Bar Code Recognition Option

This option allows the scanner to sense and recognize bar code labels contained in scanned images. Both vertical and horizontal bar code labels are processed in real time by this option. Seven bar code standards, including all the ANSI and JAN specified types, are supported. When processing horizontal bar codes, the data is sampled multiple times to find valid data.

Interface Options

Four different interface modules are available for the IS510 and IS520 that adapt the scanners to specific system requirements.

- The SCSI interface is standard and provides SCSI-2 support.
- The VSI Video interface provides a raw video interface in single or dual data channels.
- The Fujitsu interface emulates the hardware level of Fujitsu M309 scanners.
- The DR11 interfaces with 16-bit DR11 and DRV11 DMA channels.

Job Separation Option

This option recognizes a specially-formed page as a *batch control sheet*. These pages can be used by an application to mark the end of documents, set scanner parameters, or generate index information to the data base system.

When combined with the Bar Code Recognition option the batch control sheets enable complex flow control of an imaging system to be performed by the scanner.

500 and 600 dpi Options

The optical stage of the IS510 scanner is modular and can be set for true 500 or 600 dpi resolutions. A scanning rate of 20 A-size pages per minute at 600 dpi is typical.

This option targets the print-on-demand systems for publishing applications, and the ICR/OCR needs of special systems such as phone books and certain foreign language documents.

Grayscale Output, 8-Bit Processing Option

This option improves the internal image processing capability for binary scanners, and allows fast grayscale image capture.

The grayscale data is useful for systems where special ICR or post-scan image processing requirements exist. When combined with the 500 dpi option, the Grayscale option is ideal for fast fingerprint (IAFIS) system applications. Fingerprint card data capture below 5 seconds at 500 dpi is typical.

The IS510 and IS520 scanners will continue to evolve according to market needs. New options will be developed and made available as a result of discussions between the marketplace, Improvision, and Ricoh.

For information on how to select the options that are best suited for your application, please contact your Ricoh sales representative or Improvision at the numbers listed below.

Ricoh Peripheral Products Division, San Jose, CA
(800) 955-3453   fax: (408) 432-9266

Improvision Research, Emeryville, CA
(510) 653-5335   fax: (510) 652-3337

How This Manual Is Organized

This reference manual is divided into the following parts:

Part I General Information

This part describes the IS510 and IS520 scanners and the options that are available. It also includes specifications and supplemental information such as data sheets.

Part II Setup and Operation

This part includes the *IS510 and IS520 Setup and Operation Manual* that describes how to install and operate the scanner and perform routine maintenance. Supplemental information for new features and options may be added at the end of this part.

Part III Programmer's Reference (Optional)

This part describes how to program the host system for the IS510 and IS520 scanners. Its main purpose is for programmers and system integrators, but other user's may need to know some of the commands.

Part IV Service (Optional)

This part is intended for authorized service technicians and describes how to service and repair the IS510 and IS520 scanners. The ECRs, ECNs and technical bulletins that apply to these products are included under Supplemental Information.

Visual Clues

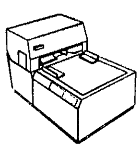
The following visual clues are used throughout this manual:

NOTE . . . Notes contain reminders and additional information when using the IS510 or IS520 scanner.

ADJUSTMENT NOTE: Indicates where adjustment is required.

CAUTION: Possibility of an undesired result if a particular instruction is not followed correctly.

WARNING: Indicates possible damage to equipment or bodily injury.



Indicates that the instructions apply only to the IS520 duplex scanner.

Part I

General Information

Rev A-2 3/31/95

IMPROVISION RESEARCH

RICOH IMAGING
PERIPHERAL PRODUCTS DIVISION

P A R T I

Contents

Introduction

The IS510 and IS520 are table-top document scanners that combine flexibility and simplicity to meet simple and complex paper-scanning requirements. The IS520 is a full duplex scanner that scans both sides of the document at the same time.

The IS510 and IS520 scanners were jointly developed by Ricoh Corporation and Improvision. The scanners are complemented by a set of option packages designed by Improvision. The scanners and options are sold and supported by Ricoh Peripheral Products Division (PPD) and Improvision Research.

Standard Features

- High resolution (400 dpi), grayscale (64 levels) scanner
- Simplex (IS510) and duplex (IS520) models
- Scans sheets, cards, continuous roll, opaque and transparent material
- Automatic or manual document feeding
- Auto page length detection
- Real-time CCITT Compression
- SCSI-2 interface
- RS232C Monitor port
- Built in self-diagnostics and PM/Alignments firmware

How the IS510 and IS520 Operate

The scanner is operated by software commands issued from the host system or the monitor port. It takes only one software command to start using the IS510 or IS520. This single command will feed, scan and eject documents. The extensive software command set adapts the scanner for different resolutions, paper sizes and other functions.

Documents move in a linear motion across a contact glass that is illuminated by a fluorescent light. The scanner's optics focus the reflected light from the document on a linear array Charge Coupled Device (CCD). The mechanical document motion combined with the CCD's self clocking results in raster data depicting the scanned media.

The paper handling mechanism supports automatic feeding using the built-in automatic document feeder (ADF) or manual feeding of long and continuous forms or delicate documents.

Single or dual side scanning in a single pass

The IS510 and IS520 use a straight paper path that protects delicate and stiff documents since no bending or flipping takes place. In IS520 scanners the same paper path is shared by two separate scanning systems to scan both sides of the document in one pass. Two CCD cameras with their light sources and optics are placed one inch apart on opposite sides of the scanned media. This keeps the dual-sided scan cycle identical to that of single-sided operation.

Digitizing Accuracy - from grayscale to binary

The CCD cameras are constructed with 5000 element linear devices permitting over 400 dot per inch (dpi) scanning of B size or longer documents. The cameras accommodate both line art and continuous tone images by generating 64 gray shades per pixel. Camera normalization against a white reference plate corrects for uneven illumination of the document as well as CCD pixel-to-pixel responsivity deviations.

The scanners generate both grayscale and binary data. Conversion of grayscale into binary images is done using contrast, slope and threshold parameters. The combined analog and digital filtering results in a unified image quality over a wide range of document background color, reflectivity and translucency.

Real-time Image Compression

The scanner's CGVS compressor buffer board performs image compression using VCEP technology combined with a large image buffer (up to 6MB) for complex images. The CGVS handles compression in real time without any added overhead.

The compression algorithm is selected by host commands and may be CCITT G3, G3-2D, G4 or explicit (no compression).

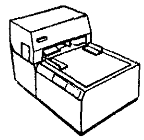


Image formats

A set of seven parameters defines the image-width, length, horizontal and vertical placement, resolution, skip factor to reduce the resolution below 400 dpi, and the use of a fixed scaler that reduces the resolution to 200 dpi. These seven parameters are collectively called *image format.* For IS520 scanners the image format can use different top margins for the front and back sides of the document.

A total of 16 formats can be stored in the scanner and selected by an ID number. Eight of the formats are predefined for standard paper sizes; the other eight formats can be defined by the user and stored in non volatile memory (EEPROM resident). Additional formats can be downloaded from the host as needed.

The size of the scan area is called the *scan window.* The scan window is determined by the active format. If the automatic image formatter is turned on, the length of the scan window varies depending on the document length.

For more details about the image format parameters and the scanner commands used to set them, refer to the "Image Formats" section in Part III, *Programmer's Reference.*

Automatic Image Formatter (AIF)

The AIF overrides the length specified in the image format and crops the scan window on a page-by-page basis by sensing the page length. The AIF is turned on and off by commands issued from the host. The benefits from using the AIF include:

- Improved throughput
- Batches of mixed size documents may be scanned without user intervention
- Multiple paper feed modes can be used
- No data is lost when scanning oversized documents
- Reduced file size improves storage efficiency in the host system
- Scan window length is determined automatically

SCSI-2 Interface

The standard interface for the IS510 or IS520 scanners is a single-ended SCSI-2 interface. It consists of an NPS/NSA board and the interface connectors. The NPS/NSA board implements a SCSI target and translates SCSI bus activities into two internal data paths within the scanner.

The NPS/NSA board communicates with the scanner's CGVS compressor buffer board and the primary CPU board. The CGVS communications is over a DR11 protocol and is used to manage the FIFO buffers and the VCEP compressor. The CPU communication is over RS232C and is used for all parametric scanner setup and scan control.

The SCSI-2 interface bridges between a standard SCSI port and the separate image and control ports commonly used in scanners. It provides the following;

- Flexible SCSI bus configuration
- Scanner-independent design
- CGVS compression and external hardware support
- Self-testing firmware
- Easy development environment

The SCSI interface implements a SCSI target using a 53C94 (ASC) device which can operate in both asynchronous and synchronous transfer modes. SCSI reselection and phase transitions are performed by the ASC hardware for reduced SCSI bus overhead.

The SCSI connection is single-ended shielded low-density "A" cable type. Two parallel connectors permit easy chaining and the use of an external terminator.

Monitor Port

The monitor port provides two-way communication between an ASCII terminal, such as a PC/AT, and the scanner. When commands are sent to the scanner, the scanner responds with a confirmation that it received the command and a description of what the scanner did in response to the command. The verbose operation of the monitor port can be used to configure the scanner for more involved activities, perform all of the self tests, and as a support tool when programming the host system.

Scanner maintenance is simplified by using the monitor port to access a comprehensive set of diagnostics firmware. A typical preventive maintenance (PM) procedure takes only minutes. All alignments and troubleshooting are done using the built-in diagnostics; resulting in typical repair times below one hour.

Description of Options

The following options are currently available for the IS510 and IS520 scanners. Additional options are under development and will be provided as supplements to this manual.

Host Interface Options

The standard interface for the IS510 or IS520 scanners is a single-ended SCSI-2 interface. The scanners can also interface to any host system via separate control and data channels. Image data can be sent using any of the following options:

- SCSI-2 (standard configuration), buffered
- DR11-W or DRV11-WA, buffered
- Fujitsu 3093/4/5/6 (buffered or unbuffered) compatible
- synchronous bit serial, buffered (VSI)

DR11 Interface Option

The DR11 Interface option permits the scanner to be attached to any host equipped with either a DR11 or DRV11 16-bit parallel DMA channel. Such configurations are presently available on the PC/AT, SUN SPARC, SUN VME, DECStation and VAX platforms. Scanner software support in all DR11 environments is presently available from Improvision and several third-party VARs.

Fujitsu Interface Option

The Fujitsu (GVS-12) interface option allows the scanner to be plug compatible with any M309X scanner. This option permits connectivity to any third-party environment where the Fujitsu scanners are used.

The Fujitsu interface generates an image data path compatible with Fujitsu scanners. It performs the following functions:

- M309X hardware compatibility
- Duplex buffered operation via GVS-01
- Multi media scanner engines support
- Adaptable data port timing

The Fujitsu interface accepts serial binary image data in Improvision's VSI format and converts it to the Fujitsu Corp. proprietary byte-oriented interface used in M309X scanners.

As done in Fujitsu scanners, the complete interface is comprised of data and control paths. The control port is RS232 compatible. The command protocol is the low level scanner language described in the "Command Language Interface" section in Part IV, *Programmer's Reference.*

The data port timing protocols for the Fujitsu interface can be modified in the field. All of the critical interface phase delays can be adjusted to accommodate extra long cabling or other host interface requirements.

Video (VSI) Interface Option

The Video interface provides a raw video interface in single or dual channels. This interface consists of a serial ASCII communication channel for control and differential image transfer lines. Conversion to other interfaces is facilitated by Improvision's GVS cards.

Document Endorser Options

Two options are available for endorsing scanned documents. The ink jet endorser marks the scanned document and the electronic endorser marks the scanned image.

Ink Jet Endorser (NPS/SPA) Option

The Ink Jet Endorser is a post-scan endorser that prints on the top side of scanned documents (reverse side of pages scanned with an IS510 scanner). The Ink Jet Endorser permits the host to specify alphanumeric print strings up to 512 characters long.

The key features are:

- Uses standard HP ink jet cartridge
- No document stoppage, uses paper motion
- Full alphanumeric character set
- Programmable print line starting point, printing pitch, and auto incrementing numeric fields within the print string

The ink jet endorser printhead installs in the upper unit of the scanner and prints alphanumeric and graphic characters on the back side of a document as part of the scan cycle. (Graphic characters include any symbol that can be defined as a 7 x 9 matrix.) The endorser uses the paper motion as its print axis, therefore, no paper stops are required. Print line placement relative to the scanner throat is done manually by sliding the print head.

Several software commands are aimed as simplifying typical scan/endorse applications. An auto incrementer lets the host define any numeric field within the print string which will increment without host intervention on a scanned page count basis.

The print string starting point and character density are programmable allowing adaptation to document layout requirements and fine PICA control.

Electronic Endorser (BMW) Option

The BMW (bitmap writer) electronic endorser option allows the scanner to mark the image bitmap with alphanumeric and graphic symbol data. It uses a hardware character generator to create a high-resolution graphic marking any place on the scanned frame.

The key features are:

- Real time processing
- Image marking modes: Stamping and Preserving
- High resolution font, two-font selection
- Up to 8 mark lines with up to 256 characters per line
- Binary scaling of the mark characters
- Programmable operation under host control

Two font selections are available for possible inclusion of user-specified symbols. A font cell of 32 by 32 pixels is used to define the marks with 256 extended characters per font. The characters can be mapped directly to image pixels resulting in an approximation of 10 point type for 300 dpi images.

Up to eight lines of mark characters are permitted with a maximum of 256 characters per line. The actual number of characters and lines may be limited by the scanned image format, the marking zoom factor, and the starting point of the marking area relative to the image frame.

Binary zoom factors of 2X, 4X and 8X provide added flexibility to this option.

The electronic endorser functions are programmed from the host control port. Several commands are defined to load marking data, select marking type, zoom factor, and image frame placement.

Marking Modes

Two image marking modes are available.

- Stamped mode overrides the image data providing the effect of a rubber stamp.
- Preserving mode preserves any image detail that may coincide with a mark character position by altering the mark color (black or white) to be the opposite of the image data underneath the mark.

Image Processor (NPS/IP) Option

The Image Processor option provides full-feature programmable image processing (enhancement) beyond the standard operations of the basic scanner. The Image Processor performs:

- Gamma correction curve selection
- Dynamic thresholding with controlled high and low spatial frequency response
- Single pixel patching and repair
- Dither matrix selections
- Controlled background sensitivity
- Gamma corrected grayscale output
- Grayscale to binary conversion
- Edge sharpening

The Image Processor accepts digital grayscale image data from a line scan camera and converts it to binary image data. The board operates on 6 bit per pixel data at pixel rates up to 14 MHz with no limit on the number of pixels per line.

The input grayscale data is translated with a selectable gamma curve correction circuit prior to its use by the Image Processor. This feature is used to fit the overall response from the media, illuminator and CCD.

The Image Processor tracks the incoming image data for localized maximum and minimum points (high peaks and low valleys in the grayscale data along a scan line). The minimum and maximum data are used in determining a threshold value against which the incoming image data is evaluated and converted to binary data.

An edge detector circuit can be set to alter the binarization process as determined by evaluating the incoming data change rates against a selectable rule set. This circuit helps in removing some of the undeterministic pixels ("fuzziness") often seen on small text and is considered a high-frequency operator.

The single pixel patch and removal (SPP) circuit operates on a 3 by 3 pixel matrix and assists in removing "orphans" of either color, as well as vertical and horizontal "holes/sticking pixels." This function improves the final image appearance and compression ratio. The SPP has a pass-through mode and three patch algorithms selectable by the CPU module.

Bar Code Recognition (IBCR) Option

The Bar Code Recognition option allows the scanner to sense and recognize bar code labels contained in scanned images. Both vertical and horizontal bar code labels are processed by this option in real time. Seven bar code standards, including all of the ANSI and JAN specified types, are supported. When processing horizontal bar codes, the data is sampled multiple times to find valid data.

The key features are:

- Real time processing
- Multiple bar code standards support
- Horizontal and vertical bar code labels
- "Auto retry" for poor quality labels
- Programmable operation under host control
- Bar code specifications supported: Code 39 Standard and Extended (ANSI MH10.8M); Codabar (ANSI MH10.8M); Interleaved 2 of 5 (ANSI MH10.8M); code 128; UPC A, E; MSI code; Code 11; and EAN/JAN 8, 13.

The Bar Code Recognition uses raster data generated by the image scanner to emulate a handheld laser bar code scanner. The data is collected in a local FIFO buffer and is processed during the scan time by a dedicated bar code processor.

Bar code label recognition is based on examination of one or more data streams intersecting the label across all its bars. The Bar Code Recognition supports vertical and horizontal label orientations placed anywhere within the image.

The label orientation is relative to image scan lines and is considered "horizontal" when a single image scan line intersects all the label bars. It is considered "vertical" when the label bars are parallel to the image scan lines.

When operating on horizontal labels, the Bar Code Recognition can be set to examine several scan lines which intersect the label. This mode of operation improves the recognition immunity to poor label quality or other noise in the image.

The Bar Code Recognition functions are programmed from the host control port. Several commands are defined to select coding type, label position and orientation, auto retry modes, etc.

