character(s) will represent a specific command. Sometimes the host computer is unable to generate the character or it uses the <ESC> character to control another function.

Selecting Protocol Control Codes (Cont.)

In this case, an Alternate Protocol Command Code set can be selected for use by placing DIP switch 2-7 in the ON position. When the Alternate set is selected, the <ESC> character is not used and is instead replaced with a “carrot” (^) character. A command stream would then start with an “^A” instead of an “<ESC>>A”. These two sets of Protocol Command Codes are adequate for the majority of all applications,

but occasionally situations occur where conflicts exist when using the Alternate set.. In these cases, the user can define and download a custom set of Protocol Command Codes that are stored in EEPROM memory in the printer. After these are downloaded, they replace the Alternate Command Code set when DIP switch DSW2-7 is in the On position. When DIP switch DSW2-7 is in the OFF position, the Standard Protocol Command Codes are used. (Currently not operational.)

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Interface Specifications

3-1 Overview

This section explains the interface specifications for the XL400/410 printers. These specifications include detailed information on how to properly interface your printer with your host system and includes data about the following:

- *INTERFACE TYPES*
- *USING THE RECEIVE BUFFER*
- *RS232C SERIAL INTERFACE*
- *CENTRONICS PARALLEL INTERFACE*

3-2 Interface Types

In order to provide flexibility in communicating with a variety of host computer systems, all XL400/410 printers can be configured for operation with either parallel or serial data transfers. Both a parallel Centronics and a serial RS232 interface are supplied with the standard printer.

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 the XL400/410 printers for either of these interface types, see the printer configuration instructions in Section 2 of this manual.

NOTE: Both the Centronics and RS232C interfaces are active at the same time, i.e. data can be received on either one, however no provision is made for port contention. If data is transmitted to both ports simultaneously, it will cause the data in the receive buffer to be corrupted.

3-2 Interface Types (Cont.)

WARNING: Never connect or disconnect interface cables or operate (switch) a switch box with power applied to either the host or the printer. This may cause damage to the interface circuitry in the printer/host and is not covered by warranty.

3-3 The Receive Buffer

The XL400/410 printers have the ability to receive a data stream from the host in one of two ways. The receive buffer may be configured to accept one print job at a time or multiple print jobs. The single job print buffer is generally used by software programs that wish to maintain control of the job print queue so that it can move a high priority job in front of ones of lesser importance. The multiple job buffer, on the other hand prints all jobs in the order they are received by the printer, and the order of printing cannot be changed.

Single Job Buffer

The printer receives and prints one job at a time. Each job must not exceed 64 K bytes.

Data Streams

Single Job Buffer: The Single Job Buffer mode is not available when using the Centronics interface.

Multi Job Buffer: <STX><ESC>A..Job#1..<ESC>Z<ETX>
<STX><ESC>A..Job#n..<ESC>Z<ETX>

Note that for parallel communications, the **STX** and **ETX** characters are not required.

Multi Job Buffer

The printer is able to continuously receive print jobs, compiling and printing other jobs at the same time. It acts much like a “print buffer” to maximize the performance of the host and the printer. When using the RS232 Serial interface, the Multi Job Buffer uses either the **Ready/Busy** with **DTR** (pin 20) or **X-On/X-Off** flow control protocols. See these sections for more details. With an empty receiving buffer, the status of **DTR** is “high” (or an **X-On** status if using **X-On/X-Off**), meaning the printer is ready to receive data. When the receive buffer is holding 62K bytes of data (2K bytes from being full), **DTR** will go “low” (or an **X-Off** is sent) indicating the printer can no longer receive data. This condition is called “Buffer Near Full”. See Figure 3-1.

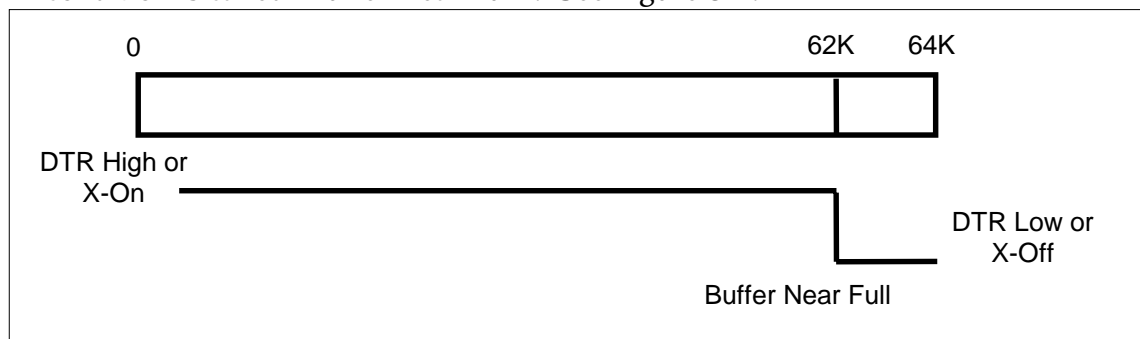


Fig. 3-1

Multi Job Buffer (Cont.)

The receiving buffer will not be able to receive more data again until a “Buffer Available” condition occurs. This takes place when the receiving buffer has emptied so that only 56K bytes of data are being held (8K bytes from being full). At this time, **DTR** will go “high” or an **X-On** is sent to tell the host that it can again receive data. See Figure 3-2.

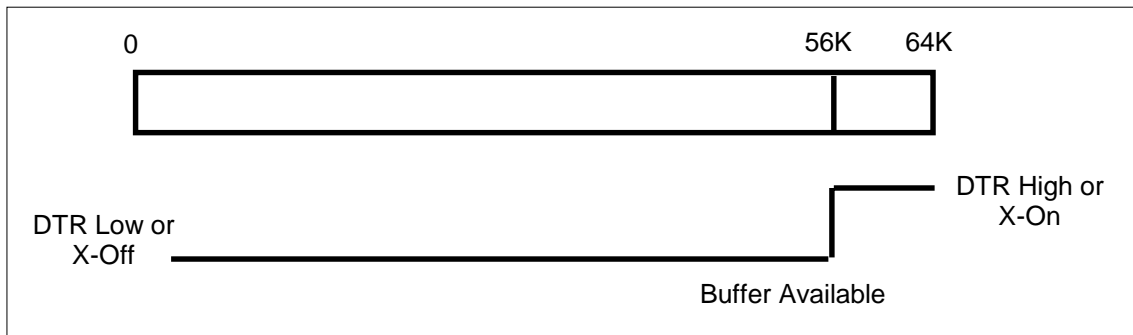


Fig. 3-2

NOTE:

All printer error conditions, (i.e., label out, ribbon out) will cause the printer to go busy (DTR “low” or X-Off) until the problem is corrected and the printer is placed on-line. The printer will also be busy if taken off-line from the front panel.

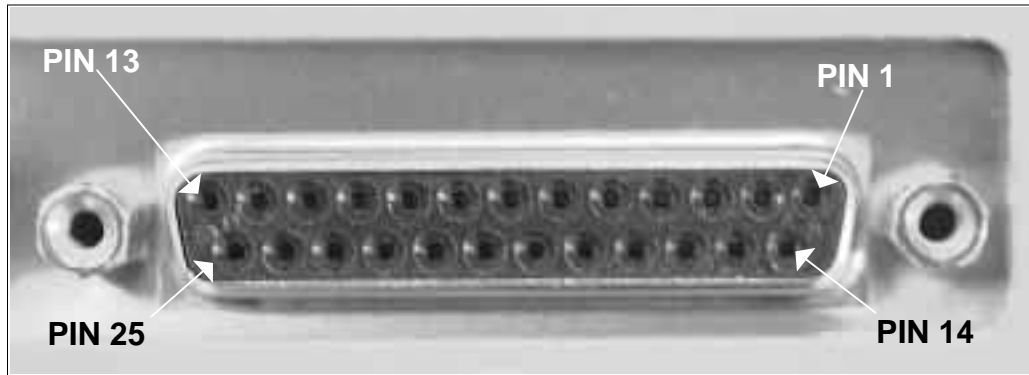
3-4 RS232C Serial Interface

General Specifications

Asynchronous ASCII	Half-duplex communication. Ready/Busy Hardware Flow Control Pin 20, DTR Control Pin 4, RTS Error Condition X-On/X-Off Software Flow Control Bi-Directional communication (ENQ/Response) Status 3
Data Transmission Rate	2400, 4800, 9600 and 19200 bps
Character Format	1 Start Bit (fixed) 7 or 8 data bits (selectable) Odd, Even or No Parity (selectable) 1 or 2 Stop bits (selectable)

3-4 RS232C Serial Interface (Cont.)**Electrical Specifications**

Connector	DB-25S (Female)
------------------	-----------------



Cable	DB-25P (Male), 50 ft. maximum length. For cable configuration, refer to Cable Requirements appropriate to the RS232C protocol chosen.
Signal Levels	High = +5V to +12V Low = -5V to -12V

Pin Assignments**RS232C Interface Signals**

PIN	DIRECTION	SIGNAL DESCRIPTION
1	Reference	FG (Frame Ground)
2	To Host	TD (Transmit Data) - Data from the printer to the host computer. Sends X-On/X-Off characters or status data (Bi-Directional protocol).
3	To Printer	RD (Receive Data) - Data to the printer from the host computer.

3-4 RS232C Serial Interface (Cont.)**Pin Assignments (Cont.)****RS232C Interface Signals**

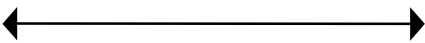
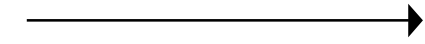
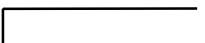
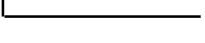
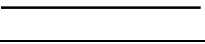
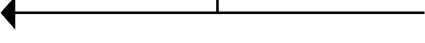
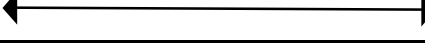
PIN	DIRECTION	SIGNAL DESCRIPTION
4	To Host	RTS (Request to Send) Used with Ready/Busy flow control to indicate an error condition. RTS is high and remains high unless the print head is open, (in this case, RTS would return to the high state after the print head is closed and the printer is placed back on-line) or an error condition occurs during printing (e.g., ribbon out, label out).
5	To Printer	CTS (Clear to Send) - When this line is high, the printer assumes that data is ready to be transmitted. The printer will not receive data when this line is low. If this line is not being used, it should be tied high (to pin 4).
6	To Printer	DSR (Data Set Ready) - When this line is high, the printer will be ready to receive data. This line must be high before data is transmitted. If this line is not being used, it should be tied high (to pin 20).
7	Reference	SG (Signal Ground).
20	To Host	DTR (Data Terminal Ready) - This signal applies to Ready/Busy flow control. The printer is ready to receive data when this pin is high. It goes low when the printer is off-line, either manually or due to an error condition, and while printing in the Single Job Buffer mode. It will also go low when the data in the buffer reaches the Buffer Near Full level.

Ready/Busy Flow Control

Ready/Busy is the hardware flow control for the serial interface on the printer. By raising/lowering the voltage level on Pin 20 of the RS232 port, the printer notifies the host when it is ready to receive data. Pin 4 (RTS) and Pin 20 (DTR) are the important signals on the printer for this method of flow control. The host must be capable of supporting this flow control method for it to function properly.

3-4 RS232C Serial Interface (Cont.)

Cable Requirements

HOST	INTERCONNECTION	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 (Data Terminal 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. Typically, on a PC, it would be either CTS (pin 5) or DSR (pin 6) on a DB-25 connector.

Data Streams

Once the flow control method has been chosen for the RS232C interface, the data stream must be sent in a specific manner. The STX and ETX Control characters must frame the data stream.

<STX><ESC>A..Job#1..<ESC>Z<ETX><STX><ESC>A..Job#n..<ESC>Z<ETX>

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

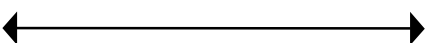
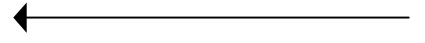
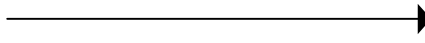
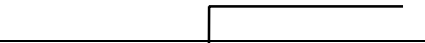
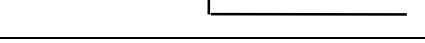
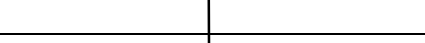
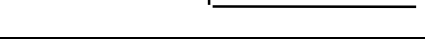
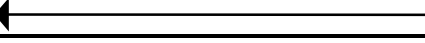
3-4 RS232C Serial Interface (Cont.)

X-On/X-Off Flow Control

X-On/X-Off flow control must be used whenever hardware (Ready/Busy) flow control is not available or desirable. Instead of a voltage going high/low at pin 20, control characters representing "Printer Ready" (X-On = 11 hexadecimal) or "Printer Busy" (X-Off = 13 hexadecimal) are transmitted by the printer on pin 2 (Transmit Data) to the host. In order for this method of flow control to function correctly, the host must be capable of supporting it. **X-On/X-Off** operates in a manner similar to the function of pin 20 (**DTR**) as previously explained. When the printer is first powered on and goes on-line, an **X-On** is sent out. In the Single Job Buffer mode, when the printer receives a viable job, it transmits an **X-Off** and begins printing. When it is done printing, it transmits an **X-On**. In the Multi Job Buffer mode, the printer sends an **X-Off** when the "Buffer Near Full" level is reached and a **X-On** when the data level of the buffer drops below the "Buffer Available" mark. When the printer is taken off-line manually, it transmits an **X-Off** indicating it cannot accept data. When it is placed back on line manually, it sends an **X-On**, indicating it is again available for receipt of data. If an error occurs during printing (paper out, ribbon out), the printer sends nothing in the Single Job Buffer mode since the last character transmitted was an **X-Off**. When the error is cleared and the printer resumes printing, no **X-On** is sent until the current job is completed and the printer is once again read to receive the next job. If it is in the Multi Job Buffer mode, it sends an **X-Off** as soon as an error condition is detected. When the error is cleared and the printer is placed back on-line, it transmits an **X-On** indicating it is again ready to accept data.

Upon power up, if no error conditions are present, the printer will continually send **X-On** characters at five millisecond intervals until it receives a transmission from the host.

Cable Requirements

HOST	INTERCONNECTION	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)

3-4 RS232C Serial Interface (Cont.)

X-On/X-Off Flow Control (Cont.)

Data Streams

The Data streams for **X-On/X-Off** are constructed in the same way as they are for Ready/Busy flow control. The **STX** and **ETX** control characters must frame the data stream. (NOTE: All characters, including **STX**, **ESC** and **ETX** are in ASCII).

<STX><ESC>A..Job#1..<ESC>Z<ESC>A..Job#n..<ESC>Z<ETX>

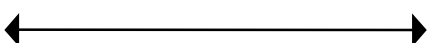
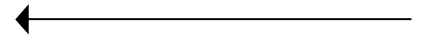
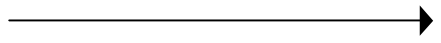

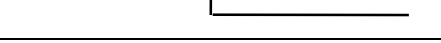
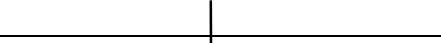
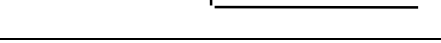
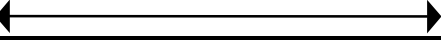
Example: <STX>A..Job#1..<ESC>Z<ETX>XXXX

Bi-Directional Communications

This is a two-way communications protocol between the host computer and the printer, thus enabling the host to check printer status. When this protocol is selected, there is no busy signal from the printer (pin 20, **DTR**, is always high). The host must request the complete status from the printer, including ready/busy. Whenever the host requests printer status, it transmits an **ENQ** to the printer and the printer will respond with its status within five milliseconds. If printing, it will respond upon finishing the current label, then resume printing. In order for this protocol to work properly, pin 6 (**DTR**) and pin 5 (**CTS**) must be held high by the host. One way to ensure these pins are always in the correct state is to tie pin 20 (**DTR**) to pin 6 (**DSR**) and pin 4 (**RTS**) to pin 5 (**CTS**) at the printer end of the cable.

NOTE: Dip switch 1-7 must be in the ON position.

Cable Requirements

HOST	INTERCONNECTION	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)

If a **CAN** (18 hexadecimal) is received by the printer, it will cancel the current print job and clear all data from the receive buffer.

3-4 RS232C Serial Interface (Cont.)

Bi-Directional Communications (Cont.)

Status Response

The Bi-Directional protocol is an advanced version of bi-directional communications where the printer can also report the number of labels remaining to be printed for the current print job. Upon receipt of an **ENQ** command, the printer responds with nine bytes of status information bounded by an **STX/ETX** pair. The Bi-Com protocol works only in the Multi Job Buffer mode. The status information is defined as follows:

<STX>{2 Byte ID}{1 Status Byte}{6 Byte Label Remaining}<ETX>

ID - This is a two byte number identifying the current print job ID. The print job ID is defined using the **<ESC>ID** Job ID command transmitted with the print job, (see Job ID Store in the command listing for more information on how to use this command). The range is from 00 to 99.

Status - A single byte defining the current status of the printer, (see the Status Byte Definition table).

Label Remaining - Six bytes defining the number of labels remaining in the current print job. The range is from 000000 to 999999 labels.

If an **ENQ** is received after the print job specified in the ID bytes has been completed, or there is no data in the buffer, the printer will respond with two "space" characters (20 hexadecimal) for the ID number and six "zero" characters (30 hexadecimal) in the Remaining Labels bytes.

If a **CAN** (18 hexadecimal) command is received, it will stop the print job and clear all data from the receive and print buffers. A delay of five milliseconds or more is required before any new data can be downloaded. The **CAN** command is effective immediately upon receipt, even if the printer is off-line or in an error condition. The printer will return an **ACK** (06 hexadecimal) if there is no printer error condition and a **NAK** (15 hexadecimal) if an error condition exists.

Upon receipt of a valid print job (**<ESC>A...<ESC>Z**), and **ACK** (06 hexadecimal) will be returned by the printer if there are no errors and a **NAK** (16 hexadecimal) if a printer error exists.

3-4 RS232C Serial Interface (Cont.)**Status Byte Definition, Bi-Com Protocol**

ASCII	HEX	DEFINITION
OFF-LINE		
0	30	No Errors
1	31	Ribbon Near End
2	32	Buffer Near Full
3	33	Ribbon Near End and Buffer Near Full
ON-LINE, WAITING FOR DATA		
A	41	No Errors
B	42	Ribbon Near End
C	43	Buffer Near Full
D	44	Ribbon Near End and Buffer Near Full
ON-LINE, PRINTING		
G	47	No Errors
H	48	Ribbon Near End
I	49	Buffer Near Full
J	4A	Ribbon Near End and Buffer Near Full
ON-LINE COMPILING PRINT JOB		
S	53	No Errors
T	54	Ribbon Near End
U	55	Buffer Near Full
V	56	Ribbon Near End and Buffer Near Full

3-4 RS232C Serial Interface (Cont.)**Status Byte Definition, Bi-Com Protocol**

ASCII	HEX	DEFINITION
OFF-LINE, ERROR CONDITION		
a	61	Receive Buffer Full
b	62	Head Open
c	63	Paper End
d	64	Ribbon End
e	65	Media Error
f	66	Sensor Error
g	67	Head Error
i	68	Memory Card Error
j	6A	Cutter Error
k	6B	Other Error Condition

3-5 Centronics Parallel Interface**Electrical Specifications**

Printer Connector	AMP 57-40360 (DDK) or equivalent
Cable Connector	AMP 57-30360 (DDK) or equivalent
Cable Length	10 ft. or less
Signal Level	High = +2.4V to +5.0V Low = 0V to -0.4V

3-5 Centronics Parallel Interface**Centronics Parallel Interface Pin Assignments**

PIN	SIGNAL	DIRECTION	PIN	SIGNAL	DIRECTION
1	$\overline{\text{STROBE}}$	To Printer	19	STROBE Return	Reference
2	DATA 1	To Printer	20	DATA 1 Return	Reference
3	DATA 2	To Printer	21	DATA 2 Return	Reference
4	DATA 3	To Printer	22	DATA 3 Return	Reference
5	DATA 4	To Printer	23	DATA 4 Return	Reference
6	DATA 5	To Printer	24	DATA 5 Return	Reference
7	DATA 6	To Printer	25	DATA 6 Return	Reference
8	DATA 7	To Printer	26	DATA 7 Return	Reference
9	DATA 8	To Printer	27	DATA 8 Return	Reference
10	$\overline{\text{ACK}}$	To Printer	28	ACK Return	Reference
11	BUSY	To Host	29	BUSY Return	Reference
12	PTR ERROR	To Host	30	PE Return	Reference
13	SELECT	To Host	31		
14			32	$\overline{\text{FAULT}}$	To Host
15			33		
16			34		
17	FG	Frame Ground	35		
18	+5V (Z=24K ohm)		36		

Electrical Checks and Adjustments

4-1 Overview

This chapter describes how to check XL400/410 voltage levels and adjust threshold sensor voltages.

The XL400/410 power supply converts 125 VAC into regulated DC voltages. The printer uses: +5VDC, +12VDC, -12VDC and +24VDC. These DC voltages are not adjustable, however you can measure these DC voltages at test points. If a voltage is out of specification, the power supply must be replaced. Section 4-3 contains procedures for measuring DC voltage levels. Power supply removal and replacement procedures are located in Section 6-5.

You can adjust threshold voltage levels for label sensors. These adjustments are made to allow for variations in the characteristics of the labels used with the printer. If you cannot calibrate the label sensor voltage level within the specified voltage range, you should reposition the label sensor by following the adjustment procedures included in this section. After completing the label sensor adjustment procedures, perform the label sensor voltage level adjustment procedure.

You can check or adjust:

- Power supply
- Label sensor

***CHECKS AND ADJUSTMENTS IN THIS SECTION REQUIRE STANDARD METRIC TOOLS.
OTHER EQUIPMENT IS LISTED WHERE NEEDED.***

4-2 Steps Prior to Some Adjustments

Some adjustments in this section require access to potentiometers and the test point connector located on the main PCB. Remove the LH cover for accessing the main PCB.

STEP	PROCEDURE
1.	Switch the printer off.
2.	Remove (2) screws holding the LH cover to the printer base to expose the main PCB. Fig.4-1 & 4-2
	Refer to the appropriate sub-section to begin adjustments.

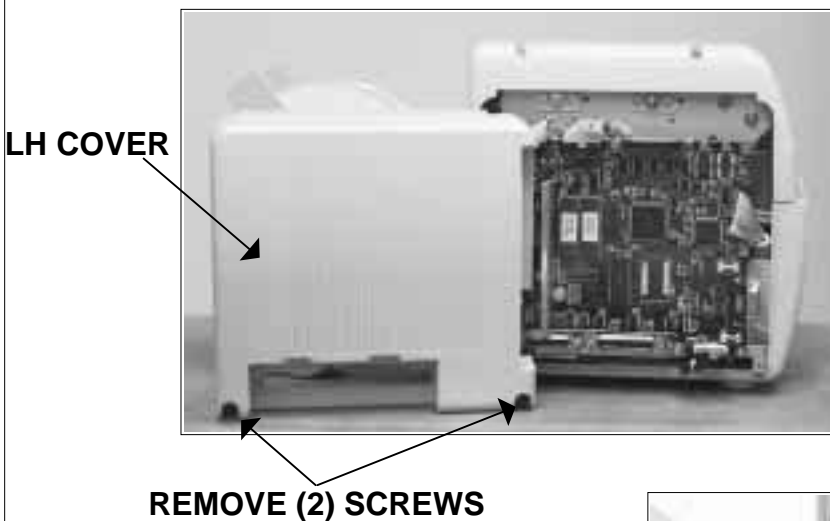
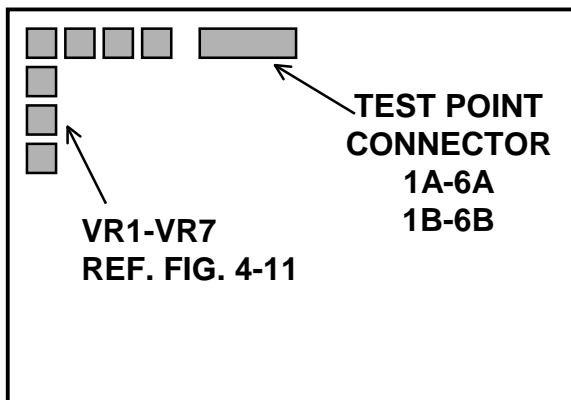


Fig. 4-1

MAIN PCB



MAIN PCB

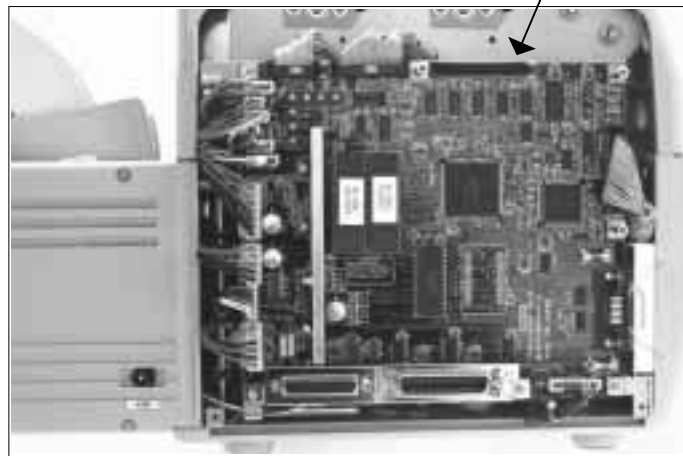


Fig. 4-2

4-3 Power Supply Checks

To check voltage levels, first check the fuses (Section 6-2) and replace if necessary, then remove the LH cover, (Section 4-2) and perform the following steps.

Additional equipment required: TP Test Module

STEP	PROCEDURE
1.	Attach the connector from the TP Test Module to the test port on the main PCB. Fig. 4-3 & 4-4
2.	Attach one end of the ground wire alligator clip to the TP Test Module ground pin and the other end to the COM inlet on the Digital Multimeter. Fig. 4-5 & 4-6
3.	Attach the second wire alligator clip to the +SIG pin on the TP Test Module terminal and the other end to the VOLT inlet on the Digital Multimeter. Fig. 4-5 & 4-6
4.	Turn printer on and rotate the dial to a TP on the TP Test Module. Record the values from the Multimeter LCD. (See chart, page 63.)
5.	Confirm voltages are correct. If not then replace power supply. Refer to Section 6-5.
6.	After performing tests, replace and secure the LH cover to the printer.

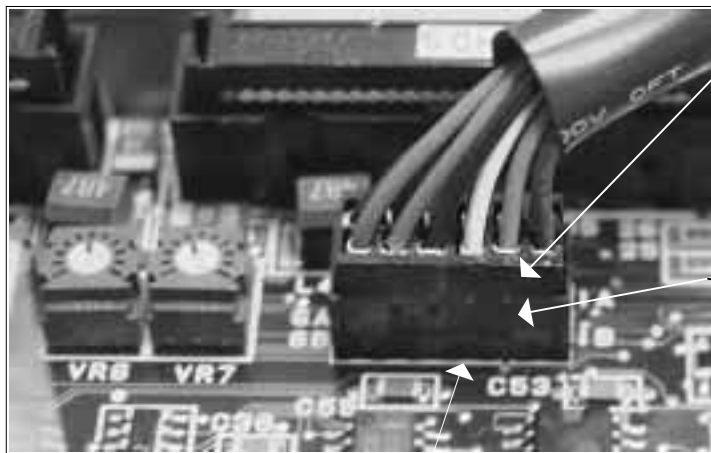
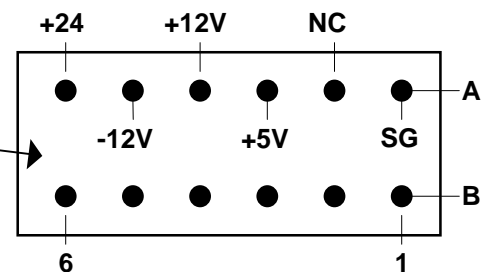


Fig. 4-3

TEST PORT

CONNECTOR FROM
TEST MODULE



TEST POINTS
Refer to Chart Fig. 4-7

4-3 Power Supply Checks (Cont.)



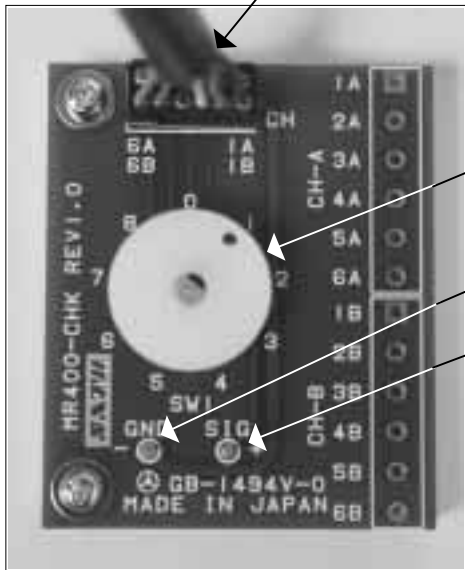
TP TEST MODULE
TO PCB TEST PORT

Fig. 4-4

LCD DISPLAY

DC VOLT MUST
BE SELECTED

CABLE TO PCB



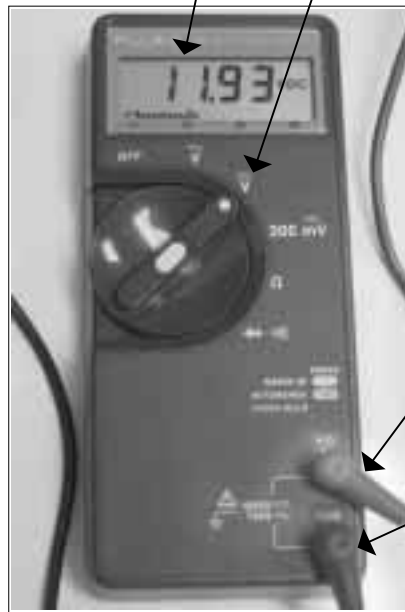
DIAL

GROUND PIN

SIG PIN

Fig. 4-5

TP TEST MODULE



VOLT

COM

Fig. 4-6

DIGITAL MULTIMETER

4-3 Power Supply Checks (Cont.)

SW POS	TEST POINTS	DISC.	VOLTAGE RANGE
	1A	SG	
	2A	NC	
0	3A	+5V	+4.8 to +5.2 VDC
1	4A	+12V	+11.4 to +12.6 VDC
2	5A	-12V	-11.4 to -12.6 VDC
3	6A	+24V	+23.5 to +24.5 VDC
4	1B	1M (VR2) "I MARK"	
5	2B	GAP (VR1) GAP & CENTER HOLE	
6	3B	CEI (VR3) RIBBON	
7	4B	(VR5) EDGE HOLE	
8	5B	(VR6) NOTCH (SIDE R)	
	6B	(VR7) JUMP HOLE	

TEST POINT CHART

Fig. 4-7

NOTE: The power supply voltages are not adjustable. All voltages must read within +/- 10% of the nominal value for correct operation of the printer.

4-4 Potentiometer Assignments

VR TO ADJUST	ITEM	MEASURE POINT	JIG DIAL
	5V	1A~3A	0
	+12V	1A~4A	1
	-12V	1A~5A	2
	24V	1A~6A	3
VR1	Center Hole/Gap	1A~2B	4
VR2	"I-Mark"	1A~1B	5
VR3	Ribbon Sensor	1A~3B	6
VR4	Print Position (for Service)		
VR5	Side Hole	1A~4B	7
VR6	Notch (R-Corner)	1A~5B	8
VR7	Jump Hole	1A~6B	

NEXT TO DIP SWITCH

VR TO ADJUST	ITEM
VR1	Darkness
VR2	Cut Position
VR3	Print Position
VR4	Display

CUTTER PCB (TR400-CUT)

VR TO ADJUST	ITEM	MEASURE POINT
VR1		SG~IM
VR2		SG~HO

CUT SENSOR PCB

VR TO ADJUST	ITEM	MEASURE POINT
VR1	"I-Mark" Sensor for Cut	SG on Cutter PCB IM on Cut Sensor PCB
VR2	"I-Mark" Threshold for Cut	SG on Cutter PCB RF on Cut Sensor PCB

4-4 Potentiometer Assignments

HOLE/NOTCH SW PCB

VR TO ADJUST	ITEM	MEASURE POINT
VR	"R" Corner Threshold for Cut if the switch is left	SG on Cutter PCB~RF on SW PCB
VR	Other Hole/Gap Threshold for Cut if the switch is right	SG on Cutter PCB~RF on SW PCB


NOTE:

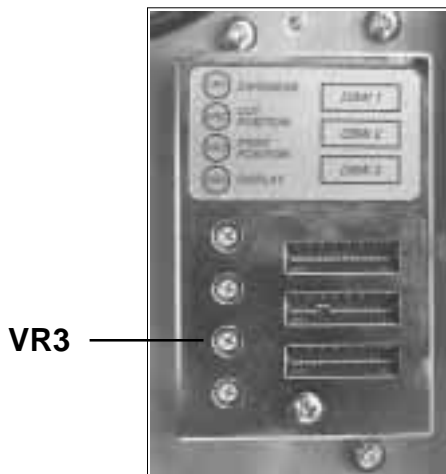
"R" Corner/Hole Gap sensor output can be checked with a voltmeter from pin SG on cutter PCB to pin IN on SW PCB. There is no adjustment potentiometer.

CUTTER PCB

VR TO ADJUST	ITEM	MEASURE POINT
VR1 & 2	Cutter Blade Positioning Sensor	SG~Pin 1&3 of SEN1 on Cutter PCB

4-5 Pitch Offset Potentiometer (User Adjustment)

STEP	PROCEDURE
1.	Turn the power on while holding the FEED key.
2.	Release the key when printer emits a sound signal.
3.	Press START/STOP key when the following message is displayed.
	
4.	The printer will start printing. To pause, press START/STOP key again. Fig. 4-8
5.	In the pause phase, adjust the print position with VR3 potentiometer (located under access panel inside printer). The adjustment range is +/- 3.75 mm. Fig. 4-9
6.	Press START/STOP key to resume printing. Check the print position and repeat STEP 4 if necessary.
7.	After the adjustment, place the printer off-line and turn the power off.



POTENTIOMETERS ARE
LOCATED UNDER
ACCESS PANEL INSIDE
PRINTER

Fig. 4-9



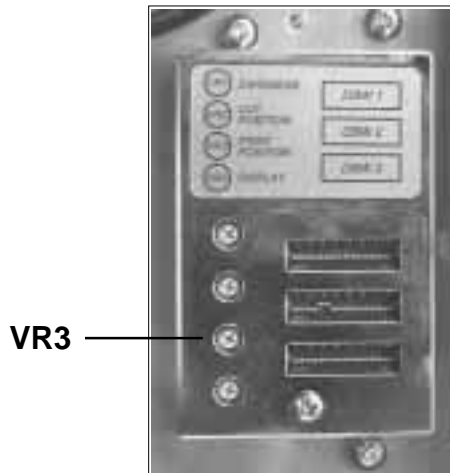
Fig. 4-8

TEST PRINT

4-6 Pitch Offset (For Factory or Service Using Center Hole Tag)

STEP	PROCEDURE
1.	Set VR3 potentiometer (located under access panel inside printer) to 12:00 position. Fig.4-10
2.	Turn the power on while holding FEED and MEDIA TYPE keys.
3.	Release the keys when printer emits a sound signal.
4.	When the following message is displayed, Press START/STOP key to move cursor to "Small". Then press FEED key. <div data-bbox="1081 594 1482 711" style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: 20px;"> SERVICE PRINT Small Large </div>
5.	When the following message is displayed, Press Start/Stop key to select print area size (width). Press FEED key to start the test print. <div data-bbox="1081 835 1482 953" style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: 20px;"> SERVICE PRINT 04cm </div> <p>Repress the FEED key to pause.</p>
6.	Use the scale on the test print to check the print position. Adjust the VR4 potentiometer on the main PCB if necessary. Fig.4-11 Adjustment range is +/- 3.75mm.
7.	Press FEED to stop the test print and power off the printer. NOTE: The adjustment for Pitch Offset, Center Hole Tag must be done first. Then Section 4-7 Pitch Offset, Other Media Type .

4-6 Pitch Offset (For Factory or Service Using Center Hole Tag)



**POTENTIOMETER
ADJUSTMENT FOR STEP 1
IS LOCATED UNDER
ACCESS PANEL INSIDE
PRINTER**

Fig. 4-10

**POTENTIOMETER
ADJUSTMENT FOR STEP 6
IS LOCATED ON THE MAIN
PCB INSIDE PRINTER**

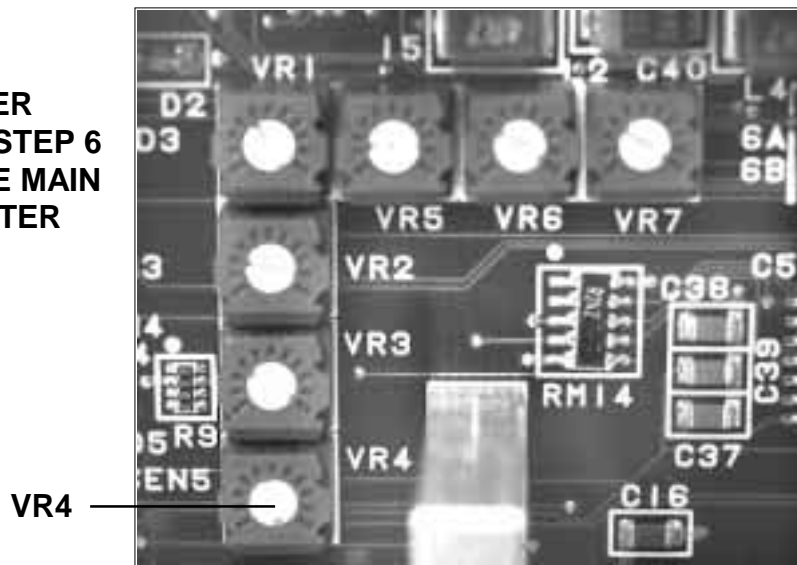


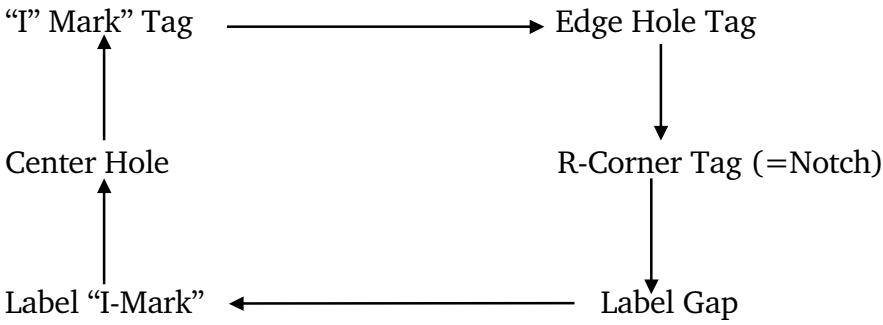
Fig. 4-11

4-7 Pitch Offset (For Factory or Service using Other Media Type)


After adjusting pitch offset for Center Hole Tag, perform the following steps to adjust pitch offset for other media.

STEP	PROCEDURE
1.	Turn the power on while holding the FEED and MEDIA TYPE keys.
2.	Release the keys when the printer emits a sound signal.
3.	When the following message is displayed, Press START/STOP key to move cursor to "Small", then Press FEED key. <div data-bbox="1057 667 1458 787" style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: 20px;"> SERVICE PRINT Small Large </div>
4.	Specify the print area size using START/STOP key at the following display. Press FEED key to start test print. Repress FEED key to pause. <div data-bbox="1057 898 1458 1018" style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: 20px;"> SERVICE PRINT 04cm </div>
5.	Use the scale printed on test print to check the print position. Pause the print by pressing the FEED key, then turn power off.
6.	Restore power by holding START/STOP key and MEDIA TYPE key.
7.	Release the key when printer emits a sound signal.
8.	Press START/STOP key, then press the FEED key when the following message is displayed. <div data-bbox="1057 1346 1458 1465" style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: 20px;"> SERVICE MODE SETUP SENSOR </div>

4-7 Pitch Offset (For Factory or Service using Other Media Type)

STEP	PROCEDURE
9.	<p>When the following message is displayed, to select MEDIA TYPE, press START/STOP key. The media type will display. Press FEED to enter the selection.</p> <div data-bbox="862 573 1341 720" style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px auto; width: fit-content;"> PITCH OFFSET R-CORNER TAG +00 </div>
10.	 <pre> graph TD IMark["I-Mark Tag"] --> EdgeHole["Edge Hole Tag"] CenterHole["Center Hole"] --> IMark RCorner["R-Corner Tag (=Notch)"] --> EdgeHole LabelGap["Label Gap"] --> RCorner LabelIMark["Label I-Mark"] --> LabelGap </pre>
11.	<p>Press the FEED key to enter each value.</p> <p>To change offset direction (+ or -) and the offset value use START/STOP key</p>
12.	<p>After entering all values, turn power off.</p>
13.	<p>Repeat from STEP 1 if necessary.</p>

4-8 Cutting Position Offset (User Adjustment)

STEP	PROCEDURE
1.	Turn the power on while holding the FEED key.
2.	Release the keys when the printer emits a sound signal.
3.	When the following message is displayed, Press the START/STOP key to start the test print.
	
4.	Repress to pause the test print. In the pause phase, adjust the print position with VR2 (located under access panel inside printer). The adjustment range is +/- 3.75 mm. Fig. 4-12
5.	Check the cut result by pressing START/STOP key. Repeat Step 4 if necessary.
6.	Press the FEED key to pause the print. Turn power off.