Light Source (Color Dropout) Options (FL/BA, FL/R37)

The Light Source option allows document scanning with dropout of selected colors. This is especially beneficial in OCR and form removal applications, such as medical forms, where controlled media is used. The standard green phosphor lamp can be replaced with a red lamp to drop specified shades of red. A blue lamp is also available to drop shades of blue. Other RGB phosphor mixes may be developed in the future to match specific customer requirements. Contact Improvision Research for details.

OCR dropout inks from Flint Ink (formerly Sinclair & Valentine) are recommended for printing forms to insure the best possible dropout under the broadest possible conditions. Flint Ink uses pure pigments with no carbon carrier in their inks. An ink with a carbon carrier will contain black as part of its color base and will not be dropped as effectively as a non-carbon based carrier ink.

The following Flint inks have been tested to dropout with each of the colored lamps.

Green Lamp (std.)	Light Green	J24554
	Light Green	J24649
	Light Green	J27975
	Light Green	J-27976
	Light Green	J-24185
	Light Yellow/Green	J27974
	Yellow	J-24182
	Dark Green	J-22052
	Light Blue/Green	J-24555
	Light Blue	J-24186
	Light Blue	J-24662
	Blue	041328
	Blue	J-30494
Blue Lamp	Light Green	J-27975
	Light Green	J-27976
	Light Blue	J-24186
	Light Blue	J-27972
	Light Blue	J-27973
	Light Blue	J-31858
	Blue	J-30494
	Dark Blue	J-18710
	Dark Blue	J-31861
	Dark Blue	J-31862
Red Lamp	Red	J-6983
	Red	J-19410
	Red	J-24882
	Red	J-24893
	Red	J-25083
	Red	J-30495

Ricoh PPD is currently profiling a large selection of Pantone inks. Pantone ink numbers found to drop with different color lamps will be published when available.

500/600 DPI (HIRES) Options

The optical stage of the IS510 scanner is modular and can be set for true 500 or 600 dpi resolutions. A scanning rate of 20 A-size pages per minute at 600 dpi is typical.

This option targets the print-on-demand systems for publishing applications, and the ICR/OCR needs of special systems such as phone books and certain foreign language documents.

Grayscale Output 8-Bit Processing (8EQ/DIT) Option

This option improves the internal image processing capability for binary scanners, and allows fast grayscale image capture.

The grayscale data is useful for systems where special ICR or post-scan image processing requirements exist. When combined with the 500 dpi option, the Grayscale option is ideal for fast fingerprint (IAFIS) system applications. Fingerprint card data capture below 5 seconds at 500 dpi is typical.

Job Separation (DOCSP) Option

This option recognizes a specially-formed page as a *batch control sheet.* These pages can be used by an application to mark the end of documents, set scanner parameters, or generate index information to the data base system.

When combined with the Bar Code Recognition option the batch control sheets enable complex flow control of an imaging system to be performed by the scanner.

Options Under Development

The following options are currently under development by Improvision. Check with your sales representative, Ricoh or Improvision for availability.

Mixed Data Type Scanning

This option will allow one pass capture of grayscale and binary scan areas of the same document. The option will greatly enhance the image buffer capacity and host interface bandwidth. Typical application areas targeted are fingerprinting, passport applications, etc.

Scanner Security and History

This option allows the scanner to maintain a private message area of any alphanumeric information up to 512 characters. The data can be read by any application but can only be written by using a software "security key".

Applications for this option include on-line configuration and ownership record, system security, and field upgrade/maintenance records.

Specifications

These specifications describe the general functions and options of the IS510 and IS520 image scanners. All functions are activated by software commands from a host device.

	IS510	**IS520**
Type	Desktop (simplex)	Desktop (duplex)
Document type	Sheets (paper), card, roll, opaque and transparent material (film of any translucency) The following materials will degrade or damage the ADF: wrinkled or torn (dog-eared) paper documents with tractor feed holes stacked together documents with loose objects (gum, glue, paper etc.) paper with foreign objects (staples, tape etc.) coated paper (wax, aluminum powder etc.) wet paper (water, ink, etc.) oil stained paper high carbon content paper (with grain perpendicular to motion) product of PPC with silicone oil fuser	
Document size	width: minimum: 0.5 in. maximum: 12 in. length: minimum: 2.75 in. maximum: unlimited (continuous scan mode) or 64K scan lines	
Document paper weight	auto feed: 8 lb. to 45 lb. paper stock manual feed: 4 lb. to 80 lb. paper stock	
Scanning speed	0.679 sec. at 200 dpi = 12.72 ips 1.006 sec. at 300 dpi = 8.48 ips 1.333 sec. at 400 dpi = 6.36 ips	
Throughput Data based on an A4 size (8.3 in. x 11.7 in.) document scanned in landscape format.	60 ppm at 200 dpi 45 ppm at 300 dpi	
Image type	Line art or dither halftone	
Resolution **major (along scan lines) and minor (along document motion axis) resolution selection per:**	400/300/200 dpi maj_res +=400 * skip/(skip+1) * mod min_res = (256 - stepper time) * 5.79 * mod (skip range: 1-999 mod = 1 or 1/2) (valid stepper time range = 140-230)	
Interface	SCSI-2 (CGVS and NSA) per Ricoh IS520 spec See “Options” in this table for other interfaces.	

	IS510	IS520
Dropout color	The following Flint Ink (formerly Sinclair & Valentine) green, yellow and blue shades have been tested to dropout when using the standard green (F1/G54) wide sprectrum lamp: J24554, J24649, J27975, J-27976, J-24185, J27974, J-24182, J-22052, J-24555, J-24186, J-24662, 041328, J-30494. See "Options" in this table for other lamp colors.	
Power source	85 to 132 V 176 to 265 V AC 110/220 (85~264V 47~65Hz) universal input PSU	
Power consumption	standby: 150 W operating: 190 W	standby: 220 W operating: 225 W
Noise	Idle: TBD dBA Scan: TBD dBA	
Heat	800 BT	
Dimensions (W x D x H)	25.9 x 17.9 x 12.3 in. (657 x 455 x 313 mm)	25.9 x 17.9 x 16.7 in. (657 x 455 x 424 mm)
Weight	approx. 88 lbs. (40 Kg)	approx. 99 lbs. (45 Kg)
User replaceable parts	separation cartridge, ADF feed and pickup rollers, fluorescent lamp assembly	
Scanning system	stationary, CCD	
Grayscale	6-bit/pixel or 8-bit/pixel (optional)	
Warm up time	approx. 10 sec. for first scan	
Camera controls	white level calibration (equalization) contrast control (range: 0-255) single pixel delete/patch (on/off) binary output control to select from: binary, positive binary, negative Bayers dither matrix (positive) 5 dither matrices with "harsher" Bayer pattern	
Temperature	10 to 40C	
Humidity	10 to 85% RH non-condensing	
MTBF	2000 hour @80% continuous load	
Scan area selection	Relative to leading edge of document, and pixel No. 1 of the CCD by the following 7 parameters: Pixel offset (first valid pixel per line) pixels per line skip factor (horizontal scaling) Lines offset (page offset from edge sensing) number of scan lines per page stepper velocity (vertical scaling) 1/2X Scaler (50% 2D scaler) All parameters are defined to a pixel/line accuracy. The pixel and page offsets can be set uniquely for the secondary side of IS520 scanners. The number of scan lines per page is ignored when the AIF is enabled.	

	IS510	IS520
Area select recall	8 sets of area selections may reside in EEPROM and recalled by reference to a format I.D. (range = 9-16)	
Data compression	Selectable by host commands to: Explicit bit map (no compression) CCITT-G3/1D (MH) CCITT-G3/2D (MR) CCITT-G4 (MMR) Jumper selection of Code reversal (16 bit words)	
Compression speed	97 Mbit/sec. max. (white space) 6 Mbit/sec. min. (1 pixel checkerboard pattern) 0 overhead for images with positive compression ratio	
Compressor FIFO	2/4/6 Mbyte FIFO prior to compression size is jumper selectable	
Monitor port	RS232C DTE, 9600 baud, No parity, 8 data bits, 1 stop	
ADF type	differential friction, center pick-up	
ADF capacity	8-10 mm stack (up to 50 sheets)	
ADF error ratio	Measured with clean high quality paper (64g/sq. m) no feed: 1/1000 double feed: 1/2000 jam: 1/1000	
Document guides	centered, uniform hand adjusted min. opening: 100 mm (60.mm with adapter) max. opening: 304 mm	
ADF cleaning	Clean rubber rollers with a dry cloth or a cloth moistened with water.	
MTTR	less than 30 min. for trained personnel	
OPTIONS		
Light Source (Color Dropout)		
Red lamp (F1/R37)	The following Flint Ink (formerly Sinclair & Valentine) red shades have been tested to dropout when using the red (F1/R37) narrow sprectrum lamp: J-6983, J-19410, J-24882, J-24893, J-25083, J-30495.	
Blue lamp (F1/BA)	The following Flint Ink (formerly Sinclair & Valentine) green and blue shades have been tested to dropout when using the blue (F1/G54) wide sprectrum lamp: J-27975, J-27976, J-24186, J-27972, J-27973, J-31858, J-30494, J-18710, J-31861, J-31862.	
500/600 dpi		
Scanning velocity	5.09 ips @500 dpi, 12.8175 MHz clock 4.24 ips @600 dpi, 12.8175 MHz clock	
DR11 Interface	DR11-W and DRV11-WA, per DEC specs (CGVS)	
Fujitsu Interface	Fujitsu MARS compatible (with GVS-12)	
Video (VSI) Interface	Video - per Improvision's VSI specs	
PVSI Interface	PVSI - per Improvision's VSI specs	

	IS510	IS520
Image Processor (NPS/IP)		
Image input	Six bit per pixel normalized data Line clock, Pixel clock Valid scan line	single ended TTL single ended TTL single ended TTL
Data rate	10 Mpix/sec. typical 14 Mpix/sec. max recommended	
Pixels/line	Unlimited for non-dithered output 5036 max. for dithered output	
Image output	Binary data, Pixel and Line clock Gamma corrected Grayscale data	differential TTL single ended TTL
Control input	EXT port from PAGS-1K/R3 32 bit wide data port	
Selections	A. Gamma curve correction B. Background sensitivity C. Change rate sensitivity D. Change rate usage algorithm E. Combiner matrix mix F. Dither matrix select G. Single pixel algorithm H. Colored media override	(32 curves) (16 steps) (2 types) (2 types) (4 choices) (8 choices) (4 types) (on/off)
Ink Jet Endorser		
Endorser type	ink jet stationary head	
Endorser character cell	7 by 9 matrix (128 symbols)	
Endorser orientation	Parallel to minor scan axis. Uses document motion as print X dimension sweep.	
Print time	overlapping with scan time	
Endorser controls	download print string (128 char. max.) Set start of string relative to leading edge sense download auto incrementing field within string download character aspect ratio.	
Cartridge type	HP 51604A, plain paper - black	
Cartridge life	0.5 million characters (average)	
Grayscale Output, 8-Bit Processing		
Optional resolution	400 dpi, 500 dpi (IAFIS applications)	
Output format	8-bit per pixel	
Data type selection	Grayscale (8, 4, 2-bit or binary)	
Data orientation	MSB-D7, LSB-D0	
Scan rate	11.25 Mpix/sec or 12.8175 Mpix/sec (selected for grayscale uniformity specs)	
Host Interface	PVSI (differential TTL, 8-bit)	

PART I

	IS510	IS520
Bar Code Recognition (IBCR)		
Bar Code types	Code 39 Standard and Extended (ANSI MH10.8M); Codabar (ANSI MH10.8M); Interleaved 2 of 5 (ANSI MH10.8M); code 128; UPC A, E; MSI code; Code 11; EAN/JAN 8, 13	
Min element	3 or 5 pixels (jumper select), horizontal labels 2 pixel (scanline), vertical labels	
Element filter	Black preserving, 7 pixel horizontal and vertical	
Code length	to 32 characters or as limited by code type	
Auto retry	Examine every 16th to 64th scanline - horizontal Inactive for vertical labels	
Host controls	A - select vertical or horizonal label B - set bar code offsets C - select bar code type, lable length (optional)	
Label position	16 pixel increments - vertical label center line or horizontal label quite zone Number of scanlines from top of page - vertical label quite zone or horizontal lable center line	
Label decoding	concurrent with scan	
Electronic Endorser (BMW)		
Marking buffer	up to 8 marking lines 256 (max) symbols per line	
Mark font cell	32 by 32 pixels	
Mark modes	"stamp" - marks black in image "preserve" - inverts image under mark symbol	
Mark position	by number of scanlines from top of image frame by blank font cells from 1st pixel per line	
Zoom factors	1X, 2X, 4X, 8X selectable by software command	
Host controls	A - select vertical mark placement B - set font zoom factor C - set "stamping" or "preserving" mark modes D - select font (std. or custom) E - enable/disable operation	
Mark timing	concurrent with scan	

Supplemental Information

Data Sheets

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PART I

Part II

Setup and Operation

Rev. A-1 2/7/95

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RICOH IMAGING
PERIPHERAL PRODUCTS DIVISION

IS510/IS520 Document Scanner

Setup and Operation

IMPROVISION RESEARCH

RICOH IMAGING

PERIPHERAL PRODUCTS DIVISION

Contents

IMPORTANT INFORMATION:

Note to Users in the U.S.A.
This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment uses, generates and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case, the user will be required to correct the interference at his own expense.

Note to Users in Canada
This digital apparatus does not exceed the Class A limits for Radio Frequency noise from Digital Apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numerique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la Classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le Ministere des Communications du Canada.

Note to Users in Germany

Bitte an den Benutzer

Bitte füllen Sie beiliegende Karte aus und senden Sie diese wieder zurück.

Die BZT-Nummer dieser Maschine ist A 700 233 C/HF (IS510)
A 700 234 C/HF (IS520)

BESCHEINIGUNG DES IMPORTEURS

Hiermit wird bestätigt da der
Bildabtaster IS510/IS520
(Gerät, Typ, Bezeichnung)

In Übereinstimmung mit den Bestimmungen der
Verfügung 523/1969 und 113 vom 28. August 1969
(Amist verfügung)

funkenstört ist.

Der Deutschen Bundespost wurde die Inbtriebnahme dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen erteilt.

RICOH COMPANY, INC.
(Name des Herstellers/Importeurs)

The use of interface cables other than shielded I/O cables or specified equivalents will invalidate the certification of this scanner and may cause interference levels which exceed the limits established for this equipment.

The noise level of this machine does nto exceed 70dB (A).

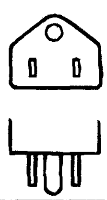
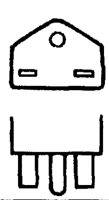
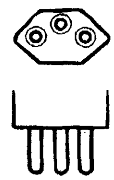
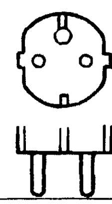
Power Supply Safety

This product should be operated from the type of power source—U.S.A.: AC 120 V 50/60 Hz, Europe: AC 220-240 V 50/60 Hz. If you are not sure of the type of power available, consult your dealer or local power company.

WARNING:
This product is equipped with a 3-wire grounded power system. Note that the plug has a third (grounding) pin, and will only fit into a grounded outlet. If you are unable to insert the plug into your outlet, contact a service person. Do not defeat the purpose of this safety feature by trying to connect the unit to a 2-pin, ungrounded outlet.

Choose a power cord that complies with the following requirements.

– Attachment plug cap: It should have the proper voltage rating and be approved for use in the country in which it will be used.

Voltage	125V 15A	240V 15A	240V 6A	240V 6A	240V 10 - 15A
Plug cap shape					
Country	USA/Canada	USA/Canada	UK	Switzerland	Europe
Standard	UL/CSA	UL/CSA	BS	SEV	CEE/DIN

Every effort has been made to ensure the accuracy of this manual. However, Ricoh Company Ltd., Ricoh Corporation and Improvision Research make no express or implied warranty of any kind in regard to the contents of this manual, and can assume no liability for any errors or their consequences.

Table of Contents

Introduction

The IS510 and IS520 scanners are high-speed scanners that let you scan a wide variety of documents.