POTENTIOMETERS ARE
LOCATED UNDER
ACCESS PANEL INSIDE
PRINTER

Fig. 4-12

4-9 Cutting Position Offset (For Factory or Service using Center Hole Tag)

STEP	PROCEDURE
1.	Set VR2 potentiometer (located under access panel inside printer) to 12:00 position. Fig.4-13.
2.	Turn the power on while holding the FEED key and Media Type keys.
3.	Release the keys when the printer emits a sound signal.
4.	When the following message is displayed, Press the START/STOP key to move the cursor to "Small", then press FEED key. <div data-bbox="980 701 1378 814" data-label="Image"> </div>
5.	Specify the print area size using START/STOP key when the following message is displayed. Press FEED key to start test print. Repress FEED key to pause. <div data-bbox="974 915 1375 1033" data-label="Image"> </div>
6.	Use the scale printed on Test print to check the cutting position. Adjust the position with VR2 if necessary. The adjustment range is +/- 3.75 mm. Fig. 4-13.
7.	Press the FEED key to pause the print. Turn power off.



POTENTIOMETERS ARE
LOCATED UNDER
ACCESS PANEL INSIDE
PRINTER

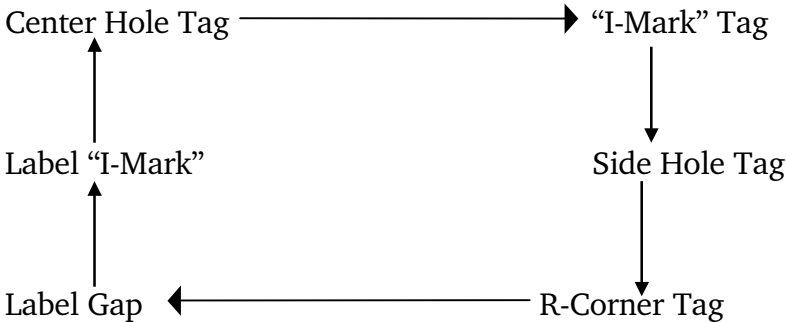
Fig. 4-13

4-10 Cutting Position Offset (For Factory or Service Using Other Media Type)

After adjusting pitch offset for Center Hole Tag, perform the following steps to adjust pitch offset for other media.

STEP	PROCEDURE
1.	Turn the power on while holding the FEED and MEDIA TYPE keys.
2.	Release the keys when the printer emits a sound signal.
3.	When the following message is displayed, Press START/STOP key to move cursor to "Small", then press FEED key. <div data-bbox="1057 688 1458 810" style="border: 1px solid black; padding: 5px; text-align: center;"> SERVICE PRINT Small Large </div>
4.	Specify the print area size using START/STOP key at the following display. Press FEED key to start test print. Repress FEED key to pause. <div data-bbox="1057 926 1458 1037" style="border: 1px solid black; padding: 5px; text-align: center;"> SERVICE PRINT 04cm </div>
5.	Use the scale printed on test print to check the print position. Pause the print by pressing the FEED key, then turn power off.
6.	Restore power by holding START/STOP key and Media Type key.
7.	Release the key when printer emits a sound signal. <div data-bbox="1052 1289 1458 1409" style="border: 1px solid black; padding: 5px; text-align: center;"> SERVICE MODE SETUP SENSOR </div>
8.	Press START/STOP key, then press the FEED key when the following message is displayed. <div data-bbox="1052 1507 1458 1627" style="border: 1px solid black; padding: 5px; text-align: center;"> SERVICE MODE CUT OFFSET </div>

4-10 Cutting Position Offset (For Factory or Service using Other Media Type)

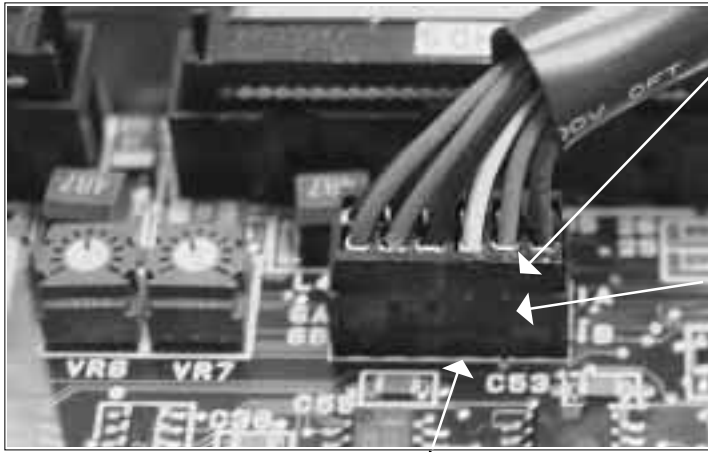
STEP	PROCEDURE
9.	<p>Use the START/STOP key to select media type, +/- direction and offset value. Press the FEED key to enter each value. The value originally configured will be displayed.</p>  <pre> graph TD LG[Label Gap] --> LI[Label "I-Mark"] LI --> CHT[Center Hole Tag] CHT --> IM["I-Mark" Tag] IM --> SH[Side Hole Tag] SH --> RC[R-Corner Tag] RC --> LG </pre>
10.	After entering the values, turn power off.
11.	Repeat from STEP 1 if necessary.

4-11 Pitch Sensor Adjustment (Center Hole Tag and Label Gap)

Additional equipment required : Digital Multimeter or: Digital Multimeter and TP Test Module

STEP	PROCEDURE
Refer to Section 4-2 for access to main PCB	
1.	Turn VR1 potentiometer on main PCB all the way to the left. Fig. 4-14
2.	Set the digital multimeter to DC voltage measurement mode. NOTE: If you are using the TP Test Module, refer to Fig. 4-15 & 4-16. Refer also to Section 4-3.
3.	Set the dial to 5. Connect (+) probe of the multimeter to check pin 2B and (-) probe to check pin 1A.
4.	For Low level (center hole or label gap part) adjustment, put center hole or label gap part in the pitch sensor. Then adjust the electrical level with VR1 on the main PCB so that it will measure + 0.5 V or less.
5.	For High level (paper part) adjustment, put paper part in the pitch sensor and check the electrical level. If the level difference is + 2.0 V more than the Low level, it is acceptable. If not, return to STEP 4 and readjust. NOTE: Press the EJECT key to cut media after pitch sensor error or cutter sensor occurs because of wrong electrical level.
6.	Standard values: Low level (gap or hole part): +0.5 V or less High level (paper part): Low level + 2.0 V or higher. If these values do not result, try the following: a) Repeat the process b) Clean the sensor c) Replace the sensor

4-11 Pitch Sensor Adjustment (Center Hole Tag and Label Gap)



CONNECTOR FROM TEST MODULE

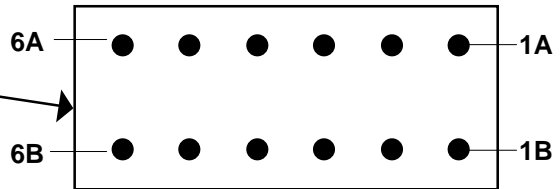
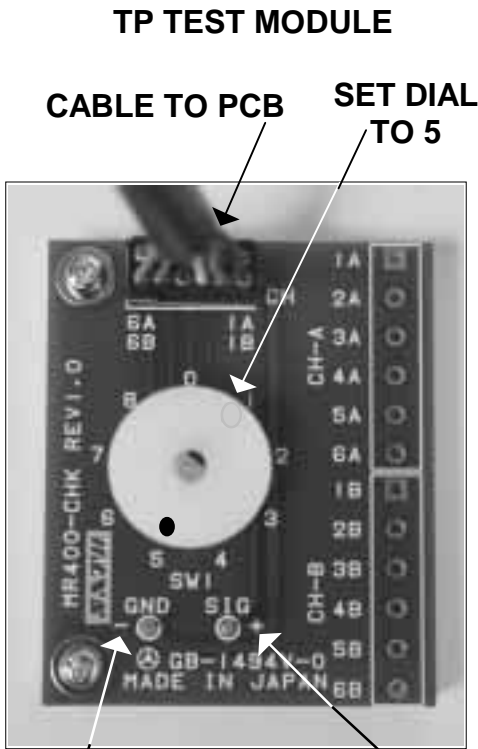


Fig. 4-15

TEST PORT



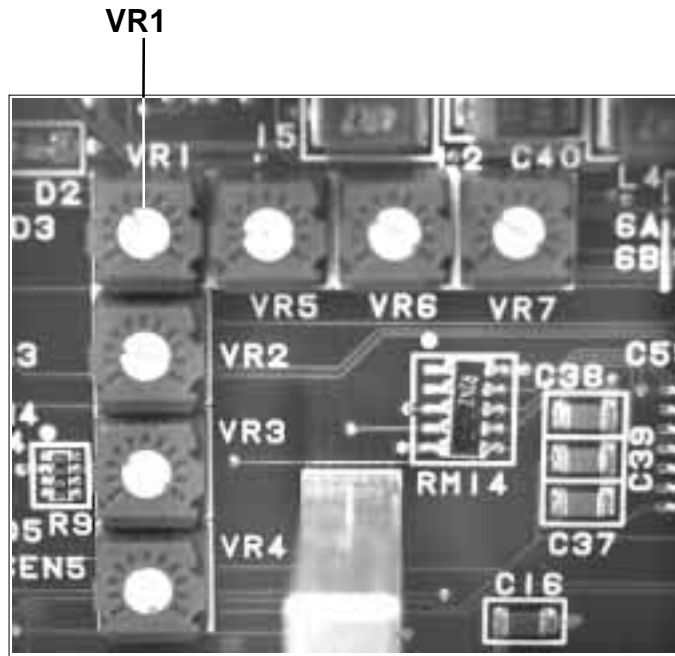
TP TEST MODULE

CABLE TO PCB

SET DIAL TO 5

CONNECT - PROBE OF MULTIMETER

CONNECT + PROBE OF MULTIMETER



VR1

Fig. 4-16

Fig. 4-14

POTENTIOMETER ADJUSTMENT FOR STEP 1 IS LOCATED ON THE MAIN PCB INSIDE PRINTER

4-12 Pitch Sensor Adjustment, (Side Hole Tag)

Additional equipment required : Digital Multimeter or: Digital Multimeter and TP Test Module
--

STEP	PROCEDURE
Refer to Section 4-2 for access to main PCB	
1.	Turn VR5 potentiometer on the main PCB all the way to the left. Fig.4-17
2.	Set the digital multimeter to DC voltage measurement mode.
3.	Connect (+) probe of the multimeter to check pin 4B and (-) probe to 1A pin. NOTE: If you are using the TP Test Module, refer to Fig. 4-18 & 4-19. Refer also to Section 4-3. Set the dial to 7.
4.	For Low level (edge hole tag part) adjustment, first align the side hole portion of the label over the pitch sensor and close the lid. Then adjust the electrical level with VR5 so that it will measure + 0.5 V or less.
5.	For High level (paper part) adjustment, first put paper part in the pitch sensor. Check the electrical level. If the level difference is + 2.0 V more than the Low level, it is acceptable. If not, return to STEP 4 and readjust. NOTE: Press the EJECT key to cut media after pitch sensor error or cutter sensor occurs because of wrong electrical level.
6.	Standard values: Low level (side hole part): +0.5 V or less High level (paper part): 2.0 V +Low level or higher If these values do not result, try the following: a) Repeat the process b) Clean the sensor c) Replace the sensor

4-12 Pitch Sensor Adjustment, (Side Hole Tag)

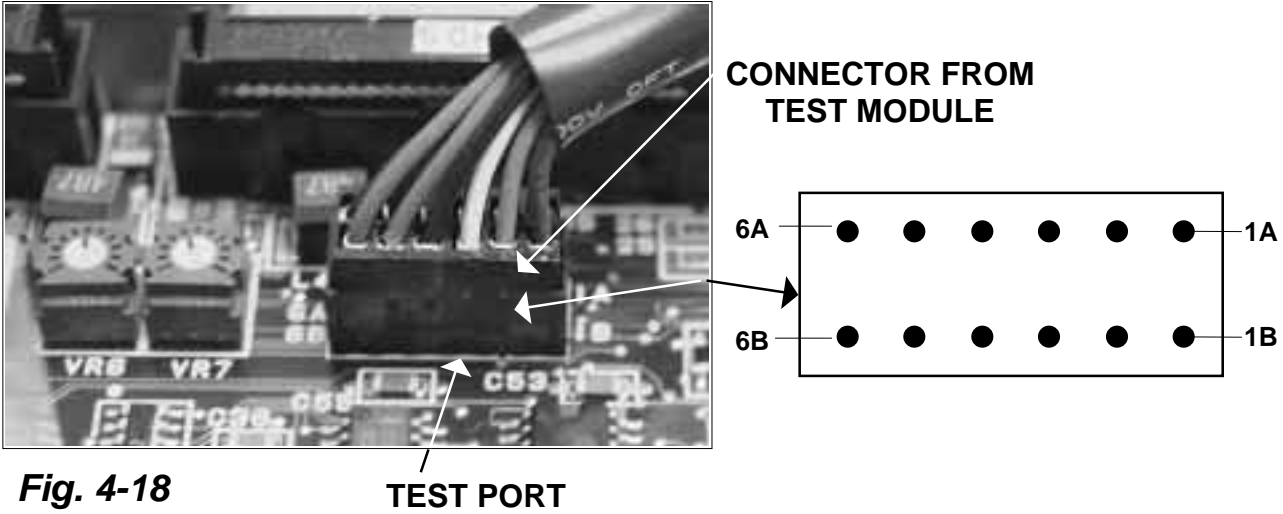
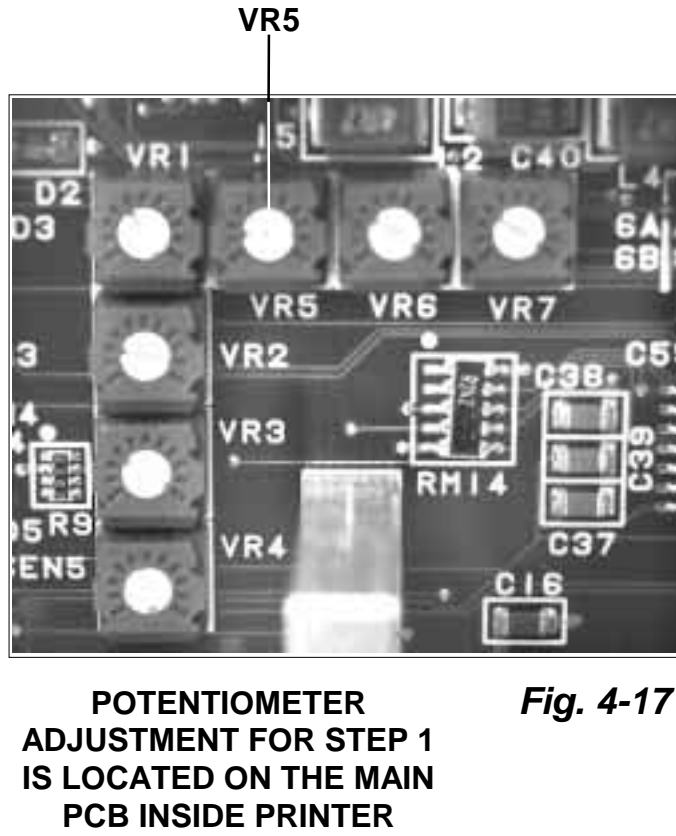
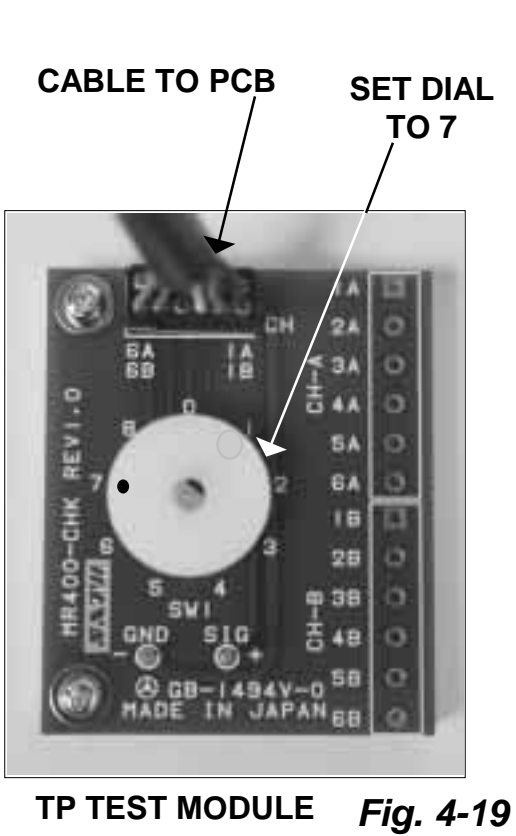


Fig. 4-18



4-13 Pitch Sensor Adjustment, ("R" Corner Notch Tag)

Additional equipment required:	Digital Multimeter or: Digital Multimeter and TP Test Module
--------------------------------	---

STEP	PROCEDURE
Refer to Section 4-2 for access to main PCB	
1.	Turn VR6 potentiometer on the main PCB all the way to the left. Fig.4-20
2.	Set the digital multimeter to DC voltage measurement mode.
3.	Connect (+) probe of the multimeter to check pin 5B and (-) probe to 1A pin. NOTE: If you are using the TP Test Module, refer to Fig. 4-21 & 4-22. Refer also to Section 4-3. Set the dial to 8.
4.	For Low level (notch tag part) adjustment, first put notch tag part in the pitch sensor. Then adjust the electrical level with VR6 so that it will measure + 0.5 V or less.
5.	For High level (paper part) adjustment, first put paper part in the pitch sensor. Check the electrical level. If the level difference is + 2.0 V more than the Low level, it is acceptable. If not, return to STEP 4 and readjust. NOTE: Press the EJECT key to cut media after pitch sensor error or cutter sensor occurs because of wrong electrical level.
6.	Standard values: Low level (side hole part): +0.5 V or less High level (paper part): 2.0 V +Low level or higher If these values do not result, try the following: a) Repeat the process b) Clean the sensor c) Replace the sensor

4-13 Pitch Sensor Adjustment, ("R" Corner Notch Tag)

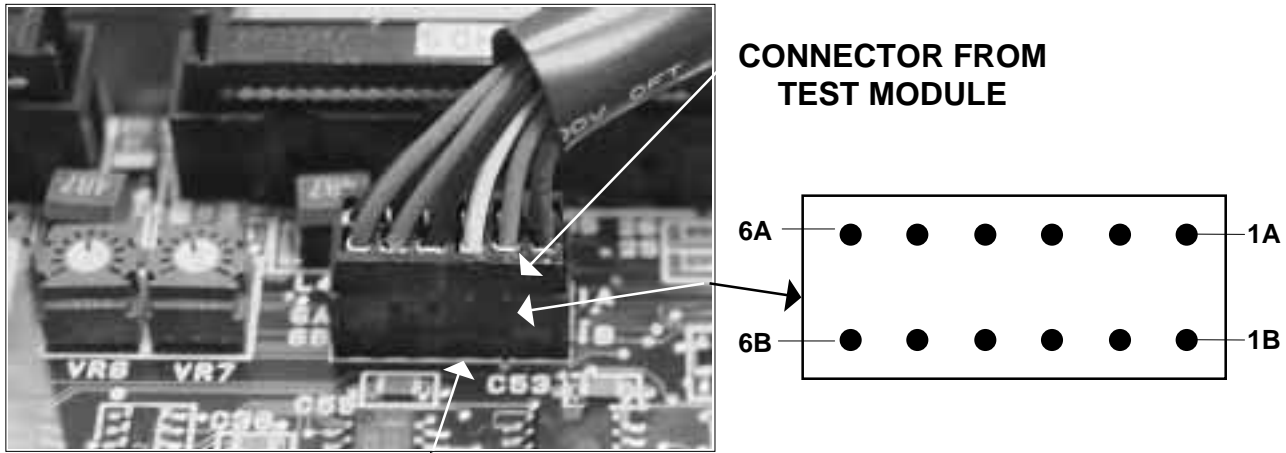


Fig. 4-21

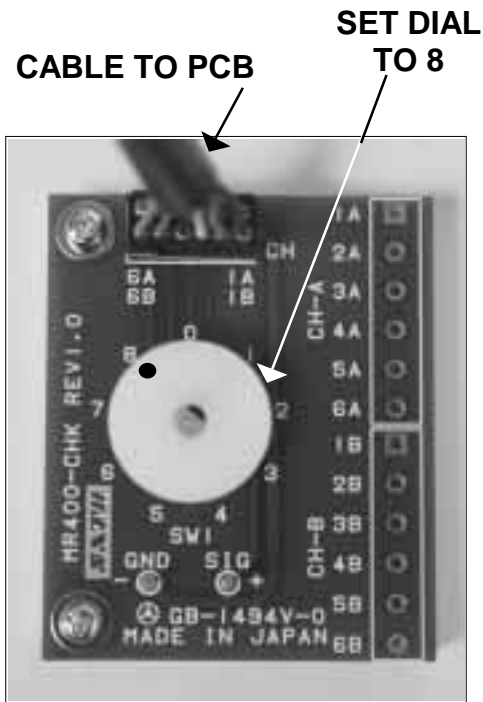


Fig. 4-22

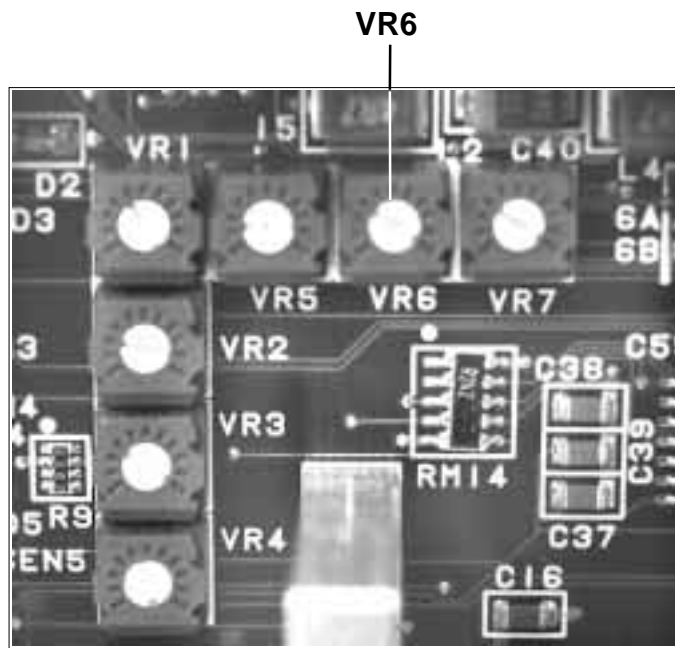


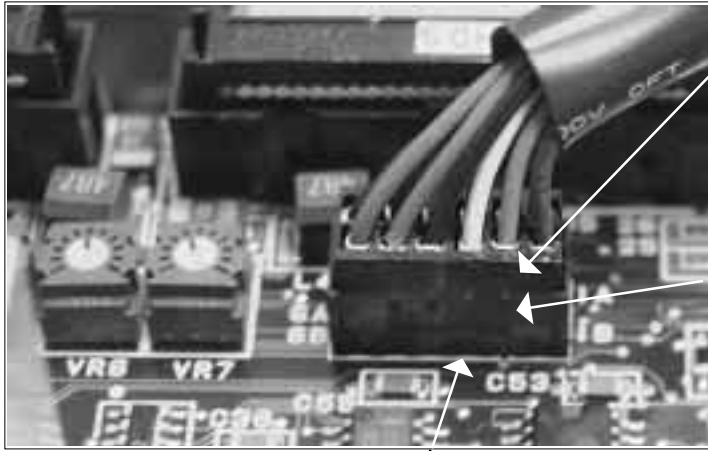
Fig. 4-20

4-14 Pitch Sensor Adjustment, (“I- Mark” Tag/Label)

Additional equipment required: Digital Multimeter or: Digital Multimeter and TP Test Module
--

STEP	PROCEDURE
Refer to Section 4-2 for access to main PCB	
1.	Turn VR2 potentiometer on the main PCB all the way to the left. Fig.4-23
2.	Set the digital multimeter to DC voltage measurement mode.
3.	Connect (+) probe of the multimeter to check pin 1B and (-) probe to check pin 1A. NOTE: If you are using the TP Test Module, refer to Fig. 4-24 & 4-25. Refer also to Section 4-3. Set the dial to 4.
4.	For Low level (no “T” marked part) adjustment, put paper part in the pitch sensor. Then adjust the electrical level with VR2 so that it will measure + 0.5 V or less.
5.	For High level (“T” marked part) adjustment, put paper part in the pitch sensor. Check the electrical level. If the level difference is + 1.5 V more than the Low level, it is acceptable. If not, return to STEP 4 and readjust. NOTE: Press the EJECT key to cut media after pitch sensor error or cutter sensor occurs because of wrong electrical level.
6.	Standard values: Low level (no “I-Mark” part): +0.5 V or less High level (“I-Mark”): Low level + 2.0 V or higher. If these values do not result, try the following: a) Repeat the process. b) Clean the sensor. c) Replace the sensor.

4-14 Pitch Sensor Adjustment, ("I-Mark" Tag/Label)



CONNECTOR FROM TEST MODULE

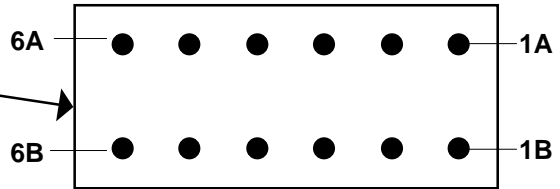
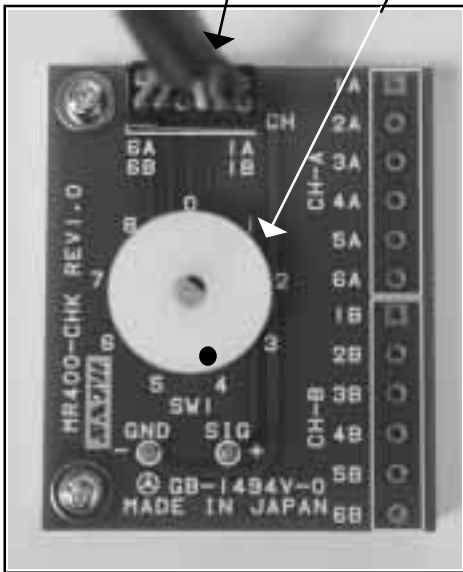


Fig. 4-24

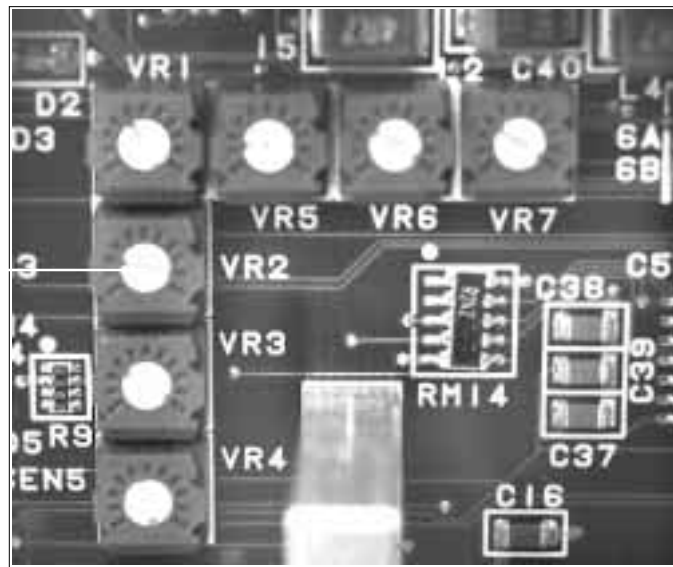
TEST PORT

CABLE TO PCB

SET DIAL TO 4



TP TEST MODULE Fig. 4-25



VR2

POTENTIOMETER ADJUSTMENT FOR STEP 1 IS LOCATED ON THE MAIN PCB INSIDE PRINTER

Fig. 4-23

4-15 Cut Sensor Adjustment, (Tag Hole Sensor and Gap Sensor)

Additional equipment required: Digital Multimeter or: Digital Multimeter and TP Test Module
--

STEP	PROCEDURE
<i>Refer to Section 4-2 for access to main PCB</i>	
1.	Turn off the printer and remove the cutter but do not disconnect the electrical connection. <i>Fig.4-26</i>
2.	Set the switch on the Cutter sensor to hole tag position, (left). <i>Fig.4-26</i>
3.	Set the digital multimeter to DC voltage measurement mode.
4.	Connect (+) probe of the multimeter to check pin IN on Hole/Notch switch PCB and (-) probe to SG on CUT PCB.
5.	Turn on the power and place hole tag in the cutter unit.
6.	Measure the value of High level (tag part) and Low level (hole part). Standard values: High level (tag part) minus Low level (hole part) =2.5 V or more. If the standard calculated value is less than 2.5V, your stock may be too transparent to work properly. Contact Sato for assistance.
7.	Connect (+) probe for the measurement to check pin RF on Hole/Notch switch PCB and adjust the threshold level with the potentiometer on Hole/Notch switch PCB. Threshold level: ((High) + (Low)) /2.
8.	Turn the power off and reinstall the cutter unit on the printer.

4-15 Cut Sensor Adjustment, (Tag Hole Sensor and Gap Sensor)

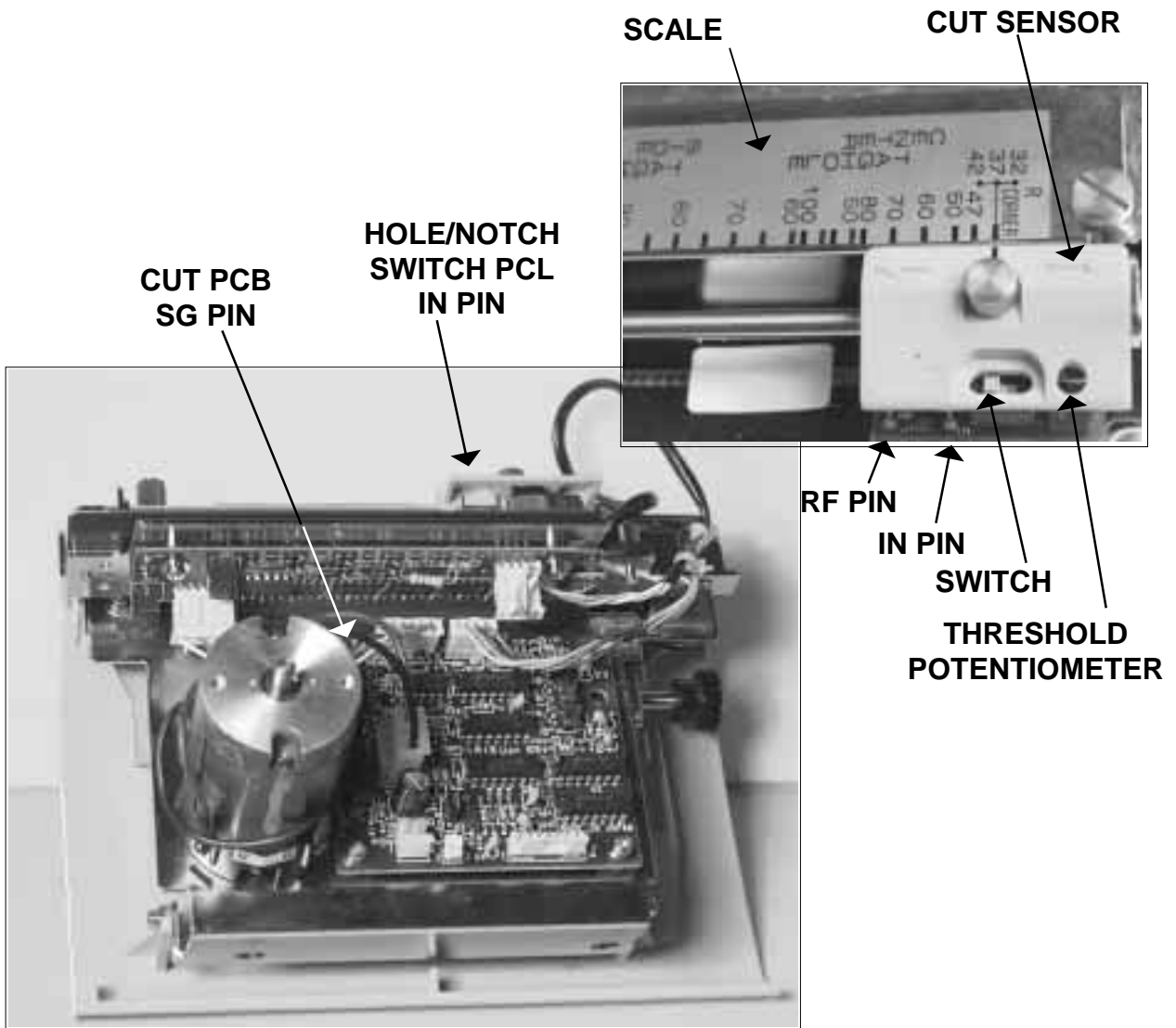


Fig. 4-26

4-16 Cut Sensor Adjustment, ("R" Corner Notch Sensor)

Additional equipment required: Digital Multimeter

STEP	PROCEDURE
1.	Turn off the printer and remove the cutter but do not disconnect the electrical connection. Fig. 4-27
2.	Set the switch on the Cutter sensor to notch tag position, (right) Fig. 4-27
3.	Set the digital multimeter to DC voltage measurement mode.
4.	Connect (+) probe of the multimeter to check pin IN on Hole/Notch switch PCB and (-) probe to SG on CUT PCB
5.	Turn on the power and place notch tag in the cutter unit.
6.	Measure the value of High level (tag part) and Low level (notch part). Standard values: High level (tag part) minus Low level (hole part) = 2.5 V or more. If the standard calculated value is less than 2.5V, your stock may be too transparent to work properly. Contact Sato for assistance.
7.	Connect (+) probe for the measurement to check pin RF on Hole/Notch switch PCB and adjust the threshold level with the potentiometer on Hole/Notch switch PCB. Threshold level: ((High) + (Low)) /2.
8.	Turn the power off and reinstall the cutter unit on the printer.

4-16 Cut Sensor Adjustment, ("R" Corner Notch Sensor)

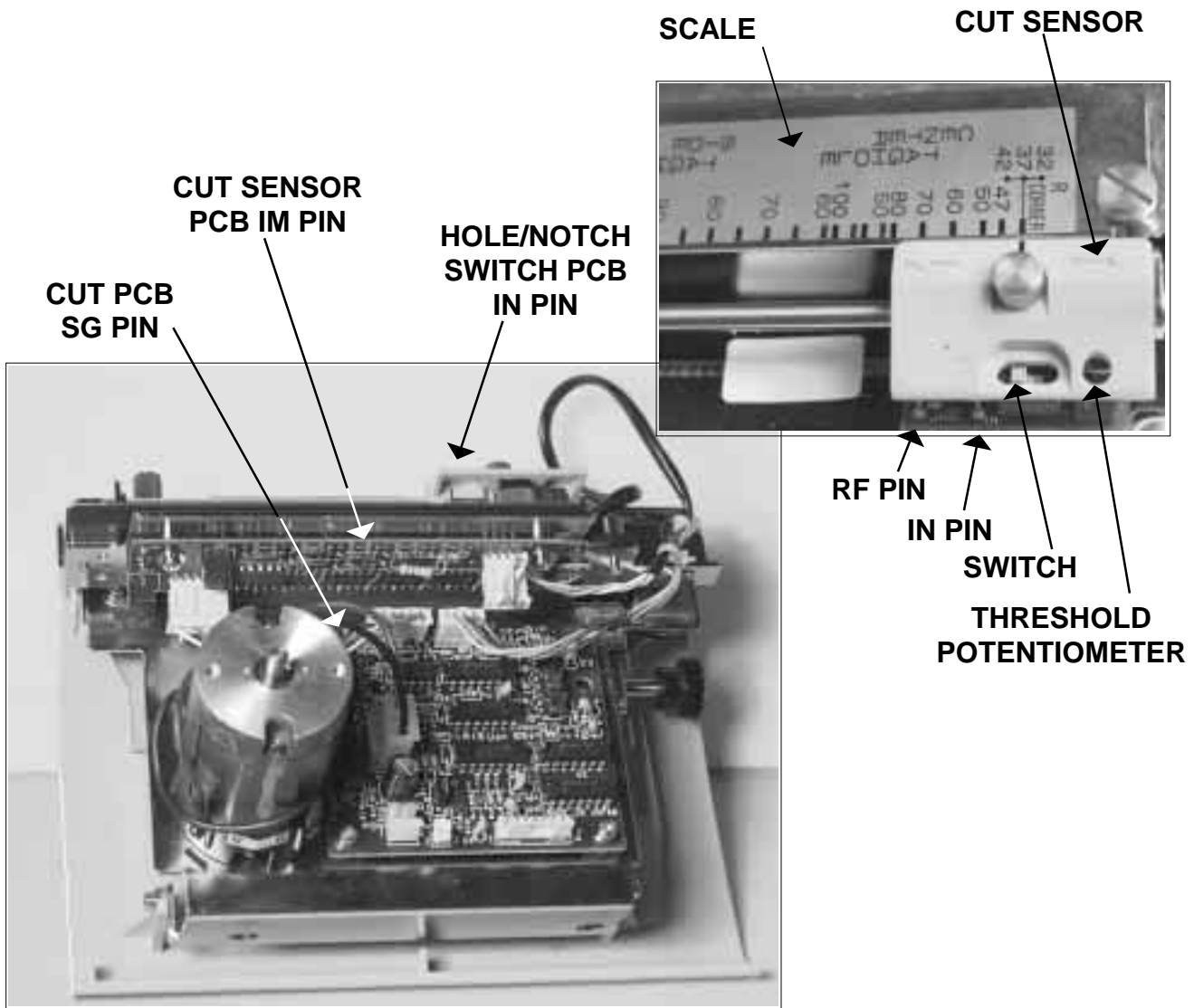


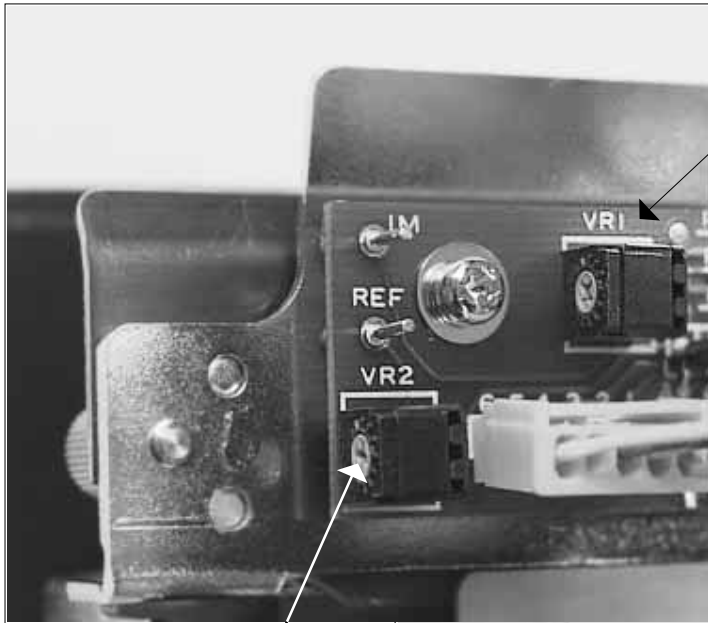
Fig. 4-27

4-17 Cut Sensor Adjustment, (“I-Mark” Sensor)

Additional equipment required: Digital Multimeter

STEP	PROCEDURE
1.	Turn off the printer and remove the cutter, but do disconnect the electrical connection. Fig. 4-28
2.	Align the potentiometer VR1 on the Cutter sensor PCB (Lower) to the center position. Fig. 4-28
3.	Set the digital multimeter to DC voltage measurement mode.
4.	Connect (+) probe of the multimeter to check pin IM on the Cut Sensor PCB and (-) probe to SG on CUT PCB.
5.	Turn on the power and place “I mark” in the cutter unit.
6.	Measure the value of High level (“I mark” part) and Low level (tag part). Adjust with VR1 on Cut Sensor PCB (lower) if the value is not in the standard range. Standard values: High level (“I mark” part) minus Low level (tag part): =4.0 V or more.
7.	Connect (+) probe for the measurement to check pin RF on the Cut Sensor PCB (lower) and adjust the threshold level with the potentiometer VR2 on the PCB. Fig. 4-28 Threshold level: ((High) + (Low)) / 2
8.	Turn the power off and reinstall the cutter unit on the printer.