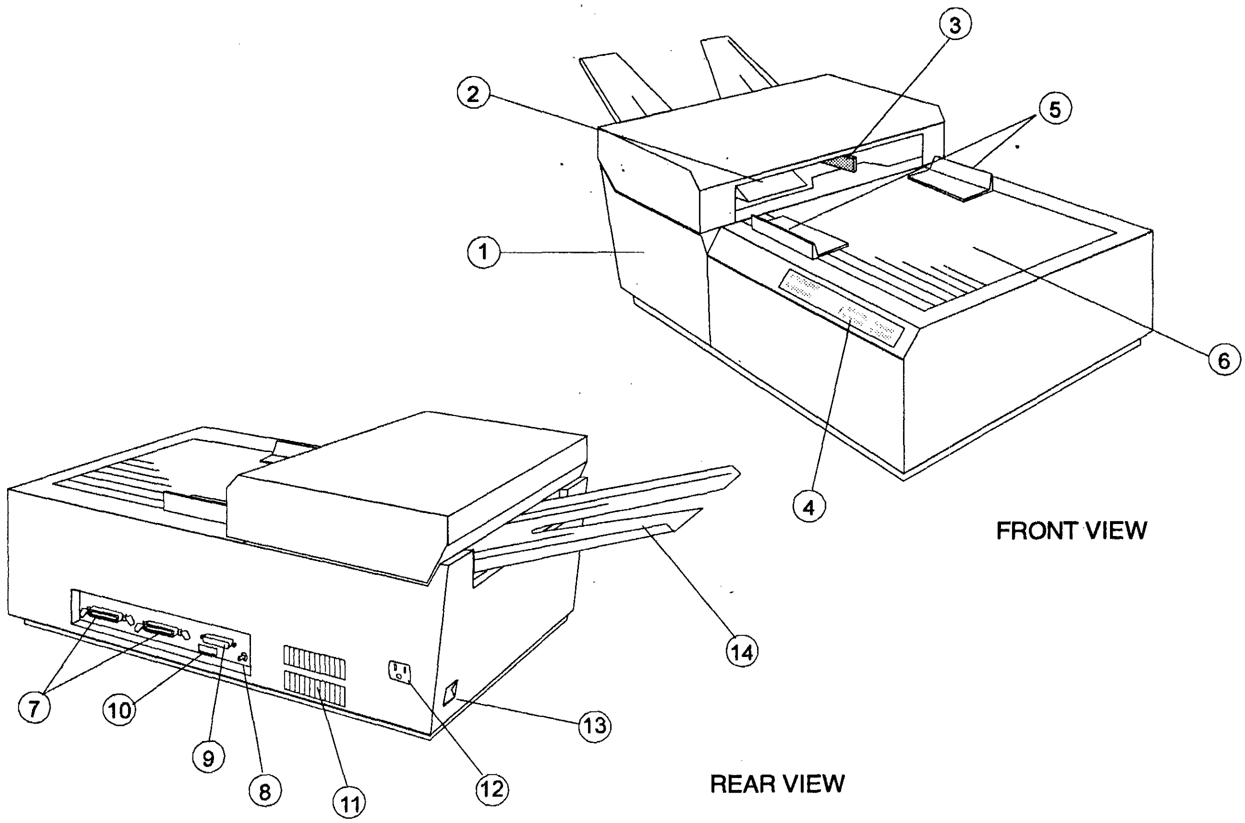
- The IS510 contains one set of optics and scans one side of the page.
- The IS520 contains two sets of optics and scans both sides of the page at the same time.

All other operations of the two models are the same.

The scanner is operated by software commands issued from the host system. These commands let you customize the scanner for simple or complex applications.

To get full use of all of the scanner features, be sure to familiarize yourself with this manual and the scanner. Keep this manual nearby for quick reference during scanner operation.

IS510 Part Names and Functions



1 Lamp access door
Opened when replacing the fluorescent lamp.

2 ADF release lever
Push up to open the ADF cover.

3 Feed lever
Move toward front of scanner for automatic feeding. Move toward the rear of scanner to manually feed documents.

4 Indicator panel
Indicates the scanner status (errors, etc.)

5 Document guides
Adjust to the width of the document being scanned.

6 Document table
The document is set here for scanning.

7 SCSI interface connectors
The SCSI interface cables are connected here to connect the scanner to the host system.

8 Rotary switch
Sets the SCSI ID number.

9 Monitor Port
A PC can be connected to the monitor port for feedback when testing and programming the scanner.

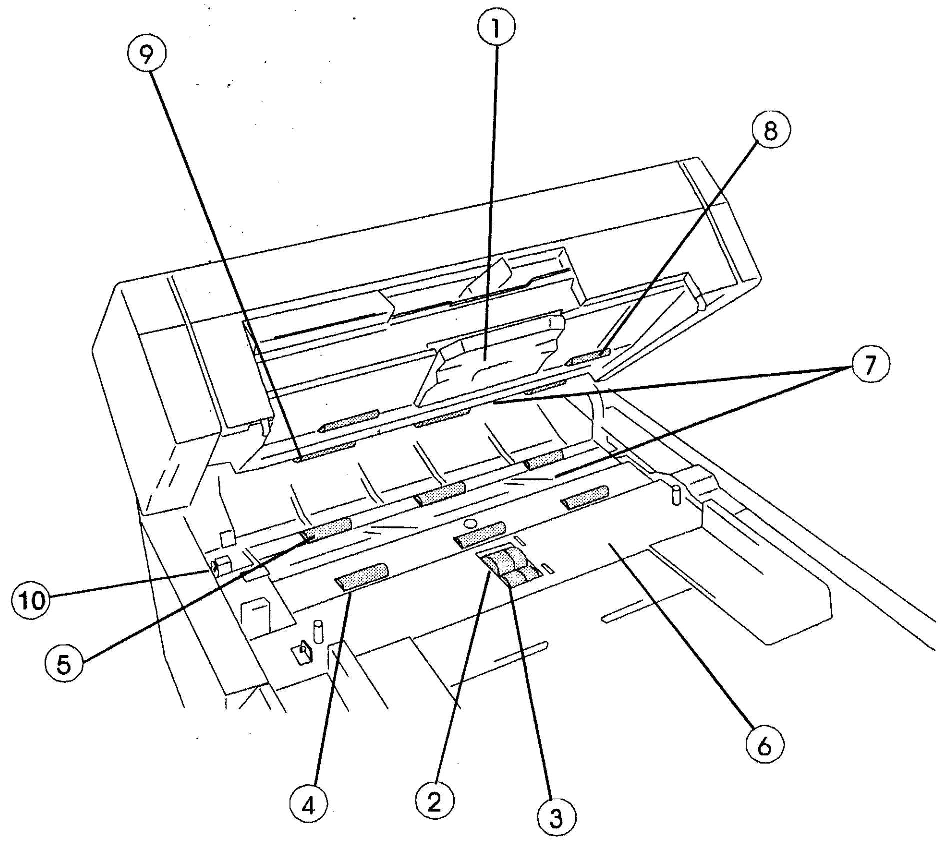
10 SCSI DIP Switch
Configures the scanner. DO NOT change switch settings.

11 Fan vent
Expels heat from the scanner. DO NOT block.

12 AC receptacle
The power cord is connected here.

13 Power switch
Turns the scanner on and off.

14 Output Tray
The document comes out here after scanning.



View with ADF Cover Open

1 **Separation cartridge**

2 **ADF Feed roller**

3 **ADF Pickup roller**

4 **R1 roller**

5 **R2 roller**
These rollers and cartridge handle the documents.

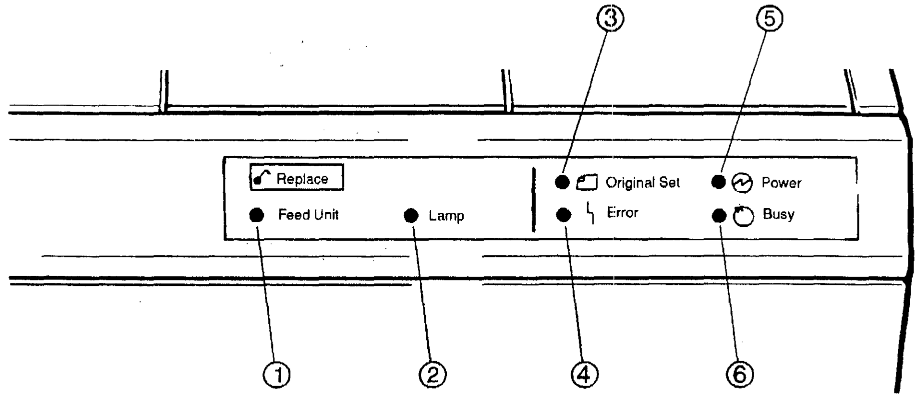
6 **ADF roller cover plate**
Opened when replacing the ADF feed roller and ADF pickup roller.

7 **Contact glasses**
The document is read when it passes over the lower contact glass.

8 **R1 idler**
Presses the document against the R1 roller.

9 **R2 idler**
Presses the document against the R2 roller.

10 **Manual Roller Activator**
Manually rotates the rollers 1/4 turn so they can be cleaned.



Indicator Panel

1 **Feed unit replacement indicator**
Lights after 1 million pages have been scanned as a reminder to check the ADF rollers for wear. Replace the ADF feed and pickup rollers when the red stripe is no longer visible. See the "Replacing the ADF Feed and Pickup Rollers" section of this manual for the procedure. If the R1 or R2 rollers are damaged (pieces missing or broken), contact a service technician for replacement. The light will remain on until reset by a service technician.

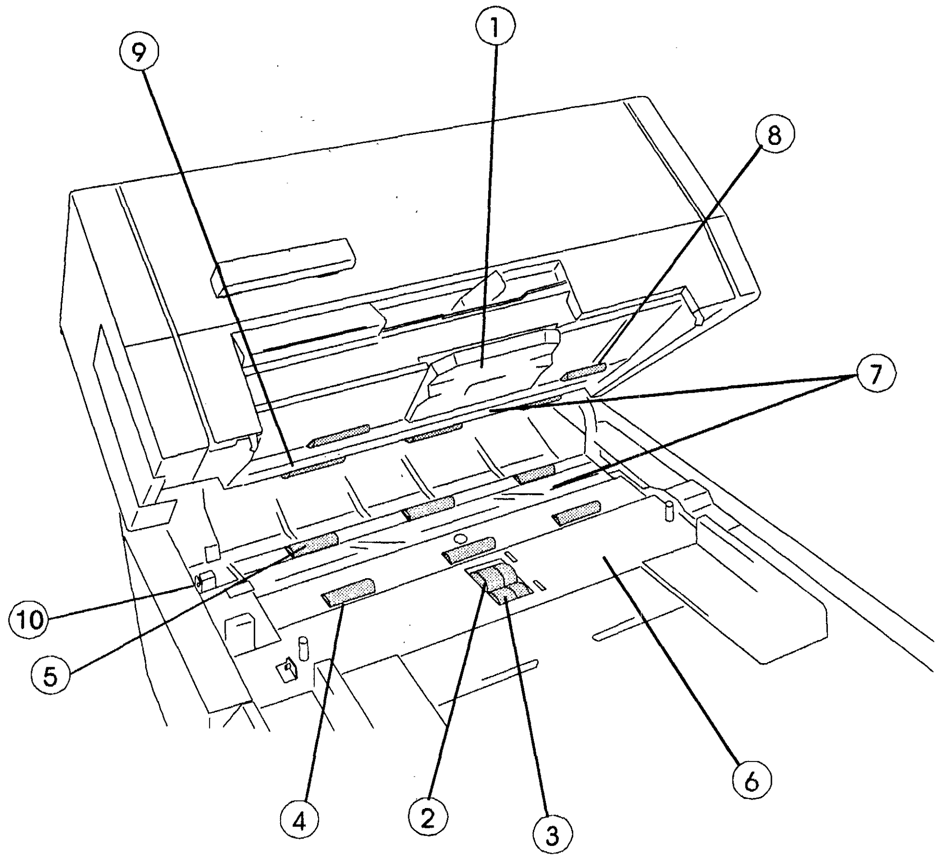
2 **Lamp replacement indicator**
There are two reasons for the yellow lamp indicator to turn on: (a) the lamp has reached the normal life span or (b) the lamp heater is broken, not connected or overheating. Follow the procedure in the "Replacing the Fluorescent Lamp" section of this manual to replace the lamp.

3 **Original Set indicator**
Lights green when the document is placed on the document table and is in position for scanning.

4 **Error indicator**
Blinks red when an abnormality such as a paper jam, open cover, etc. has occurred.

5 **Power indicator**
Lights green when the power is turned on.

6 **Busy indicator**
Lights orange when there is data to be sent to the host system.



View with ADF Cover Open

1 **Separation cartridge**

2 **ADF Feed roller**

3 **ADF Pickup roller**

4 **R1 roller**

5 **R2 roller**
These rollers and cartridge handle the documents.

6 **ADF roller cover plate**
Opened when replacing the ADF feed roller and ADF pickup roller.

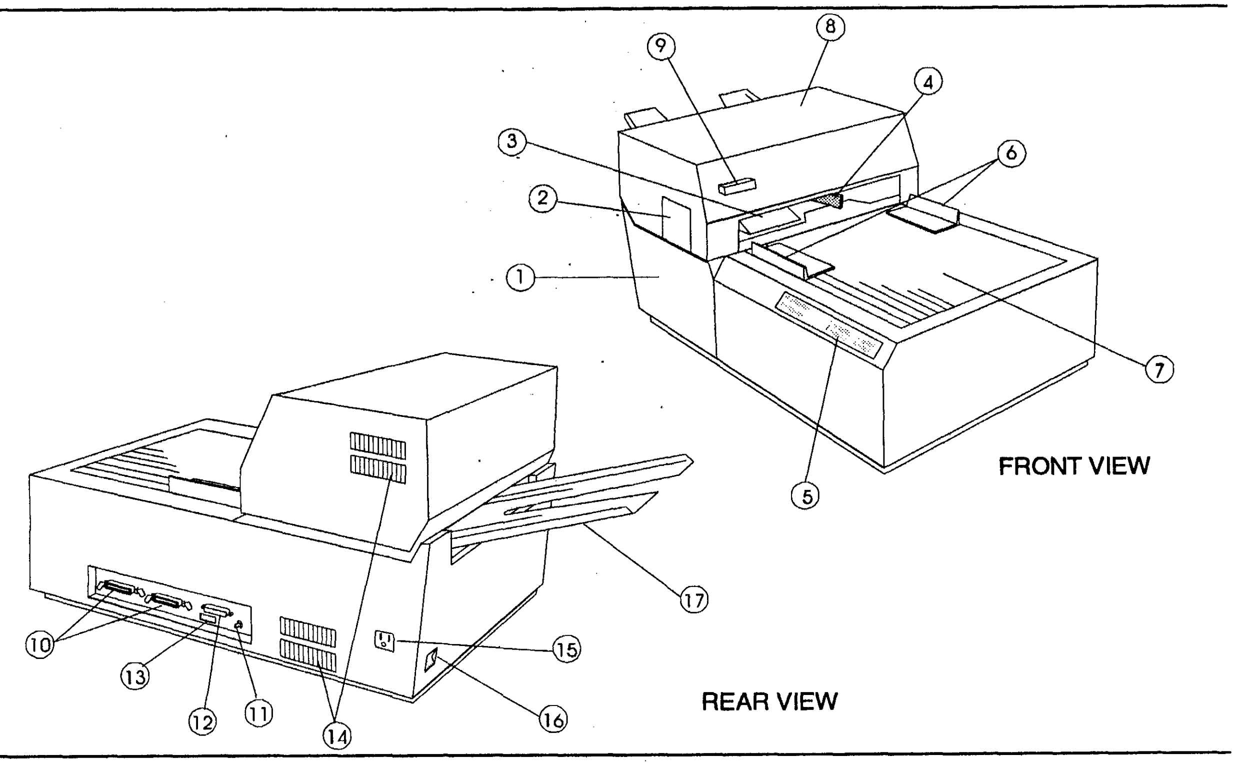
7 **Contact glasses**
The document is read when it passes over the glasses.

8 **R1 idler**
Presses the document against the R1 roller.

9 **R2 idler**
Presses the document against the R2 roller.

10 **Manual Roller Activator**
Manually rotates the rollers 1/4 turn so they can be cleaned.

IS520 Part Names and Functions



1 **Lower lamp access door**
Open to replace the lower fluorescent lamp.

2 **Upper lamp access door**
Open to replace the upper fluorescent lamp.

3 **ADF release lever**
Push up to open the ADF cover.

4 **Feed lever**
Move toward front of scanner for automatic feeding. Move toward the rear of scanner to manually feed documents.

5 **Indicator panel**
Indicates the scanner status (errors, etc.)

6 **Document guides**
Adjust to the width of the document being scanned.

7 **Document table**
The document is set here for scanning.

8 **Upper scanning unit**
The top side of the document is scanned by this unit.

9 **Upper unit handle**
Use to lift ADF cover (upper scanning unit).

10 **SCSI interface connectors**
The SCSI interface cables are connected here to connect the scanner to the host system.

11 **Rotary switch**
Sets the SCSI ID number.

12 **Monitor Port**
A PC can be connected to the monitor port for feedback when testing and programming the scanner.

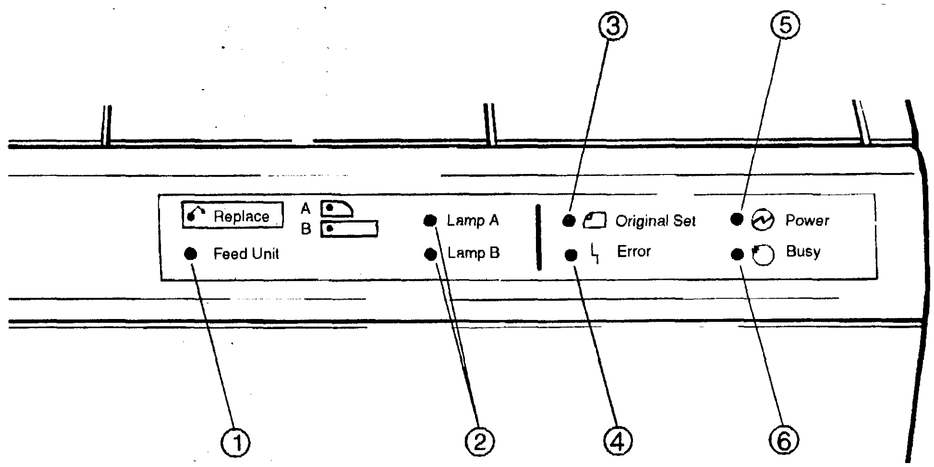
13 **SCSI DIP Switch**
Configures the scanner. DO NOT change switch settings.