4-17 Cut Sensor Adjustment, ("I-Mark" Sensor)



ALIGN VR1 TO THE CENTER POSITION

ADJUST VR2 THRESHOLD LEVEL

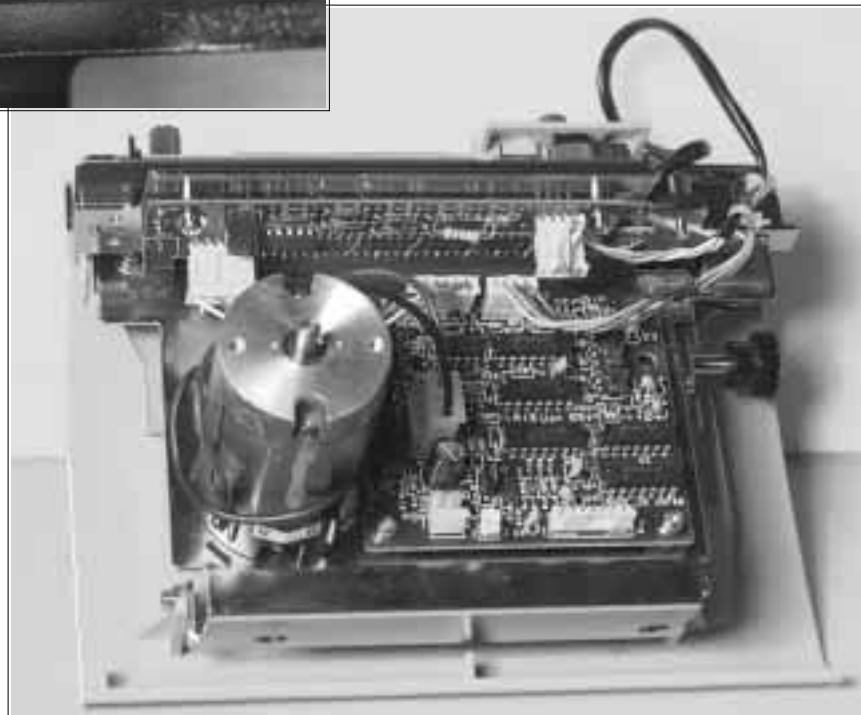


Fig. 4-28

4-18 Ribbon Sensor Adjustment

Additional equipment required: Digital Multimeter or: Digital Multimeter and TP Test Module
--

STEP	PROCEDURE
Refer to Section 4-2 for access to main PCB	
1.	Turn potentiometer VR3 on main PCB all the way to the right. Fig. 4-29
2.	Set the digital multimeter to DC voltage measurement mode.
3.	Connect (+) probe of the multimeter to check pin 3B and (-) probe to check pin 1A.
	NOTE: If you are using the TP Test Module, refer to Fig. 4-30 & 4-31. Refer also to Section 4-3.
	Set the dial to 6.
4.	Refer to Section 1-8 to locate the ribbon sensor. For low level adjustment, rotate the ribbon unwind shaft to align one of the “slots” with the sensor. Adjust the electrical level with VR3 to + 0.5 V or less.
5.	For high level adjustment, rotate the ribbon unwind shaft to align one of the “tabs” with the sensor. Check the electrical level which should be more than +2.0 different from the lower level. Return to STEP 4 if necessary to readjust.
6.	Standard values: Low level (slot): + 0.5 V or less. High level (tab): minus Low level (slot) = +2.0 V or greater.
	NOTE: Adjust low level to achieve the biggest difference between each level by repeating the process.
	If these values do not result, try the following:
	a) Repeat the process
	b) Clean the sensor
	c) Replace the sensor

4-18 Ribbon Sensor Adjustment

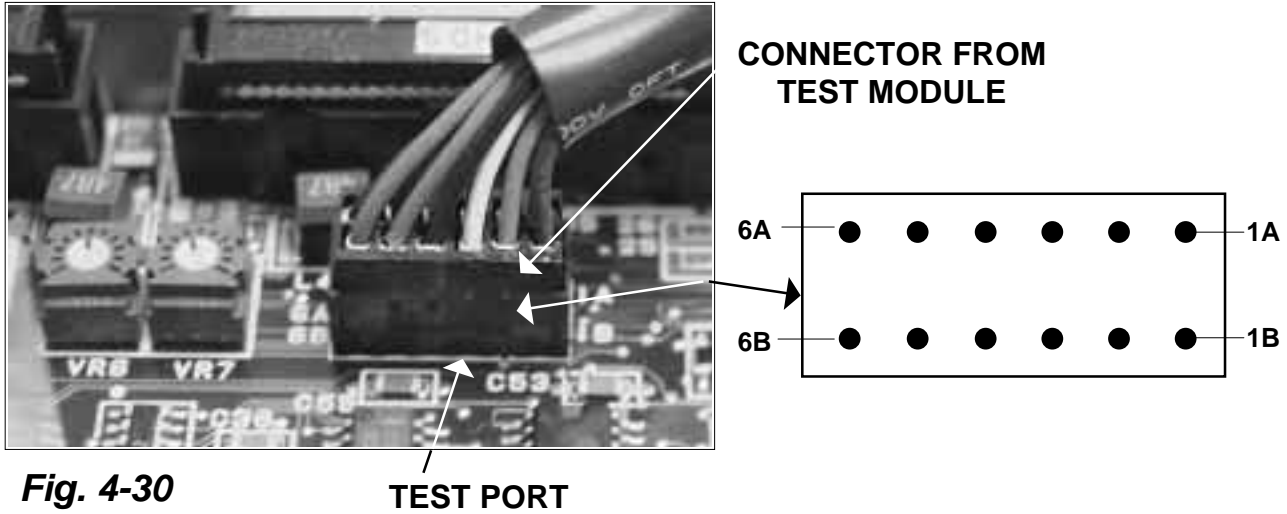


Fig. 4-30

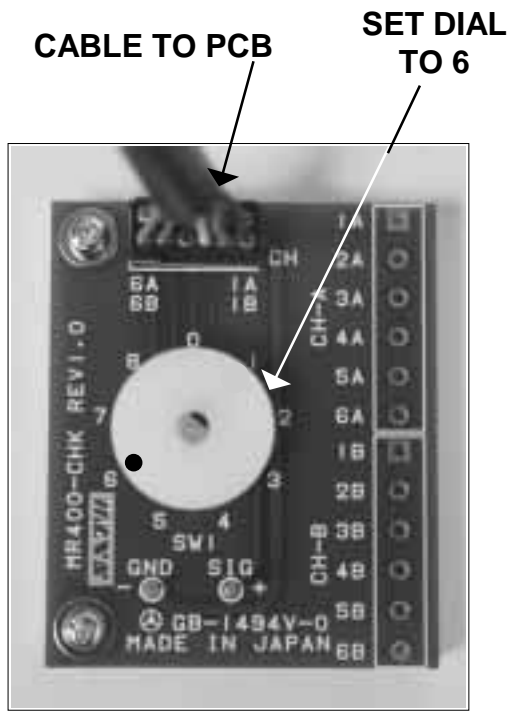


Fig. 4-31

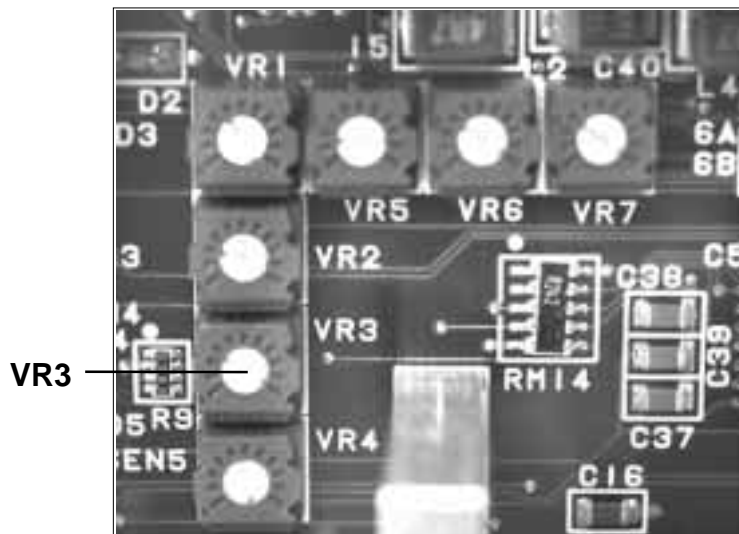
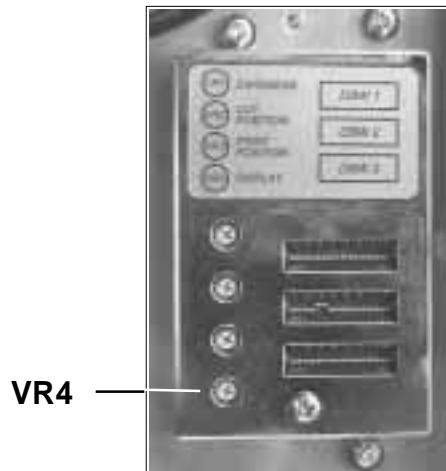


Fig. 4-29

4-19 LCD Display Adjustment

STEP	PROCEDURE
1.	Turn on the printer.
2.	Confirm the backlight on the LCD is lit and message is displayed.
3.	Adjust the display darkness with VR4 as necessary. The potentiometers are located under the access panel inside the printer. Fig. 4-32



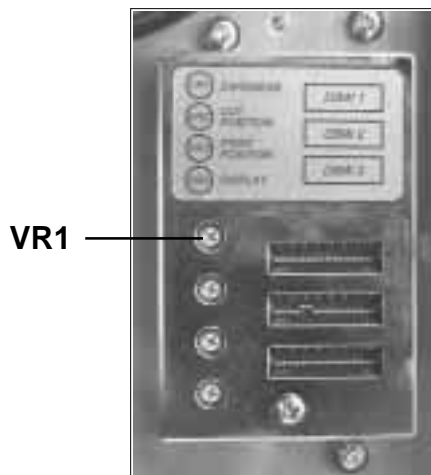
**POTENTIOMETER
ADJUSTMENT FOR STEP 3
IS LOCATED UNDER
ACCESS PANEL INSIDE
PRINTER**

Fig. 4-32

4-20 Print Darkness Adjustment

Additional equipment required: DC Voltmeter

STEP	PROCEDURE
1.	Turn potentiometer VR1 to the center position. The potentiometers are located under the access panel inside the printer. Fig. 4-33
2.	Turn on the power. Press the START/STOP key to go off-line. Then press START/STOP and FEED keys simultaneously and the following message will display. <div data-bbox="1003 594 1360 695" style="border: 1px solid black; padding: 5px; margin: 5px 0;">USER MODE</div>
3.	Scroll through the display by pressing the FEED key until the following message is displayed. <div data-bbox="1003 711 1360 816" style="border: 1px solid black; padding: 5px; margin: 5px 0;">PRINT DARKNESS 1 2 3</div>
4.	Press START/STOP key and place the cursor under print darkness 2, then press the FEED key to enter.
5.	Turn off the power.
6.	Restore power while holding the FEED key. The following message will be displayed. <div data-bbox="1003 1014 1352 1119" style="border: 1px solid black; padding: 5px; margin: 5px 0;">USER TEST PRINT</div>
7.	Press the FEED key to start printing. Re-press the FEED key to pause printing.
8.	Check the print darkness and adjust to suit with VR1 .
9.	After adjustment, press FEED key to pause then turn power off.



**POTENTIOMETER
ADJUSTMENT FOR STEP 1
IS LOCATED UNDER
ACCESS PANEL INSIDE
PRINTER**

Fig. 4-33

Mechanical Adjustments

5-1 Overview

The SATO XL400/410 printers contain adjustable mechanical sub-assemblies. This means that during your regular maintenance, your service technicians are able to make adjustments to reset the printer to factory specifications thereby ensuring optimum performance of your printer.

The main mechanical sub-assemblies are:

- Ribbon Unwind/Rewind Assembly
- Ribbon Guide Roller Assembly
- Print Head Assembly
- Drive Belt Assembly

In this section you will find procedures for:

- Ribbon Unwind/Rewind Clutch Adjustment
- Ribbon Guide Plate Adjustment
- Ribbon Tension Balance Adjustment
- Print Head Balance Adjustment
- Feed Roller Adjustment (Label Tracking)
- Print Head Adjustment
- Timing Belt Tension Adjustment

5-2 Ribbon Clutch Adjustments

Excessive ribbon unwind and rewind tension will result in variable ribbon motion and could be the cause of print quality problems.

Follow the procedures 5-2.1 and 5-2.2 to verify that the ribbon unwind and rewind tensions are within specification or if adjustment of either clutch is necessary.

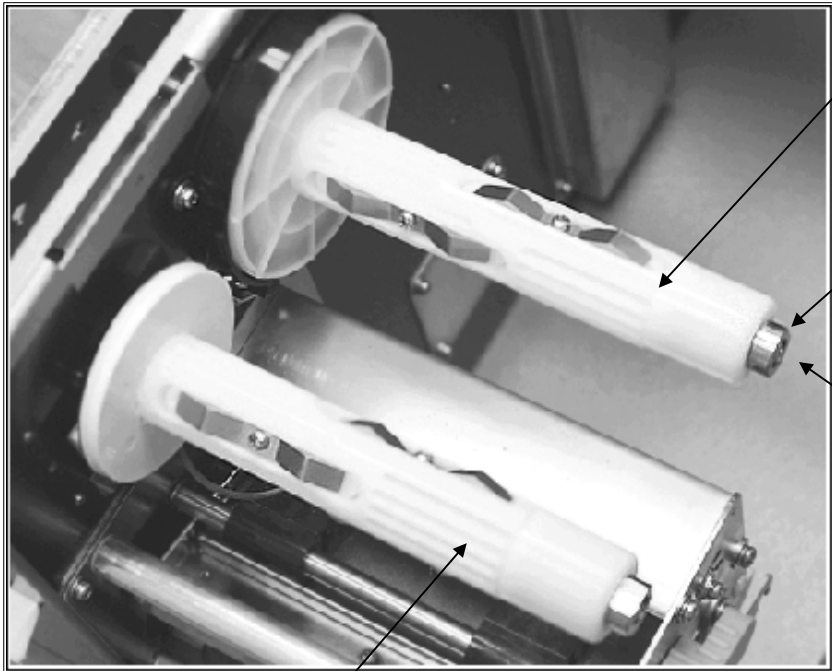
Required Equipment:	<ul style="list-style-type: none"> • 1 Kg Tension Gauge • Ribbon Core, empty • String • 12 mm Wrench • #2 Phillips Screw Driver
---------------------	--

5-2.1 Ribbon Unwind Clutch Adjustment

To adjust the Ribbon Unwind Clutch, perform the following steps:

STEP	PROCEDURE
1.	Remove the ribbon if installed.
2.	Place an empty ribbon core on the ribbon unwind spindle. Attach the free end of the string to the tension gauge. Fig. 5-2
3.	Wind the string tightly around the ribbon core in a single layer and in a clockwise direction. Attach the free end of the string to the tension gauge.
4.	Gradually lift the tension gauge, pulling the string to unwind it from the core. Once the spindle begins to move, the gauge should indicate 400 to 500 grams of tension. Excessive or insufficient tension must be corrected by adjusting the ribbon unwind clutch. Fig. 5-1, 5-2
5.	To adjust the clutch, loosen the set screw and move the adjust nut CW for more tension and CCW for less tension. Tighten the set screw and repeat Steps 3 and 4 until the correct tension is achieved.

5-2 Ribbon Clutch Adjustments



RIBBON UNWIND SPINDLE

ADJUST NUT

SET SCREW IS INSIDE ADJUST NUT

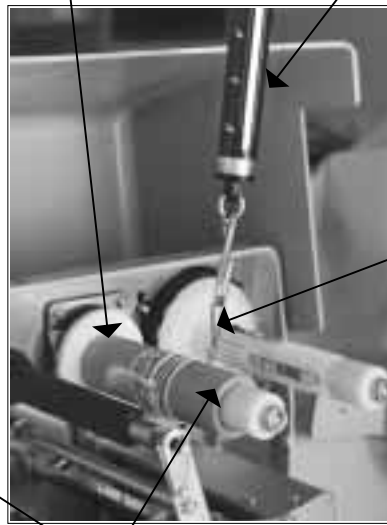
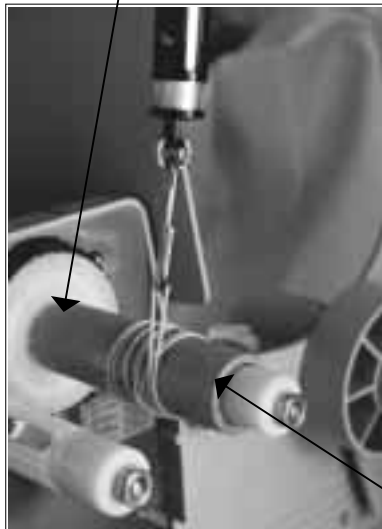
Fig. 5-1

RIBBON REWIND SPINDLE

400-500g UNWIND

500-700g REWIND

TENSION GAUGE



STRING

Fig. 5-2

EMPTY RIBBON CORES

5-2 Ribbon Clutch Adjustments

5-2.2 Ribbon Rewind Clutch Adjustment

To adjust the Ribbon Rewind Clutch, perform the following steps:

STEP	PROCEDURE
1.	Connect the power cable to the printer and AC outlet. Place the printer's power switch to the ON position.
2.	Place an empty ribbon core on the ribbon wind spindle. Attach the free end of the string to the tension gauge. <i>Fig. 5-2</i>
3.	Wind the string tightly around the ribbon core in a single layer and in a counter clockwise direction. Attach the free end of the string to the tension gauge.
4.	Gradually lift the tension gauge, pulling the string to unwind it from the core. Once the spindle begins to move, the gauge should indicate 500 to 700 grams of tension. Excessive or insufficient tension must be corrected by adjusting the ribbon unwind clutch. <i>Fig. 5-1, 5-2</i>
5.	To adjust the clutch, loosen the set screw and move the adjust nut to get the correct tension. Tighten the set screw and repeat Steps 3 and 4 until the correct tension is achieved.

5-3 Ribbon Guide Plate Adjustment

If the ribbon is not smooth across the guide plate (ribbon wrinkle), it may cause the labels to be printed with gaps or streaks as shown in **Fig. 5-3** and adjustment will be required. Perform the following steps:

STEP	PROCEDURE
1.	Check for even ribbon tension by watching the ribbon movement under the guide plate as it moves upward toward the ribbon rewind spindle. If it appears uneven, proceed to Step 2. Fig. 5-4
2.	Loosen the (2) retaining screws and reposition the guide plate. Retighten the screws. Fig. 5-5 Recheck the ribbon alignment and print. If results are still not satisfactory, perform Ribbon Tension Balance Adjustment. See Section 5-4.



DIAGONAL VOIDS (WHITE STREAKS) THAT "WALK" ACROSS LABEL, CAUSED BY RIBBON WRINKLE

Fig. 5-3

5-3 Ribbon Guide Plate Adjustment

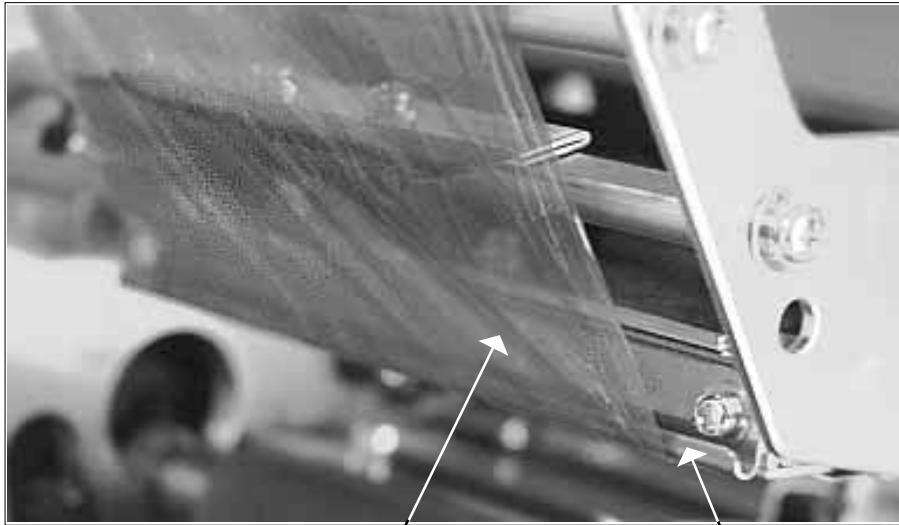


Fig. 5-4

RIBBON WRINKLE

GUIDE PLATE

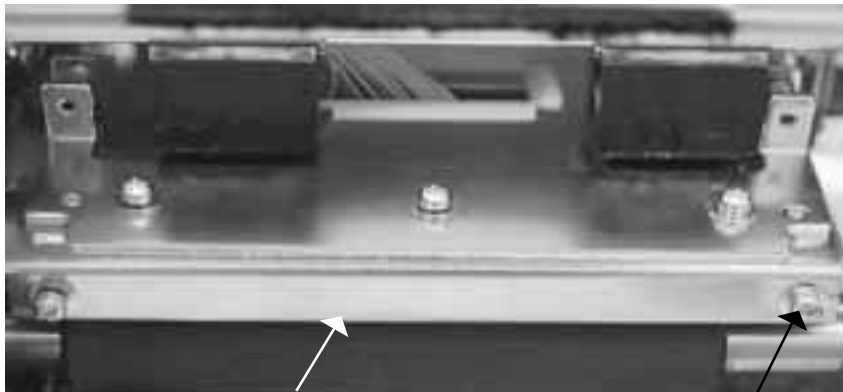


Fig. 5-5

GUIDE PLATE

**RETAINING
SCREWS**

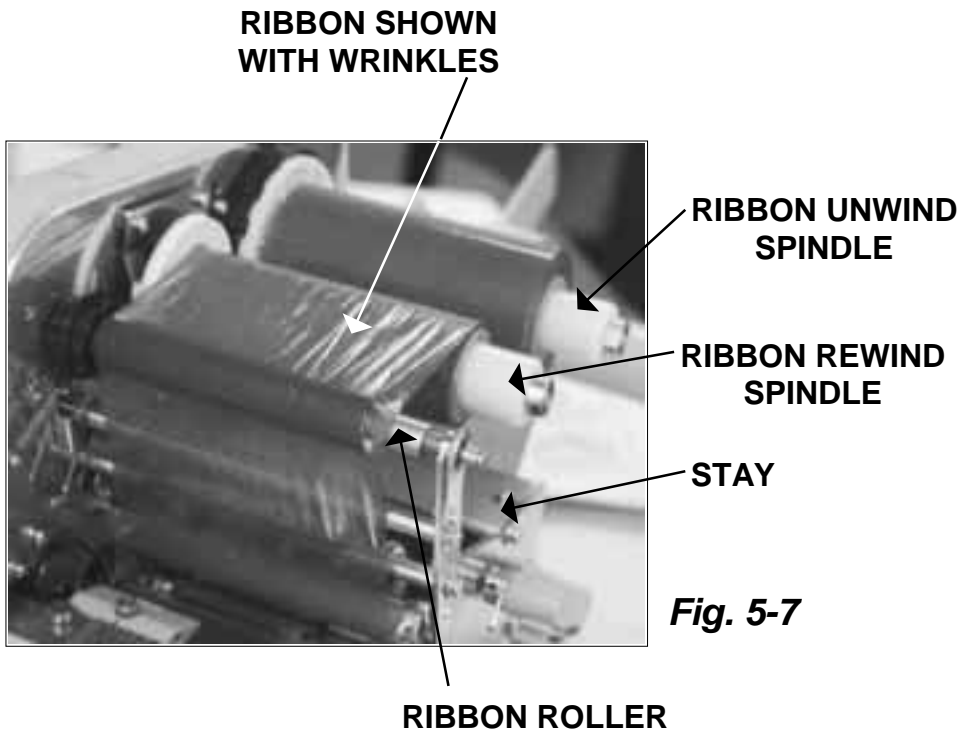
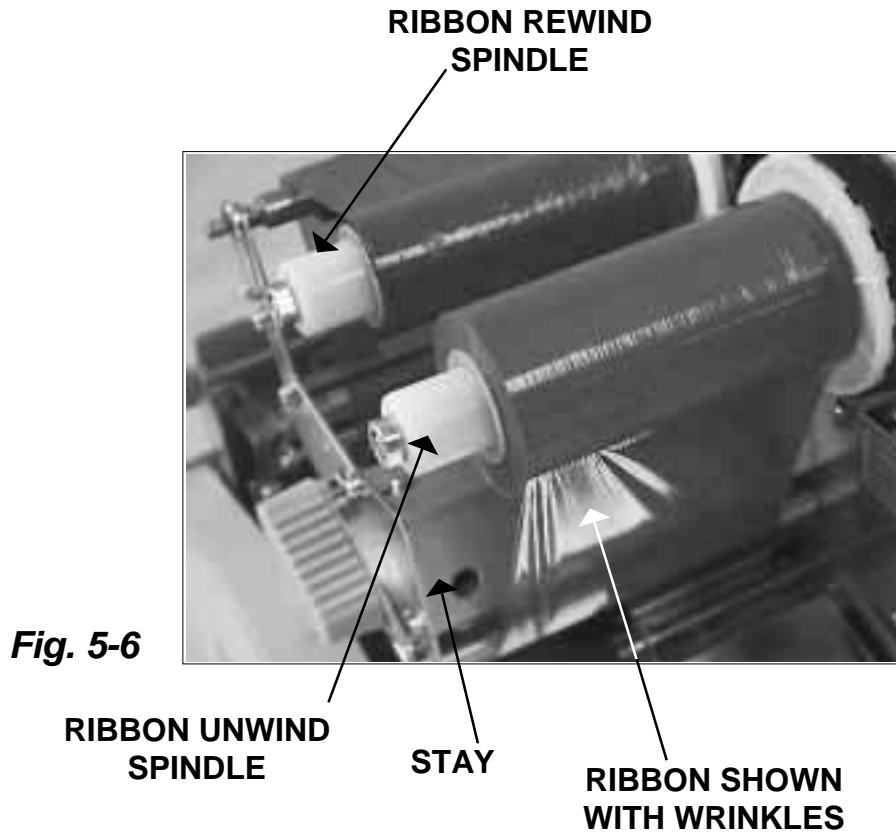
5-4 Ribbon Tension Balance Adjustment (Major)**NOTE:**

This procedure should only be attempted by a qualified technician. Please call SATO Technical Support for assistance. Phone (408) 745-1379.

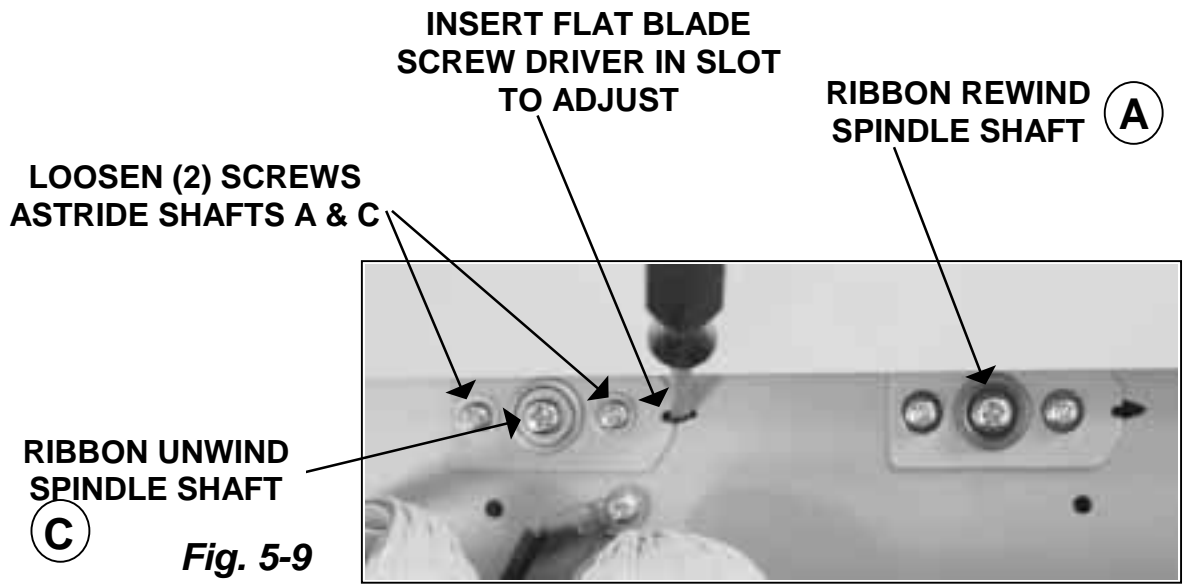
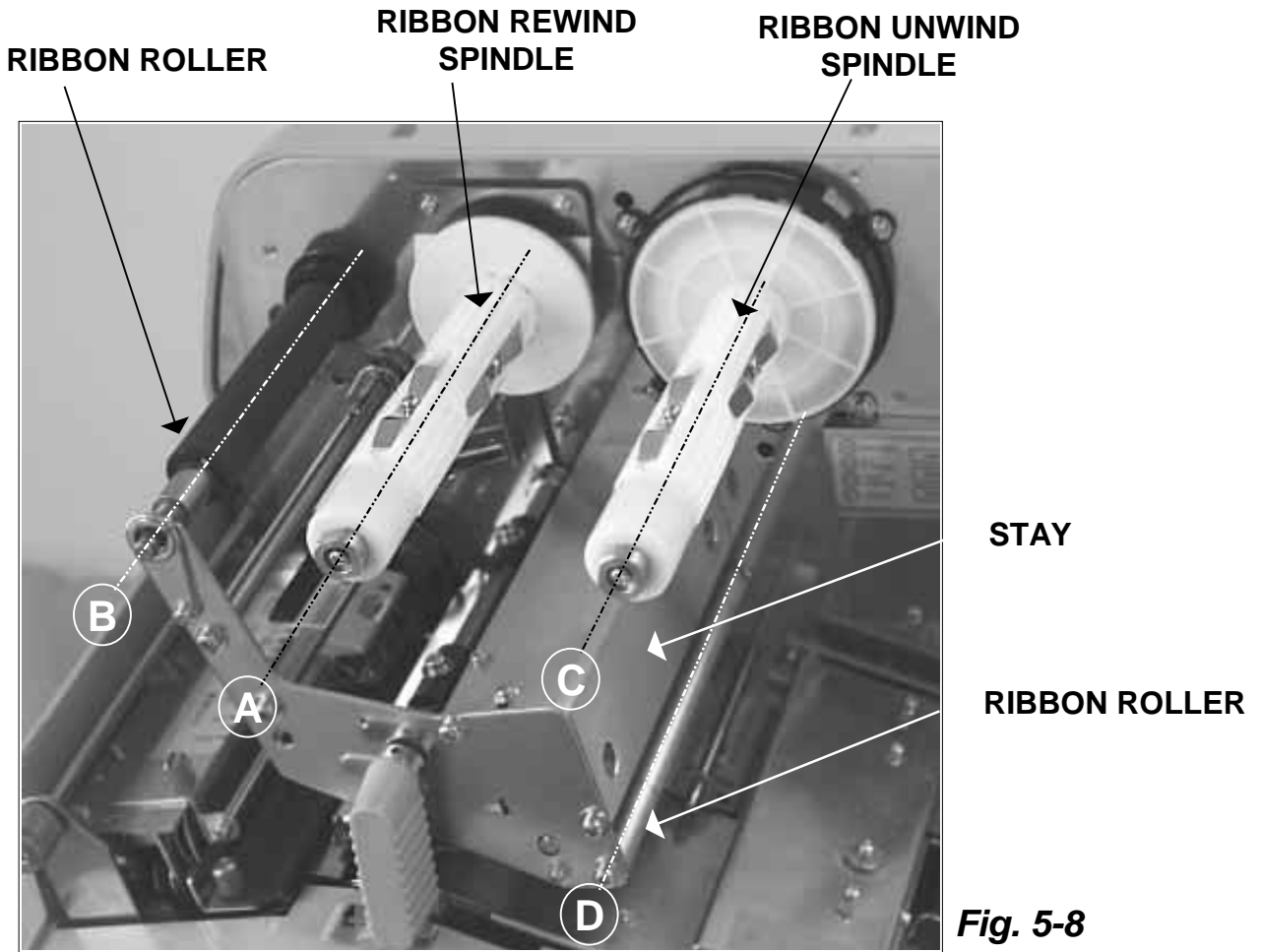
The ribbon should flow evenly along the length of the STAY to avoid ribbon wrinkles and maintain optimum print quality. If ribbon wrinkles appear as in ***Figs. 5-6 and 5-7***, perform the following steps:

STEP	PROCEDURE
1.	<p>Refer to <i>Fig. 5-8</i>.</p> <p>Ribbon Rewind Spindle @ A must be parallel with Ribbon Roller @ B. Ribbon Unwind Spindle @ C must be parallel with Ribbon Roller @ D.</p> <p>To make adjustments, refer to <i>Fig. 5-9</i>.</p> <p>Loosen (2) screws astride shafts A & B. Insert flat blade screw driver into each slot and adjust until shafts are parallel with ribbon rollers @ B & D. Tighten the screws astride shafts.</p>
2.	<p>Recheck the ribbon alignment and print outs. If necessary, redo step 1.</p>

5-4 Ribbon Tension Balance Adjustment (Major)



5-4 Ribbon Tension Balance Adjustment (Major)



5-5 Print Head Balance Adjustment

To adjust the print alignment and make print quality consistent across label, perform the following steps:

STEP	PROCEDURE
1.	Load the ribbon and label stock into the printer.
2.	Loosen screw on the STAY. Fig. 5-10
3.	Rotate adjusting screw to achieve optimum print quality along the length of the print head. Fig. 5-11
NOTE: Rotating screw CW places pressure on the inside end (left side) of the print head creating a darker impression on that surface.	
Rotating screw CCW places pressure on the outside end (right side) of the print head creating a darker impression on that surface.	

ROTATE
ADJUSTING SCREW

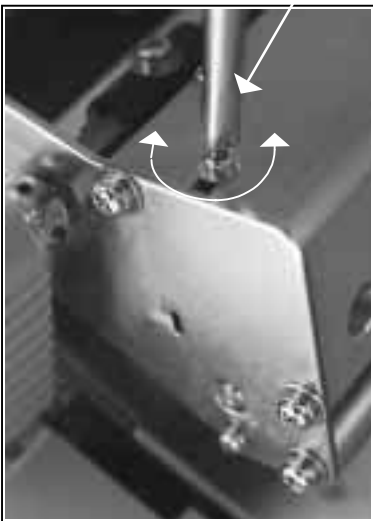
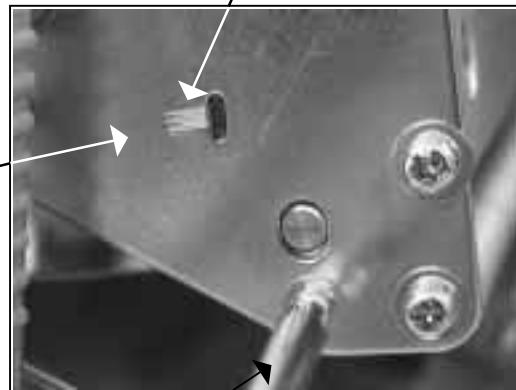


Fig. 5-11

INDEXING POINTER SHOWS
HOW MUCH SHAFT END HAS
MOVED UP OR DOWN,
CHANGING HEAD BALANCE

STAY



LOOSEN SCREW

Fig. 5-10

5-6 Feed Roller Adjustment (Label Tracking)

Required Equipment	<ul style="list-style-type: none"> • #2 Phillips Screw Driver • 1 Kg Tension Gauge • 12 mm Wrench
--------------------	--

Used for fine tuning. Adjusts pressure between upper and lower rollers.

STEP	PROCEDURE
1.	On the media lid cover adjust the height of the (2) screws @ A & B to 5mm. Fig 5-12
2.	Attach a strip of 20mm wide liner to the end of the tension gauge. Under the media cover, place the strip between the pressure rollers at one end. Gradually pull the tension gauge and measure the friction. Repeat at the opposite end of the rollers. Fig 5-13
3.	The difference between the left and right ends of the rollers must be less than 100g. Adjust the screws @ A & B if necessary. Fig 5-12
4.	Run a label and turn the eccentric nut at C with an open end wrench to adjust the reading if necessary for straight line travel. Turn nut CCW moves pressure roller forward. CW is the reverse.
5.	Eccentric Nut @ D is to adjust the height of the lower roller for feed adjustment. Fig 5-14
6.	Turn nut CCW will make label travel left. CW is the reverse.

5-6 Feed Roller Adjustment (Label Tracking)

ECCENTRIC NUT @ "C"
LOCATED ON MEDIA
LID COVER

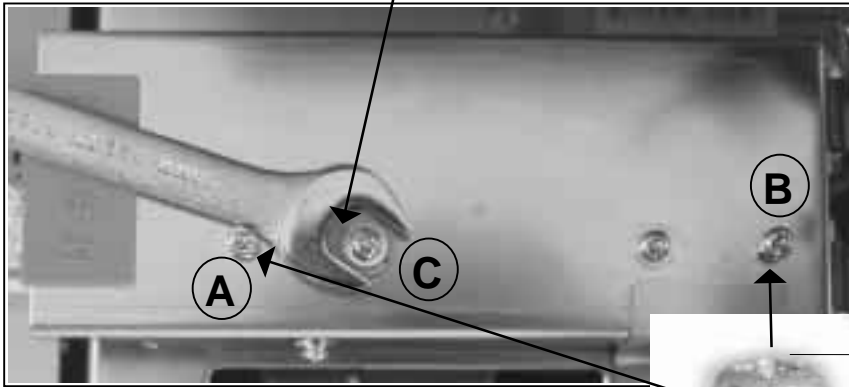
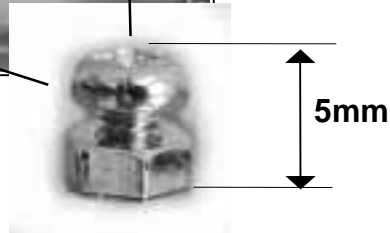


Fig. 5-12



MEDIA COVER

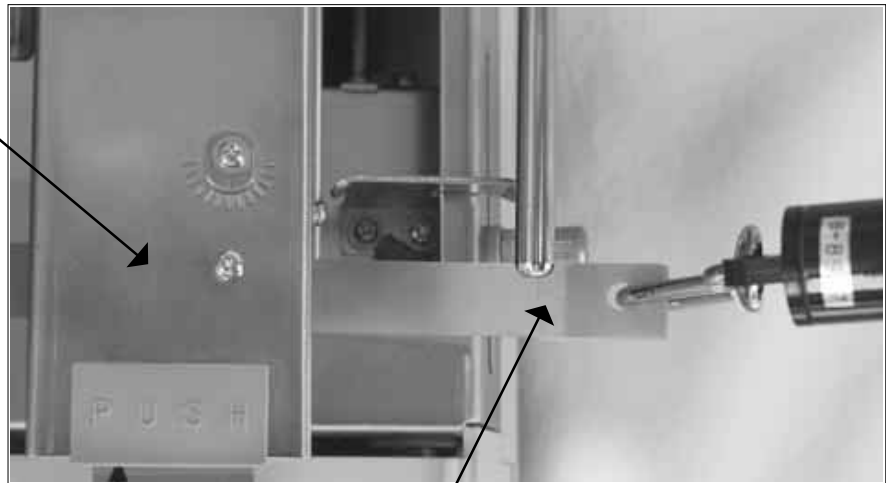


Fig. 5-13

ECCENTRIC NUT @ "D"
LOCATED ON MEDIA
RAMP ASSEMBLY

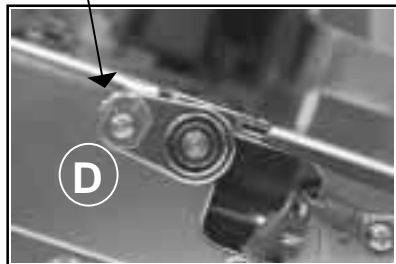


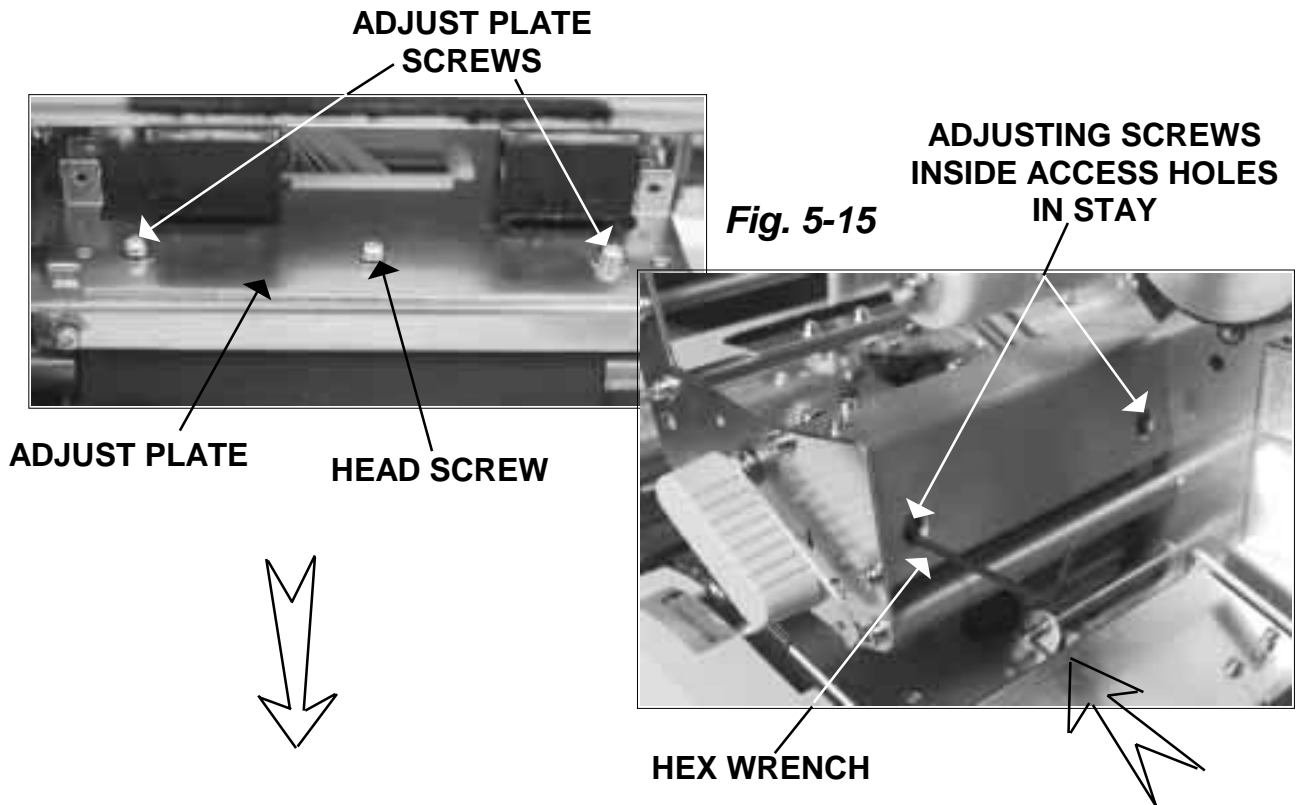
Fig. 5-14

20mm WIDE LINER
ATTACHED TO
TENSION GAUGE

5-7 Print Head Alignment Adjustment

To adjust the print alignment and make print quality consistent across label, perform the following steps:

STEP	PROCEDURE
1.	Loosen (2) Screws on the Adjustment Plate and screw holding the head. Fig. 5-15.
2.	Turn the Adjusting Screws to adjust the head alignment. Reprint label to check print quality.
3.	After adjusting, tighten the (3) screws.