14 **Fan vents**
Expels heat from the upper and lower scanners. DO NOT block.

15 **AC receptacle**
The power cord is connected here.

16 **Power switch**
Turns the scanner on and off.

17 **Output tray**
The document comes out here after scanning.



Indicator Panel

1 **Feed unit replacement indicator**
Lights after 1 million pages have been scanned as a reminder to check the ADF rollers for wear. Replace the ADF feed and pickup rollers when the red stripe is no longer visible. See the "Replacing the ADF Feed and Pickup Rollers" section of this manual for the procedure. If the R1 or R2 rollers are damaged (pieces missing or broken), contact a service technician for replacement. The light will remain on until reset by a service technician.

2 **Lamp replacement indicators**
There are two reasons for the yellow lamp indicators to turn on: (a) the lamp has reached the normal life span or (b) the lamp heater is broken, not connected or overheating. Follow the procedure in the "Replacing the Fluorescent Lamps" section of this manual to replace the lamp.

3 **Original Set indicator**
Lights green when the document is placed on the document table and is in position for scanning.

4 **Error indicator**
Blinks red when an abnormality such as a paper jam, open cover, etc. has occurred.

5 **Power indicator**
Lights green when the power is turned on.

6 **Busy indicator**
Lights orange when there is data to be sent to the host system.

Configuration Information

The Configuration Form located in the front pocket of this binder provides a detailed description of how your scanner was configured before it was shipped from the factory. Any optional equipment that is installed on the scanner is indicated on the Configuration Form.

NOTE . . . Please keep the Configuration Form in the pocket so it is immediately available for service and maintenance purposes.

Have You Changed Your Configuration?

Please indicate any changes that are made to the scanner's configuration on the Configuration Form. The blank Configuration Form on the following page can be used for changes to the configuration.

Resident Image Formats

A total of sixteen image formats can be resident in the scanner. Eight are predefined and eight are EEPROM-resident.

Predefined Image Formats

The eight predefined image formats are for common US paper sizes. These formats cannot be changed. The programmed parameters for each format are shown in the table.

ID No.	Paper Size	Width	Length	Resolution	Skip Factor	Top Margin Primary	Top Margin Secondary	Left Margin	1/2X Scaler
1	A	8.5 in	11 in	400 dpi	0	1.825 in	0.91 in	0.73 in	off
2	A	11 in	8.5 in	400 dpi	0	1.825 in	0.91 in	2.01 in	off
3	B	11 in	17 in	400 dpi	0	1.825 in	0.91 in	0.73 in	off
4	A	8.5 in	11 in	300 dpi	3	1.73 in	0.67 in	0.97 in	off
5	A	11 in	8.5 in	300 dpi	3	1.73 in	0.67 in	2.6 in	off
6	B	11 in	17 in	300 dpi	3	1.73 in	0.67 in	0.97 in	off
7	Legal	8.5 in	14 in	300 dpi	3	1.73 in	0.67 in	2.6 in	off
8	A	8.5 in	11 in	200 dpi	0	1.825 in	0.91 in	0.73 in	on

The scanner contains 400 dpi optics. The skip factor reduces the resolution by the specified factor and the 1/2X scaler reduces 400 dpi to 200 dpi.

NOTE . . . The margins in the above table may vary slightly depending on how the scanner is set up.

Default EEPROM-Resident Image Formats

The eight EEPROM-resident image formats can be set by the user. Refer to your Configuration Form for the default EEPROM image formats that are installed at the factory. These defaults can be changed by issuing commands from the host system. Part III, *Programmer's Reference*, provides information on the default EEPROM-resident image formats installed by different API's.

Required Software

Host software is required to operate the IS510 and IS520 scanners. This software is available from Ricoh PPD and several other ISVs (Independent Software Vendors). See Part III, *Programmer's Reference,* for additional information.

The **R_Scan** program disk that is included with the scanner can be used to test the scanner. R_Scan runs under Microsoft Windows on an IBM-compatible PC. Refer to Part III, *Programmer's Reference,* for information on how to use R_Scan.

To install R_Scan:

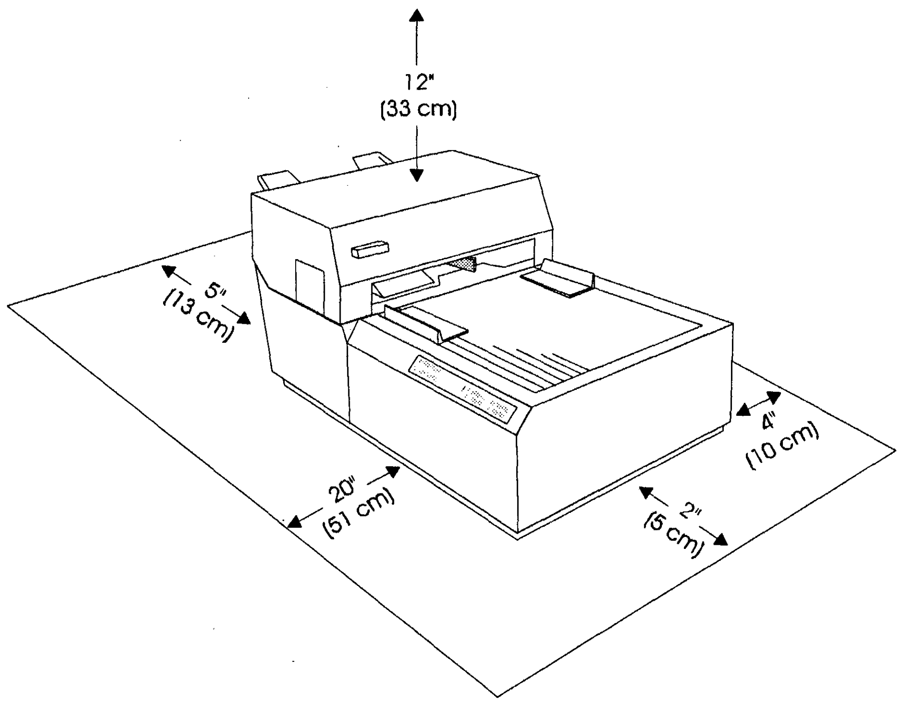
1. Create a new R_SCAN directory on your hard disk.
2. Copy the contents of the R_Scan disk to the R_SCAN directory.
3. Go to the Windows Program Manager and select the program group that you want to use for R_Scan.
4. Choose **New** from the File menu. Select **Program Item** and click **OK**.
5. Select the **Command Line** and click **Browse**. Select **R_SCAN.EXE** from the R_SCAN directory and click **OK** to exit back to the Program Item dialog box. Click **OK** to accept the command line entry. The dialog box closes and the R_Scan icon appears in the program group.

Installing the Scanner

Setup Conditions

The scanner should be placed on a firm, level surface such as a sturdy table. Check to be sure the scanner is level within 1.5 degrees.

Allow sufficient space around the scanner for proper ventilation and cooling and to provide access for routine maintenance.



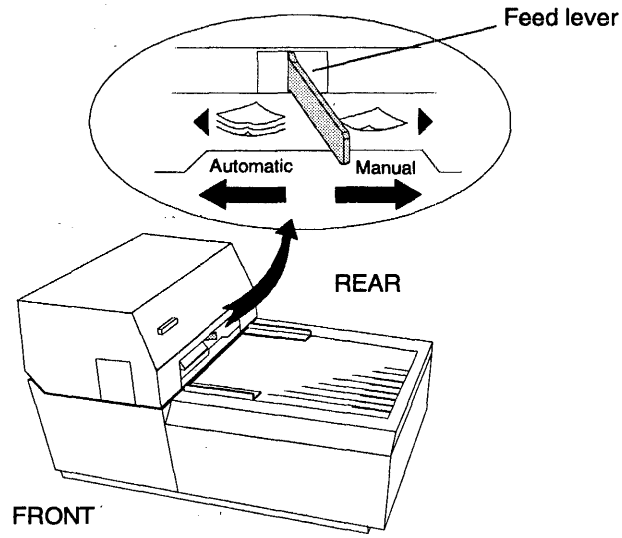
Scanner Space Requirements

Power Requirements:

Input voltage:	85 to 138V AC 176 TO 276V AC
Frequency:	50 Hz: 47 to 53 Hz 60 Hz: 57 to 63 Hz
Power capacity:	10A or more
Phase:	Single phase
Cut-off:	100% ripple 20 ms or less

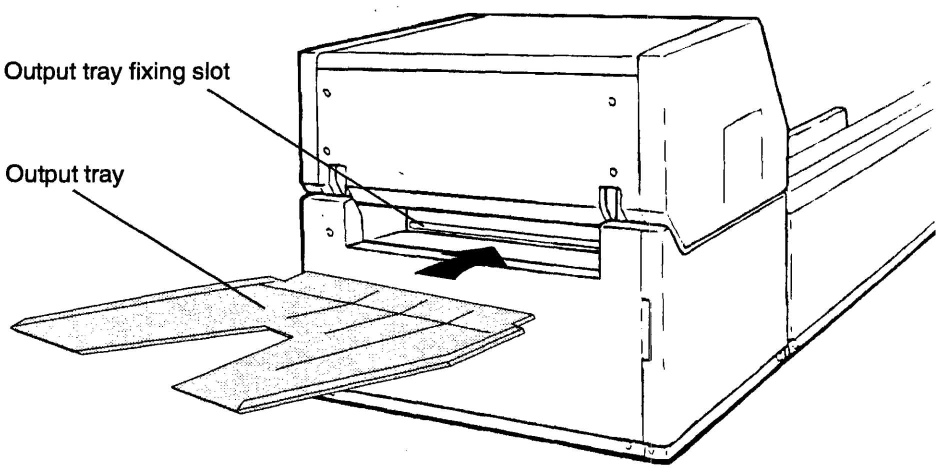
Releasing the Feed Lever

Remove the tape from the feed lever and slide the lever toward the front of the scanner. This sets the scanner for automatic feeding.



Mounting the Output Tray

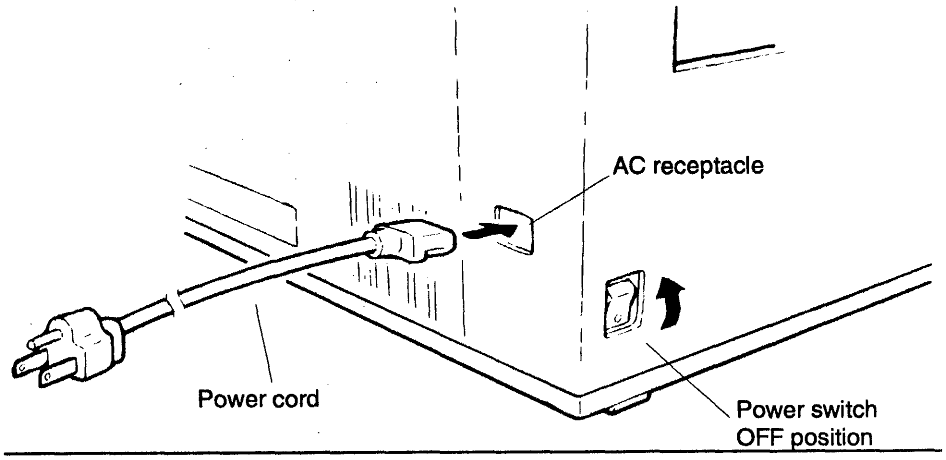
Insert the output tray into the output tray fixing slot as illustrated.



Connecting the Power Cord

1. Check to be sure the power switch is turned OFF (O side).

2. Insert the power cord into the AC receptacle on the scanner, then plug the other end into the wall outlet.



Connecting the Interface Cables

SCSI-2 is the standard interface for IS510 and IS520 scanners. Scanners with a SCSI-2 interface installed have two daisy-chained 50-pin low-density connectors on the rear panel and a rotary switch to select the SCSI ID.

NOTE . . . If your scanner has an optional interface installed, follow the instructions in Appendix C to connect the interface cables.

Multiple peripheral devices, such as SCSI-compatible hard drives, tape back-ups and scanners, can be cabled together on the same SCSI bus.

CAUTION: Before connecting the interface cables, make sure that the power switch is turned off (O side).

SCSI Interface Cable Requirements

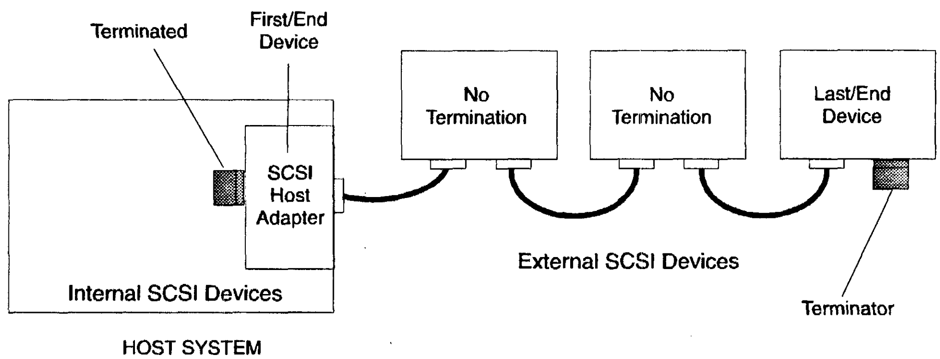
- The characteristics of the interface cable and terminator must conform to the ANSI SCSI-2 standard.
- The cable must be a shielded 50-pin SCSI interface cable with a minimum conductance of 28 AWG.
- The recommended characteristic impedance is $100\Omega \pm 10\%$.
- The total length of the SCSI bus (cables connecting the scanner and all other devices) should be no more than 19.6 ft. (6m).

SCSI Bus Configuration

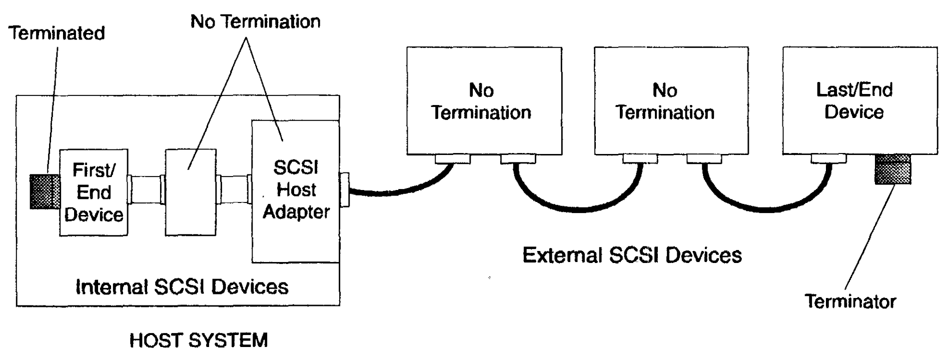
On a SCSI bus all of the SCSI devices are daisy-chained together. This includes the SCSI host adapter, all internal SCSI devices (inside your computer), and all external SCSI devices (outside your computer). Up to seven devices can be linked in the SCSI bus chain.

- The *first* and *last* devices on the SCSI bus MUST BE terminated.
- Devices in the middle of the chain MUST NOT BE terminated.

The SCSI adapter has an internal port for connecting internal SCSI devices and an external port for connecting external SCSI devices.



External SCSI Devices Only



Internal and External SCSI Devices

Connecting External Devices

Most external SCSI devices have two 50-pin connectors that are used to link the devices together. A cable connects the first external device to the host system. This device is then connected to the next device by another cable. A terminator is required on the last device to close the SCSI bus connection.

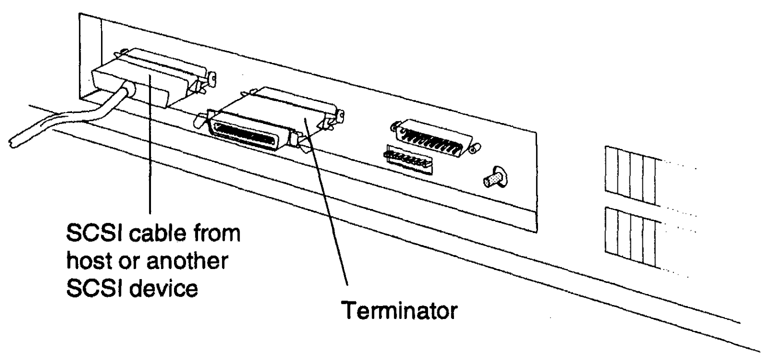
Active termination is recommended for noise-free operation.

NOTE . . . Any external device that has an internal terminator must be the last device on the SCSI bus. The IS510 and IS520 scanners do not have an internal terminator and can be located anywhere within the SCSI bus.

If the scanner is your only external SCSI device or the last device on the bus:

The interface cable from the host system or another SCSI device can be connected to either of the scanner's SCSI connectors. A terminator should be connected to the other connector.