5-8 Timing Belt Tension Adjustment

Required Equipment:	<ul style="list-style-type: none"> • 500g Tension Gauge • #2 Phillips Screw Driver
---------------------	--

- There are four timing belts to adjust
- Belt "A" Label Feed Roller Timing Belt
- Belt "B" Platen Pulley Timing Belt
- Belt "C" Carbon Ribbon Pulley Rewind Timing Belt
- Belt "D" Carbon Ribbon Rewind Spindle to Carbon Rewind Roller

Refer to Section 6-6 & 6-7 for access to motor and belts

STEP	PROCEDURE
1.	Pull the center of each timing belt with the tension gauge and note the tension reading when the belt is moved. If the tension reading of each belt is not within range of 100 - 150 g, adjust the position of the pulley by loosening the motor mounting screws and moving the motor to achieve the required range.
2.	After adjusting motor, tighten but do not over tighten screws. Belts should have some movement. Fig. 5-16 & 5-17

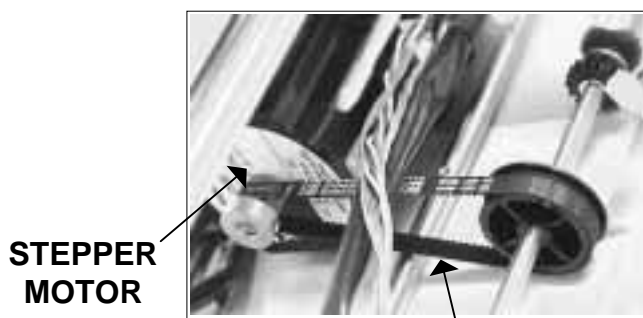


Fig. 5-16 BELT "A"

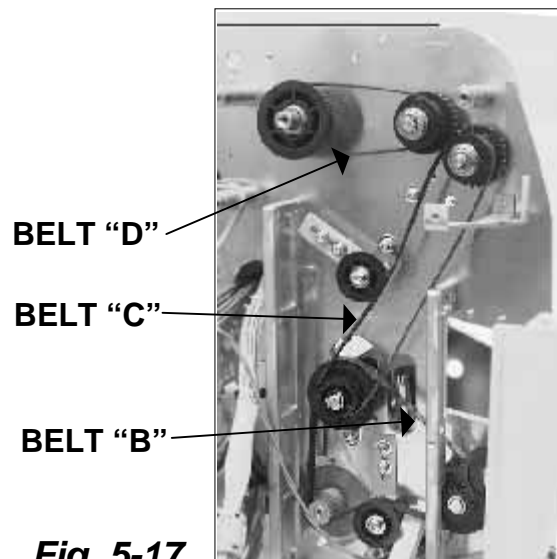


Fig. 5-17

Replacement Procedures

6-1 Overview

The SATO XL-400/XL-410 printer modules contain replaceable components and sub-assemblies. This chapter contains step-by-step instructions for removing and replacing the following components and sub-assemblies.

- Fuses
- Print Head
- Main Circuit Board
- Power Supply
- Stepper Motor
- Timing Belts
- Platen
- Ribbon Drive Disks
- Ribbon Motion Sensor
- Label Ramp Assembly
- Sensors
- Label Tracking
- Display Panel

6-2 Replacing Fuses

Fuse replacement is described in the following section.

- 6-2.1 Removing and Replacing the Main Power Fuse
- 6-2.2 Removing and Replacing the +5V or +24 Fuse

NOTE: Before replacing a fuse, determine the cause of the overload condition.

6-2.1 REMOVING AND REPLACING THE MAIN POWER FUSE

Required Equipment: T3.15 Amp, 250 V Fuse

STEP	PROCEDURE
1.	Switch the printer off and disconnect the AC Power Cord.
2.	Locate and remove the fuse cover. Remove and replace the main power fuse with one of equal rating (T3.15 Amp, 250 V). Do not use a fuse with a higher rating. Replace the fuse cover. Fig.6-1
3.	Reconnect the AC Power Cord.

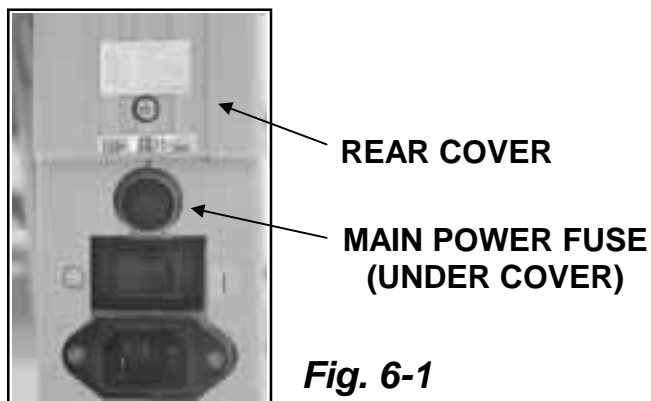
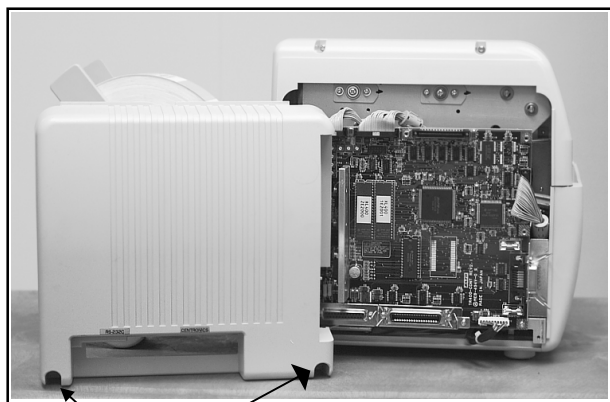


Fig. 6-1

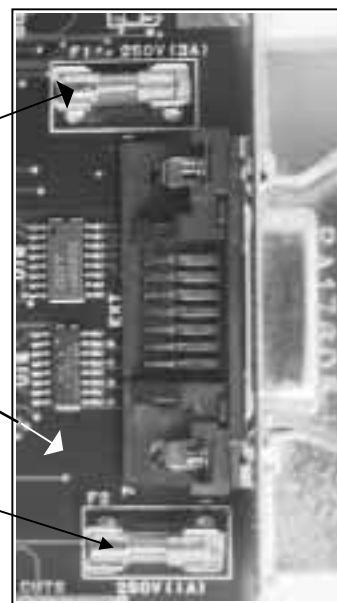
6-2.2 Removing and Replacing the +5V or +24V FUSE(s)

- | | |
|---------------------|---|
| Required Equipment: | <ul style="list-style-type: none"> • 1 Amp, 250 V Fuse (+5V)
or • 3 Amp, 250 V Fuse (+24V) • #2 Phillips Screwdriver |
|---------------------|---|

STEP	PROCEDURE
1.	Switch the printer off and disconnect the AC Power Cord.
2.	Remove (2) screws holding the LH cover to the printer base. Fig.6-2
3.	Refer to Fig.6-3 and locate the +5V Fuse (F2) or +24V Fuse (F1).
4.	Remove and replace the fuse(s) with one of equal rating. Do not use a fuse with a higher rating.
5.	Replace the cover and secure with screws removed in Step 2 .
6.	Reconnect the AC Power Cord.



(2) SCREWS **Fig. 6-2**



F2 = +24V
250V, 3A
FUSE

MAIN PC BOARD

F1 = +5V
250V, 1A
FUSE

Fig. 6-3

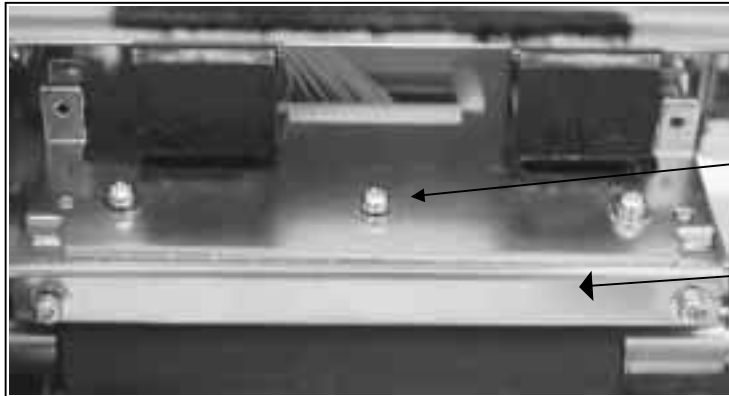
6-3 Replacing the Print Head

The XL400/XL410 print head can be replaced with a screwdriver. No critical adjustments are required because the print head is a subassembly mounted on a permanent, factory adjusted mechanism.

Before you replace the print head, check the head counter values by printing a test pattern. (Refer to Section 2-4).

STEP	PROCEDURE
1.	Switch the printer off and disconnect the AC Power Cord.
2.	Raise the top cover.
3.	Remove the center screw holding the head bracket to the thermal head. Fig.6-4
4.	Carefully open the print head so that the print head will drop down. Fig.6-5
5.	Carefully disconnect the print head data cable and the print head power cable and remove the print head.
6.	Remove the connector guard from the print head for installation on new print head. Fig.6-5A
7.	Install the new print head by reconnecting the print head data cable and the print head power cable to the print head. Attach connector guard.
8.	Position the print head so that the center screw is aligned with the mechanism and the alignment pins are aligned with the alignment holes on top of the print head. Fig.6-6
9.	Close the head, replace the center screw and tighten securely. Close the top cover.
10.	Reconnect the AC Power Cord and perform the following procedures. <ul style="list-style-type: none"> • Head Counter Clear (Refer to Section 7-4). • Confirm that the head cables are connected and that it does not touch the head opening spring. Also confirm that you can open and close the head without restriction and that the ribbon guide plate adjustment is correct. Fig.6-5 • Print test pattern.

6-3 Replacing the Print Head



CENTER SCREW

RIBBON GUIDE PLATE

Fig. 6-4

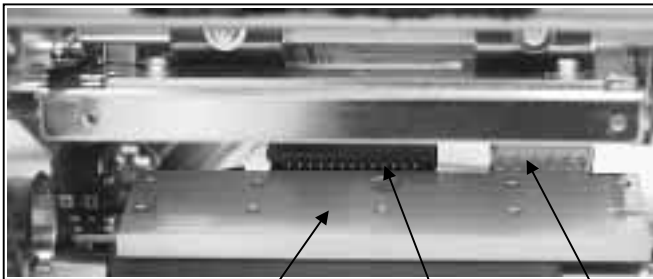


Fig. 6-5

PRINT HEAD

PRINT HEAD
DATA CABLE

PRINT HEAD
POWER CABLE

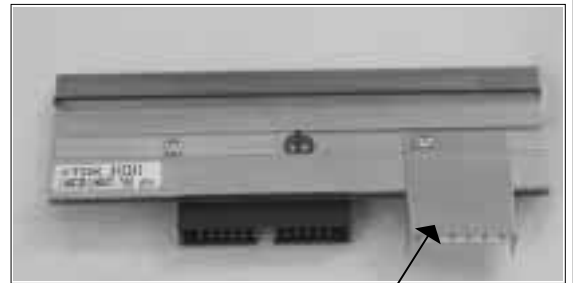
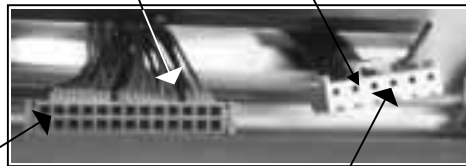


Fig. 6-5A

CONNECTOR
GUARD



ALIGNMENT PINS

PRINT HEAD

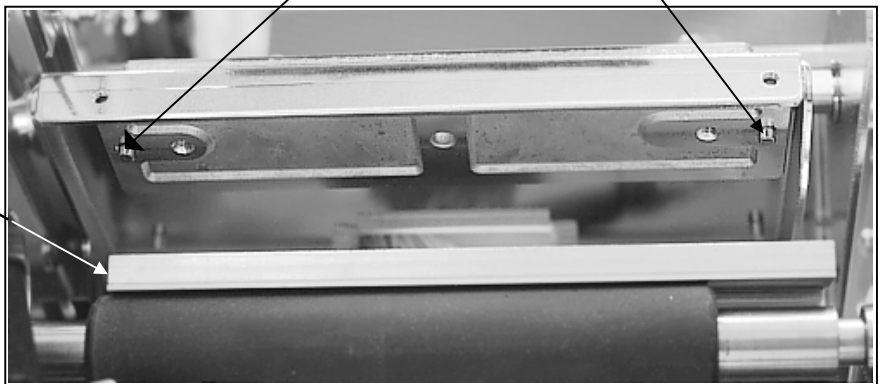


Fig. 6-6

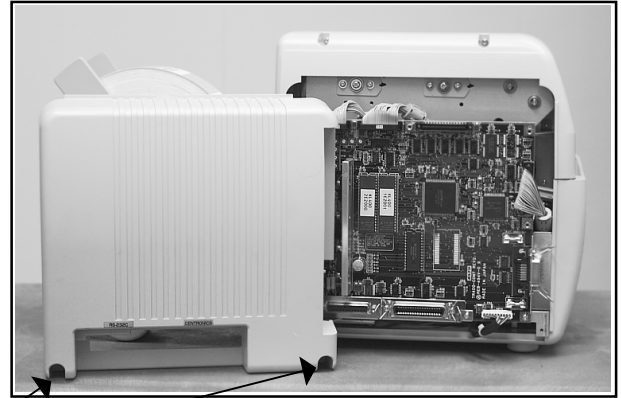
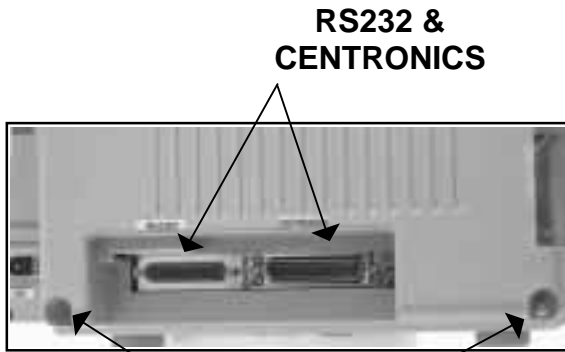
6-4 Replacing the Main Circuit Board

The Main Circuit Board contains the control electronics for the XL-400/410 and is located behind the LH cover of the printer. This board also includes an interface for a centronics and RS232 connector.

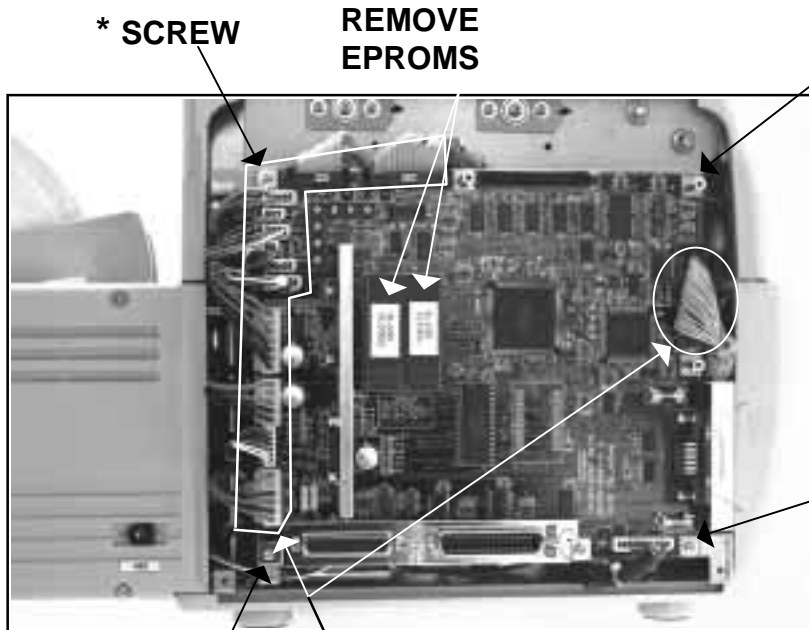
NOTE: Many of the components on these boards are extremely susceptible to damage by static electricity. To avoid damage from static electricity, do not unpack new circuit boards from anti-static bags until instructed to do so. Before unpacking the PCB, hold the anti-static bag with one hand and touch the printer's metal frame with the other hand for a few seconds to discharge static electricity.

STEP	PROCEDURE
1.	Switch the printer off and disconnect the AC Power Cord.
2.	Remove (2) screws holding the LH cover to the printer base. Fig.6-7 & 6-8
3.	Note cable connections locations, then disconnect all cables from the PCB board. Fig. 6-9
4.	Remove (3) screws and (1) standoff to remove PCB board from printer.
5.	Carefully remove the EPROM(s) from the defective PCB with a small flat blade screw driver and install in the same location(s) on the new PCB.
6.	Reinstall the PCB using screws and standoff previously removed.
7.	Reconnect all cables previously detached. The cable connectors are identified.
8.	Replace and secure the LH cover to the printer base with (2) screws previously removed.
9.	Reset printer to factory defaults.

6-4 Replacing the Main Circuit Board



REMOVE (2) SCREWS



* (3) SCREWS
TOTAL

6-5 Replacing the Power Supply

The XL-400/410 Power Supply is attached to the rear cover and the base frame. The Power Supply is a non-repairable component with no service parts and is replaced as a complete assembly.

STEP	PROCEDURE
1.	Switch the printer off and disconnect the AC Power Cord.
2.	Remove (2) screws holding the LH cover to the printer base and (4) screws holding the power supply cover. Fig.6-10 & 6-11
3.	Detach the main PCB by removing (3) screws and (1) standoff. Note the cable connections locations, then disconnect all cables from the PCB. Fig.6-12
4.	Remove (2) screws holding (3) grounding lugs. Fig.6-13
5.	Remove (1) screw holding the fuse holder bracket to printer case and (1) screw holding the power bracket to label rewind shaft. Fig.6-13
6.	Remove (4) screws holding the power supply bracket to the printer case. Detach connectors. Fig.6-13 Note: Do not remove the circuit board located on the power supply housing. Fig.6-14
7.	Lift the power supply from the printer. The fuse holder bracket will still be attached to the power supply. Fig.6-14
8.	Remove the black & white wire connections from the power supply.
9.	Install the new power supply, reinstall all mounting screws, cables and wire connections.
10.	Reinstall the main PCB.
11.	Replace LH cover and the power supply cover.
12.	Check the DC power voltages. Refer to Section 4-3.

6-5 Replacing the Power Supply

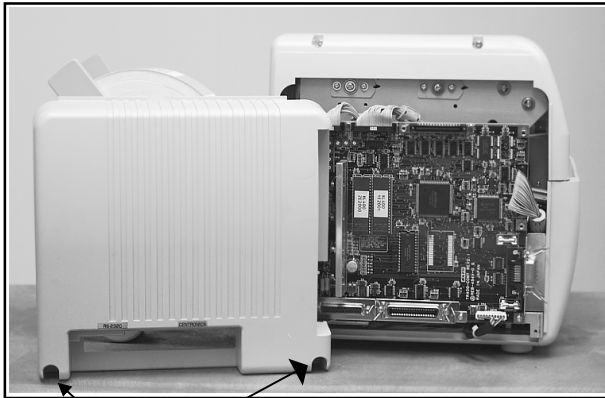


Fig. 6-10

(2) SCREWS

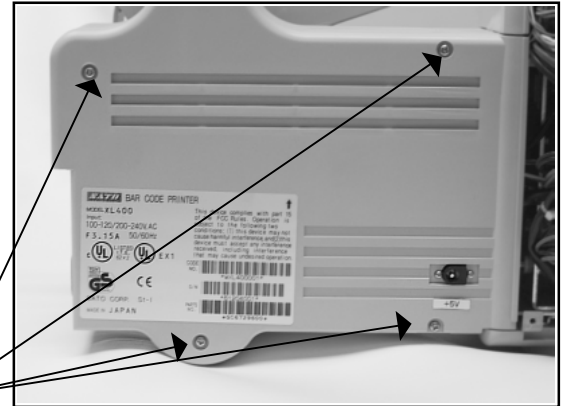


Fig. 6-11

(4) SCREWS

REMOVE COVER

* SCREW

REMOVE (1)
STANDOFF

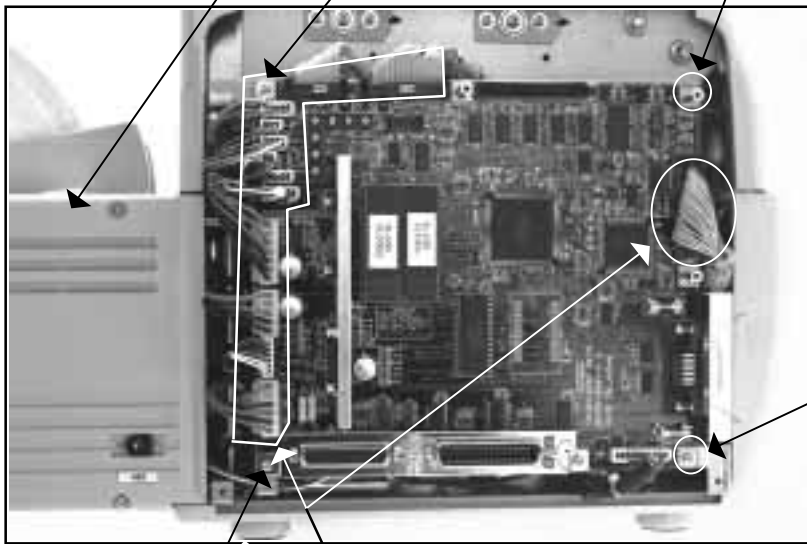


Fig. 6-12

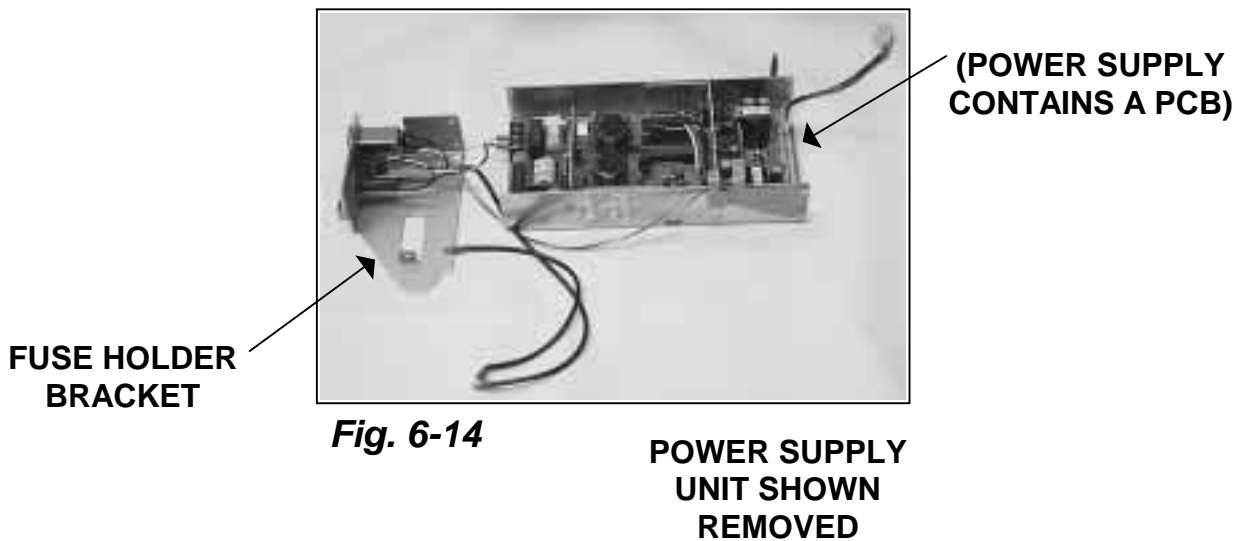
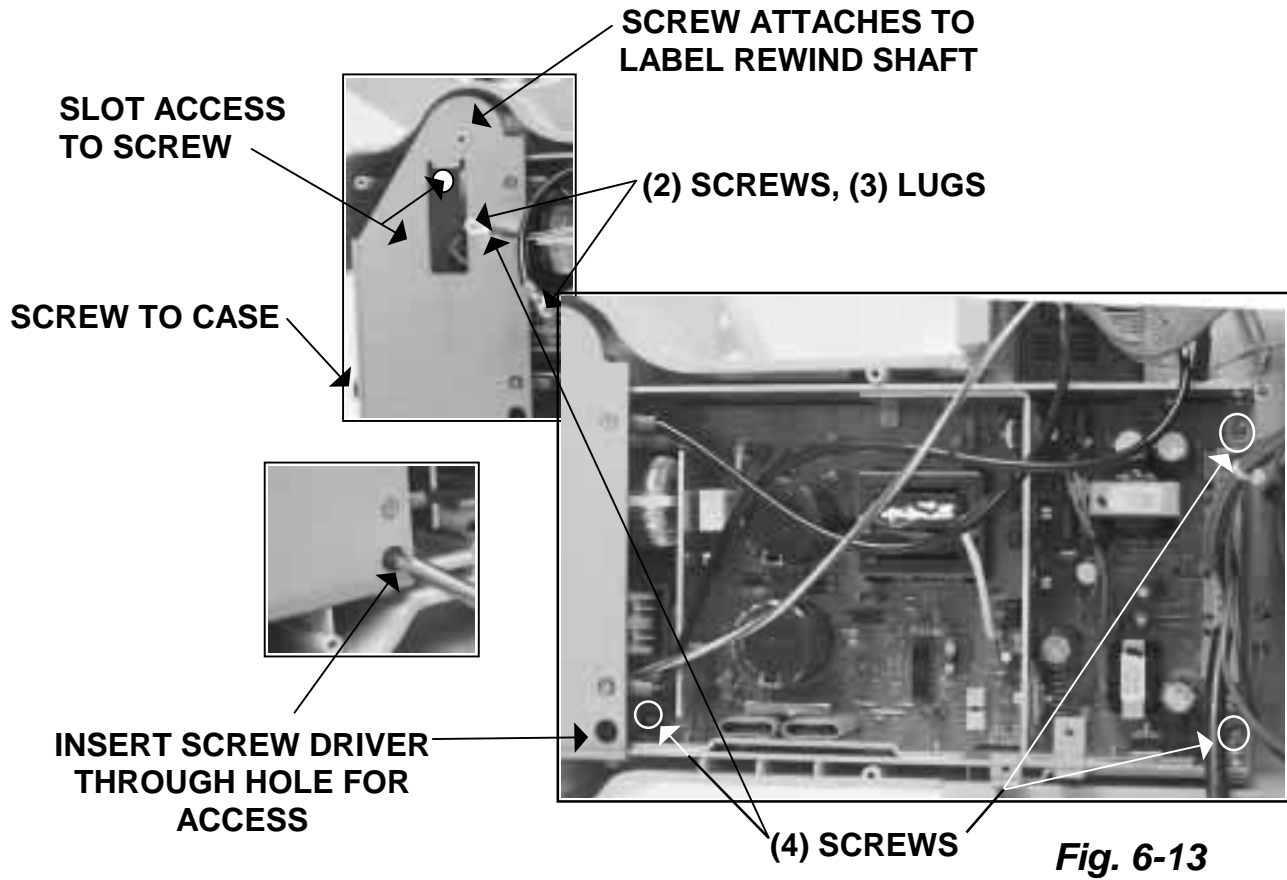
* SCREW

DISCONNECT
CABLES

* SCREW

* (3) SCREWS
TOTAL

6-5 Replacing the Power Supply



6-6 Replacing the Stepper Motor

The stepper motor is used to transmit motion to the print mechanism for precise print positioning. The stepper motor transmits torque to the label feed roller, the platen roller, the ribbon feed roller, and the ribbon rewind spindle via a series of toothed pulleys and three timing belts.

To remove and replace the stepper motor, perform the following steps:

STEP	PROCEDURE
1.	Switch the printer off and disconnect the AC Power Cord.
2.	Raise the top cover for access to mechanical section. Fig.6-15
3.	Remove (2) screws holding the LH cover to the printer base. Fig.6-16
4.	Detach the PCB by removing (3) screws and (1) standoff. Note cable connections locations, then disconnect all cables from the PCB. Fig.6-17
5.	Unscrew rod and remove from unit. Pull out cutter head. Fig.6-18
6.	Remove (2) screws on the underside of the printer base which attaches to the motor shield. Lift out the shield. Fig.6-19 & 6-20

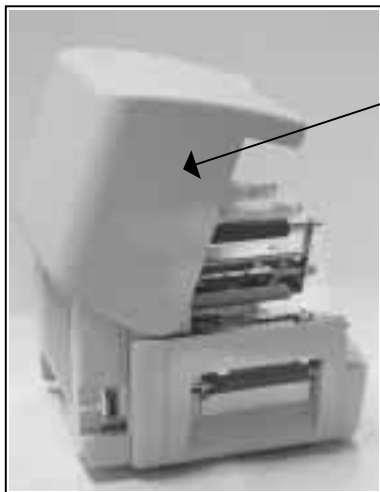
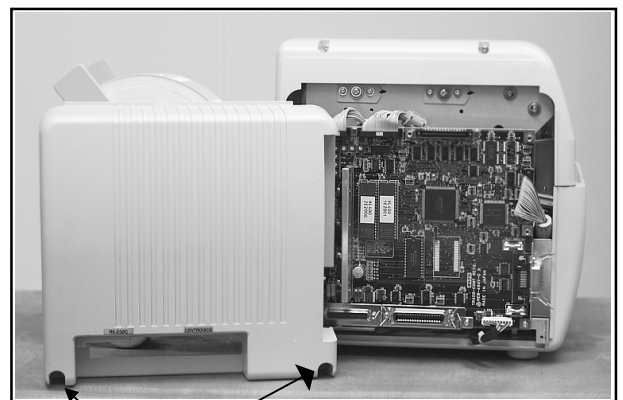


Fig. 6-15

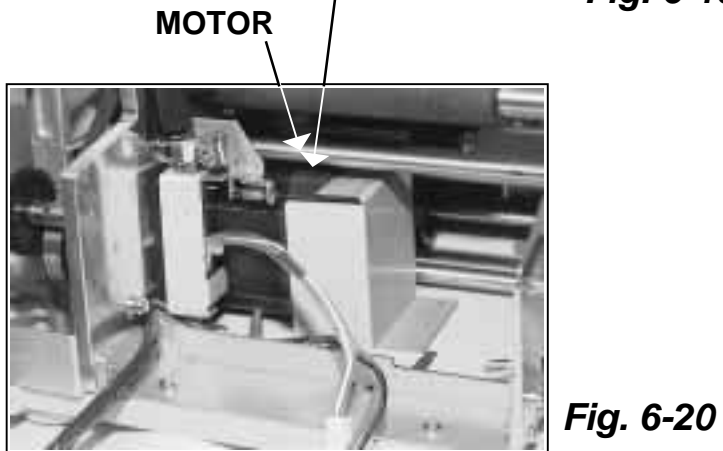
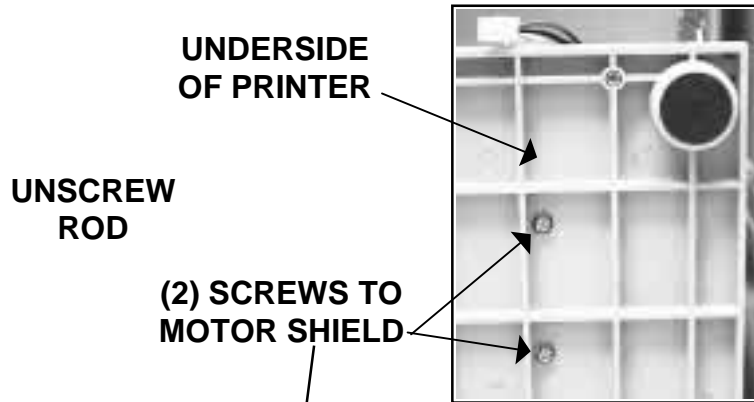
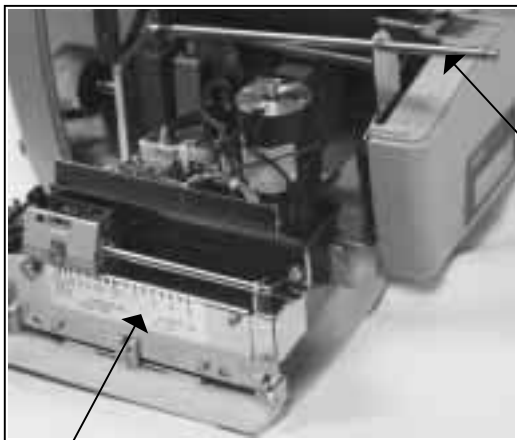
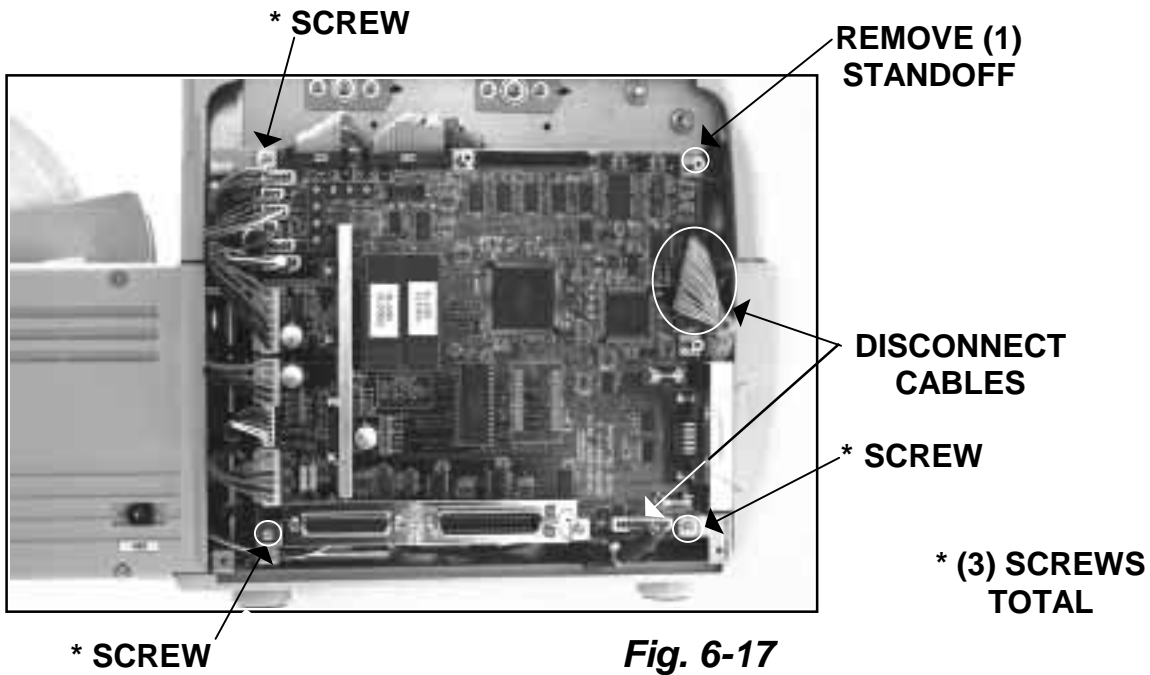
**ROTATE LEFT,
THEN SPREAD
SIDES TO
REMOVE**



(2) SCREWS

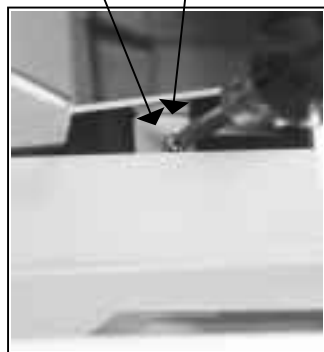
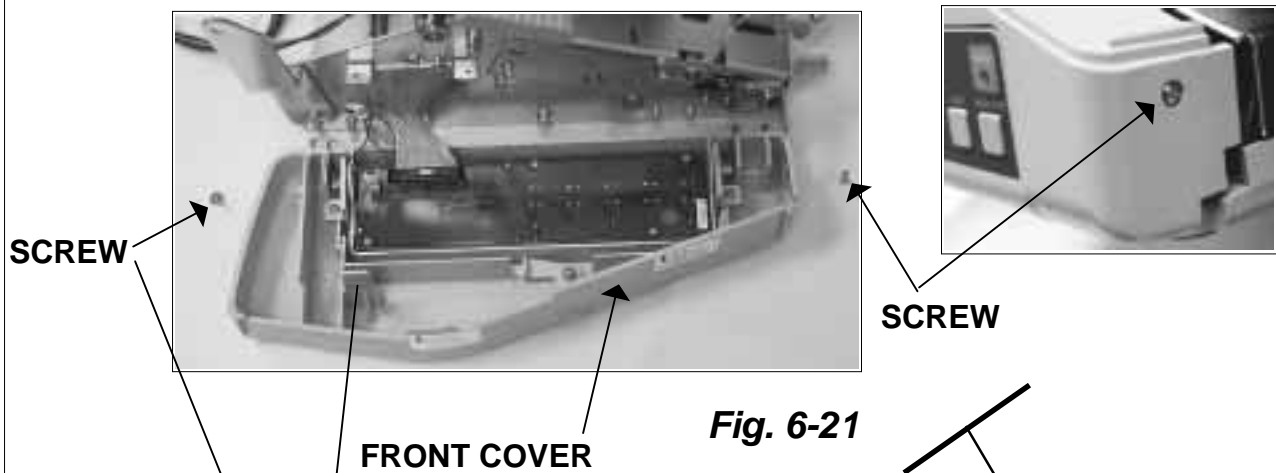
Fig. 6-16

6-6 Replacing the Stepper Motor

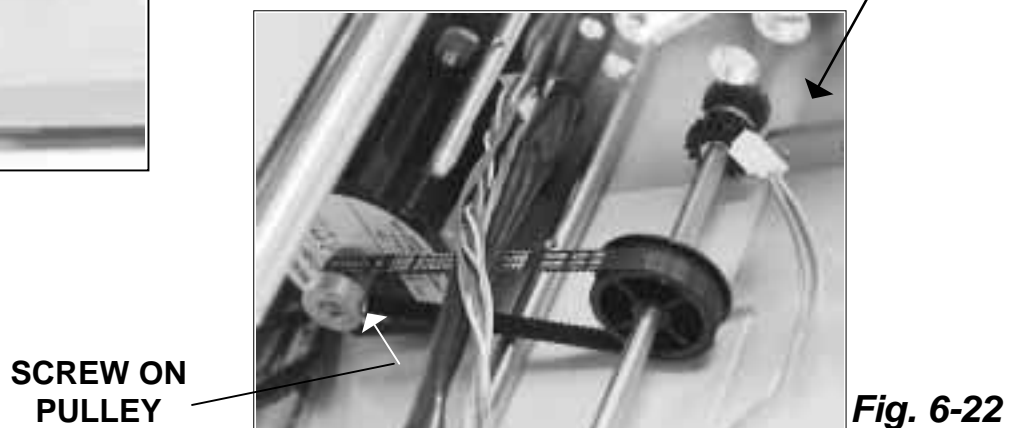


6-6 Replacing the Stepper Motor (Cont.)

STEP	PROCEDURE
7.	Remove (2) screws, one from each side to detach front cover. Fig.6-21
8.	<u>Remove the Label Ramp Assembly. Refer to Section 6-11, Steps 4 through 6, then continue here.</u>
9.	Lift up ramp (from Section 6-11) for access to motor. Fig.6-22
10.	Loosen screw and remove pulley from motor shaft.

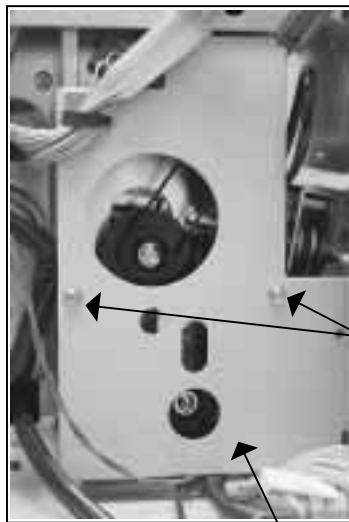


**REFER TO SECTION 6-11
FOR INTERMEDIATE STEPS,
THEN CONTINUE HERE**



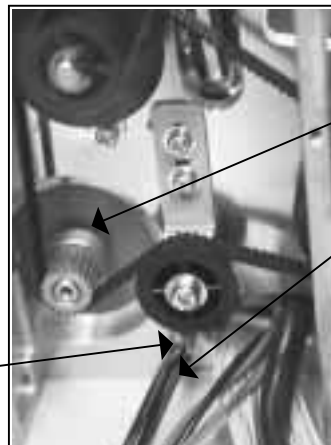
6-6 Replacing the Stepper Motor (Cont.)

STEP	PROCEDURE
11.	Remove (2) screws and detach motor plate. Fig.6-23
12.	Remove (2) motor mounting screws to free motor and disengage belt. Fig.6-24 & 6-25
13.	Remove (2) pulleys from motor shaft, (one from each end).
14.	Replace the motor and reattach (2) motor mounting screws.
15.	Replace pulleys removed in Step 13 .
16.	Engage and adjust timing belt removed in Step 12 as outlined in Section 5-8.
17.	Reattach motor plate removed in Step 11 .
18.	Reattach ramp removed in Step 8 .
19.	Reattach PCB removed in Step 4 and attach connectors.
20.	Replace cover removed in Step 3 and close top cover.

**Fig. 6-23**

MOTOR PLATE

(2) SCREWS

**Fig. 6-24**

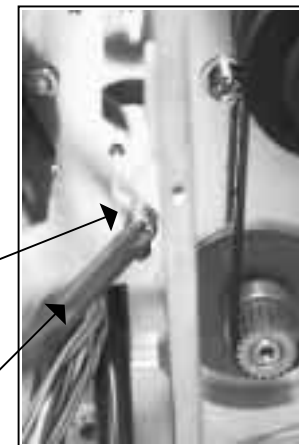
PULLEY

(SCREWDRIVER)

(1) SCREW

(1) SCREW

(SCREWDRIVER)

**Fig. 6-25**

6-7 Replacing the Timing Belts

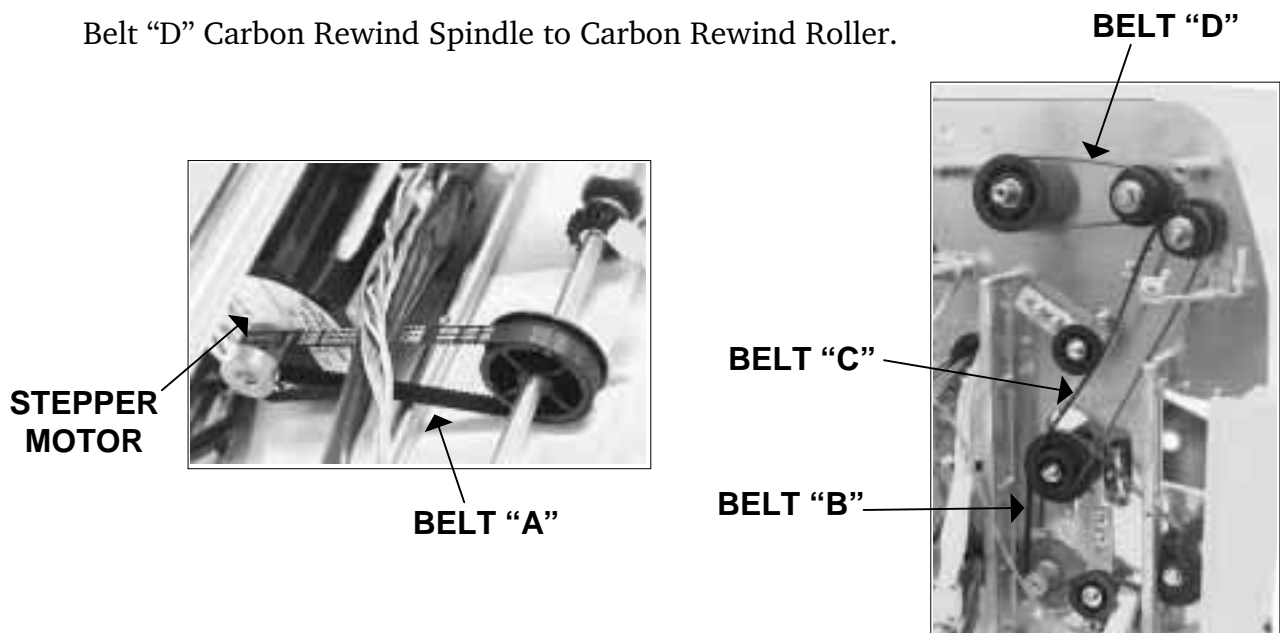
There are four timing belts in the XL4XX Printers:

Belt "A" Label Feed Roller Timing Belt is used to feed torque from the stepper motor to a set of toothed pulleys which is connected to the label feed mechanism.

Belt "B" Platen Pulley Timing Belt is used to transmit torque from the stepper motor to the platen pulley via a set of toothed pulleys.

Belt "C" Carbon Pulley Rewind Timing Belt is used to transmit torque from the platen pulley to the ribbon roller via another set of toothed pulleys.

Belt "D" Carbon Rewind Spindle to Carbon Rewind Roller.



6-7.1 REMOVING BELT "A" LABEL FEED ROLLER

STEP	PROCEDURE
1.	Switch the printer off and disconnect the AC Power Cord.
2.	Raise and remove the top cover. Fig.6-26
3.	Unscrew rod and remove from unit. Pull out cutter head. Fig.6-27
4.	Remove (2) screws on the underside of the printer base which attaches to the motor shield. Lift out the shield.
5.	Remove (2) screws, one from each side to detach front cover. Fig.6-28

6-7 Replacing the Timing Belts

6-7.1 REMOVING BELT "A" LABEL FEED ROLLER (CONT.)

STEP	PROCEDURE
6.	Remove the Label Ramp Assembly. Refer to Section 6.11, Steps 4 through 6, then continue here.
7.	Lift up ramp (from Section 6.6) for access to motor. Fig.6-29
8.	Loosen screw and remove pulley from motor shaft and label feed pulley.
9.	Slide a replacement belt "A" over pulleys and secure pulleys. Fig.6-29
10.	Refer to Section 5.8 to adjust timing belt.
11.	Reattach ramp removed in Step 6 .
12.	Reattach front cover removed in Step 5 .
13.	Replace motor shield removed in Step 4 .
14.	Replace cutter head removed in Step 3 .
15.	Reattach cover for mechanical section.

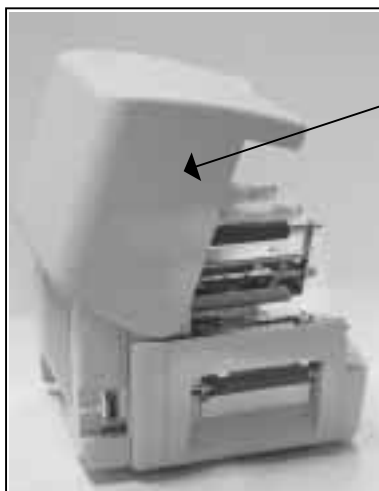


Fig. 6-26

**ROTATE LEFT,
THEN SPREAD
SIDES TO
REMOVE**

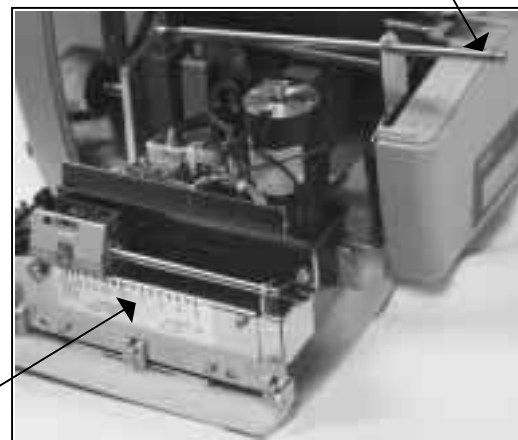


Fig. 6-27

6-7 Replacing the Timing Belts

6-7.1 REMOVING BELT "A" LABEL FEED ROLLER (CONT.)



Fig. 6-28

**REFER TO SECTION 6-11
FOR INTERMEDIATE STEPS,
THEN CONTINUE HERE**

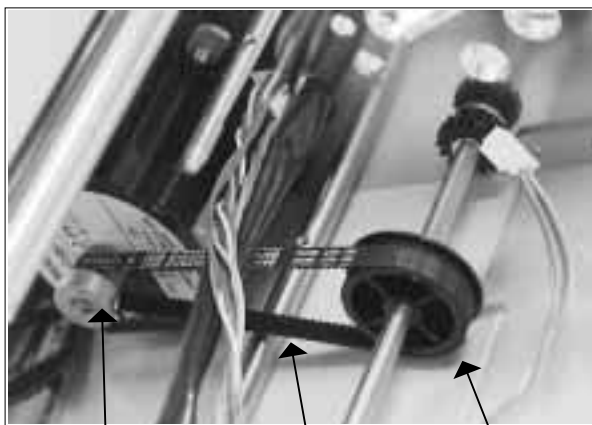
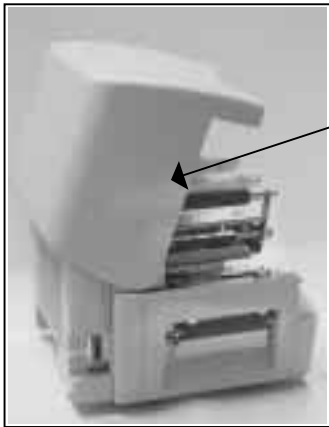


Fig. 6-29

6-7 Replacing the Timing Belts

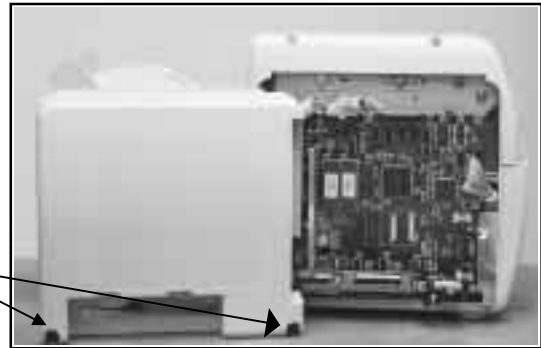
6-7.2 REMOVING AND REPLACING BELTS "B", "C" AND "D"

STEP	PROCEDURE
1.	Switch the printer off and disconnect the AC Power.
2.	Raise and remove the top cover. Fig.6-30
3.	Remove (2) screws holding the LH cover to the printer base. Fig.6-31
4.	Detach the PCB by removing (3) screws and (1) stand-off. Note cable connections locations, then disconnect all cables from the PCB. Fig.6-32



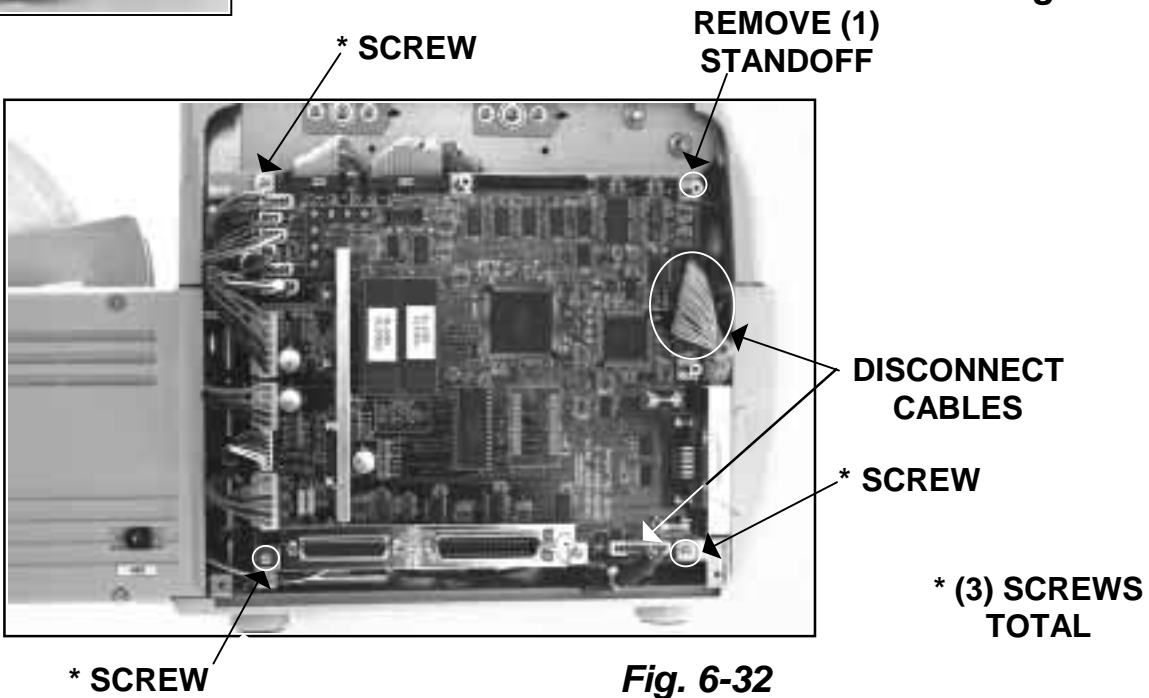
ROTATE LEFT,
THEN SPREAD
SIDES TO
REMOVE

Fig. 6-30



(2) SCREWS

Fig. 6-31



REMOVE (1)
STANDOFF

* SCREW

DISCONNECT
CABLES

* SCREW

* (3) SCREWS
TOTAL

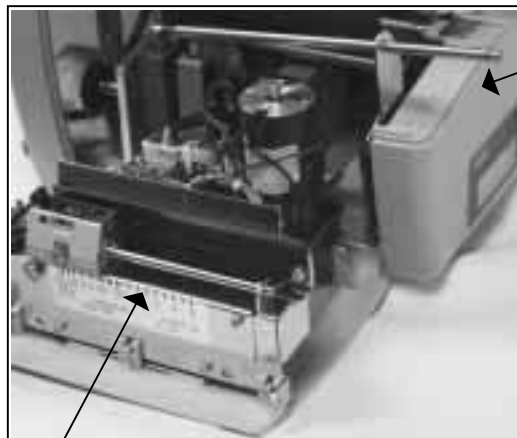
* SCREW

Fig. 6-32

6-7 Replacing the Timing Belts

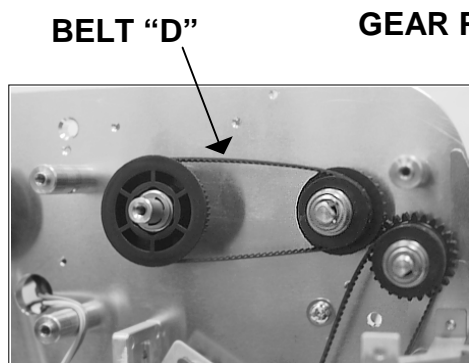
6-6.2 REMOVING AND REPLACING BELTS "B", "C" AND "D" (CONT.)

STEP	PROCEDURE
5.	Unscrew rod and remove from unit. Pull out cutter head. Fig 6-32A
6.	Remove (2) screws to detach top cover. Fig.6-33
7.	Remove (6) screws to detach gear plate. Fig.6-33
7a	<p>BELT "D" (Carbon Ribbon Rewind Spindle to Carbon Ribbon Rewind Roller). Fig 6-34</p> <ul style="list-style-type: none"> • Apply finger pressure on Ribbon Unwind Spindle shaft and remove belt from pulleys. • Slide a replacement belt over the gears. Refer to Section 5.8 to adjust belt. • Continue with STEP 8 to remove belts "B" and "C".



CUTTER HEAD

Fig. 6-32A



BELT "D"

GEAR PLATE

Fig. 6-34

UNSCREW
ROD

(2) SCREWS

(6) SCREWS

TOP COVER

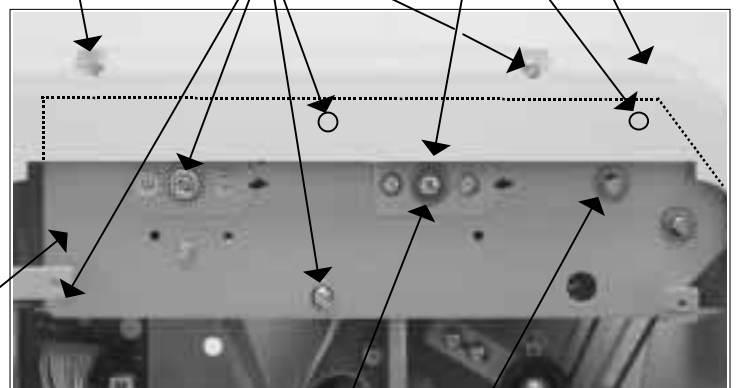


Fig. 6-33

CARBON RIBBON
REWIND SPINDLE
SHAFTCARBON RIBBON
REWIND ROLLER
SHAFT

6-7 Replacing the Timing Belts

6-7.2 REMOVING AND REPLACING BELTS "B", "C" AND "D" (CONT.)

STEP	PROCEDURE
8.	CONT. BELTS "B" AND "C". Fig.6-35 Loosen (2) idler bracket screws.
8a	BELT "C" (Carbon Ribbon Pulley Rewind)_ <ul style="list-style-type: none"> • Remove belt from pulleys. • Slide a replacement belt over the gears. • Adjust idler and tighten idler screws while referring to Section 6.5 for adjusting belt. • Continue with STEP 15 for Belt "C"
9.	CONT. BELT "B" (Platen Pulley) Remove (2) screws to detach bracket for "B" belt access. Fig.6-35
10.	Loosen (2) idler bracket screws.
11.	Remove "E"-Clip and remove gear.
12.	<ul style="list-style-type: none"> • Remove (2) screws from far side of bracket. • Remove belt "B" from pulleys. • Slide a replacement belt over the gears. Replace bracket removed in STEP 9.
13.	Replace gear and "E" clip removed in STEP 11 .
14.	Adjust idler and tighten idler screws removed in STEP 10 while referring to Section 5.8 for adjusting belt.

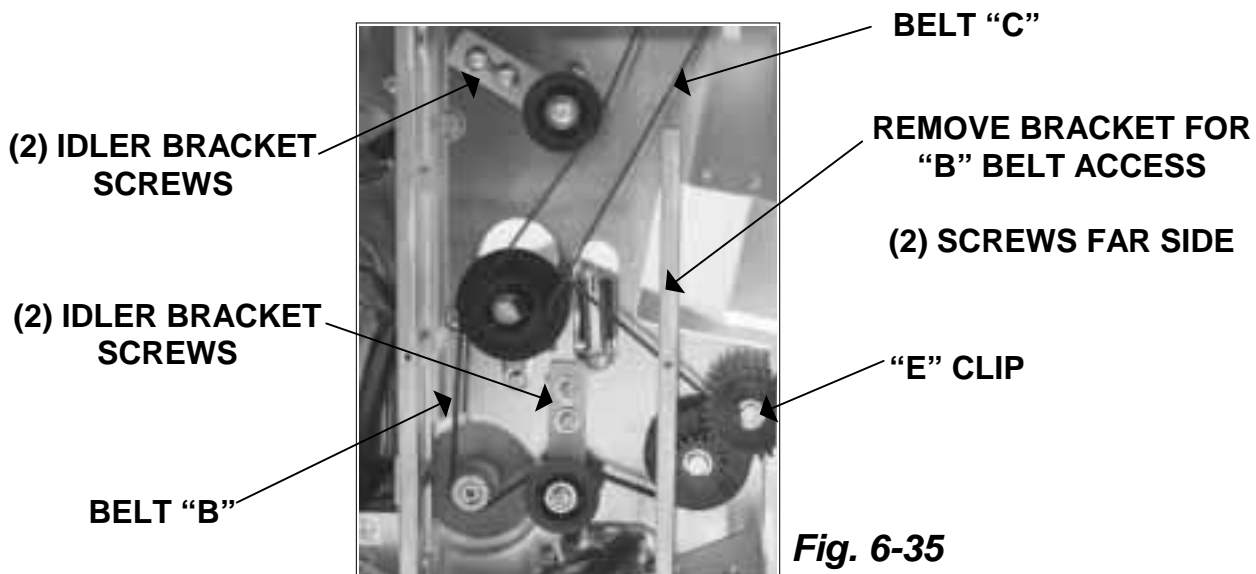


Fig. 6-35

6-7 Replacing the Timing Belts

6-7.2 REMOVING AND REPLACING BELTS "B", "C" AND "D" (CONT.)

STEP	PROCEDURE
15.	<u>CONT. BELT "C"</u> . Adjust idler and tighten idler screws removed in STEP 8 while referring to Section 6.5 for adjusting belt.
16.	Replace (6) screws to attach gear plate removed in STEP 7 .
17.	Replace (2) screws to attach top cover removed in STEP 6 .
18.	Replace rod and cutter head removed in STEP 5. Fig.6-32
19.	Attach the PCB removed in STEP 4 with (3) screws and (1) standoff. Replace cable connections.
20.	Replace (2) screws to attach the LH cover to the electronics section removed in STEP 3 .
21.	Reattach cover removed in STEP 2 .

6-8 Replacing the Platen

To replace the platen, you must first remove items that will allow access to timing belts "B" & "C" but it is not necessary to remove the belts.

STEP	PROCEDURE
1.	Switch the printer off and disconnect the AC Power Cord.
2.	Raise and detach cover for access to mechanical section. Fig.6-36
3.	Remove (2) screws to detach the LH cover from electronics section. Fig.6-37

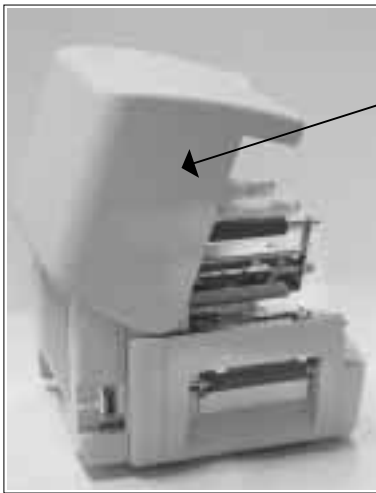


Fig. 6-36

**LIFT AND
DETACH COVER**

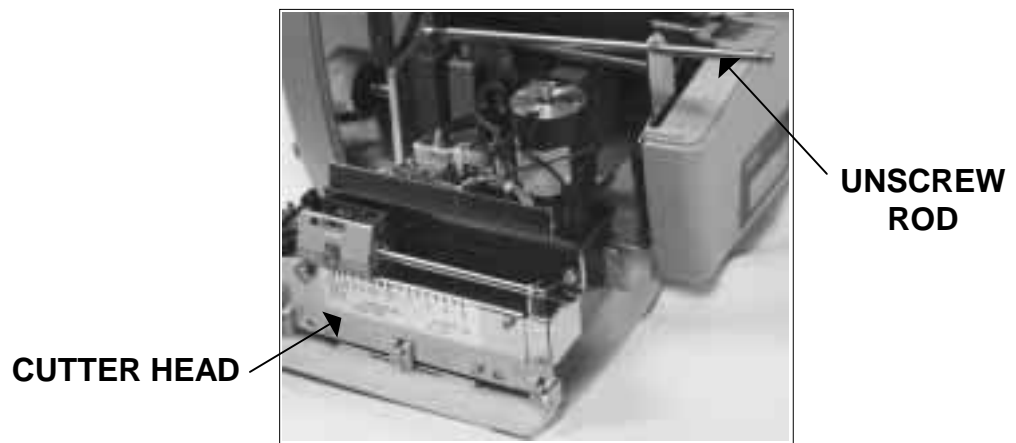
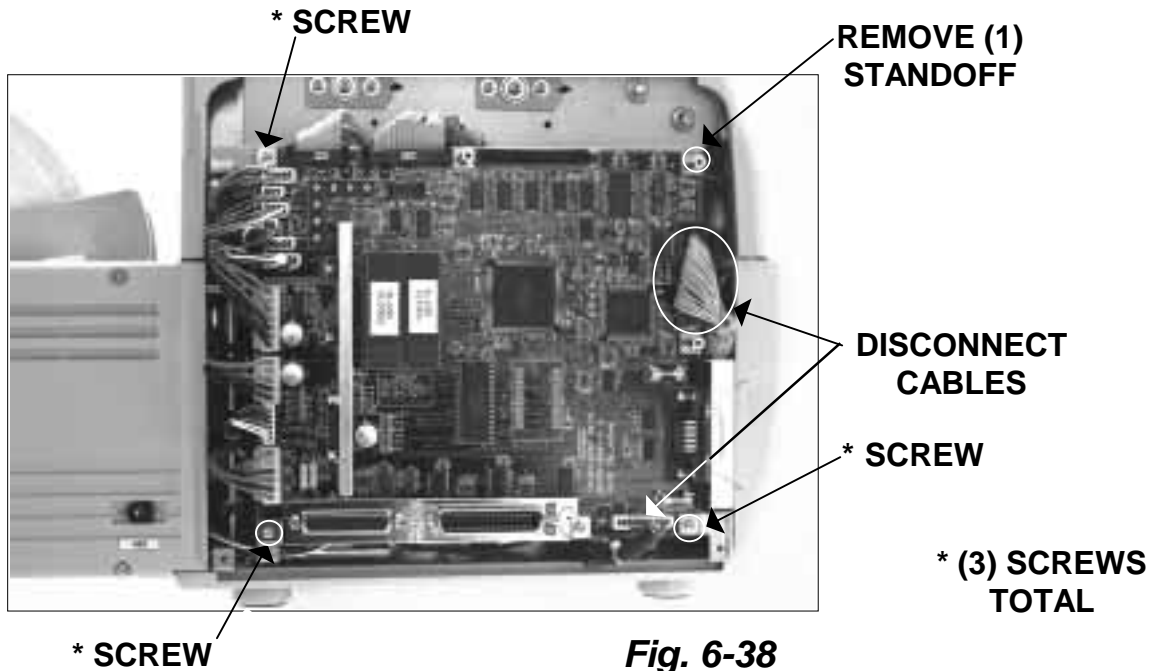


(2) SCREWS

Fig. 6-37

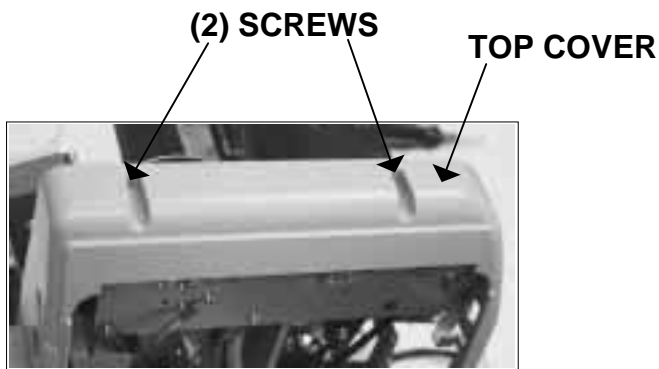
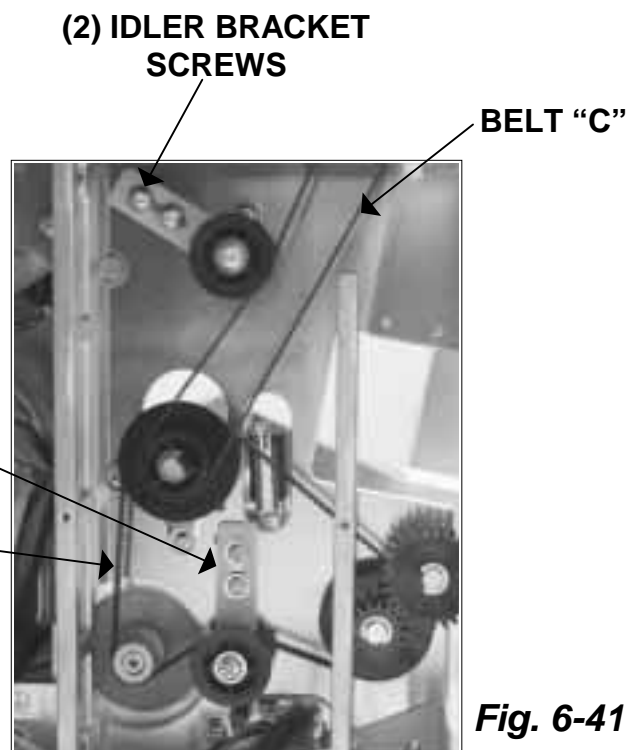
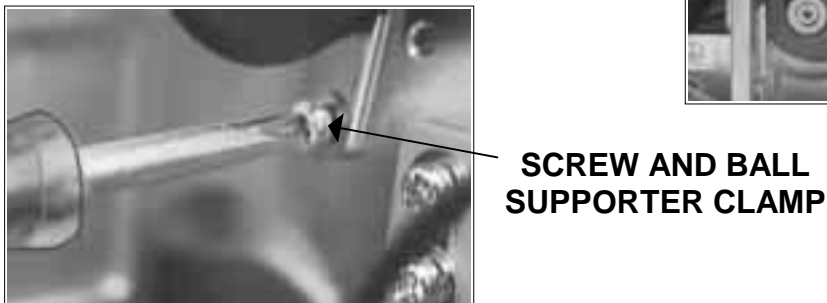
6-8 Replacing the Platen

STEP	PROCEDURE
4.	Detach the PCB board by removing (3) screws and (1) standoff. Note cable connections locations, then disconnect all cables from the PCB. Fig.6-38
5.	Unscrew rod and remove from unit. Pull out cutter head. Fig.6-39



6-8 Replacing the Platen

STEP	PROCEDURE
6.	Remove (2) screws to remove top cover. Fig.6-40
7.	Loosen (2) idler bracket screws @ (2) places. Fig.6-41
8.	Remove screw holding the ball supporter clamp and platen components to the side frame. Fig.6-42

**Fig. 6-40****Fig. 6-41****Fig. 6-42**

6-8 Replacing the Platen

STEP	PROCEDURE
9.	Displace platen by tilting up and forward from the hole in the frame and releasing from ball supporter on opposite end of shaft. Separate the platen and components for replacing. Fig.6-43
10.	Install replacement platen. Platen ball supporters (both ends of shaft), must be seated in the recesses of both ball supporter clamps before tightening clamp screw. Fig.6-44 & 6-45

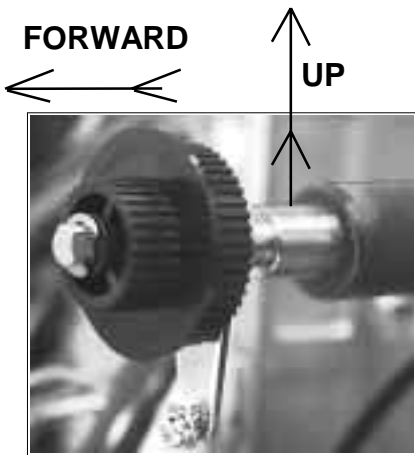


Fig. 6-43

TILT PLATEN UP
AND FORWARD TO
DISPLACE

BALL SUPPORTERS MUST
BE SEATED IN RECESS

BALL
SUPPORTER
CLAMP

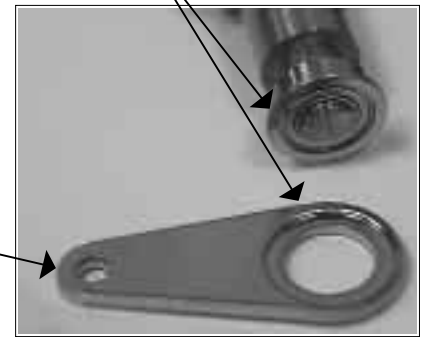
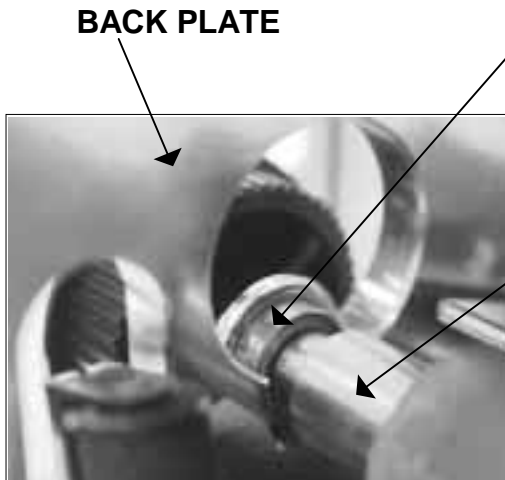


Fig. 6-44



BALL SUPPORTERS
LOCATED AT BOTH
ENDS OF SHAFT

PLATEN

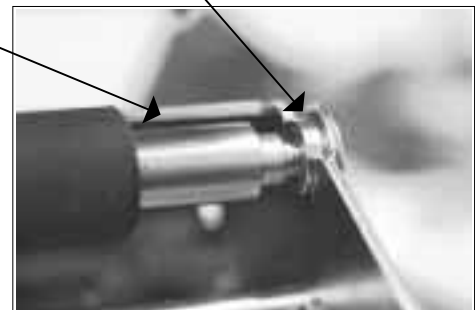


Fig. 6-45

6-8 Replacing the Platen

STEP	PROCEDURE
11.	Replace screw and ball supporter clamp removed in STEP 8 .
12.	Replace belts. Adjust idler and tighten idler screws loosened in STEP 7 while referring to Section 5.8 for adjusting belts.
13.	Replace (2) screws to attach top cover removed in STEP 6 .
14.	Replace rod and cutter head removed in STEP 5 .
15.	Attach the PCB removed in STEP 4 with (3) screws and (1) standoff. Replace cable connections.
16.	Replace (2) screws to attach the LH cover to the electronics section removed in STEP 3 .
17.	Reattach cover removed in STEP 2 .

6-9 Replacing the Ribbon Drive Clutch Washers

Both the ribbon unwind and the rewind drive spindles incorporate a friction clutch assembly to control tension. The friction washers within these clutch assemblies are replaceable. The procedure is identical for both the off-wind and the on-wind clutch assemblies.

To remove the Ribbon Drive Clutch Washers, perform the following steps:

STEP	PROCEDURE
1.	Switch the printer off and disconnect the AC Power Cord.
2.	Raise and detach cover for access to mechanical section. Fig.6-46
3.	Remove the following parts from two spindle shafts (in order): Fig.6-47

ITEM NO.	DESCRIPTION	QTY EA ASSY
1.	Screw	(1)
2.	Adjustment Nut	(1)
3.	Stopper Collar	(1)
4.	Spring	(1)
5.	Disc	(1)
6.	Oil-less Dry Metal Washer	(1)
7.	Collar	(1)
8.	Ribbon Boss	(1)
9A & 9B	Disc Plate (each different)	(1)
10.	Friction Washer	(1)
11.	Hold Plate	(1)

NOTE: Disassemble one spindle at a time so that the other can be used for reference.

6-9 Replacing the Ribbon Drive Clutch Washers

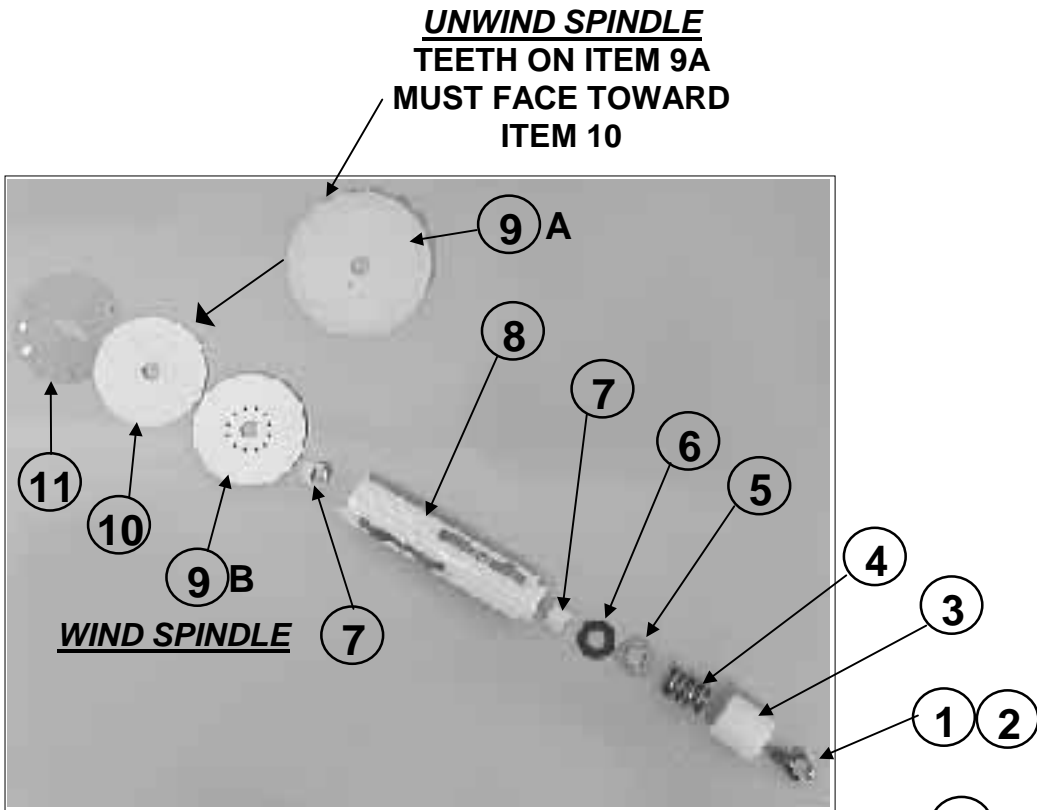


Fig. 6-47

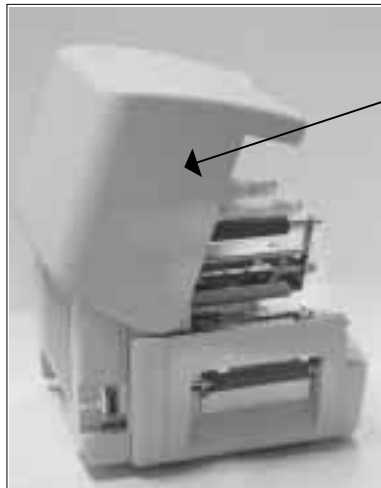


Fig. 6-46

**LIFT AND
REMOVE COVER**

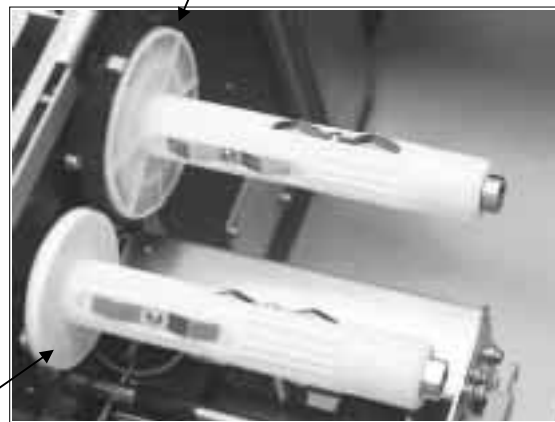


Fig. 6-48

**COMPONENTS ARE
SHOWN ASSEMBLED**

6-9 Replacing the Ribbon Drive Clutch Washers

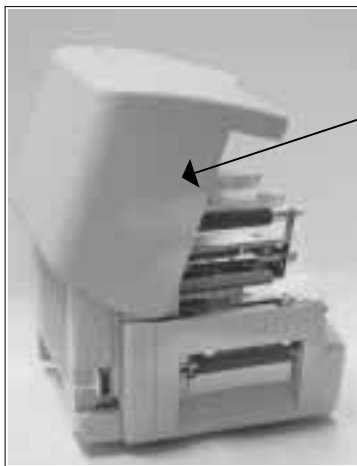
Refer to **Fig.6-47 & 6-48.**

STEP	PROCEDURE
1.	To each spindle install Item 11 Plate with teeth facing outward and align the plate with the peg on the Ribbon Shaft Flange.
2.	Install Item 10 Felt Friction Washer onto the Ribbon Shaft and slide it against Item 11 Plate.
3.	Install (1) ea. Item 9A& 9B Wind and Unwind Disc Plates onto Item 8 Ribbon Bosses. Align the hole in the Disc Plates over the pegs on Item 8. The teeth/slots on the unwind disc plate must be facing away from the Ribbon Boss. Install this assembly onto the Ribbon Shaft and slide it against the felt friction washer.
4.	Install Item 6 Oil-less Dry Metal Washer onto the ribbon shaft with the copper side facing inward (the black carbon side will face outward). Align Item 6 Washer with the peg on #8 Ribbon Boss.
5.	Install Item 5 Disc onto the ribbon shaft with the smooth side facing Item 6 Washer, (one side of the disc is smooth and the other side has sharp edges).
6.	Install Item 4 Spring onto the ribbon shaft.
7.	Install Item 3 Stopper Collar onto the ribbon shaft.
8.	Screw the Item 2 Adjustment Nut clockwise into the end of the ribbon shaft. Turn until proper tension is reached.
9.	Replace #1 Screw and tighten.
10.	Reattach cover for mechanical section.

NOTE: Do not over-tighten the adjustment nut since this screw is used to adjust the clutch tension. Adjust the clutch tension as outlined in Section 5-2.

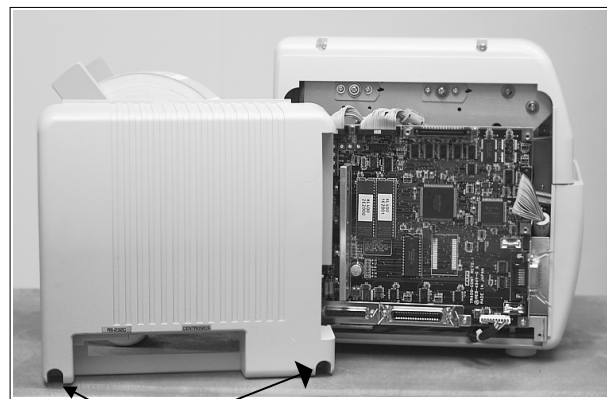
6-10 Replacing the Ribbon Motion Sensor

STEP	PROCEDURE
1.	Switch the printer off.
2.	Raise and detach cover for access to mechanical section. Fig.6-49
3.	Remove (2) screws to detach the LH cover from electronics section. Fig. 6-50
4.	Remove (2) screws to remove top cover. Fig.6-51
5.	Remove Ribbon Unwind Spindle components down to Hold Plate Item 11 to allow access to the sensor connector which is routed to the PCB. Fig.6-47, 6-52 & 6-53.
6.	Remove sensor mounting screw. Fig.6-53
7.	Unplug the SEN3 connector from the PCB and pull through the frame hole. Fig.6-54
8.	Remove (1) screw holding sensor to the mounting bracket. Fig.6-55
9.	Replace sensor and mount to bracket. Feed sensor connector through the frame hole and secure bracket to the frame.
10.	Remount the Ribbon Unwind Spindle Assembly components removed in STEP 5 following the procedure in Section 6.8.
11.	Reattach covers removed in STEPS 3 & 2.