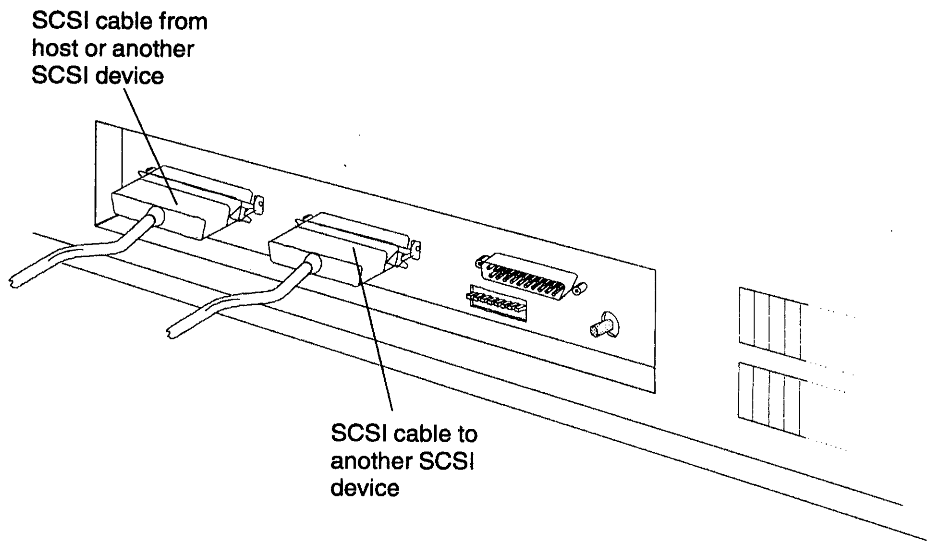
Be sure to snap the spring clamps in place on both sides of the cable and terminator.



Connecting the Scanner as the Last Device on the SCSI Bus

If the scanner is located between other SCSI devices:

1. Connect the interface cable from the host system or another SCSI device to either of the scanner's SCSI connectors and snap the spring clamps in place on both sides of the cable.



Connecting the Scanner between Devices on SCSI Bus

2. Connect another interface cable to the scanner's other connector and snap the spring clamps in place. Route the cable to the next SCSI device.

Setting the SCSI ID

The rotary switch on the rear of the scanner sets the SCSI device ID number.

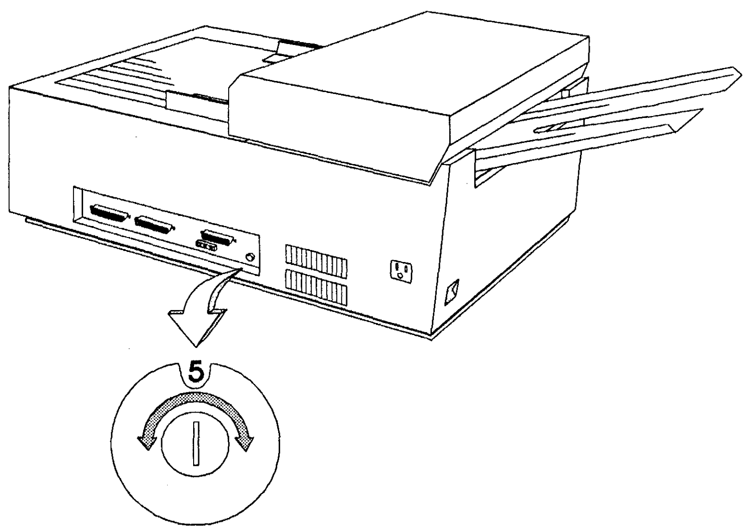
Before changing the rotary switch setting, determine the device ID number for the computer itself and any other SCSI devices that are connected. Set the scanner for an ID number that is not in use by any other device.

NOTE . . . No two devices on the SCSI chain can have the same ID number.

1. Turn the scanner OFF (O position).

   If the rotary switch setting is changed while the scanner is turned on, the host system will not sense the ID setting until the scanner power is recycled or a RESET command is issued from the host.

2. Turn the rotary switch knob to set the scanner ID number. The number indicated in the slit of the rotary switch is the selected ID number. The numbers 0 through 7 can be selected. Numbers 8 and 9 should not be used (if they are used, the scanner is set for ID No. 7).



Setting the SCSI ID

SCSI Conflicts

Due to differing implementations of SCSI between peripheral devices, SCSI conflicts may arise between the scanner and other connected SCSI devices. If you have problems which do not stem from ID conflicts, try moving the scanner or another peripheral device to a different position on the SCSI bus. This will sometimes correct the problem.

Always use high-quality cables and terminators. Ricoh recommends that active termination be used whenever possible for a more stable bus condition. Never exceed the 19.6 ft. (6m) cable length limit.

NOTE . . . Most host adapters are set for ID 7. DO NOT set the scanner for ID 7, 8 or 9.

Testing the Scanner

Basic Functionality

Basic scanner functionality may be tested as follows:

1. Turn the scanner power switch ON and observe the lights on the indicator panel and the fans.

   All of the indicator lights should turn on for 3 seconds and the fan located on the rear of the scanner should blow air through the lower vent. After 3 seconds all lights should turn off with the **Power** light staying on.

   If the **Error** light is flashing, check the lamp access door(s) and the ADF cover to be sure they are closed and locked in position.

2. Lift the ADF cover and observe the **Error** light flashing. Lay a sheet of paper (standard weight or heavier) over the contact glass to activate at least one of the two left optical sensors. Slowly close the ADF cover on top of the document and lock it in position. The **Error** light will turn off, the scanner's motor will turn on, and the document will be ejected from the paper path. If the scanner is an IS520, the upper unit fan will also turn on.

3. Set the feed lever to the Automatic position. Place your finger under the right side of the separation cartridge to engage the ADF sensors. The lamp(s) should turn on for 1 minute.

Using the Monitor Port

The monitor port provides a convenient means for testing the scanner's operation. When a PC is connected to the monitor port, you can issue commands from the PC that will do everything except send images to the host system. A detailed explanation of the scanner's response to each command appears on the PC screen.

The monitor port is also a valuable programming aid. A PC can be connected to the monitor port to monitor commands as they are issued from the host system.

The syntax and commands used by the monitor port are fully explained in the "Command Language" section of the *Programmer's Reference* in Part III of this manual.

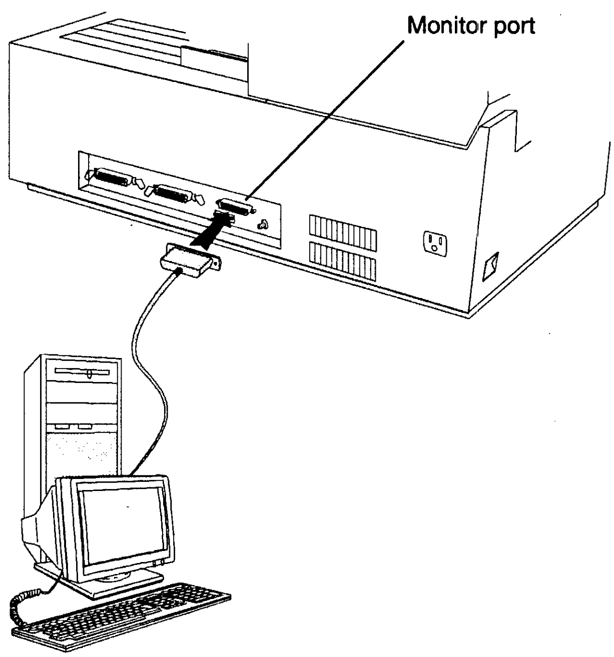
CAUTION: Since the monitor port can access all scanner commands, be careful not to issue any commands to the monitor port *concurrent* with the SCSI interface. This may put the scanner in an undefined state. In all cases do not use the 6F command unless you fully intend to modify the EEPROM format table.

The monitor port is RS232C and is set for 9600 baud, 8 data bits, 1 Stop bit, No parity and does not use any handshake scheme.

Connecting a PC to the Monitor Port

The PC you connect to the monitor port can be either a laptop or standard system. The PC must have communications software that allows it to operate as a terminal. Microsoft Windows has a Terminal program that can be used for this purpose.

1. Connect a straight-through RS232C serial cable with a 25-pin connector with pins 2, 3 and 7 active to the monitor port on the scanner.



2. Connect the other end of the cable to either COM1 or COM2 on the PC.

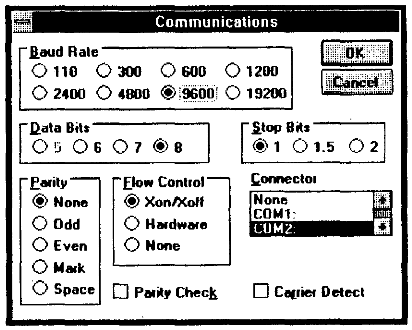
3. Run the PC as a terminal and set the following communication parameters:

Terminal Emulation:	Any, but VT100 not recommended
Baud Rate:	9600
Data Bits:	8
Stop Bits:	1
Parity:	None
Flow Control:	None

To run the PC in terminal mode from Microsoft Windows:

1. Start Windows on the PC and open the Accessories group.

2. Double-click the Terminal icon to start the Terminal program. A prompt will appear if the COM port has not been selected. Click **OK**. The Communications dialog box opens. Select the COM port that is being used on the PC and the other options as illustrated below.



3. Choose **Terminal Emulation**, **Communications** and **Terminal Preferences** from the Settings menu to set the communication parameters.

Testing Scanner Operation

The following steps describe how to use the monitor port to test the basic operation of the scanner.

1. Turn the scanner power switch ON.

2. Insert several sheets of paper into the scanner.

3. Type the **7t** command to cycle the scanner and feed the paper.

   ✍ *NOTE . . . A "K" response on the monitor screen confirms that the scanner received the command and performed the function.*

4. When finished checking the scanner, exit from terminal mode and disconnect the PC from the monitor port.

Refer to Part III, *Programmer's Reference*, if you want to test other functions.

Operating the Scanner

Dos and Don'ts

The following rules should be observed to avoid damage to the scanner and documents.

During Scanning Operations

- Lock the ADF cover down before starting to scan. Severe document skew and misfeeds can result if the ADF cover is unlocked.
- DO NOT close the ADF cover on fragile or very thick or thin materials.
- DO NOT open the ADF cover or the fluorescent lamp access door while scanning is in process.
- DO NOT place anything but the document on the scanner document table.
- DO NOT let the output tray get too full. The maximum capacity of the tray is 50 sheets of paper.
- DO NOT move the feed lever while documents are loaded in the scanner.
- DO NOT attempt to remove a jammed document with the ADF cover closed. Unlock and lift the ADF cover before removing the document.
- DO NOT move the scanner or block the fan vents (located on the rear of the scanner).
- DO NOT turn off the power switch or remove the power cord.

General

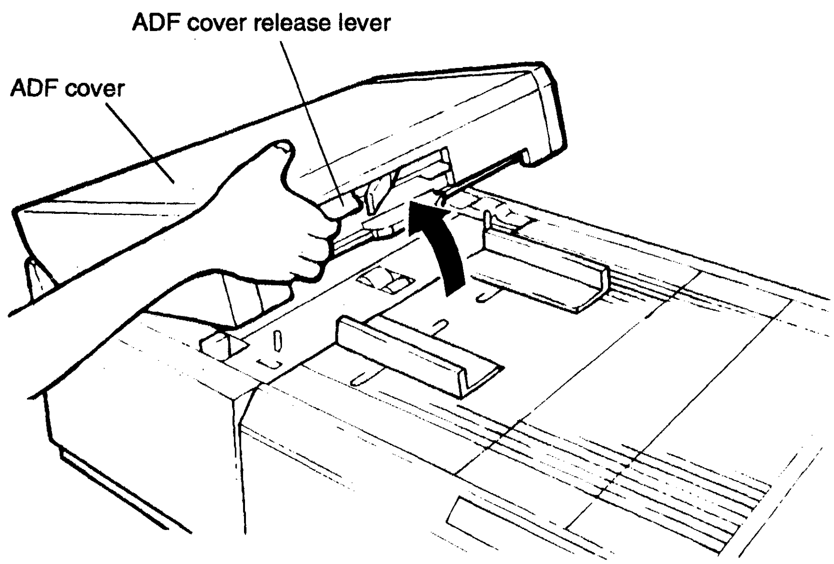
- Keep corrosive liquids, such as acid, off the scanner.
- DO NOT allow paper clips, staples or other small objects to fall into the scanner.
- Always turn the scanner off when you are finished scanning for the day.
- When not using the scanner for long periods, disconnect the power cord and move the feed lever to the manual position.
- DO NOT modify the scanner or replace any parts other than the ones mentioned in the "User Replaceable Parts" section of this manual.

Opening the ADF Cover

The ADF cover will need to be opened to perform some of the procedures in this manual.

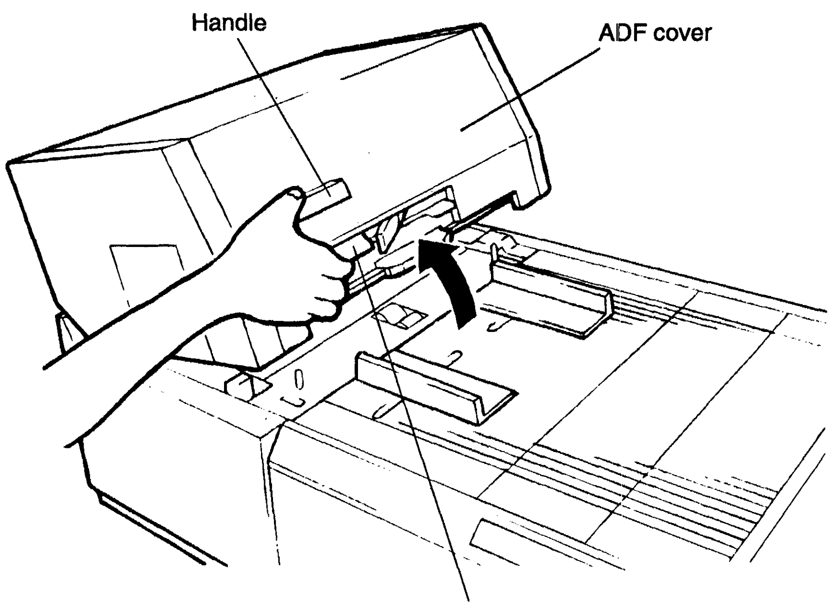
IS510 Scanners

Place your thumb on top of the ADF cover and squeeze the release lever to unlock the cover so it can be raised.



IS520 Scanners

Place your thumb on the handle and squeeze the release lever to unlock the cover so it can be raised.



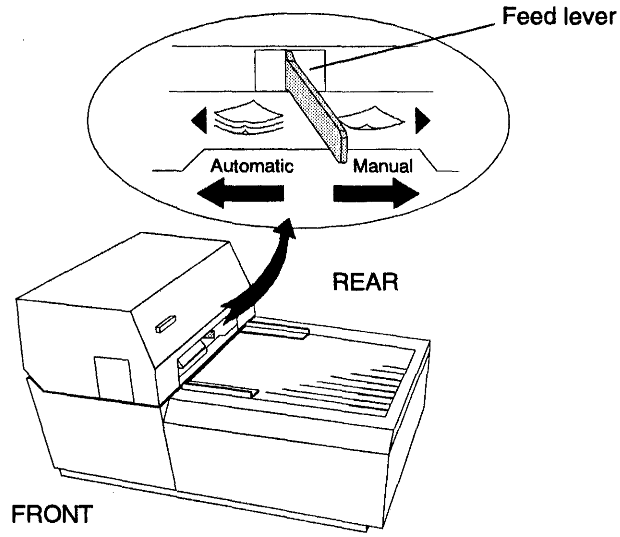
Closing the ADF Cover

To close the ADF cover on either scanner, firmly press down on the cover until the lock lever clicks.

Selecting the Feed Mode

Documents can be fed either automatically or manually. The feed mode is selected by the position of the feed lever.

CAUTION: Be sure to remove any documents from the scanner BEFORE moving the feed lever.



Automatic Feed. To automatically feed stacks of documents, move the feed lever toward the front of the scanner.

Manual Feed. To feed documents one page at a time, move the feed lever toward the rear of the scanner.

Automatic Feeding

The automatic document feeder (ADF) keeps the documents flowing at the maximum speed and should be used whenever possible. Pages that are different lengths and widths can be included in the same stack. Extremely thick or thin documents should be fed manually.

Set the feed lever to the automatic position.

What you can scan automatically...

- stacks of paper
- stacks of cards
- continuous rolls (under software control)
- opaque or transparent material

Refer to the Specifications at the end of this manual for the exact document requirements for automatic and manual feeding.

Remove all...

- staples and paper clips
- wrinkled or torn (dog-eared) pages
- pages with attached objects such as gum, glue, paper, tape, etc.
- pages coated with wax, aluminum powder, etc.
- wet paper (water, ink, etc.)
- oil stained paper
- high carbon or clay content paper (with grain perpendicular to motion) such as carbonless copy paper
- product of PPC with silicone oil fuser (Xerox 9700, Ricoh 4400, etc.)
- Tractor feed holes from computer paper. The holes can make it difficult to separate the pages.

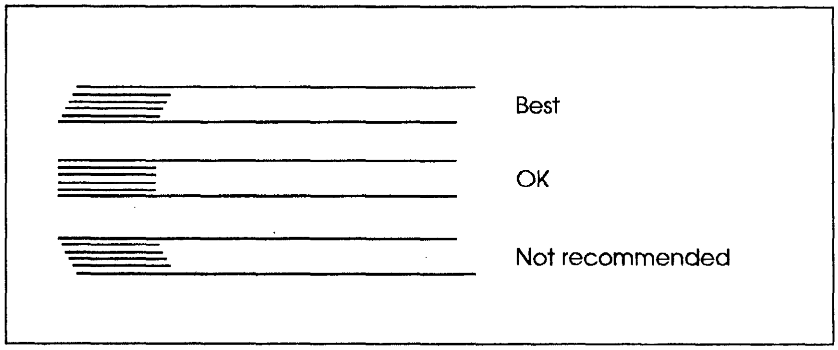
Loading Documents

Up to 50 pages of normal weight paper can be loaded into the scanner at a time. Additional pages can be added to the stack while scanning is in progress.

1. Fan the pages to avoid double feeding.

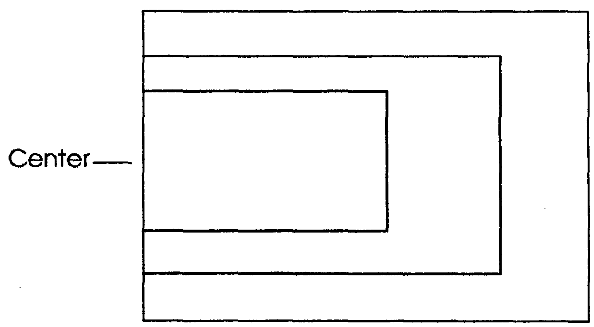
2. Align the top edge of all of the pages. The scanner feeds from the bottom of the stack, so it is important to keep the pages aligned when you insert the stack into the scanner.

   Gently slide the stack into the scanner until a stop is felt.

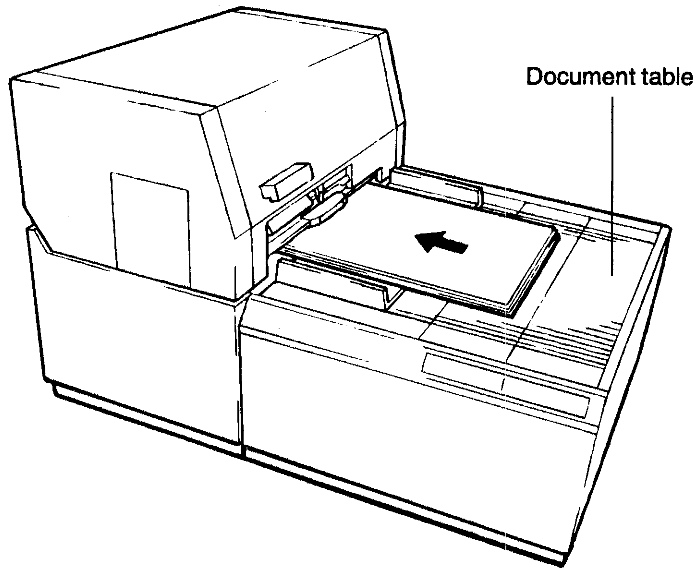


NOTE . . . Double-feeds may occur if the leading edge of the bottom sheet shifts behind the leading edge of subsequent sheets.

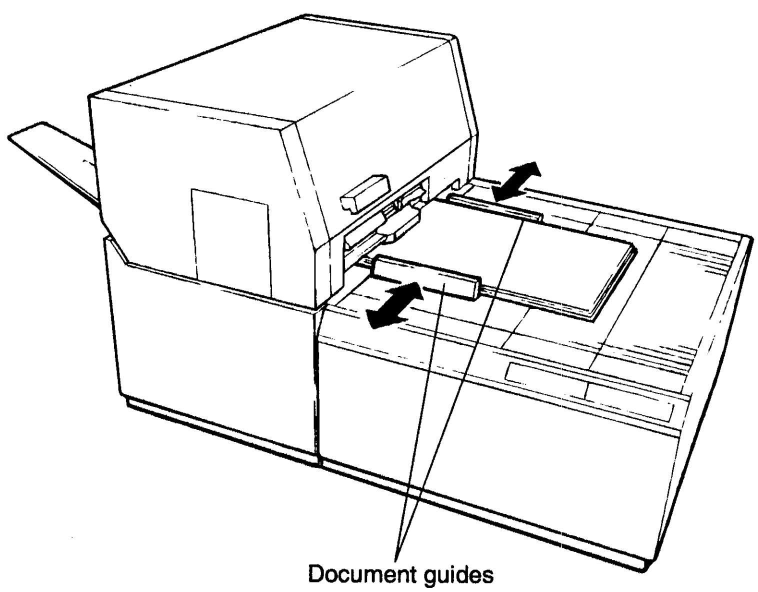
If scanning pages of different widths, center all of the pages within the stack as illustrated. The ADF feeds from the center and may skew pages that are not centered.



3. Place the document *face down* on the document table. Gently push the document into the ADF until a stop is felt. Check the Indicator Panel to be sure the green *Original Set* indicator is ON.



4. Close the document guides until they lightly touch the sides of the document.



NOTE . . . When the width of the document is smaller than the minimum document guide width, insert the small document guides as described in "Scanning Small Documents."

5. Initiate scanning from the host system.

6. To add pages while scanning is in progress, align the pages as in step 2 and gently insert the pages face down on top of the stack. Do not
insert the pages while a page is feeding as this will cause a false jam condition.

7. If you plan to scan more than 50 pages, you will need to empty the output tray while scanning is in progress.

Manual Feeding

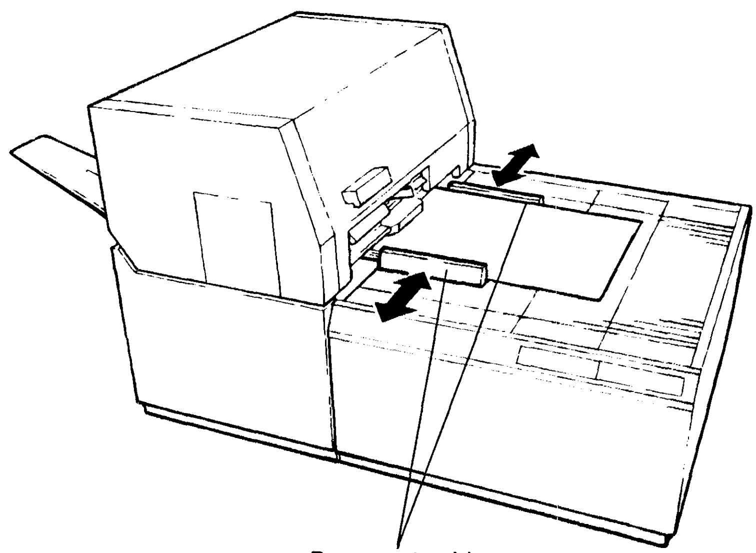
Manual feeding can be used to scan documents that are too thick or thin to be handled by the ADF and valuable documents that you don't want to risk damaging.

Feed only one sheet at a time. Multiple sheets or overlapping sheets will result in errors and possible jams.

CAUTION: Under no circumstances should the separation cartridge be removed when using manual feed.

1. Set the feed lever to the manual position (toward the rear of the scanner).

2. Place the first sheet *face down* on the document table. Gently push the sheet into the ADF until a stop is felt. Check the Indicator Panel to be sure the green *Original Set* indicator is ON.



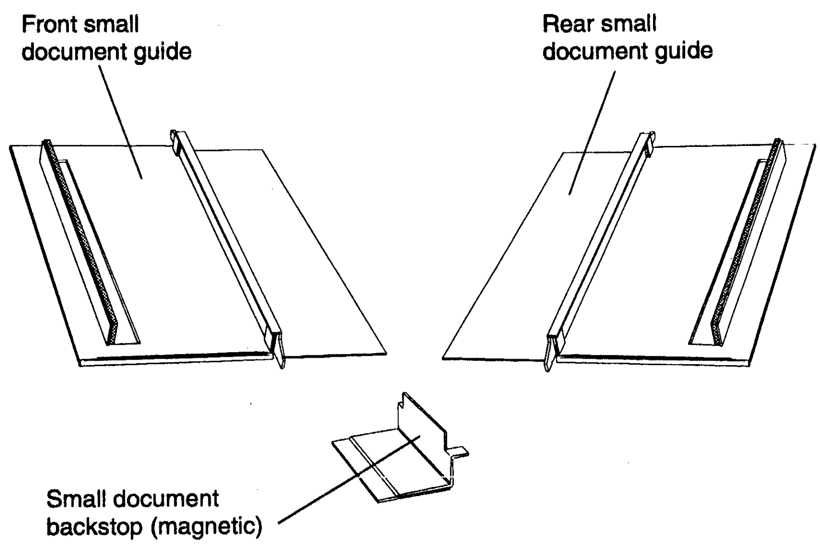
3. Close the document guides until they lightly touch the sheet.

   NOTE . . . When the width of the sheet is smaller than the minimum document guide width, insert the small document guides as described in "Scanning Small Documents."

4. Initiate scanning from the host system. The sheet feeds through the scanner and exits to the output tray.

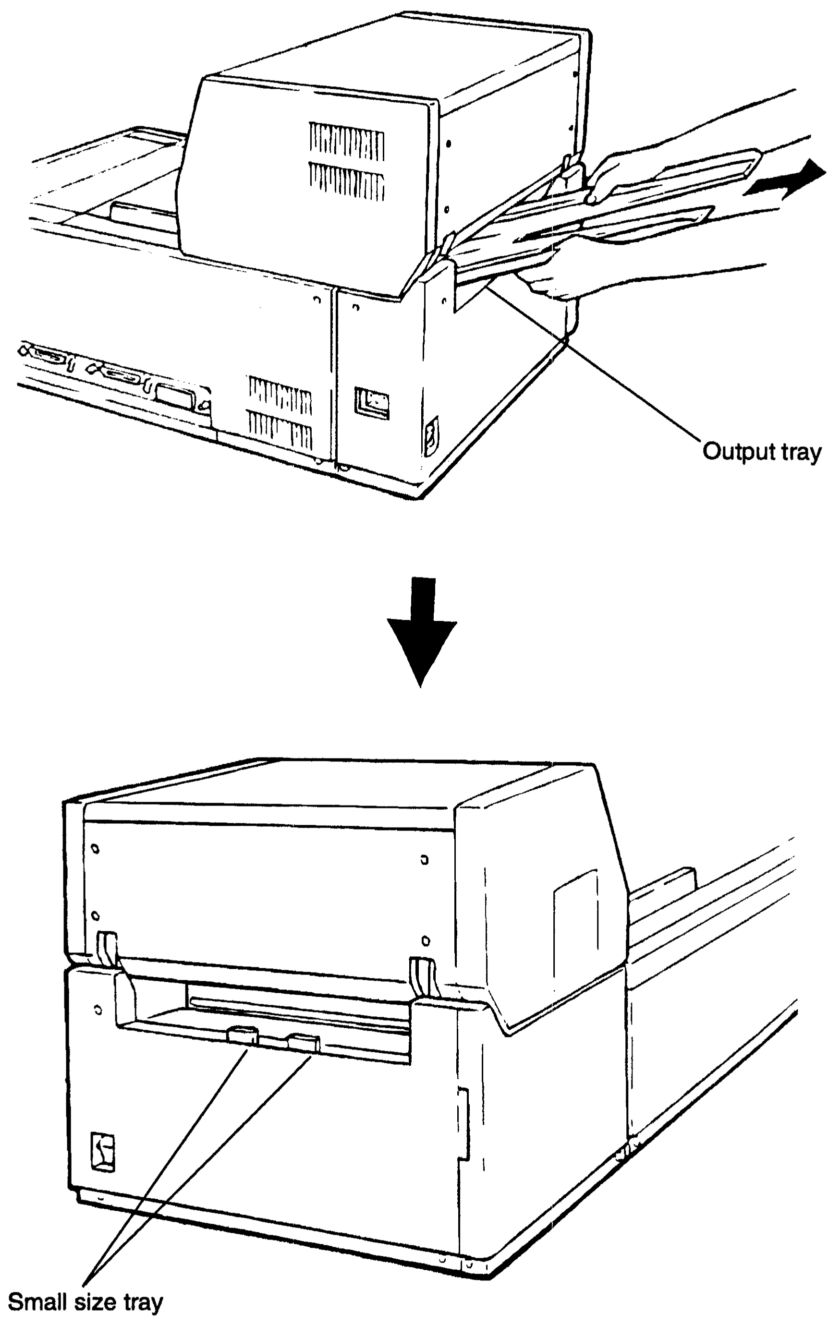
5. Continue inserting sheets one at a time until finished.

Scanning Small Documents



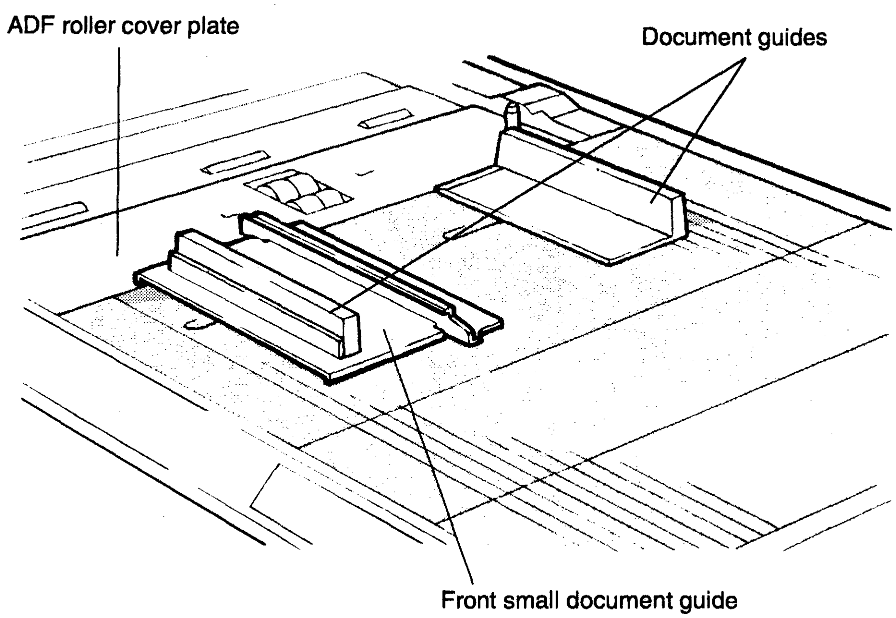
Small document guides are provided with the scanner to position small documents such as business cards so they can be fed into the scanner. The guides consist of two document guide inserts and a backstop.

1. Remove the output tray from the scanner. The small size tray becomes visible when the output tray is removed.



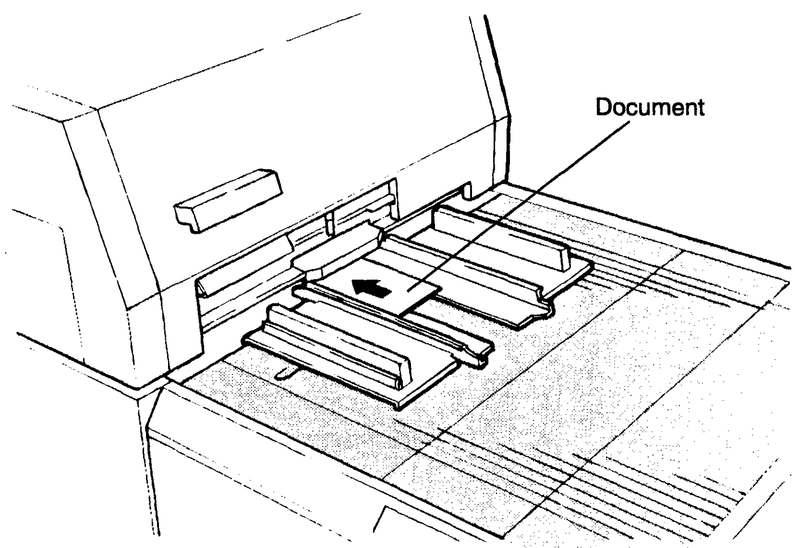
2. Open the ADF cover.