LIFT AND
REMOVE COVER

Fig. 6-49



(2) SCREWS

Fig. 6-50

6-10 Replacing the Ribbon Motion Sensor

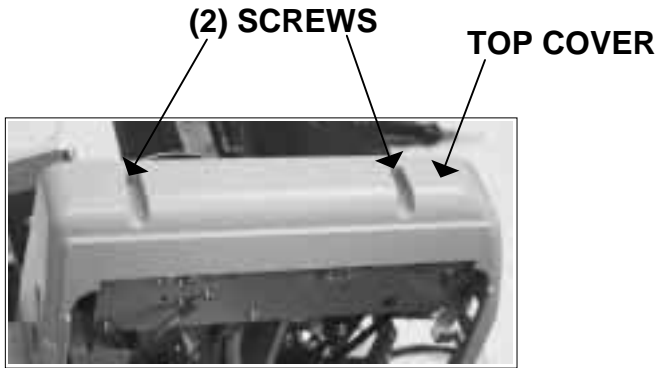


Fig. 6-51

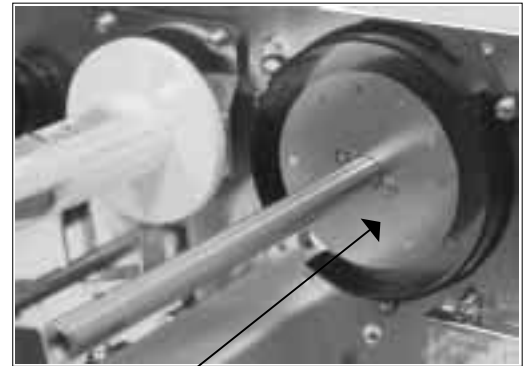


Fig. 6-52

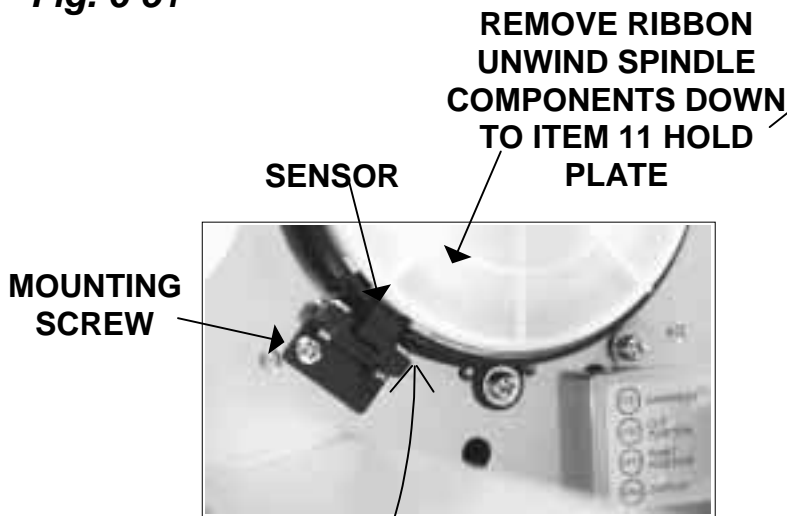


Fig. 6-53

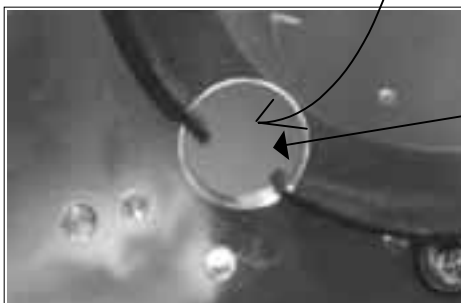


Fig. 6-54

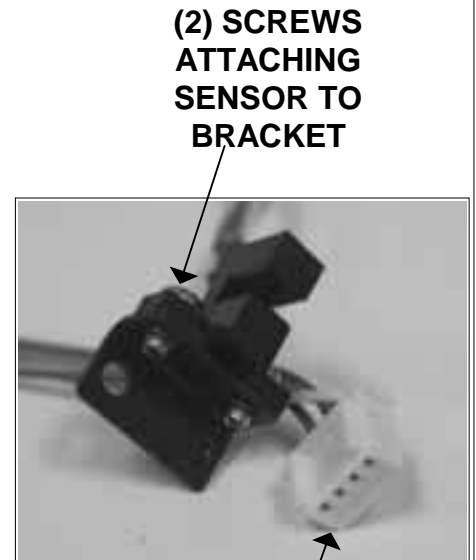


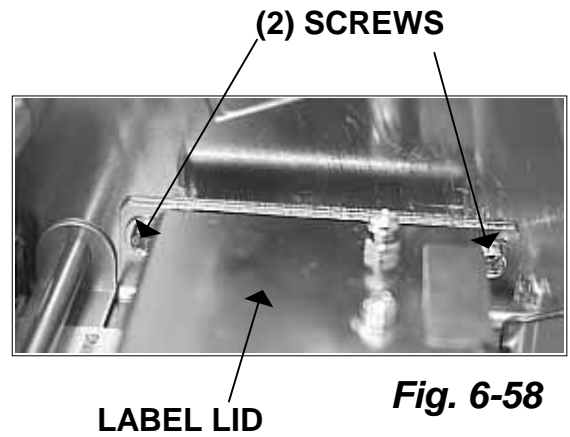
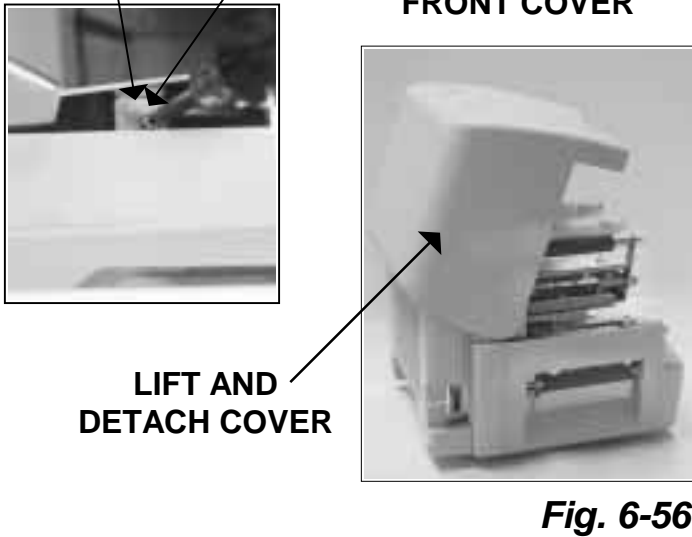
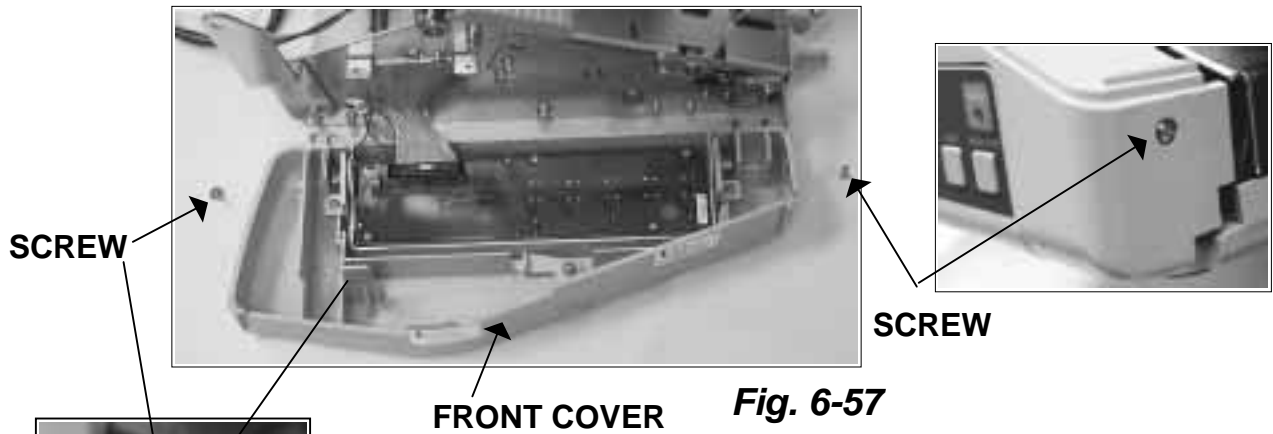
Fig. 6-55

OTHER SENSORS:
TO REMOVE OTHER SENSORS, FIRST REMOVE THE LABEL RAMP ASSEMBLY IN STEP 6-11 FOR ACCESS TO SENSOR MODULES.

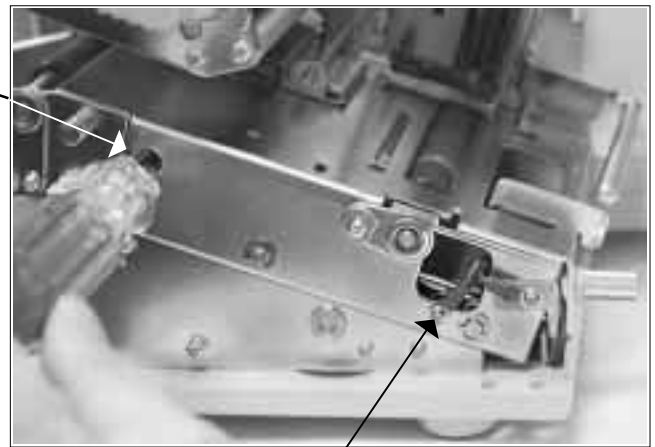
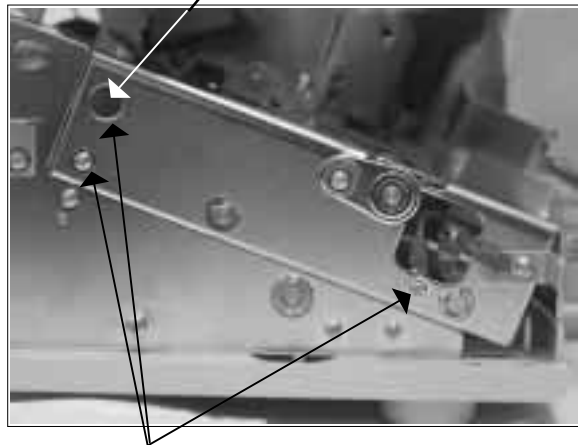
6-11 Replacing the Label Ramp Assembly and Roller

STEP	PROCEDURE
1.	Switch the printer off.
2.	Raise and detach cover for access to mechanical section. Fig 6-56
3.	Remove (2) screws, one from each side to detach Front Cover. Fig. 6-57
4.	Remove (2) screws to detach Label Lid. Fig. 6-58
5.	Insert screwdriver through access hole in label ramp to remove screw on far side. Remove (2) additional screws, holding ramp to frame. (One screw is attached to grounding strap.) Fig. 6-59 & 6-60
6.	Lift up ramp for access to stepper motor, label feed roller, and sensors. Fig. 6-61
	To remove Label Feed Roller: Continue from here.
7.	Remove screw from eccentric nut and support bearing.
8.	Move/disconnect second green grounding wire if necessary.
9.	Pull label feed roller free from unit through hole. Fig 6-62
10.	Replace roller and seat back in bearing.
11.	Replace ramp and screws removed in STEPS 5 & 6.
12.	Reattach label lid removed in STEP 4.
13.	Reattach front cover removed in STEP 3.
14.	Reattach cover for mechanical section.

6-11 Replacing the Label Ramp Assembly and Roller



INSERT SCREWDRIVER THROUGH ACCESS HOLE TO UNFASTEN SCREW ON FAR SIDE



6-11 Replacing the Label Ramp Assembly and Roller

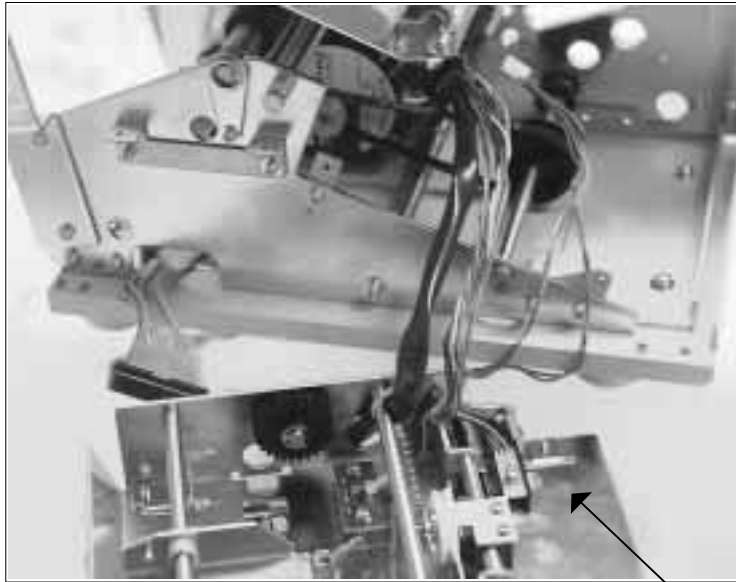


Fig. 6-61

**UNDERSIDE OF LABEL RAMP
WITH CONNECTIONS**

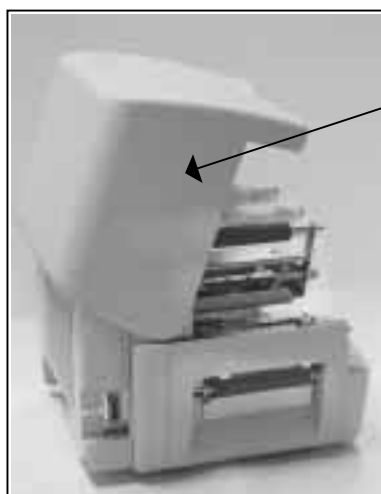
**PULL LABEL FEED ROLLER FREE
FROM UNIT THROUGH HOLE**



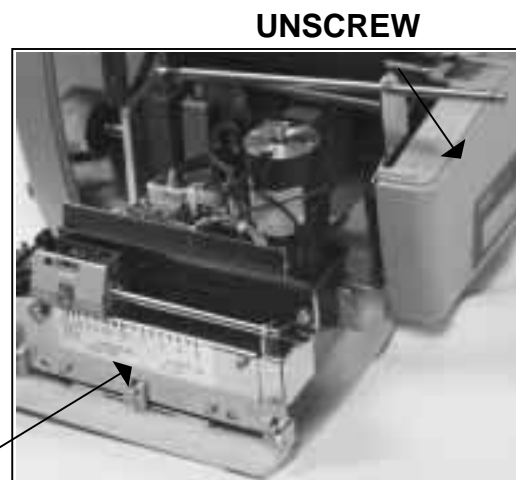
Fig. 6-62

6-12 Replacing the Batch Marker/Ink Roller

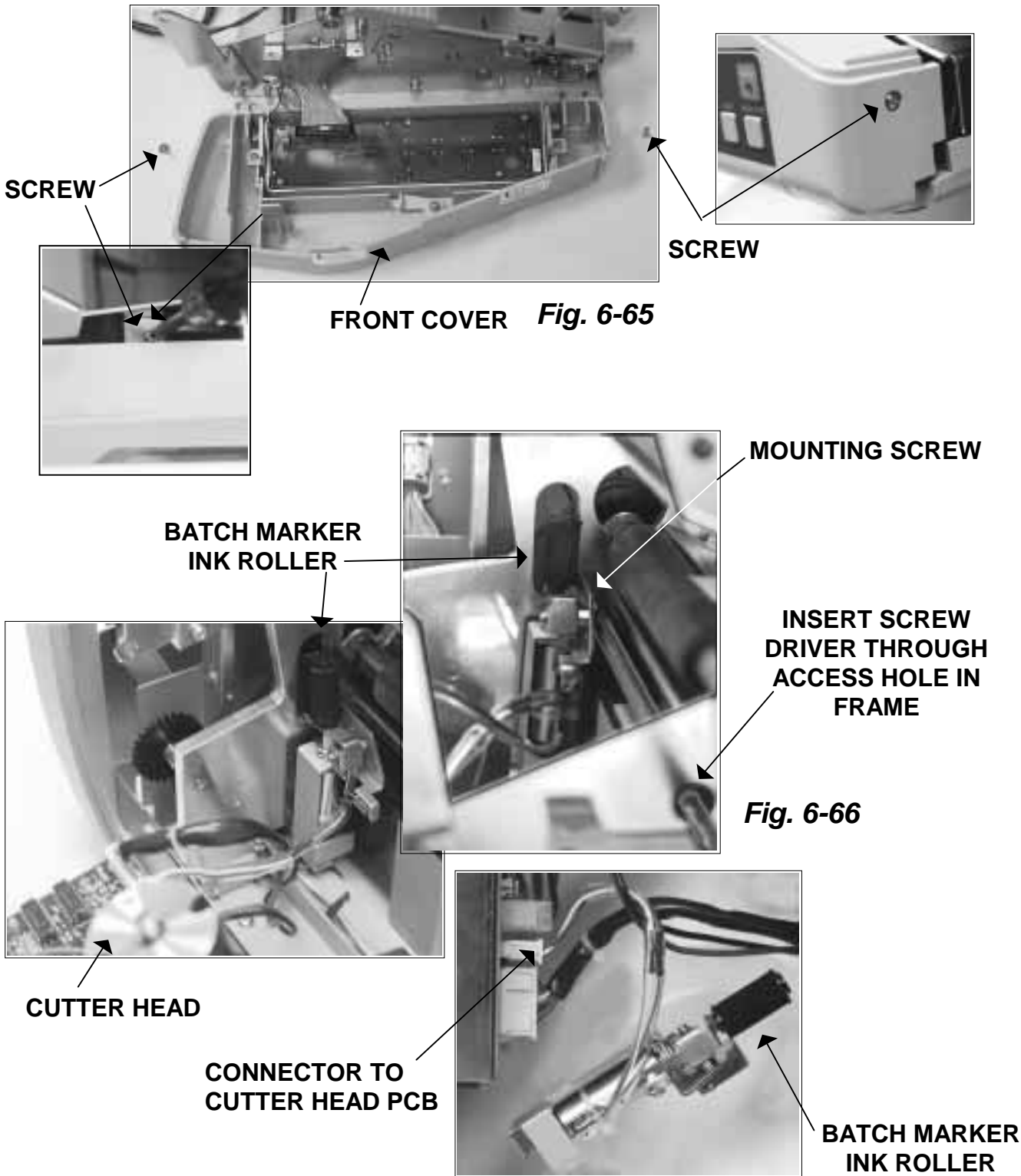
STEP	PROCEDURE
1.	Switch the printer off.
2.	Raise and detach lid for access to mechanical section. Fig 6-63
3.	Unscrew and remove the rod securing the cutter head. Lift the cutter head up and forward to detach. Fig 6-64
4.	Remove (2) screws to detach front cover. Fig 6-65
5.	Insert screwdriver through access hole and unscrew the Batch Marker/Ink Roller from the frame. Fig 6-66
6.	Detach connector from the Cutter Head PCB. Fig 6-66
7.	Replace and reattach the Batch Marker/Ink Roller.
8.	Reattach the front cover removed in STEP 4 .
9.	Replace the rod and the cutter head removed in STEP 3 .
10.	Replace the lid removed in STEP 2 .

**Fig. 6-63**LIFT AND
DETACH LID

CUTTER HEAD

**Fig. 6-64**

6-12 Replacing the Batch Marker/Ink Roller



6-13 Sensors - Other

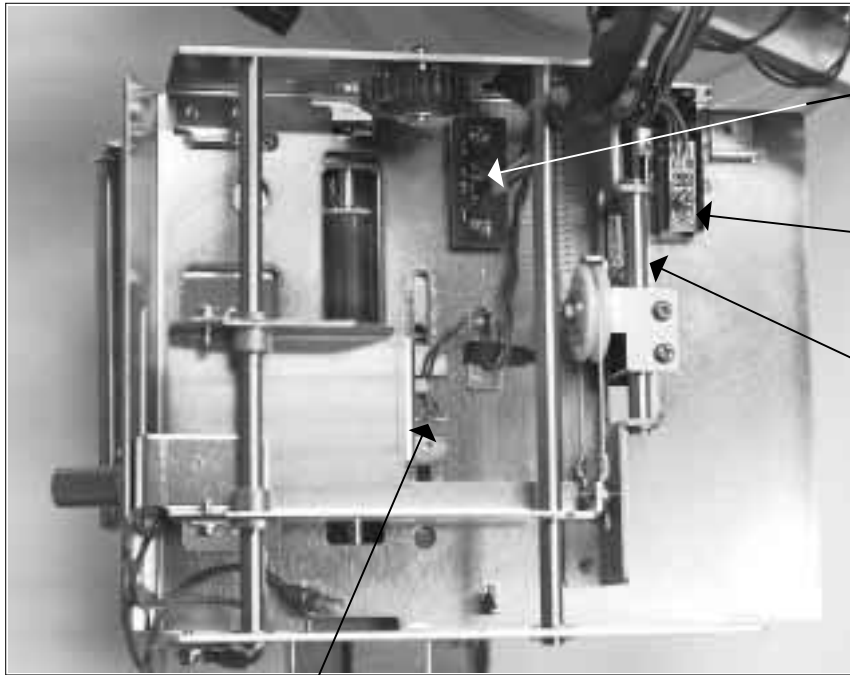
Other sensors that are replaceable.

STEP	PROCEDURE
1.	(A) SIDE HOLE TAG SENSOR (Bottom half of sensor, receiving) (B) CENTER HOLE AND GAP SENSOR (C) "I-Mark" SENSOR (D) "R" MARK SENSOR (Bottom half of sensor)
2.	Refer to Section 6-11 to detach the Label Ramp Assembly.
3.	Turn the Label Ramp Assembly over to expose the sensor modules. Fig. 6-67
4.	Remove sensor(s) from mounting.
5.	Remove connector(s) from main logic board
6.	Install new sensor(s).
7.	Reinstall Label Ramp Assembly removed in Step 2.

The Label Lid contains portions of the above sensors. To replace modules perform the following steps:

1. Remove (2) screws to detach Label Lid from printer. **Fig. 6-68**
2. Carefully remove (2) screws from Label Lid cover which is attached to the sensor module section. Open lid and remove sensor panel. **Fig. 6-69**
3. Remove connector(s) from main logic board
4. Install new sensor panel.
5. Reinstall Label Lid removed in Step 1.
6. Reattach cover for mechanical section.

6-13 Sensors - Other



"R" CORNER
RECEIVING SENSOR (D)

"I-MARK" SENSORS (C)

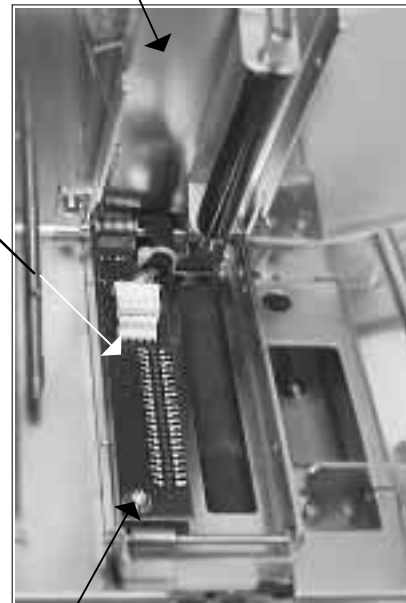
CENTER HOLE AND
GAP SENSORS (B)

Fig. 6-67

SIDE HOLE TAG
RECEIVING SENSOR
(BOTTOM 1/2)

(A)
SENSOR PANEL CONTAINS
(TOP 1/2) OF SIDE HOLE TAG
SENSOR AND "R" CORNER
SENSOR PANEL

LABEL LID COVER



(2) SCREWS

Fig. 6-69

(2) SCREWS

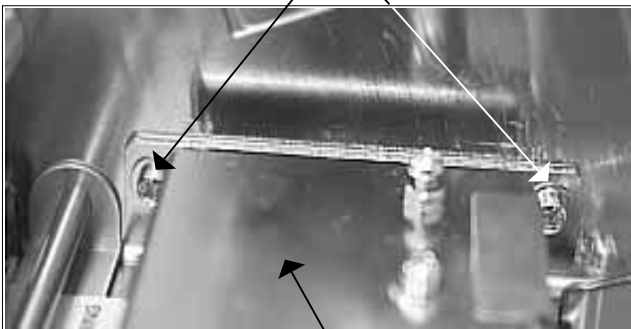


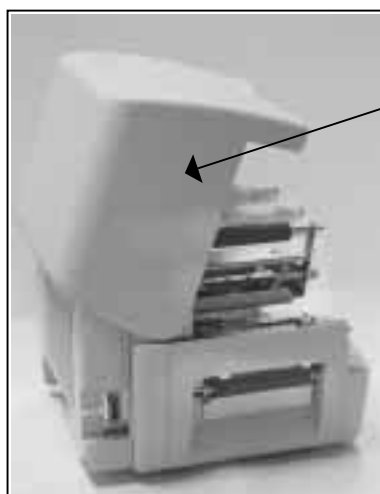
Fig. 68

LABEL LID UNIT

6-14 Replacing the Display Panel PCB

To remove and replace the Display Panel PCB, perform the following steps:

STEP	PROCEDURE
1.	Switch the printer off (position 0).
2.	Raise and detach cover for access to the mechanical section. Fig. 6-70
3.	Remove (2) screws, one from each side and lift cover to detach.
4.	Disconnect cables from the display panel PCB. Fig. 6-71
5.	Remove (4) screws and remove the Display Panel PCB. Fig. 6-72 & 6-73
6.	Replace the display panel PCB and secure with (4) screws. Reconnect cable connectors.
7.	Reattach panel to printer removed in Step 3.
8.	Reattach cover removed in Step 2.



**LIFT AND
REMOVE COVER**

Fig. 6-70

6-14 Replacing the Display Panel PCB

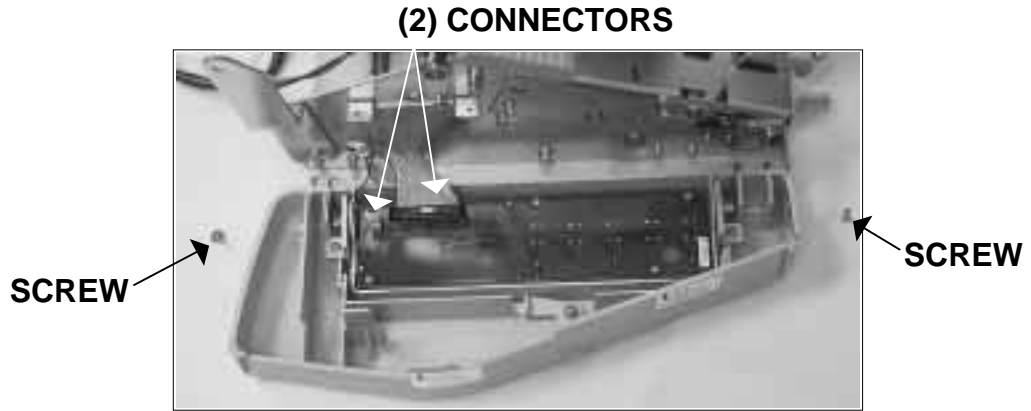


Fig. 6-71

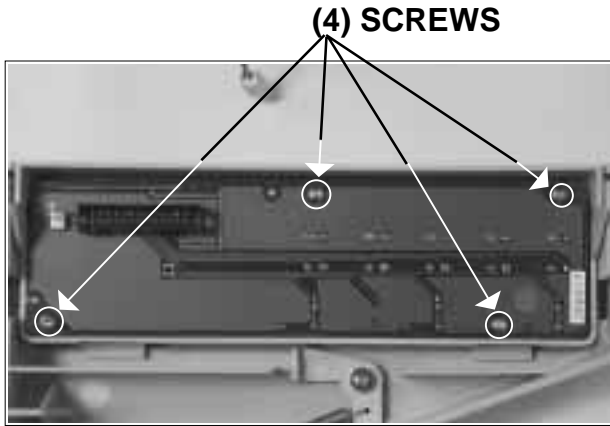


Fig. 6-72

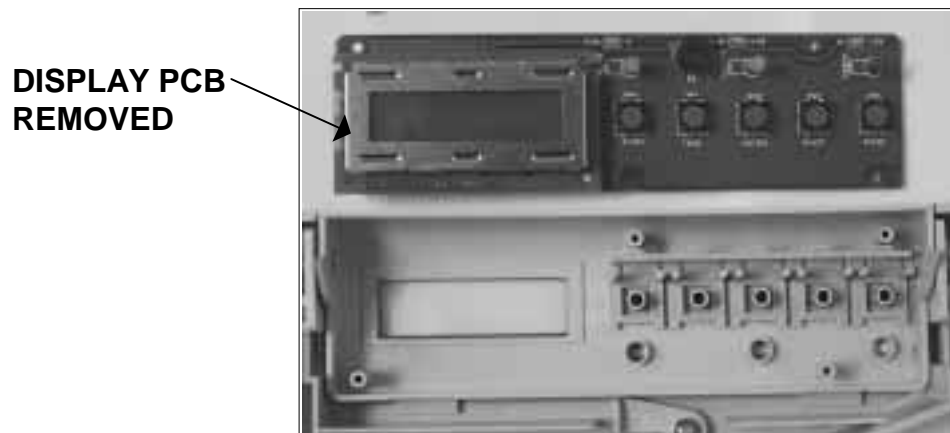


Fig. 6-73

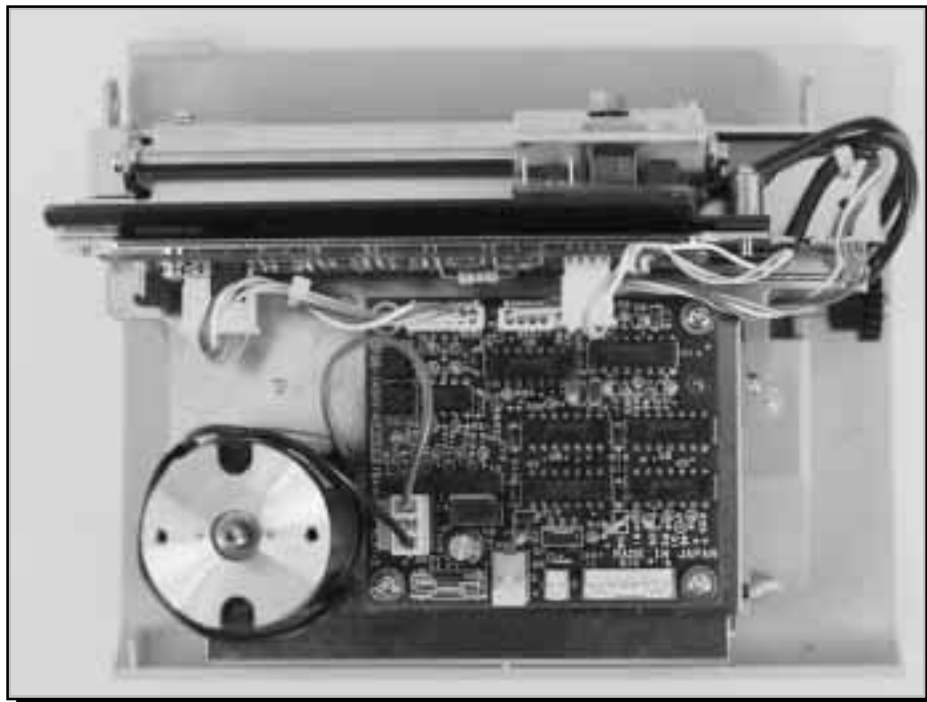
Section 7

Cutter Replacement Procedures

7-1 Overview

The Cutter Unit has the following replaceable components :

- “Pizza” Blade Assembly
- Motor Drive Belt
- Three PCBoards



7-2 Cutter Unit - Replacing "Pizza" Blade Assy

To remove and replace the "Pizza" Blade Assy, perform the following steps:

STEP	PROCEDURE
1.	Switch the printer OFF and disconnect the AC Power Cord.
2.	Raise and remove the top cover. Fig. 7-1
3.	Unscrew rod and remove from the unit. Lift out cutter head and carefully disconnect cables routed to the main PCB and motor. Fig. 7-2
4.	Loosen (5) screws holding the cutter unit to the front mounting plate. Fig.7-3
5.	Remove (2) screws to detach roller assembly. Fig. 7-4
6.	Remove (1) screw holding "Pizza" Blade Assy to mounting bracket. Fig. 7-5
7.	Install replacement "Pizza" Blade Assy to mounting bracket
8.	Replace roller assembly removed in Step 5.
9.	Attach cutter unit to front mounting plate with (5) screws removed in Step 4.
10.	Reinstall cutter head and reattach cables removed in Step 3. Replace rod.
11.	Replace and lower the top cover.

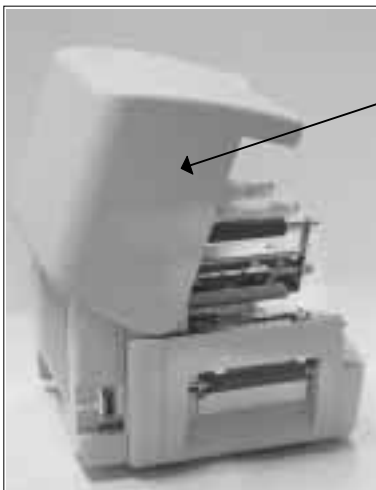


Fig. 7-1

ROTATE LEFT,
THEN SPREAD
SIDES TO
REMOVE

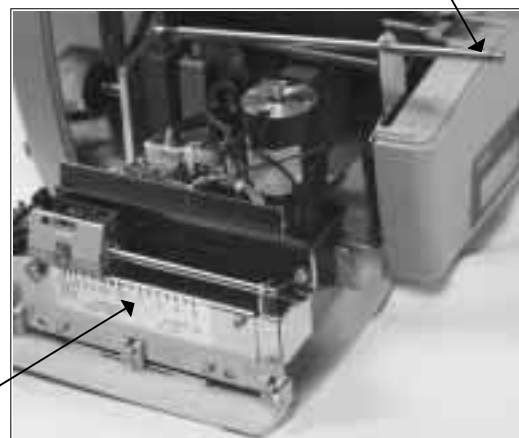


Fig. 7-2

UNSCREW
ROD

CUTTER HEAD

7-2 Cutter Unit - Replacing "Pizza" Blade Assy

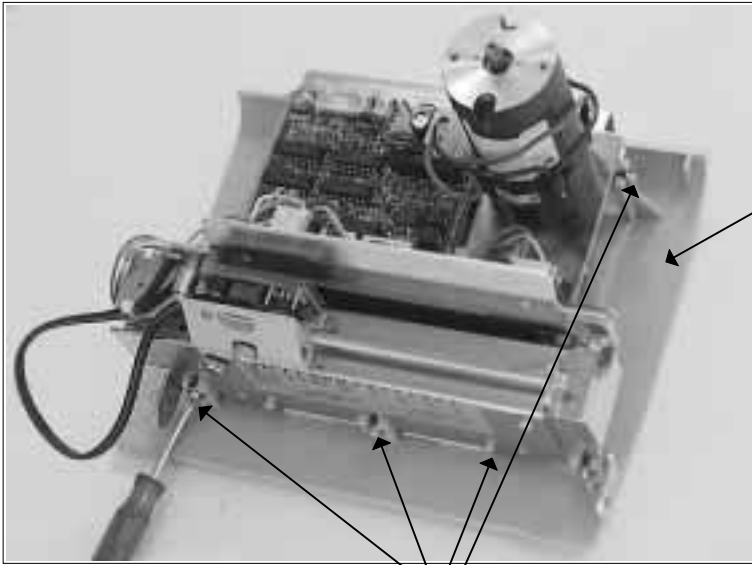


Fig. 7-3

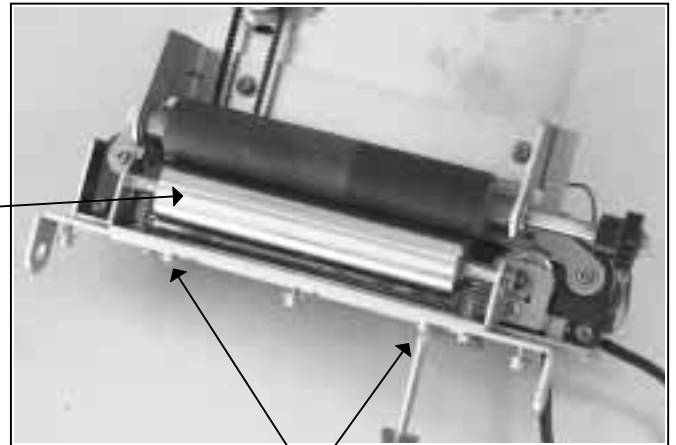


Fig. 7-4

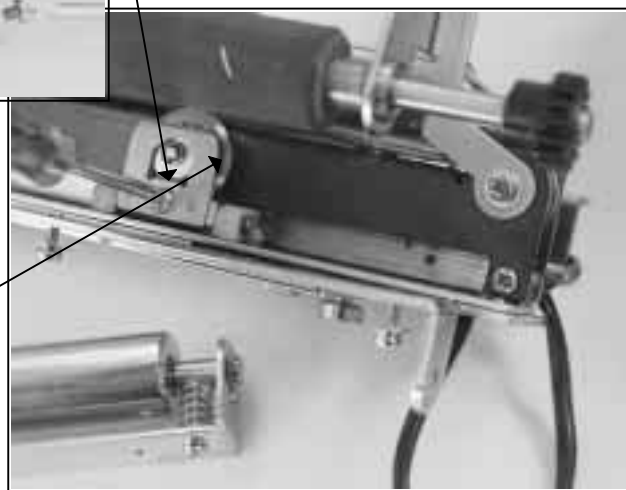
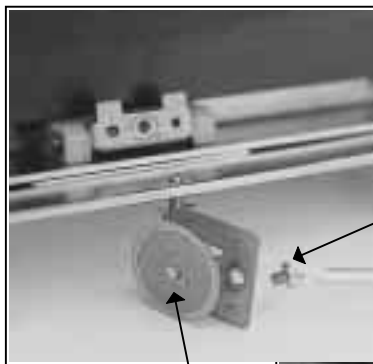


Fig. 7-5

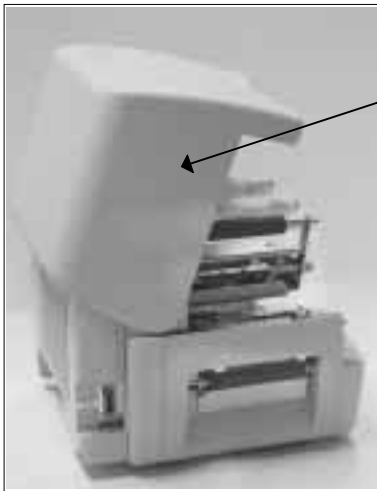
7-3 Cutter Unit-Replacing Motor Drive Belt

Replacement procedures for the cutter unit and components

STEP	PROCEDURE
1.	Switch the printer OFF and disconnect the AC Power Cord.
2.	Raise and remove the top cover. Fig. 7-6
3.	Unscrew rod and remove from the unit. Lift out cutter head and carefully disconnect cables routed to the main PCB and motor. Fig. 7-7
4.	Loosen (5) screws holding the cutter unit to the front mounting plate and detach. Fig. 7-8
5.	Loosen (2) motor mounting screws and slide belt from motor pulley. Fig. 9
6.	Remove (4) screws to detach roller mounting bracket. Slide bracket free of belt. Fig. 7-9 & 7-10
7.	Remove (2) screws to detach metal roller from frame. Note protruding screw heads that secure the two springs to the roller shaft through the centering holes on the bottom plate. Fig. 7-11
8.	Remove (2) screws holding black mounting plate on top of two spacers. (Two screws attaching the roller mounting bracket to the black plate were removed in Step 6.) The blade actuator will still be attached to the plate. Fig. 7-12 & 7-13
9.	Press the spring action metal tab on the actuator and slide the "Pizza" blade from the black mounting plate. The surface of the actuator (opposite the blade) mounts on the back of the black mounting plate. Fig. 7-13
10.	Remove (2) screws to detach the belt from the actuator. Fig. 7-14
11.	Install replacement belt in the groove of the actuator. Place the second part of the actuator in position and secure with screws remove in Step 10. Fig. 7-14
12.	Assure that two metal spacers are in place on the back plate. Place the black mounting plate in position on top of the two lower pulleys and on top of the two spacers. Replace the two screws removed in Step 8. Fig. 7-12
13.	Route belt around the inside surfaces of the two idlers and on top of the rubber roller mounting plate and around the motor pulley. Place the rubber roller mounting plate in position and install and tighten the (2) screws on the pulleys and (2) on the bracket surface. Fig. 7-9, 7-10 & 7-15
14.	Reposition motor and tighten motor mounting screws (from Step 5).

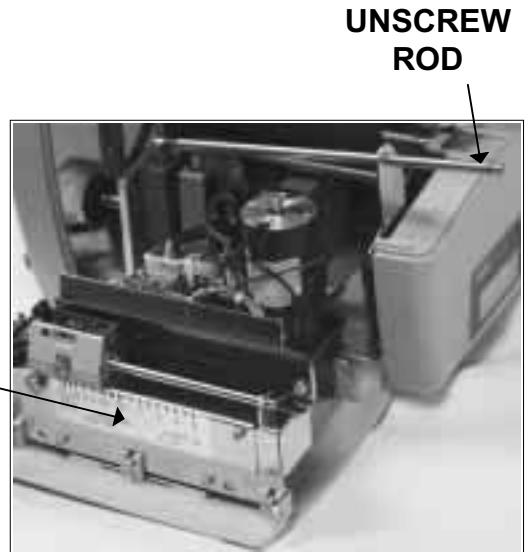
7-3 Cutter Unit-Replacing Motor Drive Belt (Cont.)