3. Place the slots in the small document guides over the rails of the document guides and fit them in place.

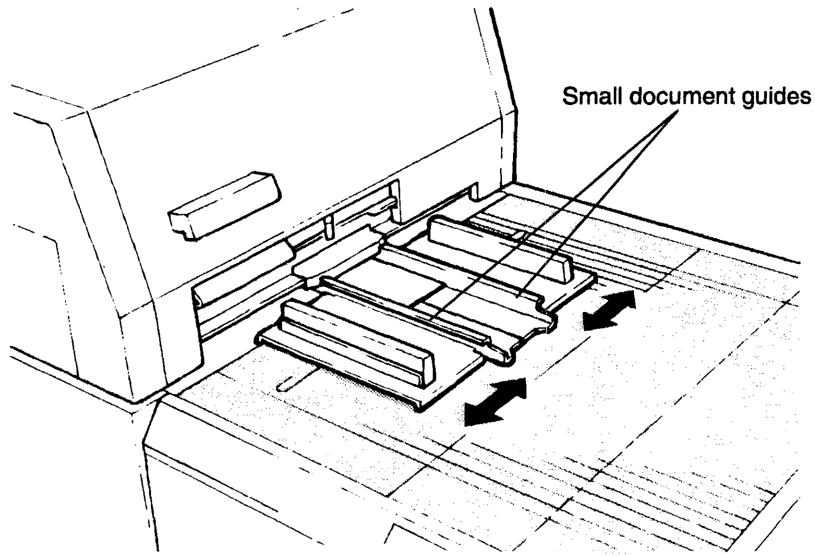


4. Close the ADF cover by firmly pressing down on the cover until the lock lever clicks.

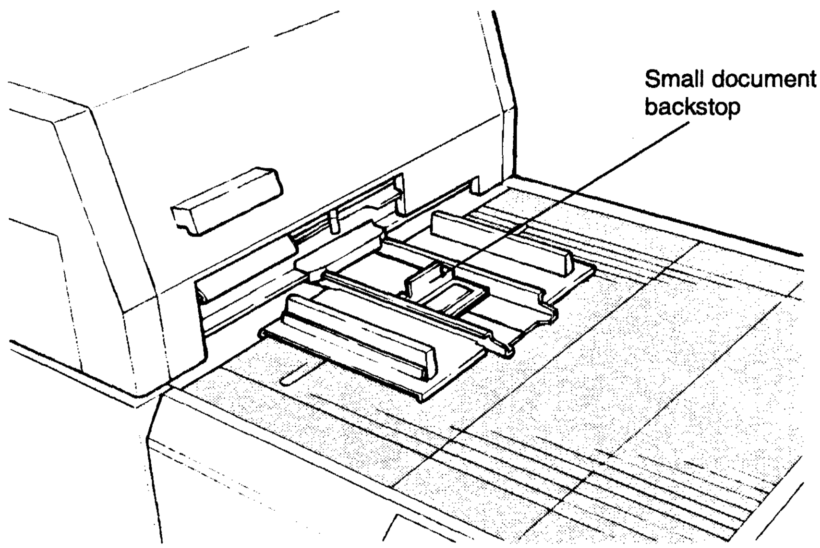
5. Load the document into the scanner as described for automatic or manual feeding.



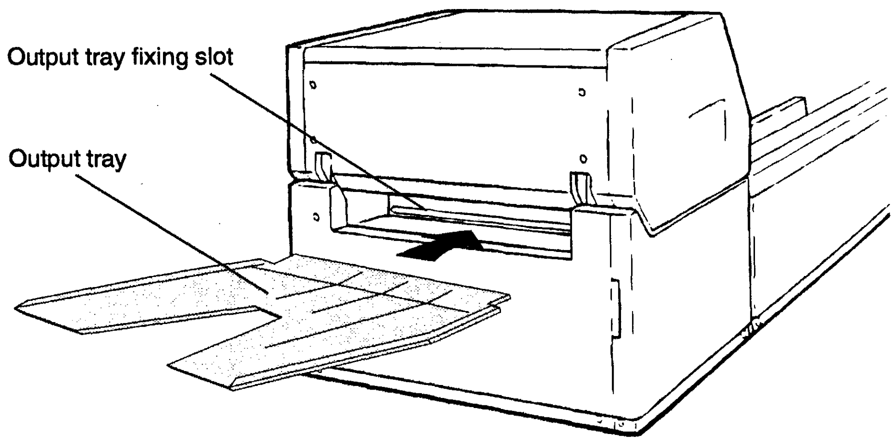
6. Set the small document guides so they lightly touch the sides of the document.



7. Insert the small document backstop behind the document, positioning it so it lightly touches the bottom edge. This keeps the document from moving.



8. When finished scanning small documents, remove the small document guides and replace the output tray.



Routine Maintenance

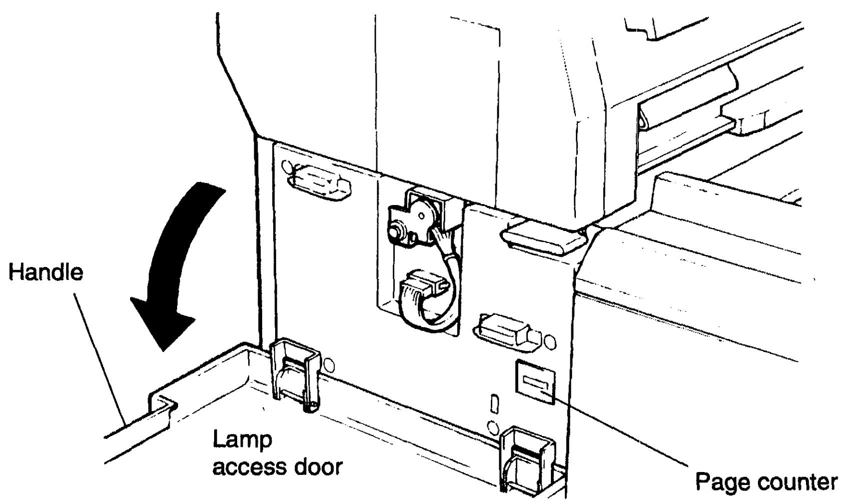
The following procedures will ensure long, trouble-free performance from your scanner.

Checking the Page Count

It is recommended that you maintain a log that tracks the number of pages that are scanned, it can be done daily, weekly, or at any interval that you desire. You may also want to log the page count when the lamp, separation cartridge or rollers are replaced. This information can be used for your records and is very helpful when service is required.

The page counter is located behind the lamp access door. It indicates the total number of pages that have been scanned.

Open the lamp access door by pulling on the handle on the left side of the access door.



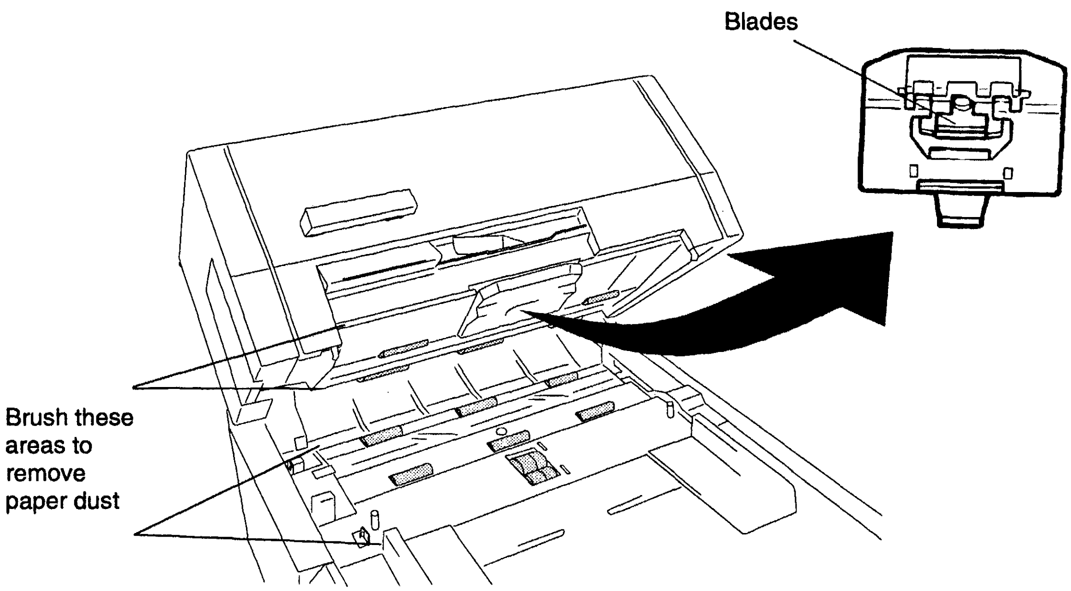
Daily Cleaning

As pages are scanned, paper dust and dirt are deposited on the ADF rollers, contact glasses and the surrounding surfaces. For proper operation of the optical system and the ADF, these areas should be kept clean.

Before starting operations at the beginning of each day:

1. Open the ADF cover.

2. Use a clean soft brush, such as a drafting brush or a wide good-quality paint brush, to brush the accumulated dust from the rollers, contact glasses and surrounding surfaces. The brush should be new and only used for this purpose.



3. Wipe your finger across the separation cartridge blades to clean them and check to be sure they are even and smooth.

4. Close the ADF cover by firmly pressing down on the cover until the lock lever clicks.

When scanning a high volume, you may want to repeat this procedure several times during the day.

Weekly Cleaning

The rollers and contact glasses should be wiped clean once a week to remove dust and dirt. In most cases the rollers can be cleaned with a clean dry cloth or a cloth moistened with water. Use a separate, glass-cleaning type cloth to clean the contact glasses.

DO NOT use cleaning materials that can leave particles, such as tissue paper or paper towels.

Never spray cleaners directly into the scanner.

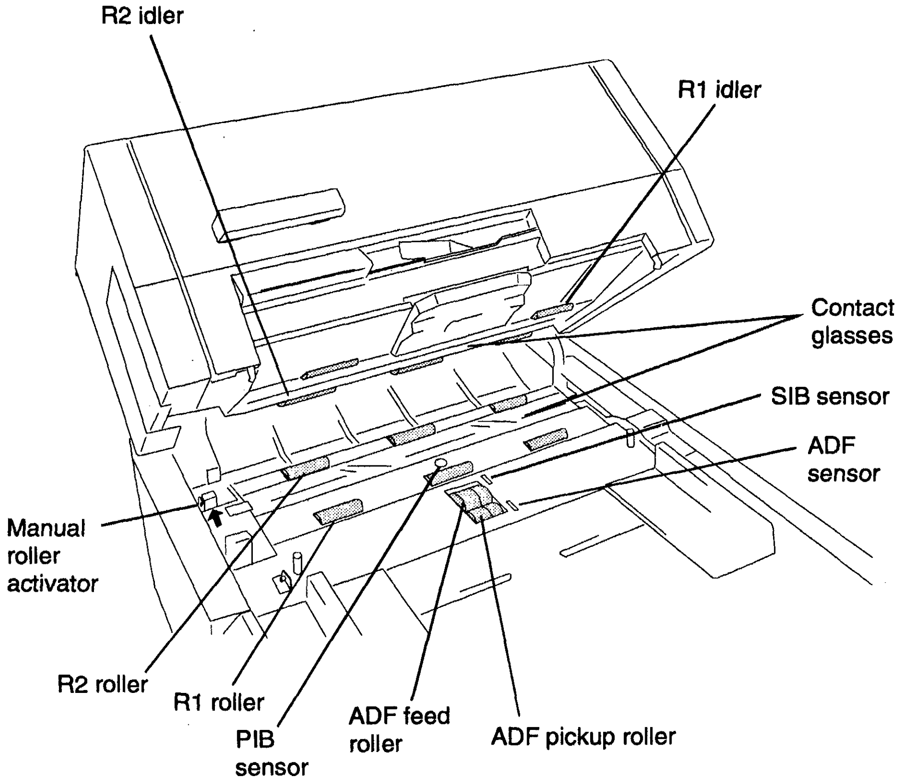
DO NOT clean the rollers with a rubber cleaner that contains alcohol or formaldehyde. Alcohol will cause the rollers to harden and lose their grip and formaldehyde will make them swell.

To clean the rollers and contact glasses:

1. Open the ADF cover.

2. Place a sheet of paper over the lower contact glass and rollers to keep foreign matter from falling into the mechanism while you clean the R1 and R2 idler rollers. Rotate the rollers to clean all surfaces.

3. Remove the paper and press the manual roller activator button to rotate the rollers so all surfaces can be cleaned. The roller activator rotates the lower rollers 1/4 turn each time it is pressed.



Be careful not to break the sensors located near the ADF feed and pickup rollers.

4. Wipe the upper and lower contact glasses with a clean, dry glass-cleaning type cloth. Be careful not to touch the contact glass with your hands. If you accidentally touch the contact glass, clean the glass with one of the recommended glass cleaners.

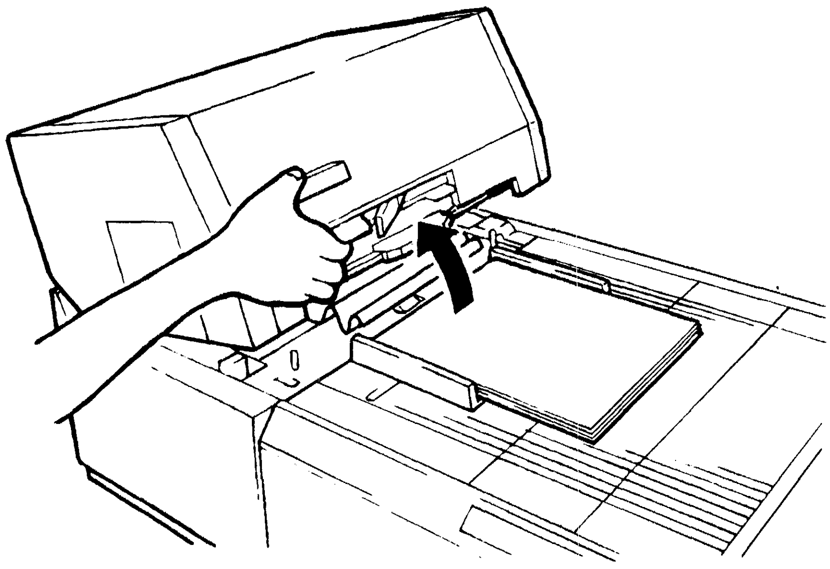
5. Close the ADF cover by firmly pressing down on the cover until the lock lever clicks.

Clearing a Jam

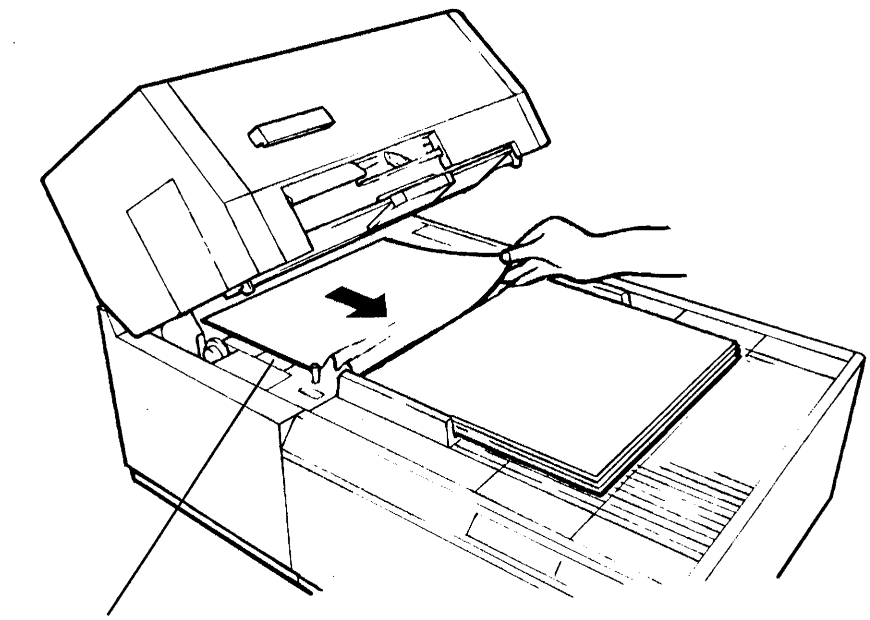
When a jam occurs, the Error indicator on the Indicator Panel blinks red. The indicator turns off when the jam is cleared.

CAUTION: Always open the ADF cover before removing a jammed document. Remove the document carefully—never pull it out forcefully.

1. Open the ADF cover.



2. Gently pull the document out in the direction indicated by the arrow in the figure below. Be careful not to touch the contact glass when removing the document.



3. Close the ADF cover by firmly pressing down on the cover until the lock lever clicks.

4. Remove the documents from the document table. Fan the documents and realign the top edges before inserting them back into the scanner.

Correcting Problems

Several mechanical interlocks are placed in the scanner for safety reasons. If any interlock is not activated, the scanner's mechanical motions, lamps and duplex unit cooling fan are all disabled. If operational problems are encountered or the error light is flashing, verify that the lamp access doors and ADF cover are securely latched in position.

Symptom	Cause	Remedy
The error lamp on the indicator panel blinks red.	A jam has occurred or the ADF cover or one of the lamp access doors is unlocked.	Clear the jam. Close the ADF cover or lamp access doors firmly.
No power.	The power cord is not plugged in securely.	Check the power cord and connect it properly.
Scanner does not run after power switch is turned on.	The interface cable is not connected securely or the wrong type of interface cable has been used.	Check the interface cable and connection.
The scan is abnormal (the image is unclear or off center).	The document is dirty, torn or wrinkled.	Check the document and if necessary, replace it.
	The contact glass is dirty.	Clean the contact glass following the cleaning procedure.
	The document is located outside of the scanning area set in the image format.	Place the document so it is within the margins set in the image format.
The scanned image is a solid color (blank).	The connector on one of the fluorescent lamps is not correctly connected.	Check the connection of the lamp connector. Check both lamps in IS520 scanners.
Documents are frequently double-fed or mis-fed.	The ADF feed roller or ADF pickup roller is dirty or worn out.	Clean the rollers following the cleaning procedure. If the red stripe is no longer visible, replace the rollers.
	The separation cartridge blades are worn.	Check the blades for wear. Replace the cartridge if the blades are not smooth and even.
	The separation cartridge is out of alignment.	This adjustment must be performed by a qualified service technician.