STEP	PROCEDURE
15.	Slide the metal roller in position below the rubber roller inserting the screw heads that secure the two springs through the clearance holes on the bottom plate. Replace screws (from Step 7). Fig. 7-11 & 7-9
17.	Replace the cutter unit and carefully reconnect the cables remove in Step 3. Replace rod. Fig. 7
18.	Reattach the top cover. Fig. 7-6



ROTATE LEFT,
THEN SPREAD
SIDES TO
REMOVE

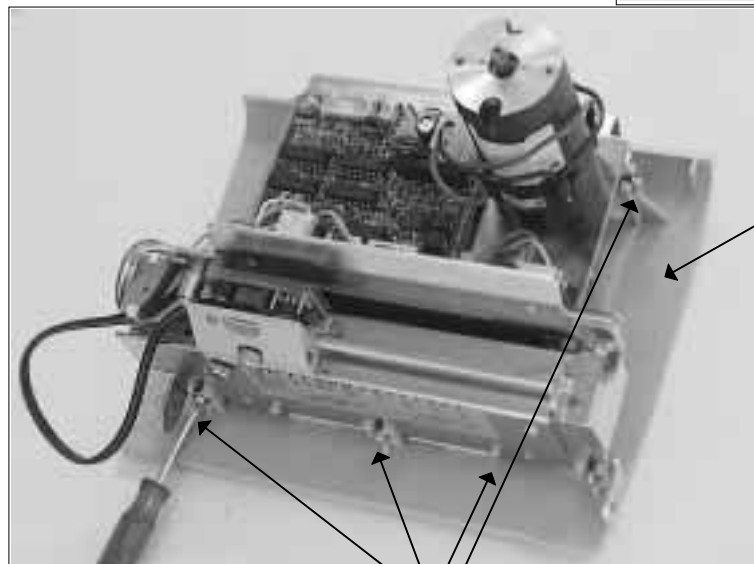
Fig. 7-6



CUTTER HEAD

UNSCREW
ROD

Fig. 7-7



FRONT
MOUNTING
PLATE

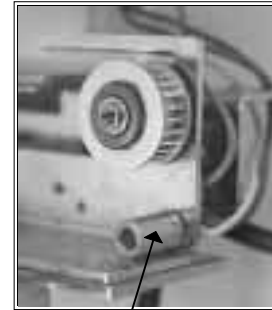
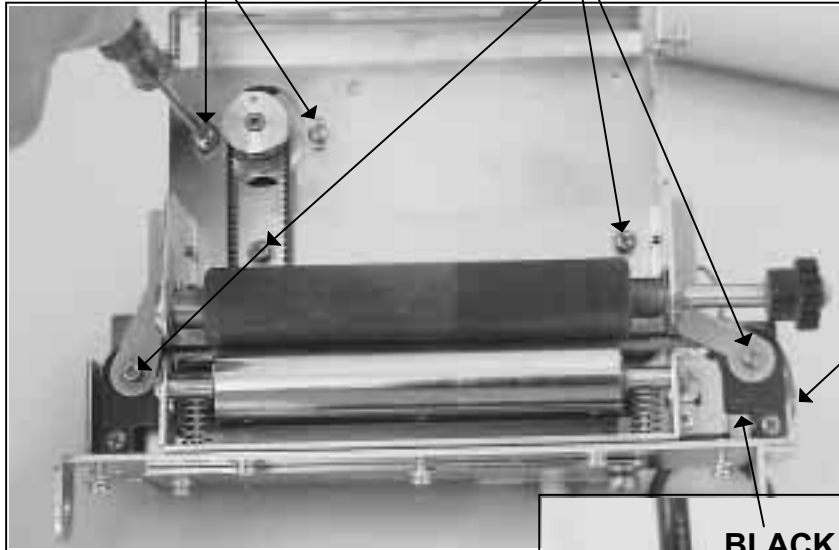
Fig. 7-8

LOOSEN (5)
SCREWS

7-3 Cutter Unit-Replacing Motor Drive Belt

LOOSEN (2) MOTOR MOUNTING SCREWS TO FREE BELT FROM PULLEY

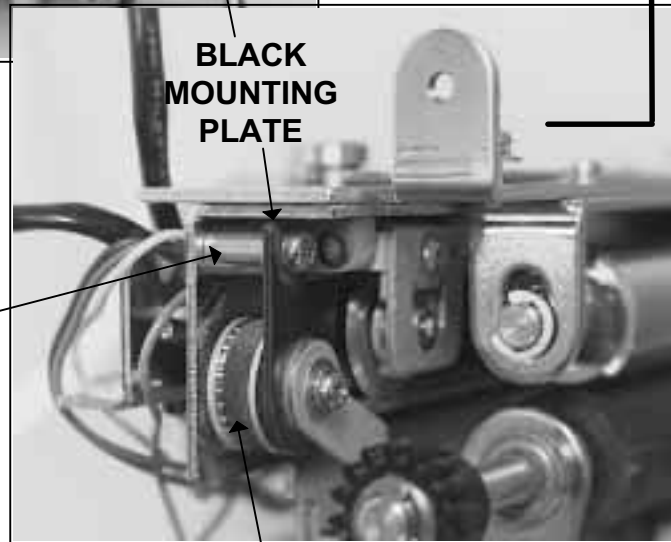
REMOVE (4) SCREWS



SPACER (UNDER PLATE BOTH ENDS)

VIEW

Fig. 7-9



BLACK MOUNTING PLATE

SPACER UNDER (BOTH ENDS)

BELT

REMOVE ROLLER MOUNTING BRACKET

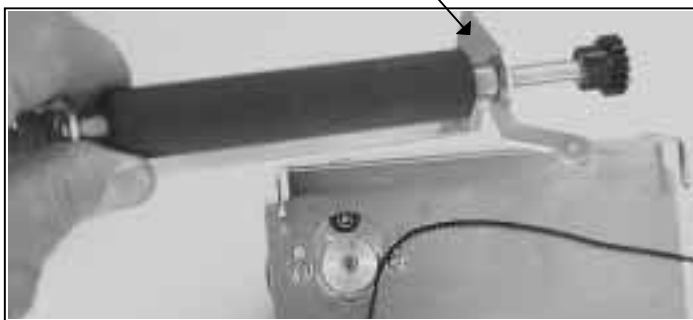
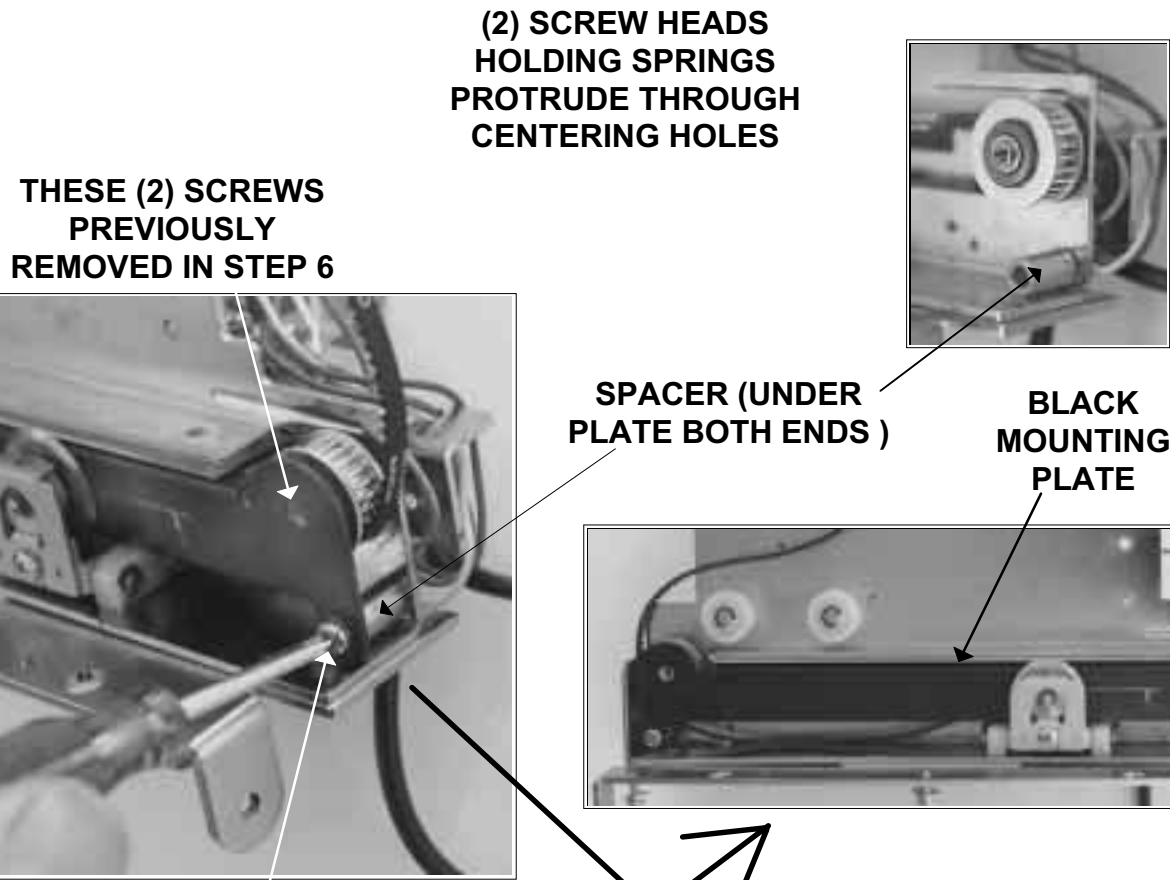
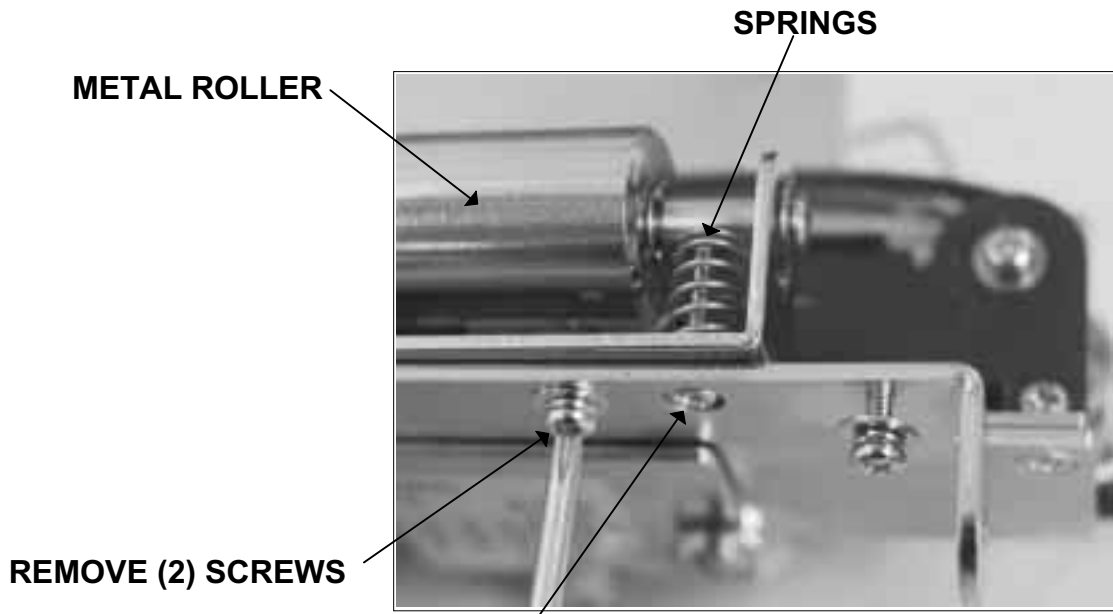
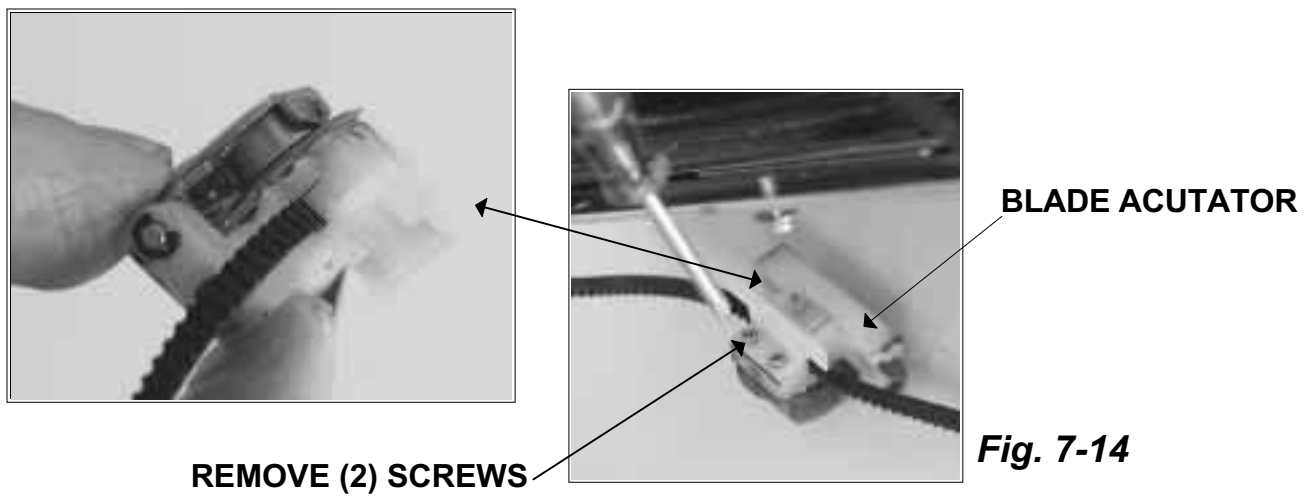
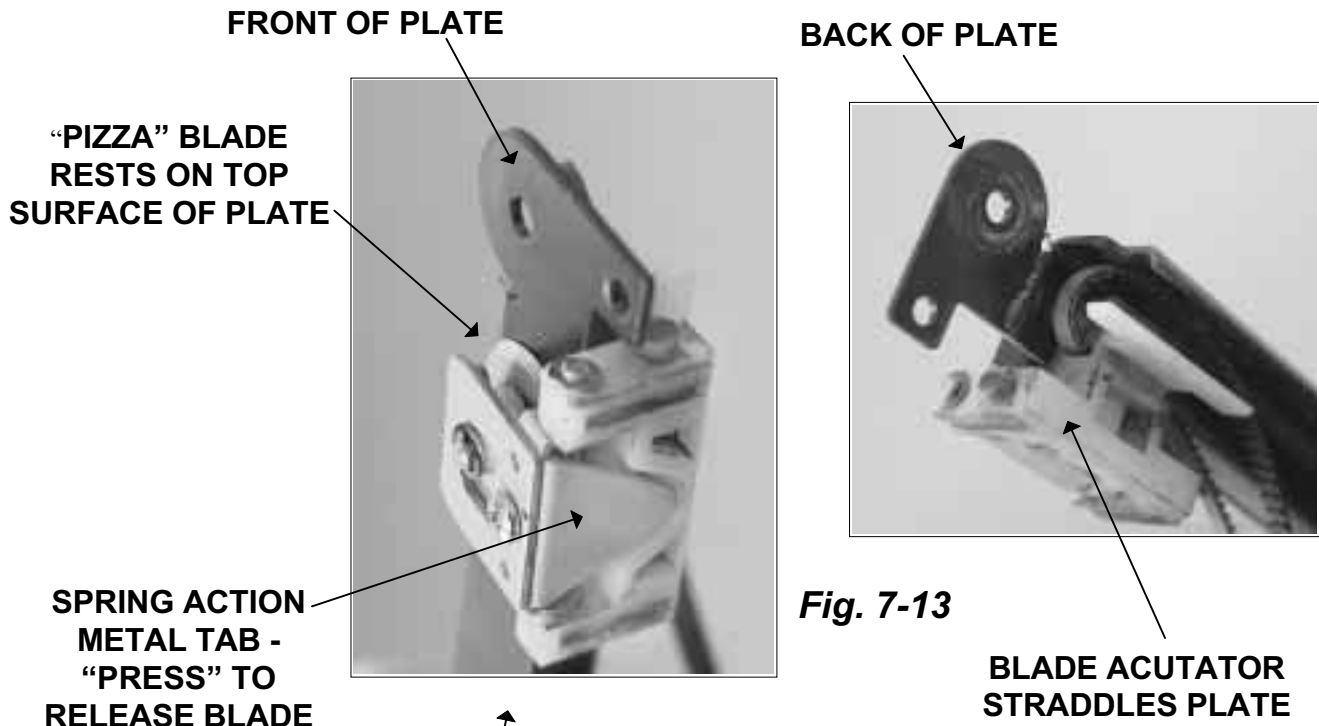


Fig. 7-10

7-3 Cutter Unit-Replacing Motor Drive Belt



7-3 Cutter Unit-Replacing Motor Drive Belt



7-3 Cutter Unit-Replacing Motor Drive Belt

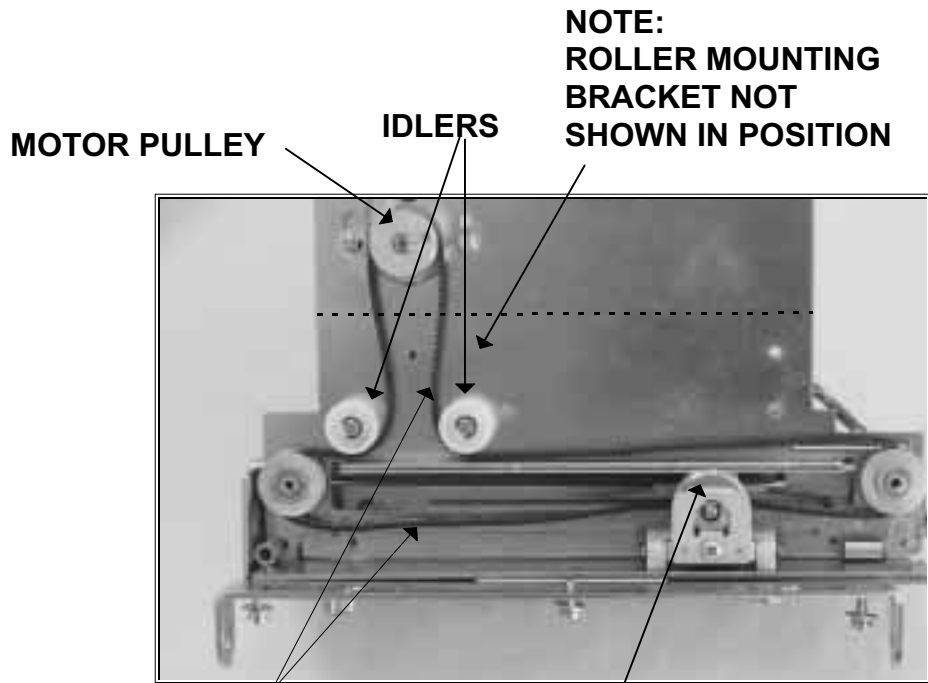
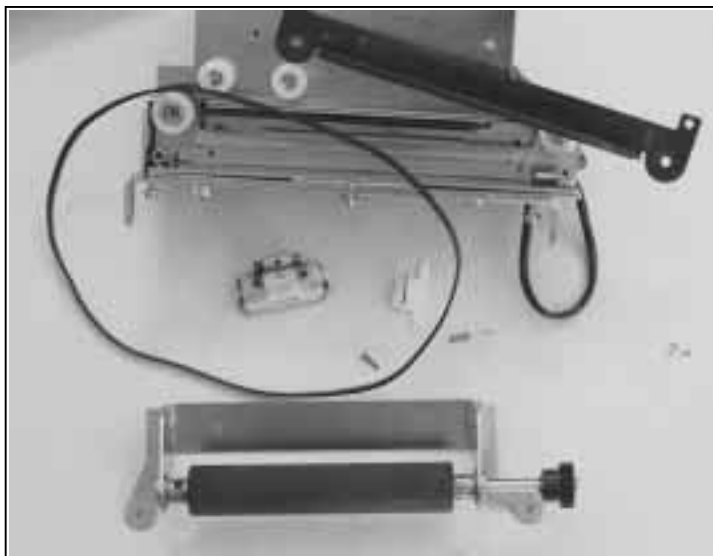


Fig. 7-15

“PIZZA CUTTER

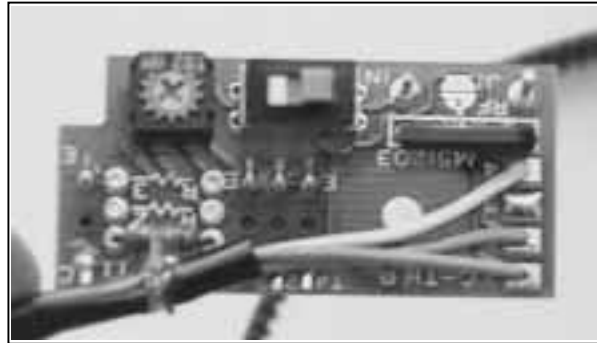


**DISASSEMBLED
COMPONENTS**

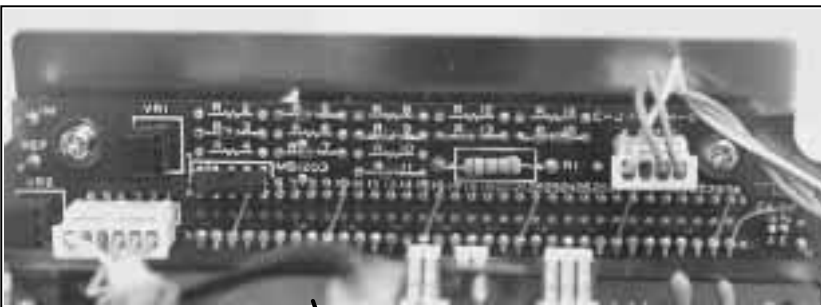
REFERENCE

7-4 Cutter Unit PCBoards

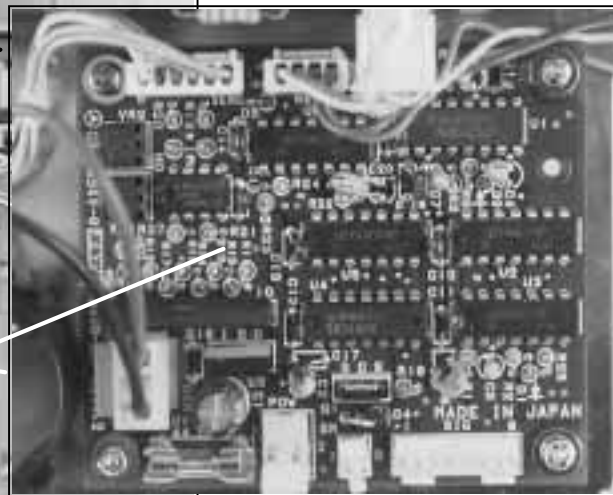
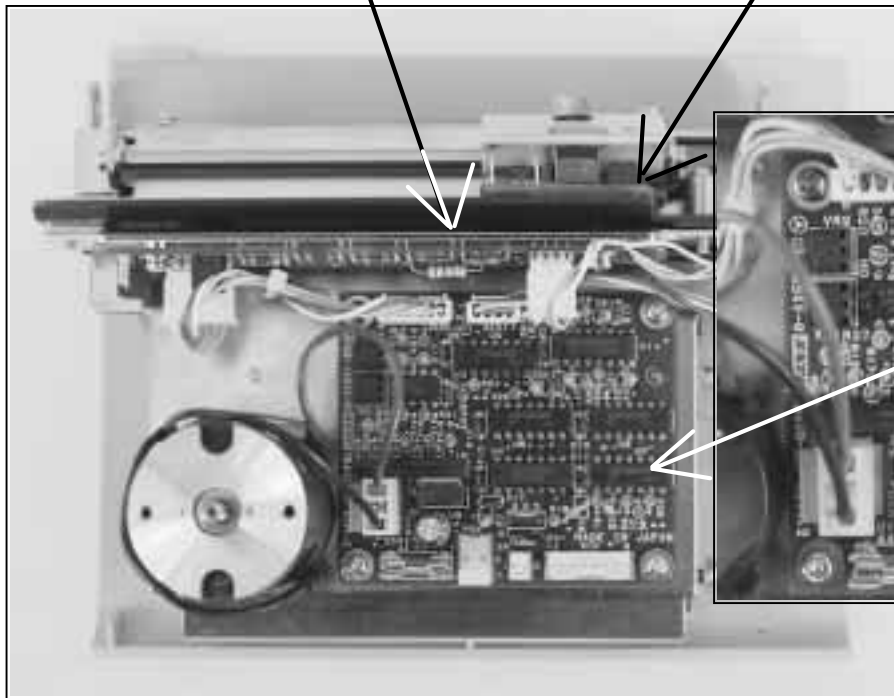
The three PCBoards in the Cutter Unit are replaceable



PCB #3



PCB #2



PCB #1

7-4 Cutter Unit PCBoards

Replacement procedures for the three cutter PCBoards are as follows:

STEP	PROCEDURE
	PCB #1
1.	Switch the printer OFF and disconnect the AC Power Cord.
2.	Raise and remove the top cover. Fig. 7-16
3.	Unscrew rod and remove from the unit. Lift out cutter head and carefully disconnect cables routed to the printer PCB and motor. Fig. 7-17
4.	Disconnect cables routed to PCB#1.
5.	Remove (4) screws to detach board. Fig. 7-18
6.	Reinstall replacement PCB and reconnect cables.
7.	Replace the cutter unit and carefully reconnect the cables detached in Step 3.
8.	Reattach the top cover.

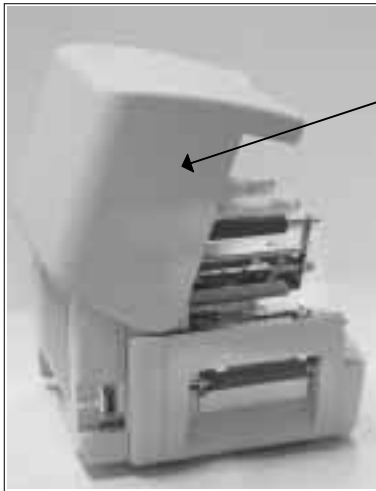
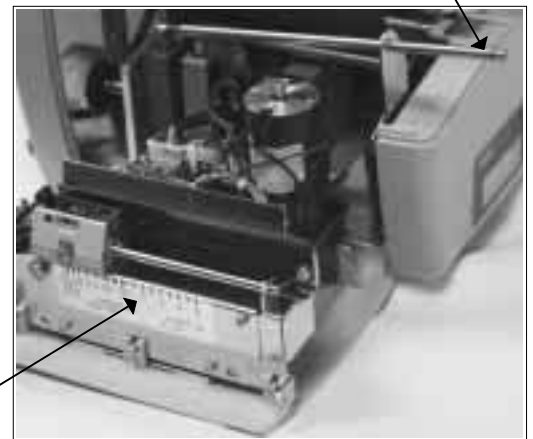


Fig. 7-16

ROTATE LEFT,
THEN SPREAD
SIDES TO
REMOVE



UNSCREW
ROD

CUTTER HEAD

Fig. 7-17

7-4 Cutter Unit PCBs

STEP	PROCEDURE
------	-----------

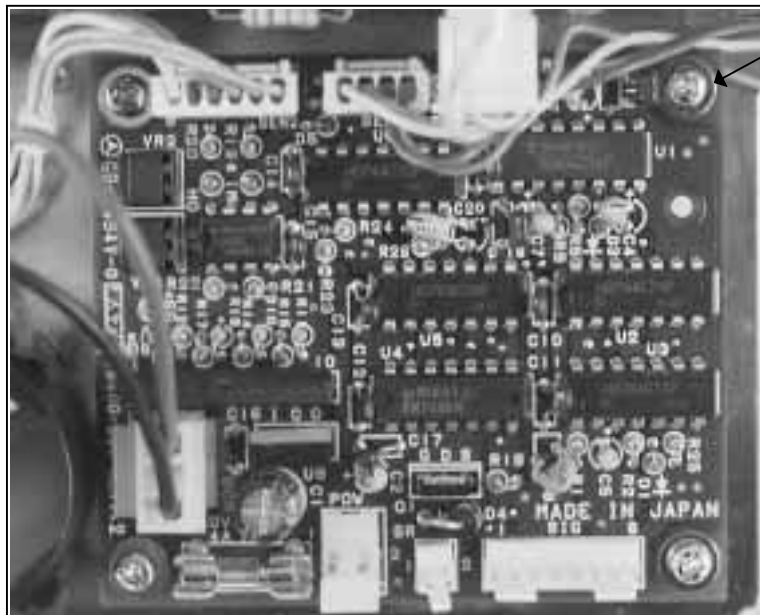
	PCB #2
--	---------------

- | | |
|----|--|
| 1. | Repeat Steps 1-3 for PCB #1. |
| 2. | Disconnect cables routed to PCB#2. |
| 3. | Remove (2) screws to detach PCB. Fig. 7-19 |
| 4. | Reinstall replacement PCB and reconnect cables. |
| 5. | Replace the cutter unit and carefully reconnect the cables routed to the printer PCB and motor. Fig. 7-16 |
| 6. | Reattach the top cover. |

	PCB #3
--	---------------

- | | |
|----|--|
| 1. | Repeat Steps 1-3 for PCB #1. |
| 2. | Remove (2) screws holding rod and PCB attached to the enclosure. Fig. 7-20 |
| 3. | Disconnect cable attached to PCB #2. |
| 4. | Remove (1) screw to detach shield and PCB from the enclosure. Fig. 7-21 |
| 5. | Reinstall replacement PCB and reconnect cable to PCB #2. |
| 6. | Replace the cutter unit and carefully reconnect the cables routed to the printer PCB and motor. Fig. 7-16 |
| 7. | Reattach the top cover. |

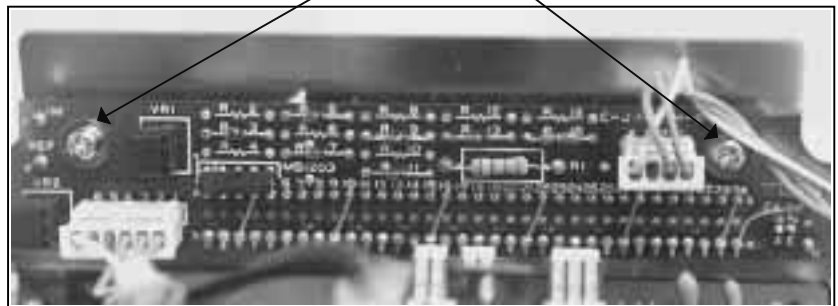
7-4 Cutter Unit PCBoards



REMOVE (4)
SCREWS

PCB #1

Fig. 7-18

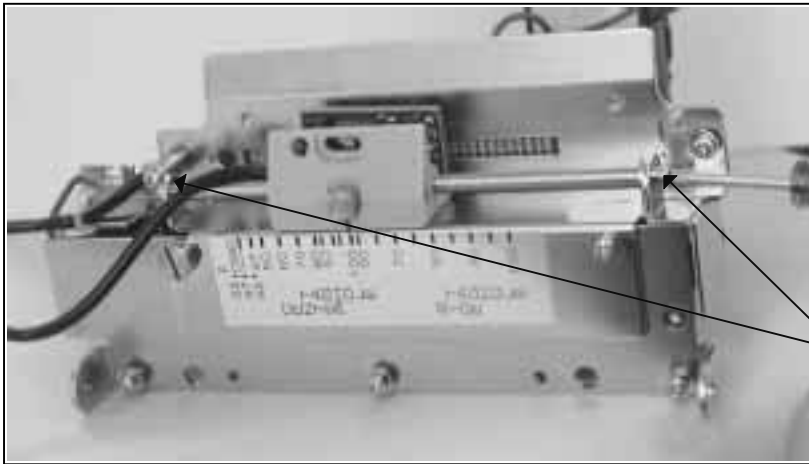


REMOVE (2)
SCREWS

PCB #2

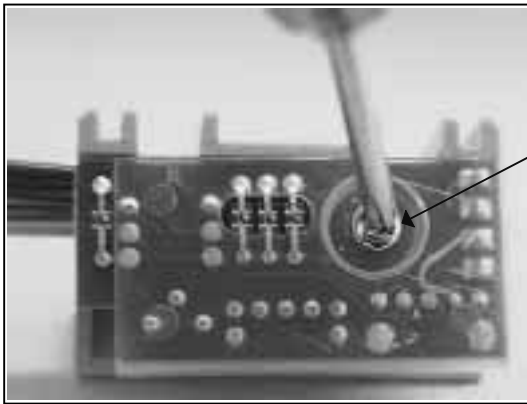
Fig. 7-19

7-4 Cutter Unit PCBoards



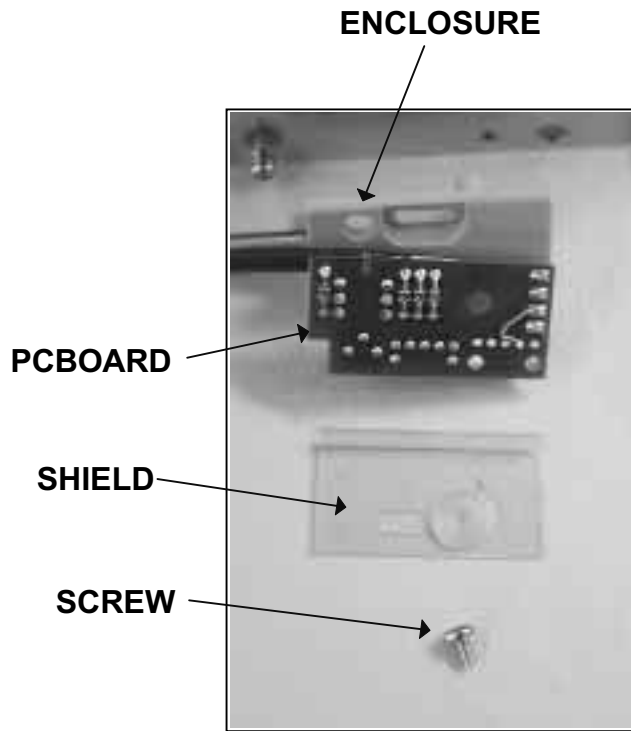
REMOVE (2)
SCREWS

Fig. 7-20



REMOVE (1)
SCREW

PCB #3 Fig. 7-21



ENCLOSURE

PCBOARD

SHIELD

SCREW

COMPONENTS

Factory Resets

8-1 Overview

The Factory Reset Mode allows you to :

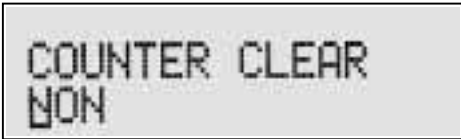
- Reset to Factory Default
- Clear Counter Heads
- EEPROM Clear All
- Clear Cutter Counter



8-2 Resetting the Printer (Test Print)

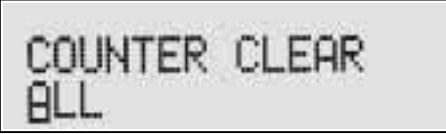
To reset the printer to the factory settings perform the following steps:

Caution: *Resetting the printer will clear all registers.*

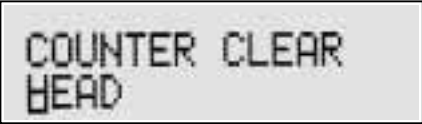
STEP	PROCEDURE
1.	Refer to Section 2-1 for Dip Switch location. Record all current dip switch positions, then place all switches in the off position.
2.	Place the DSW2-5 in the ON position.
3.	Place the print head in the OPEN position, keeping both the LINE & FEED keys depressed power on the printer.
4.	Upon hearing the audible tone, release the LINE & FEED keys. Place the print head back in the CLOSED position and DSW2-5 in the OFF position.
5.	Verify display: "Factory Mode".
6.	Press the FEED key once. Verify display:
	
7.	Press the FEED key to initialize reset. After a slight pause, (1) blank will feed out followed by a factory test print. <i>Warning: This test activates all the heating elements on the print head and therefore should be used for testing purposes only to avoid damaging the print head, especially when performed with labels less than the full width of the print head.</i>
8.	Press the FEED key to stop printing.
9.	Place the printers power switch to the off position and return all switches to their original positions.

8-3 EEPROM Clear All

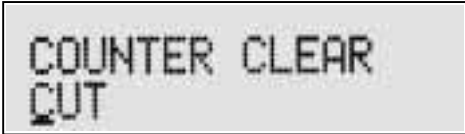
This setting clears all counters.

STEP	PROCEDURE
1.	Refer to Section 2-1 for Dip Switch location. Record all current dip switch positions, then place all switches in the OFF position.
2.	Place the print head in the open position and the DSW2-5 in the ON position.
3.	Turn on the power while pressing the LINE & FEED keys. Release when an audible sound is heard.
4.	Place the print head back in the closed position and DSW2-5 in the OFF position. Verify display: "Factory Mode".
5.	Press the FEED key once. Verify display:
6.	Press the LINE key once to change the display from NON to ALL . Verify display:
	
7.	Press the FEED key to initialize reset. After a slight pause, (2) blank labels will feed out followed by a test print. <i>Warning: This test activates all the heating elements on the print head and therefore should be used for testing purposes only to avoid damaging the print head, especially when performed with labels less than the full width of the print head.</i>
8.	Press the FEED key to stop printing. Verify that the counters on test print have reset to 0.0 km.
9.	Place the power switch to the OFF position and return all switches to the original positions.

8-4 Clear Counter Heads

STEP	PROCEDURE
1.	Refer to Section 2-1 for Dip Switch location. Record all current dip switch positions, then place all switches in the off position.
2.	Place the print head in the open position and the DSW2-5 in the ON position.
3.	Turn on the power while pressing the LINE & FEED keys. Release when an audible sound is heard.
4.	Place the print head back in the closed position and DSW2-5 in the OFF position. Verify display: "Factory Mode".
5.	Press the FEED key once. Verify display:
6.	Press the LINE key twice to change the display to HEAD.
	
7.	Press the FEED key once. After a slight pause, (1) blank label will feed out followed by a test print. <i>Warning: This test activates all the heating elements on the print head and therefore should be used for testing purposes only to avoid damaging the print head, especially when performed with labels less than the full width of the print head.</i>
8.	Verify that the head counter has reset to 0 (Zero).
9.	Place the printers power switch to the OFF position and return all switches to their original positions.

8-5 Clear Cutter Counter

STEP	PROCEDURE
1.	Refer to Section 2-1 for Dip Switch location. Record all current dip switch positions, then place all switches in the off position.
2.	Place the print head in the open position and the DSW2-5 in the ON position.
3.	Turn on the power while pressing the LINE & FEED keys. Release when an audible tone is heard.
4.	Place the print head back in the closed position and DSW2-5 in the off position. Verify display: "Factory Mode".
5.	Press the FEED key once. Verify display:
6.	Press the LINE key three times to change the display to CUT.
	
7.	Press the FEED key once. After a slight pause, (1) blank label will feed out followed by a factory test print.
	<p>Warning: <i>This test activates all the heating elements on the print head and therefore should be used for testing purposes only to avoid damaging the print head, especially when performed with labels less than the full width of the print head.</i></p>
8.	Verify that cutter counter has been reset to (0).
9.	Place the printers power switch to the off position and return all switches to their original positions.

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Troubleshooting

9-1 Overview

The design of the SATO XL-400/410 printer is based upon proven technology and reliable components. When a problem occurs, the solution can be easily traced using the troubleshooting tables in this section. These tables list symptoms, probable causes, and suggested corrective actions. Many of the suggested corrective actions include references to a section or paragraph found elsewhere in this manual where more complete descriptions and procedures may be found.

Make sure the basics have been checked before deciding you are unable to proceed any further. To help you, this section has been divided into the following parts:

- Initial Checklist
- Centronics Parallel Interface
- RS232C Serial Interface
- Error Signals
- Troubleshooting Tables
- Head Pattern Examples

9-2 Initial Checklist

If you are unable to produce output on your printer, check the following before deciding you are unable to proceed any further.

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 or another error condition exists.
3. Is the Print Head and the Label Hold Down in the down and latched position?

Other areas that may need looking at include:

9-3 Troubleshooting the Centronics (Parallel) Interface

1. Is the IBM compatible parallel printer cable connected securely to your parallel port (DB-25S Female) on the PC and to the Centronics connector on the printer?

Warning: Never connect or disconnect interface cables (or use a switch box) with power applied to either the printer or the host. This may cause damage to the interface circuitry and is not covered by warranty.

2. Is there more than one parallel interface port on your PC (LPT1, LPT2, etc.)? If so, make sure you are sending data out the correct port.
3. When you send the print job to the printer, and it does not respond, do you get an error message on your PC that says "Device Fault" or something similar?

This may mean that the computer doesn't know the printer is there. Verify that:

- a. Both ends of the cable are securely inserted into their respective connectors.
- b. The printer is ON-LINE.
- c. The cable is not defective. There are other things that can cause this error message on your computer, but at this stage, a defective cable may be one of the reasons.

SECTION 9 - TROUBLESHOOTING

4. When you send the print job to the printer and it does not respond, and there is no error message on the PC:
 - a. Check your data stream for some of the basics. Is your job framed as follows?
<ESC>A—DATA—<ESC>Z
 - b. Verify that you've included all required parameters in the data stream.
 - c. Verify the following:
 - You have not typed a "0" (zero) for an "O" (letter) or vice-versa.
 - You have not missed any **<ESC>** characters where they're needed.
 - Make sure all printer command codes are capital letters.
 - Your protocol codes are set for Standard or Non-Standard and your data stream is consistent with these.
5. If you've checked all of the above and the printer still isn't printing, you may want to try a Receive Buffer Hex Dump to determine what (if anything) the printer is receiving from your computer. See Hex Dump Diagnostic Labels.

The Centronics port is now listening for incoming data. Send your print job. The printer will now print (only once) a Hexadecimal (Hex) Dump of everything it received from the host computer. Each 2-digit hexadecimal character represents a character the printer received. It may be tedious, but now you can analyze and troubleshoot the data stream.

6. While checking the Hex Dump printout, look for 0D 0A (Carriage Return and Line Feed) characters throughout. The command string should be continuous. CR or LF characters are not allowed between the Start Command (**<ESC>A**) and the Stop Command (**<ESC>Z**). If you are using BASIC, it may be adding these characters automatically as the line wraps. Adding a "width" statement to your program can help to suppress these extra 0D 0A characters by expanding the line length up to 255 characters.

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.

9-4 Troubleshooting the RS232C (Serial) Interface

1. Is the RS232C Serial cable connected securely to your serial port on the PC (DB-25S Male) and to the RS232C connector on the printer?

Warning: Never connect or disconnect interface cables (or use a switch box) with power applied to either the printer or the host. This may cause damage to the interface circuitry and is not covered by warranty.

2. Is the cable defective? At the very least, you should be using a “Null Modem Cable,” which crosses pins in a specific manner. This should enable your printer to print. We recommend that you use a cable built to specifications described in Section 3, 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.
4. If after sending your job to the printer, it only “beeps” and the display indicates a “framing error” message, you may have a configuration problem. There may be some inconsistencies with the Baud Rate, Parity, Data Bits, or Stop Bits in relation to your host computer. If you are confused as to what the printer’s current RS232 settings are, you may choose the SATO defaults (all DIP switches in the OFF position) to achieve 9600 baud, no parity, 8 databits, and 1 stop bit.

9-5 Error Signals

LED	LCD MESSAGE	AUDIBLE BEEP	ERROR CONDITION	TO CLEAR
Error On	Machine Error	1 Long	Machine Error	Cycle power ON/OFF
Error On	EEPROM Error	1 Long	EEPROM Read/Write	Cycle power ON/OFF
Error On	Head Error	3 Short	Print Head is damaged	Replace Print Head Cycle power ON/OFF
Error On	Sensor Error	3 Short	Media wandering Mis-selected sensor type	Check media guides Cycle power ON/OFF
Error Blinks	Card R/W Error	1 Long	Memory Card Read/Write	Format Memory Card Cycle power ON/OFF
Error Blinks	Card Low Battery	1 Long	Memory Card Battery Low	Replace MC battery Cycle power ON/OFF
Error Blinks	Head Open	3 Short	Head Open	Close head lever
Error On Line Blinks	Parity Error	3 Short	RS232 Parity Error	Cycle power ON/OFF
Error On Line Blinks	Overrun Error	3 Short	RS232 Overrun Error	Cycle power ON/OFF
Error On Line Blinks	Framing Error	3 Short	RS232 Framing Error	Cycle power ON/OFF
Error On Line Blinks	Buffer Full	3 Short	Buffer Overflow	Cycle power ON/OFF
Error Blinks Label On	Paper End	3 Short	Media End or Mis-selected media type	Replenish media Select correct media type Open/close Head Lever Open/close Media Hold down
Error Blinks	Ribbon End	3 Short	Ribbon End Ribbon Broken	Replace Ribbon Open/close Head Lever Open/close Media Hold down
Error Blinks	Media Error	3 Short	Media pitch is different than specified by command	Install proper media Open/close Head Lever
Error Blinks	Stacker Full	3 Short	Stacker is full of cut media	Empty Stacker
Error Blinks	Rewinder Full	3 Short	Rewinder is full	Remove roll from rewinder
Error Blinks	Cutter Error	3 Short	Cutter is jammed	Clear Cutter Cycle power ON/Off
Error Blinks	Cutter Sensor Error	3 Short	Media in cutter sensor Wrong cutter sensor position	Remove media from cutter sensor Select correct sensor

9-6 Troubleshooting Tables

The troubleshooting table below includes the following general symptom descriptions:

- Image Voids
- Ribbon Wrinkle
- Light Images
- Smearing
- No Ribbon Movement
- No Label Movement
- No printed Image
- Display Problem
- POWER LED not on
- ERROR LED on
- ON LINE LED not on
- No Label Drive

Print Quality Problems

Symptom	Probable Cause	Suggested Corrective Action
Image Voids	Poor quality labels	Use thermal transfer compatible stock
	Poor quality ribbons	Use genuine SATO ribbons
	Ribbon not matched to label stock	Check with media suppliers
	Damaged electronics	Replace circuit board (6-4)
Ribbon Wrinkle	Damaged Platen	Replace Platen
	Poor Head Alignment	Adjust head balance (5-5) Adjust ribbon roller Adjust head alignment
	Poor Ribbon Tension	Adjust ribbon tension
	Worn Platen	Replace platen (6-8)
	Foreign material on head or platen	Clean head and platen
	Foreign materials on labels	Use high quality label stock
	Damaged print head	Replace print head (6-3)

SECTION 9 - TROUBLESHOOTING

Print Quality Problems

Symptom	Probable Cause	Suggested Corrective Action
Light Images	Poor quality labels	Use thermal transfer compatible stock
	Poor quality ribbons	Use genuine SATO ribbons
	Low print head energy/darkness	Adjust darkness control (See Operator Manual)
	Low print head pressure	Adjust head balance (5-5)
	Ribbon not matched to label stock	Use Premier II ribbon with a "1C" thermal transfer ribbon stock or equivalent for optimum results
	Low ribbon drive torque No ribbon movement	Adjust ribbon drive clutch (5-2)
	Foreign material on head	Clean head and platen
	Poor head alignment	Align Print Head (5-7)
Excessive print speed	Reduce print speed setting	
Smearing	Poor quality labels	Use Premier II ribbon with a "1C" thermal transfer ribbon stock or equivalent for optimum results
	Poor quality ribbons	Use genuine SATO ribbons
	Foreign material on head/platen	Clean head and platen
	Foreign material on labels	Use high quality label stock
	Excessive print head energy	Adjust darkness control
	Excessive print speed	Adjust print speed
	Excessive head pressure	Adjust head balance (5-5)
No Ribbon Movement	Incorrect ribbon core size	Use genuine SATO ribbons
	Loose drive clutch	Adjust clutch tension (5-2)
	Loose platen drive belt	Adjust/replace belt (6-7)
	No + 24 volt output	Test power supply and replace if required (6-5)

SECTION 9 - TROUBLESHOOTING

Symptom	Probable Cause	Suggested Corrective Action
No Ribbon Movement	Loose set screws on rewind pulley	Tighten set screws
	Damaged electronics	Replace circuit board (6-4)
No Label Movement	Loose/broken platen drive belt	Adjust/replace belt (6-7)
	Incorrect label pitch sensor selected	Select correct label sensor type (DSW2-2)
	No +24 volt output	Replace fuse on main PCB (6.2) Test power supply and replace if required (6-5)
	Loose set screw on platen pulley/stepper motor	Tighten set screws
No Printed Image	Print head not connected	Verify print head connector fully seated at head and main PCB (6-3)
	Ribbon upside down	Use genuine SATO ribbons
	No + 24 volt output	Test power supply and replace if required (6-5)
	Damaged print head	Replace print head (6-3)
	Damaged electronics	Replace circuit board (6-4)
Back light but no words on display or no display.	Most common failure of printer is DOA situation. The most likely cause is the ribbon cable has fallen out or not seated fully into connector.	Verify that the cable and connector are properly seated.
POWER LED not on	AC power cable not connected	Verify that the cable is connected to the printer and the AC outlet
	Main Power Fuse defective	Replace fuse (6-2)
	Defective power supply	Test power supply and replace if defective (6-5)
ERROR LED on	Head not locked	Close and latch head release
ON LINE LED not on	LABEL, RIBBON, ERROR LED (s) on	Clear error condition
	Illegal printer memory state	Cycle POWER switch off and back on
No Label Drive	Timing Belt bad/loose	Replace/tighten timing belts (6-7)

9.7 Head Pattern Examples



Fig. 9-1 FACTORY DEFAULT

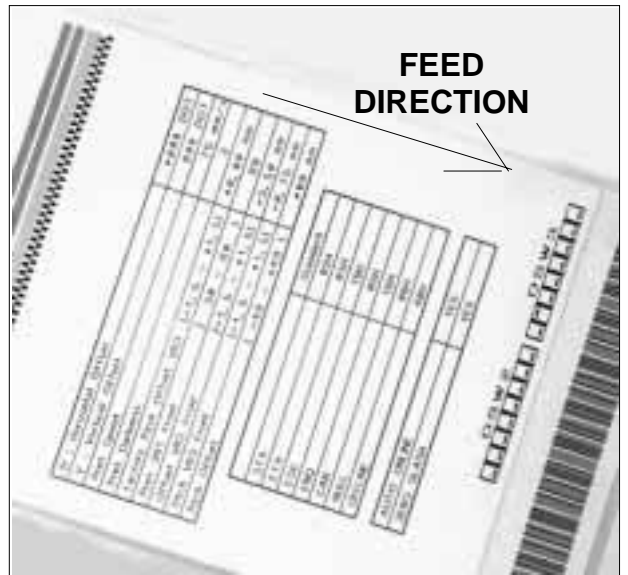
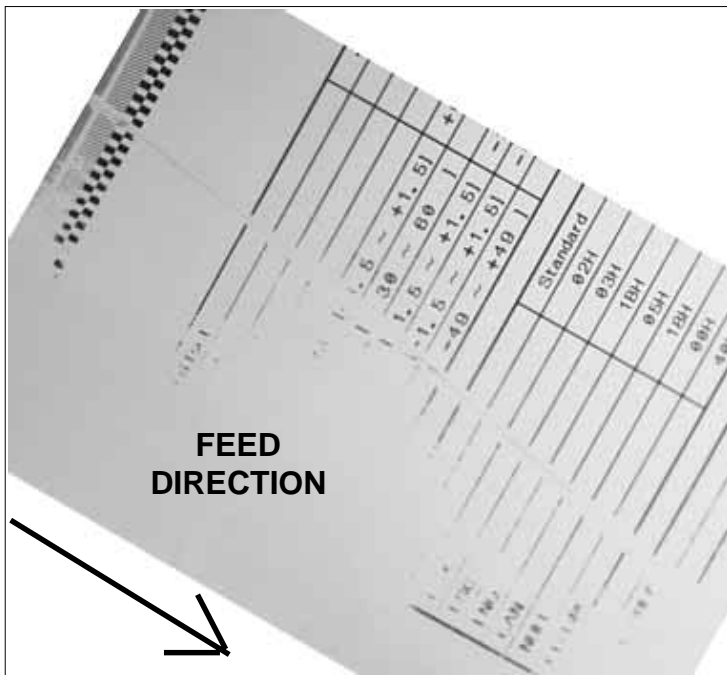


Fig. 9-2

**GOOD ADJUSTMENT,
CLEAR, DARK,
EVEN TEXT**

9.7 Head Pattern Examples



DISPLAY:
IRREGULAR UNEVEN TEXT,
ECCENTRIC NUT TURNED
TOO FAR COUNTER
CLOCKWISE

CAUSE:
POOR HEAD ALIGNMENT,
BALANCE OUT OF
ADJUSTMENT

Fig. 9-3

DISPLAY:
IRREGULAR UNEVEN TEXT,
ECCENTRIC NUT TURNED
TOO FAR CLOCKWISE

CAUSE:
POOR HEAD ALIGNMENT,
BALANCE OUT OF
ADJUSTMENT

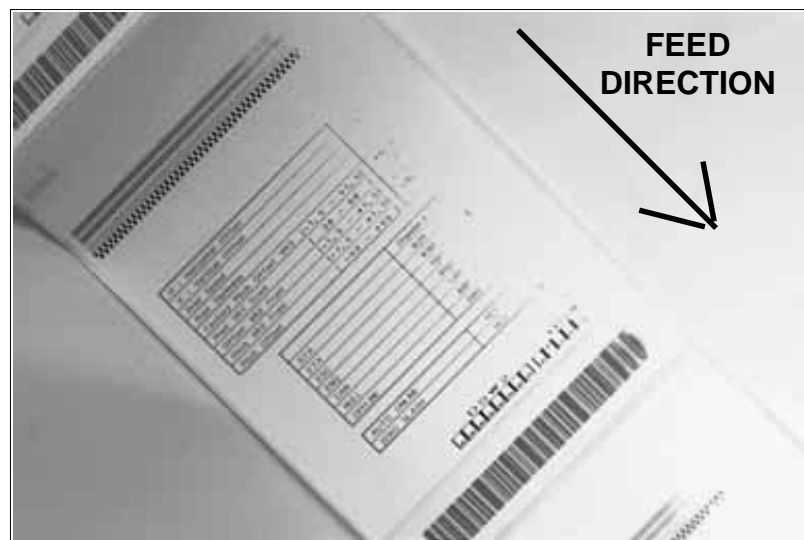
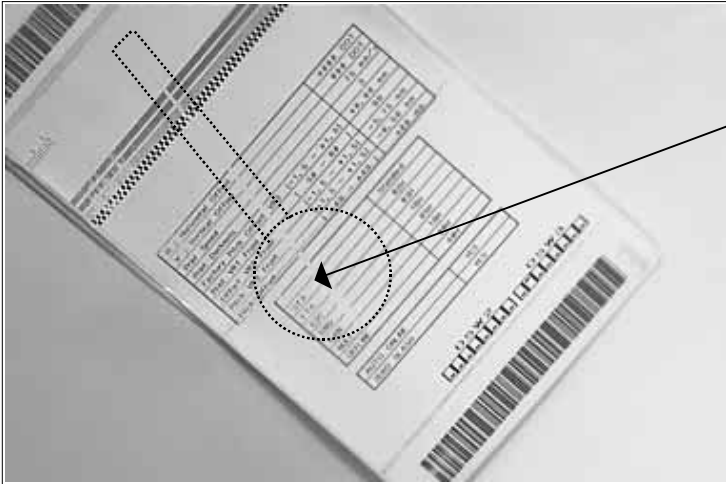


Fig. 9-5

9.7 Head Pattern Examples



DISPLAY:
RIBBON WRINKLE, DIAGONAL
VOIDS (WHITE STREAKS)
THAT “WALK” ACROSS
LABEL

CAUSE:
POOR HEAD ALIGNMENT,
POOR RIBBON TENSION,
WORN PLATEN,
FOREIGN MATERIAL,
DAMAGED PRINT HEAD

Fig. 9-6

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Section 10

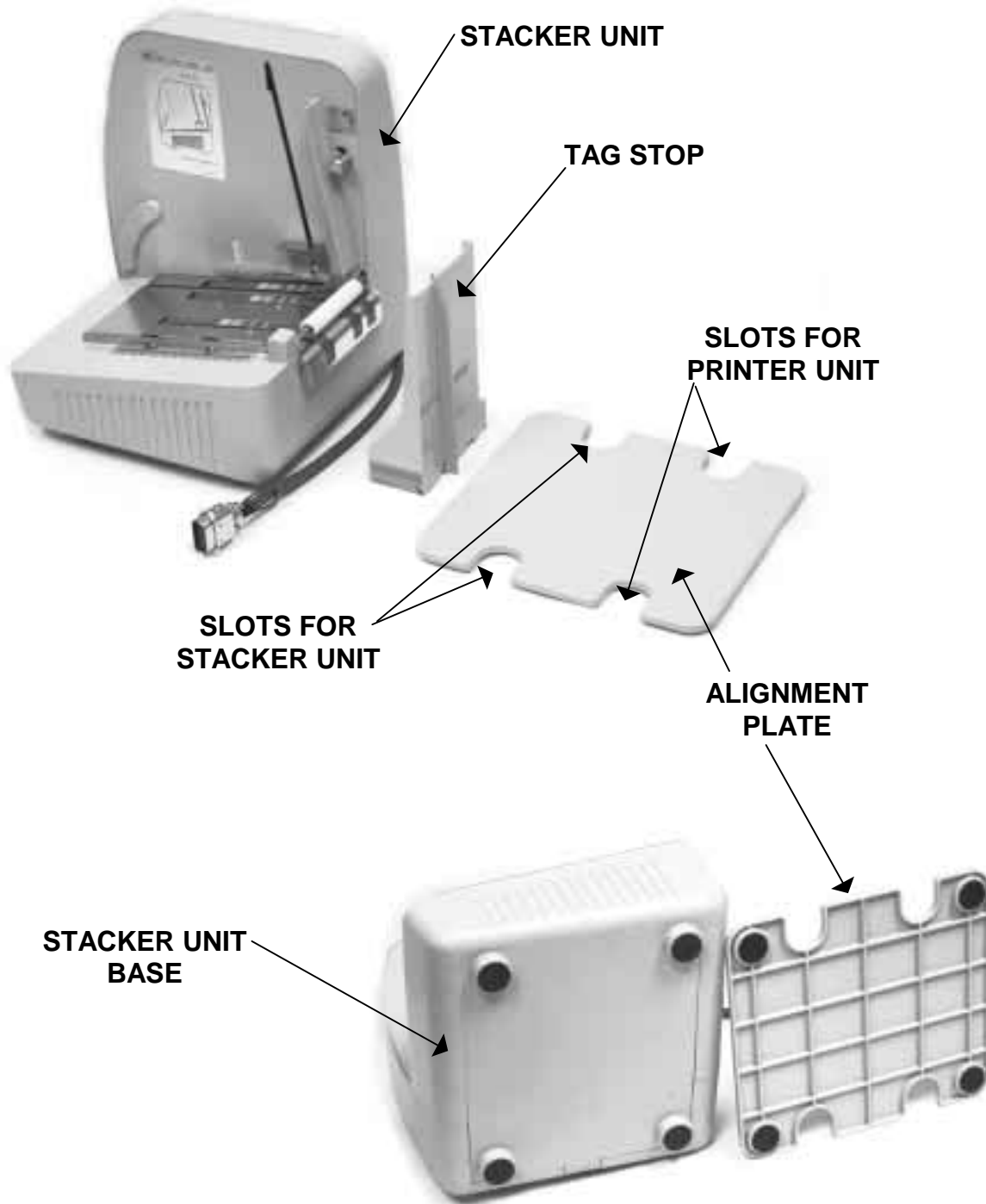
Stacker Option

10-1 Overview

An Integrated Stacker is available as an accessory for the XL printers. The unit can stack up to 500 tags at maximum print speed. It obtains power and is controlled through the External Accessory port on the XL printer.



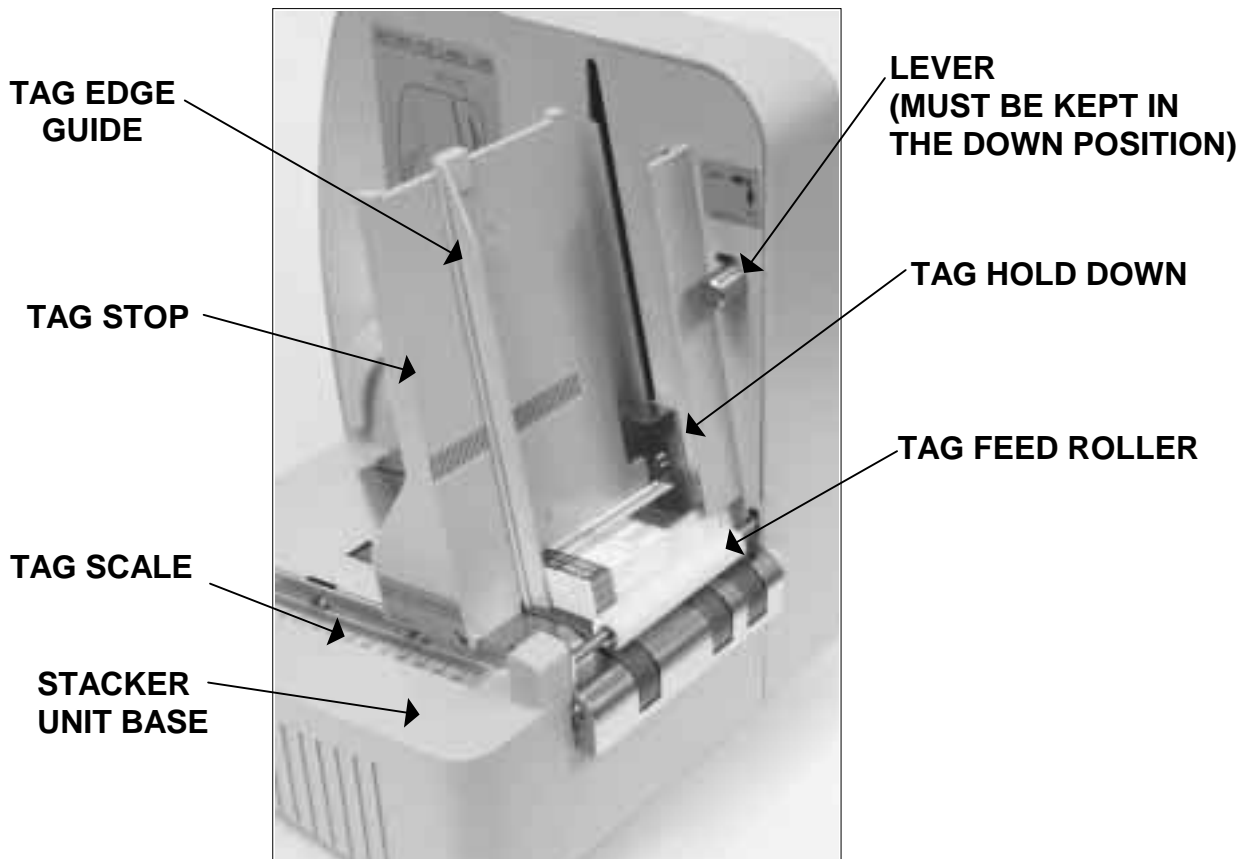
10-2 Components



10-2 Components

The SATO Stacker is used for collecting and stacking tags as they are printed and cut.

- Stacker Unit - The main component.
- Tag Stop - The container for the tags. The Tag Stop is adjusted to the length of the label. It is magnetically held in place and should be adjusted for the length of the tags being stacked. A scale is provided for reference when making this adjustment.
- Tag Edge Guide - Used to keep the stack of tags in alignment. The Tag Edge Guide should be adjusted for the width of the tag. It is held in place after adjustment by friction teeth on the Tag Stop.
- Alignment Plate - Used to maintain proper alignment between the printer and the Stacker. The front two feet of the Stacker are aligned in one pair of notches and the left two feet of the printer are aligned the other pair of notches.



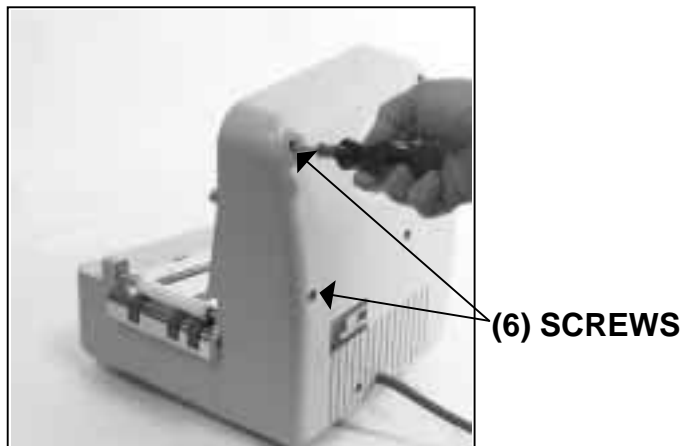
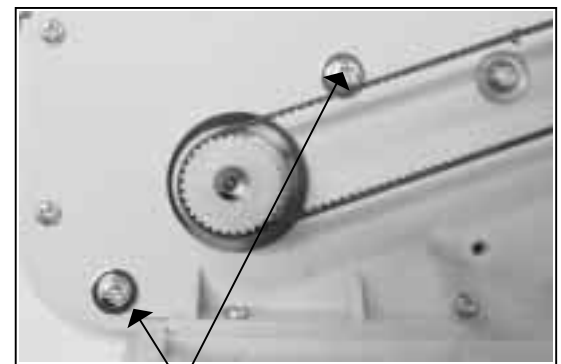
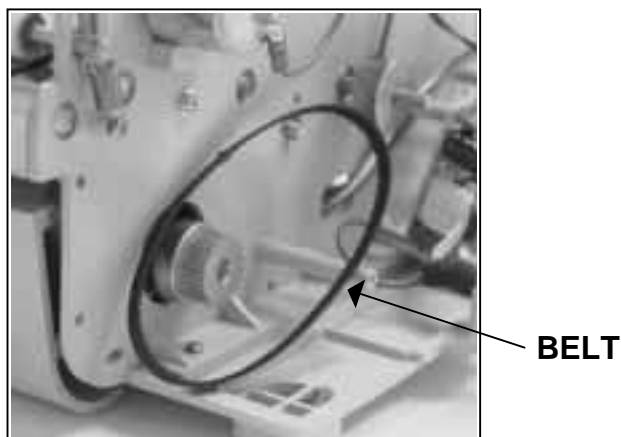
10-3 Installation

To install the Stacker on an XL Printer, perform the following steps:

STEP	PROCEDURE
1.	Turn the power off.
2.	Place the Alignment Plate under the printer and align the two notches with the feet.
3.	Place the Stacker on the Alignment Plate, aligning the other two notches with the Stacker feet.
4.	Connect the attached interface cable to the OPTION connector on the printer.
5.	Adjust the Tag Stop for the length of the tag.
6.	Adjust the Tag Edge Guide to the width of the tag.
7.	Turn the printer on and make sure the cutter is enabled and tags aligned for printing. <i>Note: If the tag sensors are not aligned properly, the printer feeds out a length of tag stock without cutting it as it is attempting to determine the tag pitch (length). Temporarily move the Stacker unit to one side if this occurs until the sensors are correctly set and the tags are at the proper position.</i>
8.	Send the print job to the printer and let it cut and stack a few tags. Then temporarily stop the printer by pressing the START/STOP key and check to make sure the tags are being stacked under the Tag Hold Down and that the Tag Stop and Tag Edge Guide are properly set.
9.	When proper operation has been verified, place the printer back ON-LINE by pressing the START/STOP key again to finish the print job.
10.	The printer will automatically stop and go OFF-LINE when the Stacker is full. When this happens, remove the tags and finish the print job by pressing the START/STOP key to place the printer back ON-LINE.

10-4 Replacing the Motor Belt

STEP	PROCEDURE
1.	Switch the power off and disconnect the AC Power Cord.
2.	Detach the back cover by removing (6) screws. Fig.10-1
3.	Loosen (2) motor mounting screws and slide belt from pulleys. Fig.10-2 & 10-3
4.	Replace the belt and tighten the (2) motor mounting screws. Press in the center of the timing belt with the tension gauge and note the tension reading when the belt is moved 1 to 2mm. If the tension reading of the belt is not within range of 150 - 200g, adjust the position of the pulley by loosening the (2) the stepper motor mounting screws and moving motor to achieve the required range. After adjusting motor, tighten but do not over tighten screws. Belts should have some movement.
5.	Position the back cover and reattach by replacing (6) screws.

**Fig. 10-1****Fig. 10-2 (2) SCREWS****Fig. 10-3**

10-5 Replacing the Motor

STEP	PROCEDURE
1.	Switch the printer off and disconnect the AC Power Cord.
2.	Detach the back cover by removing (6) screws. Fig.10-4
3.	Detach the connector from the motor to the PCB assy. Fig.10-5
4.	Remove (4) screws holding frame to RH cover and slide apart for access to the motor. Fig.10-5
5.	Remove (2) motor mounting screws and slide belt from pulleys. Remove the motor through the side. Fig.10-5 & 10-6
6.	Slide the replacement motor through the side and attach to the frame with (2) mounting screws.
7.	Slide the RH cover to the frame and reattach with (4) screws. Fig.10-5
8.	Reattach the connector from the motor to the PCB assy.
9.	Press in the center of the timing belt with the tension gauge and note the tension reading when the belt is moved 1 to 2mm. If the tension reading of the belt is not within range of 150 - 200g, adjust the position of the pulley by loosening the (2) the stepper motor mounting screws and moving motor to achieve the required range. After adjusting motor, tighten but do not over tighten screws. Belts should have some movement.
10.	Reattach the back cover by replacing (6) screws.

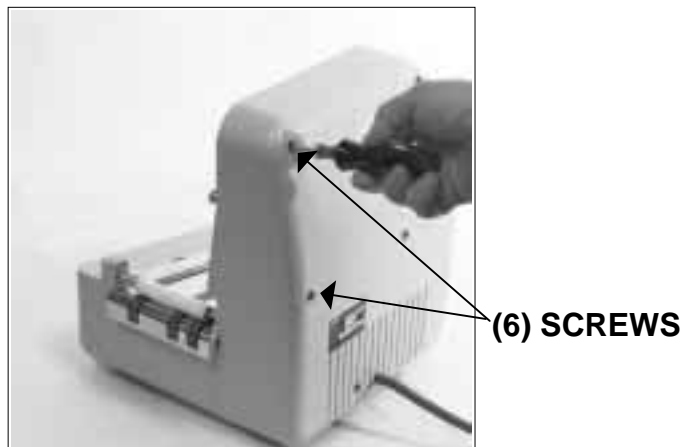
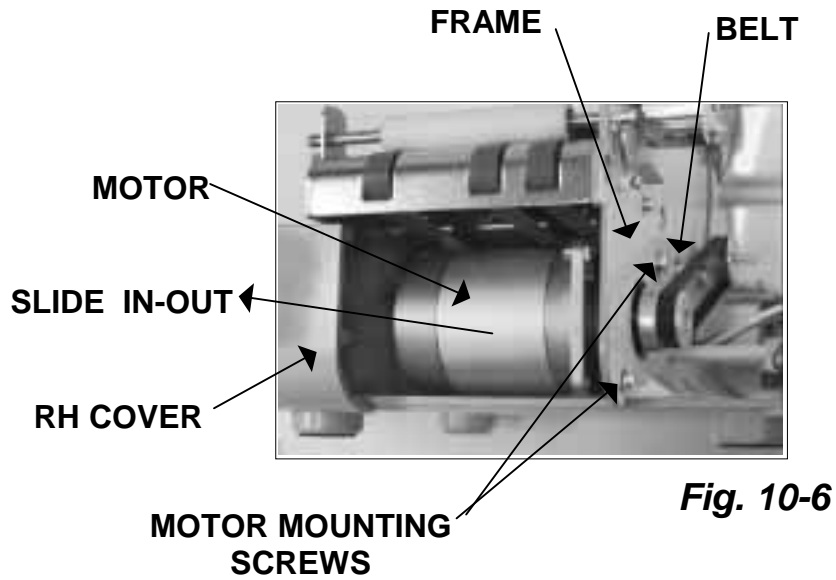
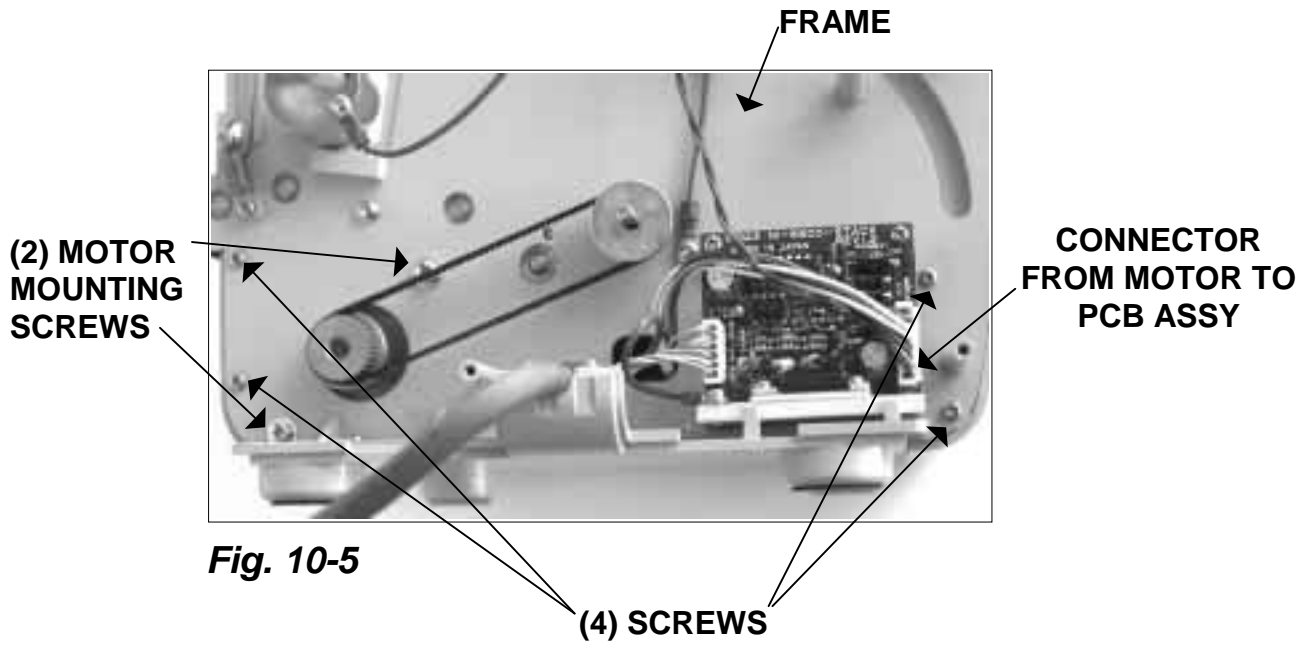


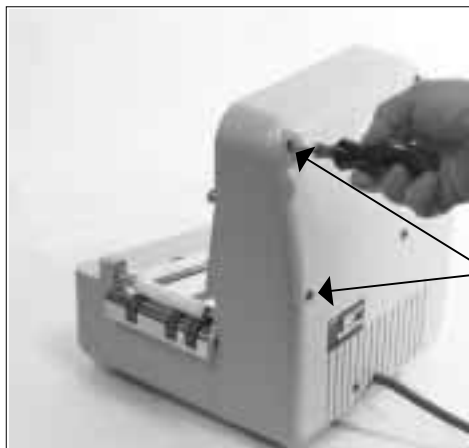
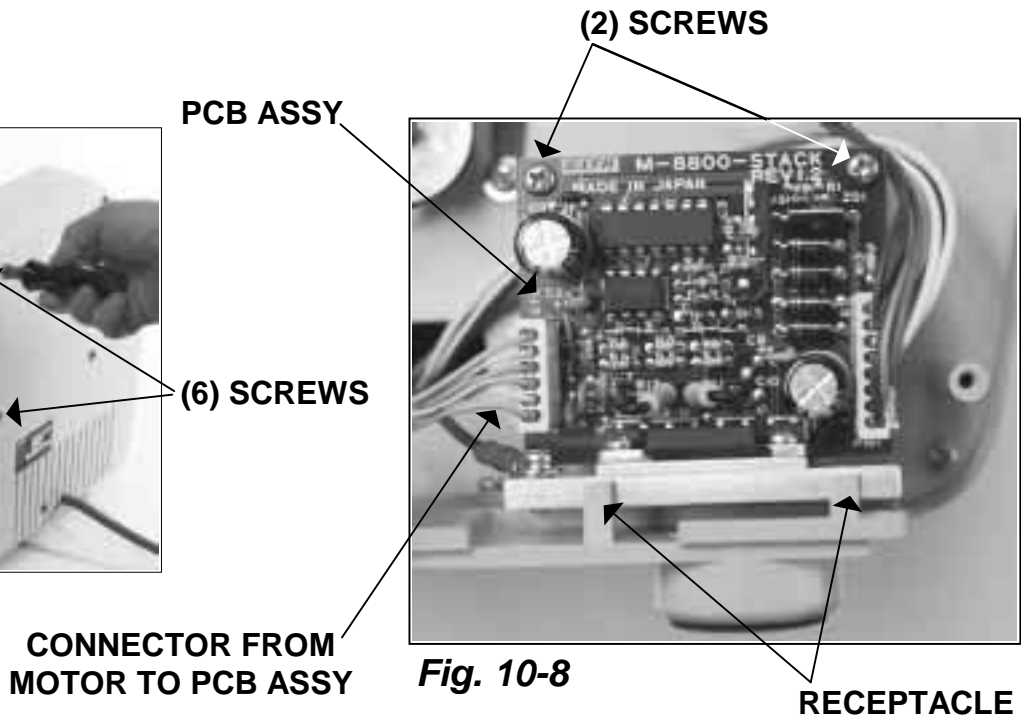
Fig. 10-4

10-5 Replacing the Motor



10-6 Replacing the PCB Assembly

STEP	PROCEDURE
1.	Switch the printer off and disconnect the AC Power Cord.
2.	Detach the back cover by removing (6) screws. Fig.10-7
3.	Detach the connector from the motor to the PCB assy. Fig.10-8
4.	Remove (2) screws holding the PCB assy to the frame. Lift the PCB assy from the receptacle. Fig.10-8
5.	Install a replacement PCB assy in the receptacle and secure to the frame with (2) screws. Attach the connector from the motor to the PCB assy.
6.	Reattach the back cover by replacing (6) screws.

**Fig. 10-7****Fig. 10-8**

10-7 Replacing (1-3) Stacker Belts

STEP	PROCEDURE
1.	Switch the power off and disconnect the AC Power Cord.
2.	Detach the back cover by removing (6) screws. Fig.10-9
3.	Detach the PCB assy by removing (2) screws. Lift the PCB assy from the receptacle and move to the side for access to screw. Fig.10-10
4.	Loosen (2) motor mounting screws to allow motor to be moved to the side for access to screw. Fig.10-11 & 10-12
5.	Remove (2) screws at (2) places to detach the vertical plate from the base plate. Slide members apart to separate. Fig.10-12
6.	Remove (4) screws holding frame to cover and slide apart for access to belts. Fig.10-13
7.	Remove(3) screws to the detach the base plate from the chassis.
8.	Remove (2) screws holding chassis to plate and slide 1-3 belt(s) from pulleys. Fig.10-10
9.	Replace the belt(s) and the (2) screws.
10.	Reattach the base plate to the chassis with (3) screws and the vertical plate to the base plate with (2) screws at (2) places. Fig.10-8
11.	Position the motor box and replace (4) screws.
12.	Replace the PCB board removed in STEP 2 .
13.	Reattach the motor to the frame with (2) mounting screws. Press in the center of the timing belt with the tension gauge and note the tension reading when the belt is moved 1 to 2mm. If the tension reading of the belt is not within range of 150 - 200g, adjust the position of the pulley by loosening the (2) the stepper motor mounting screws and moving motor to achieve the required range. After adjusting motor, tighten but do not over tighten screws. Belts should have some movement.
14.	Reattach the back cover removed in STEP 1 .

10-7 Replacing (1-3) Stacker Belts

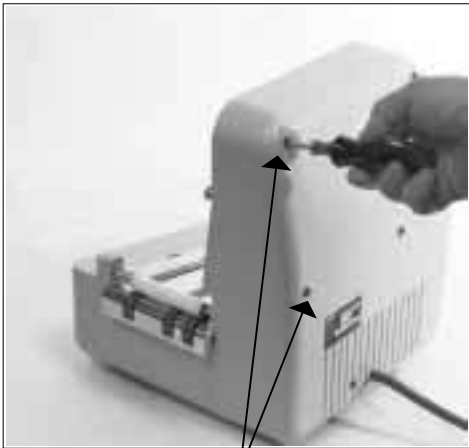


Fig. 10-9 (6) SCREWS



Fig. 10-10 DETACH PCB ACCESS TO THIS SCREW

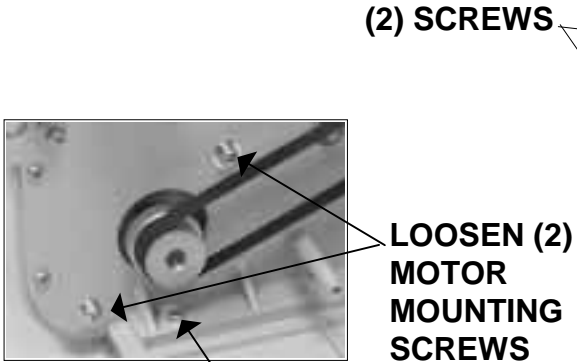


Fig. 10-11 LOOSEN (2) MOTOR MOUNTING SCREWS ACCESS TO THIS SCREW



Fig. 10-13 (2) SCREWS (2) SCREWS

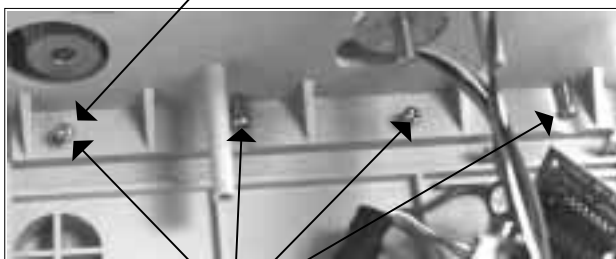


Fig. 10-12 REMOVE (2) SCREWS AT (2) PLACES

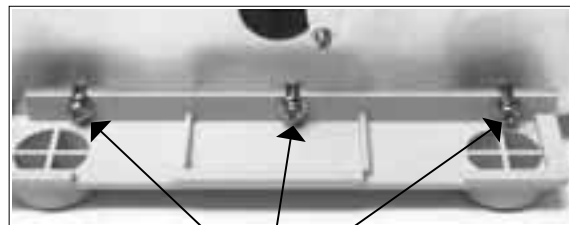
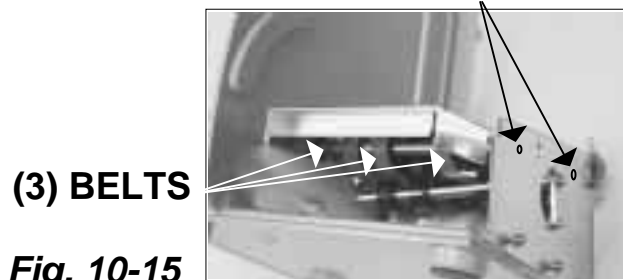


Fig. 10-14 (3) SCREWS (2) SCREW LOCATIONS



(3) BELTS
Fig. 10-15