Symptom	Cause	Remedy
Poor print quality from the ink jet endorser. (The ink jet endorser is an option that may be installed on the scanner.)	The ink jet cartridge needs to be primed or replaced.	Prime the cartridge following the procedure in Appendix C.
	The printhead and cartridge may need to be cleaned.	Use a lint-free cloth dampened with alcohol to wipe any excess ink from the printhead faceplate and cartridge pins.
	The print characters are smearing because of a non-absorbing paper.	Avoid endorsing non-absorbing papers and using colored ink cartridges.
	The jets plate is not parallel to the document plane.	Check the printhead orientation by looking through the output tray opening while the ADF cover is closed. The printhead should be vertical to ensure that the jets plate is parallel to the document plane.

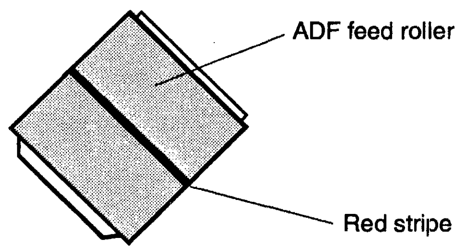
User Replaceable Parts

The ADF feed roller, ADF pickup roller, separation cartridge and the fluorescent lamps may be replaced by the operator. All other repairs and replacements should only be performed by an authorized service technician.

Replacing the ADF Feed and Pickup Rollers

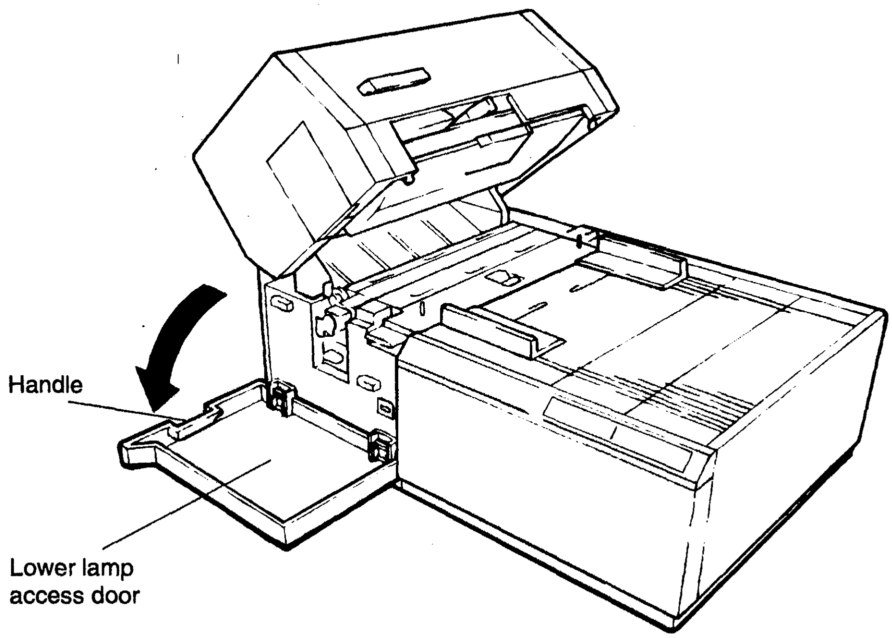
Replace the ADF feed and pickup rollers when the red center stripe on the feed roller is no longer visible. It is recommended that you also replace the separation cartridge at the same time.

NOTE . . . If the document guide adapters for small documents are installed on the scanner, remove them before replacing the rollers.

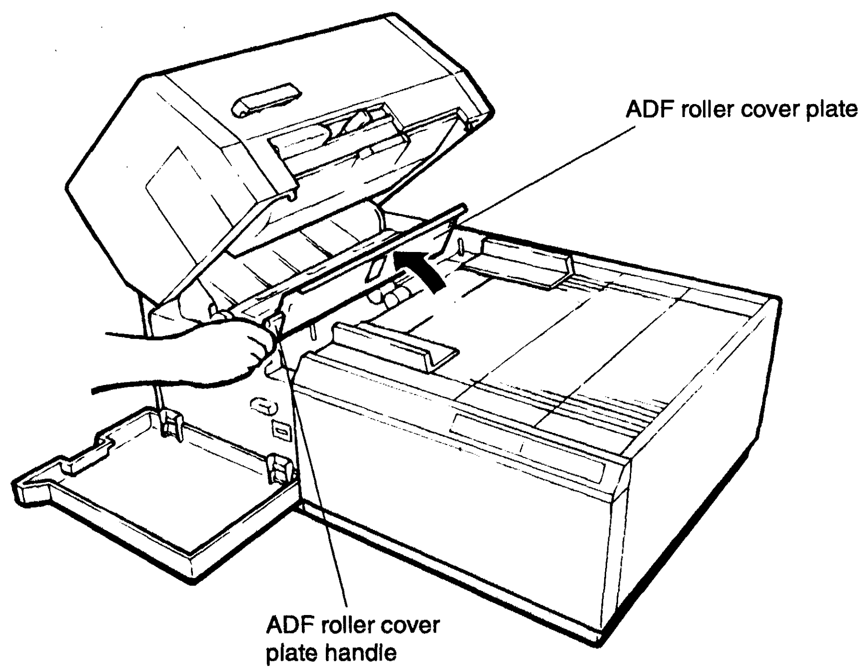


1. Open the ADF cover.

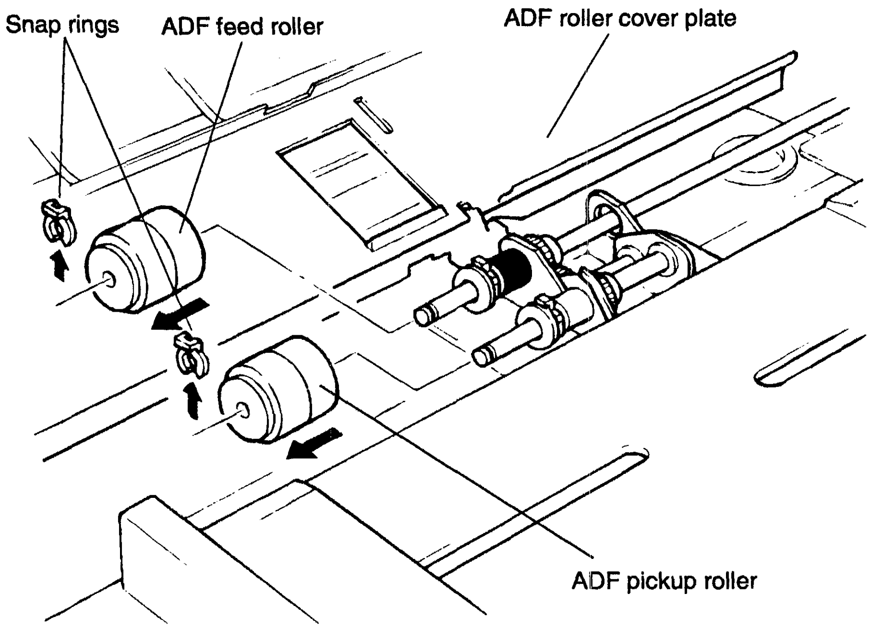
2. Open the lower lamp access door by pulling on the handle as shown below.



3. Lift the green handle on the ADF roller cover plate as indicated by the arrow in the figure below.



4. Remove the snap rings from the ADF feed roller and the ADF pickup roller by holding the roller with one hand while lifting the claws of the rings upward. Remove the two rollers by pulling them off to the side as indicated by the arrows in the following illustration.



CAUTION: Be careful not to drop the snap rings into the scanner when removing and replacing them.

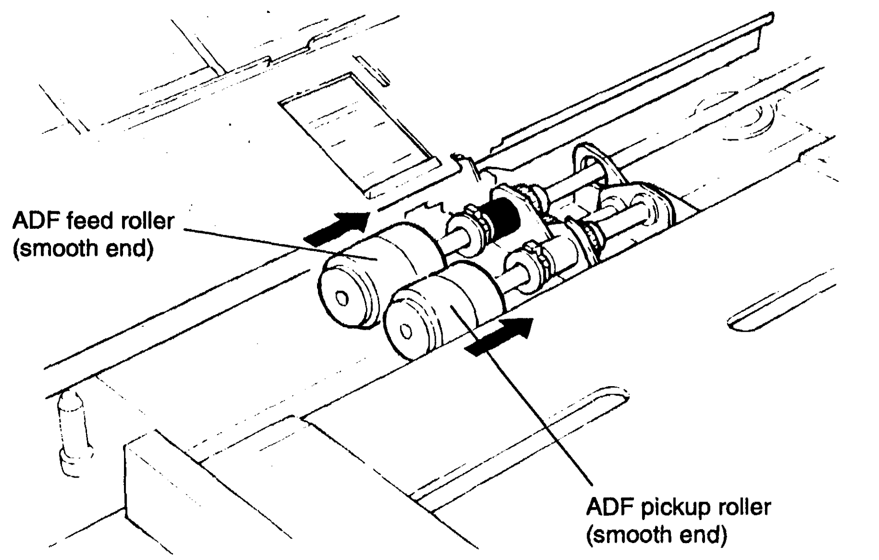
5. Insert the new ADF feed roller and ADF pickup roller as indicated by the arrows in the illustration on the next page and attach the snap rings. The ADF feed roller has a red stripe.

   NOTE . . . When installing the rollers be sure that the smooth end faces toward the front of the scanner.

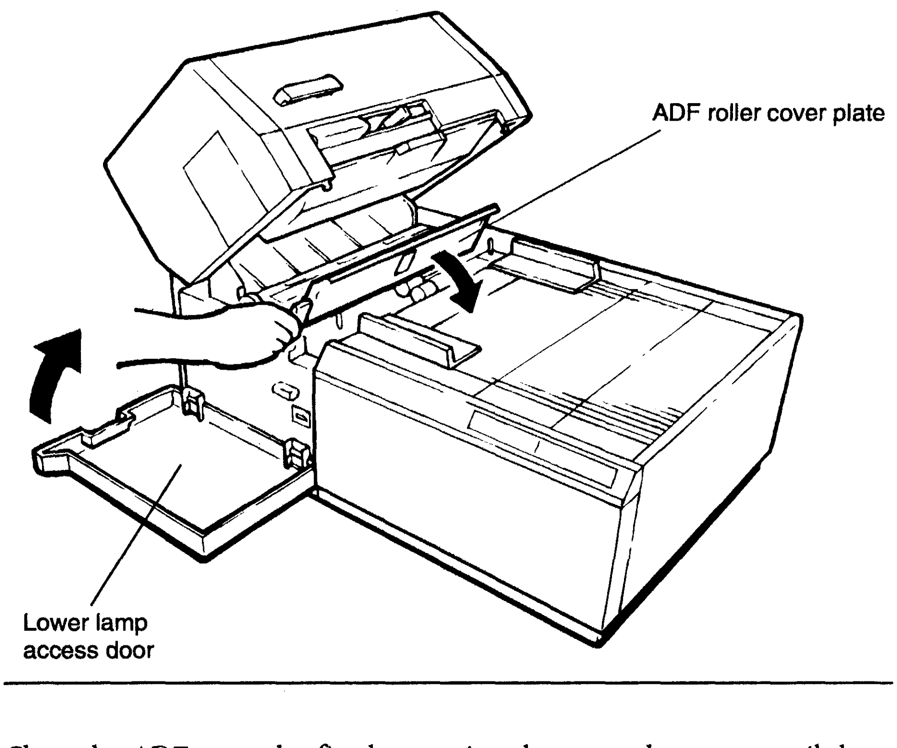
6. To verify that the rollers are installed properly:

   Gently turn the rollers in the normal paper direction (counterclockwise if viewed from the front side of the scanner). Both rollers should move freely with no resistance applied to the ADF shaft.

   Try to rotate either roller in the opposite direction. A resistance should be felt.



7. Close the ADF roller cover plate and then the lamp access door.



8. Close the ADF cover by firmly pressing down on the cover until the lock lever clicks.

CAUTION: *DO NOT* close the ADF cover when the ADF roller cover plate is open. Severe damage to the roller cover plate can result which will require repair and adjustment procedures.

Replacing the Separation Cartridge

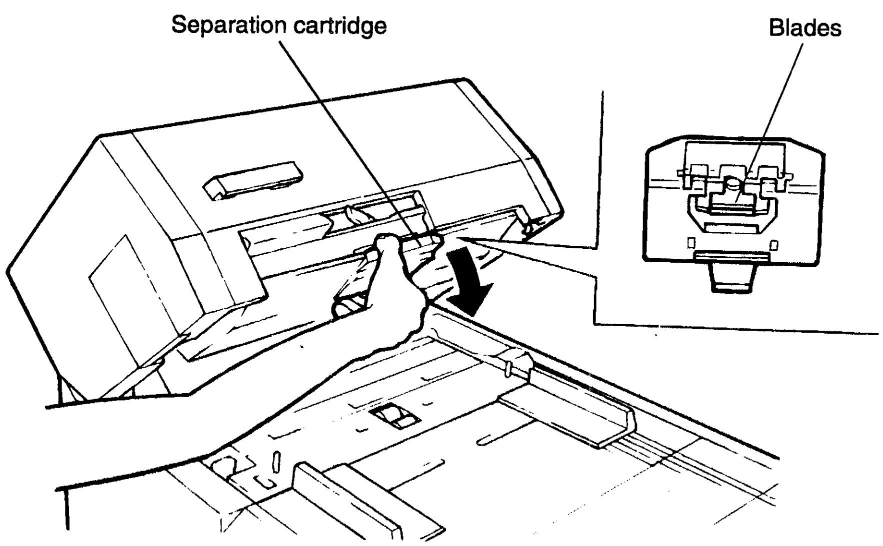
The separation cartridge should be replaced when the red stripe on the ADF feed roller is no longer visible or if the cartridge is damaged and not functioning properly.

1. Set the feed lever for automatic feeding (move lever toward the front of scanner).

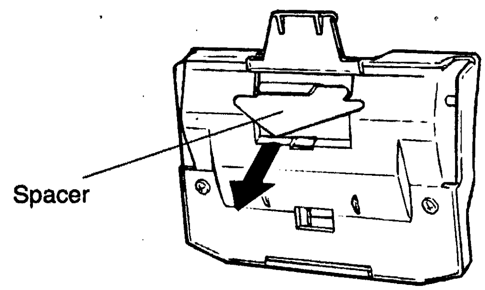
2. Open the ADF cover.

3. Grasp the separation cartridge as shown and pull it out in the direction indicated by the arrow.

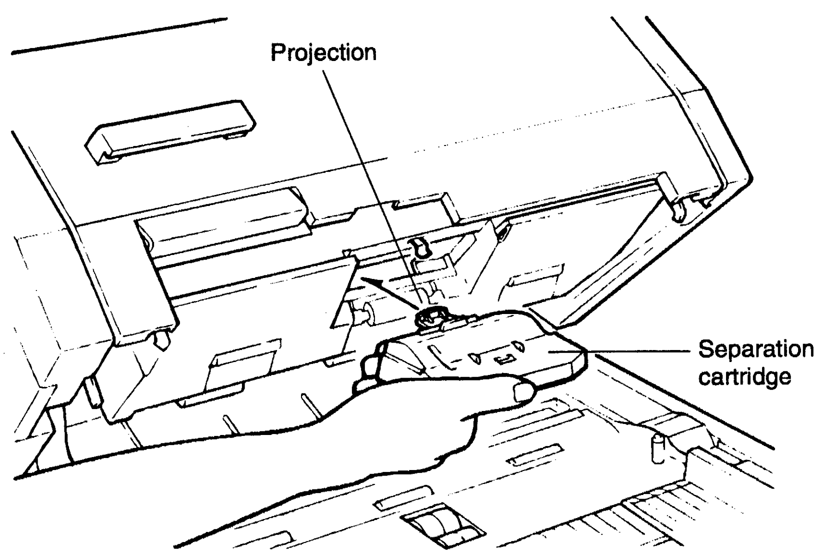
   NOTE . . . To keep your hands clean, avoid touching the blade on the cartridge.



4. Pull the red, arrow-shaped spacer out of the new cartridge.



5. Holding the new cartridge as shown, set the projection on the side of the cartridge into the aperture indicated by the arrow, then press the cartridge firmly until it clicks.



6. With the ADF cover open, move the feed lever between the Automatic and Manual positions. Verify that the movement is not jammed (friction is OK). Note that the two separation blades retract when the feed lever is in the Manual position.

7. Close the ADF cover by firmly pressing down on the cover until the lock lever clicks.

Replacing the Fluorescent Lamps

When the yellow *Lamp A* (upper lamp) or *Lamp B* (lower lamp) Indicator Panel light turns ON, it is recommended that you turn the scanner OFF and check the lamp connector. Turn the scanner ON and check the lamp indicator light(s). If the lamp light turns on immediately, it indicates that the lamp has reached the end of its normal life span and should be replaced to ensure consistent high-quality images. If the indicator lights after 5 minutes, there is a problem with the lamp heater and the lamp should be replaced.

NOTE . . . Since the life span varies from lamp to lamp, you may continue using the lamp as long as you are getting high-quality images. Appendix B suggests ways to judge when the lamp should be replaced.

Always replace the lamps with the same color lamps as currently installed.

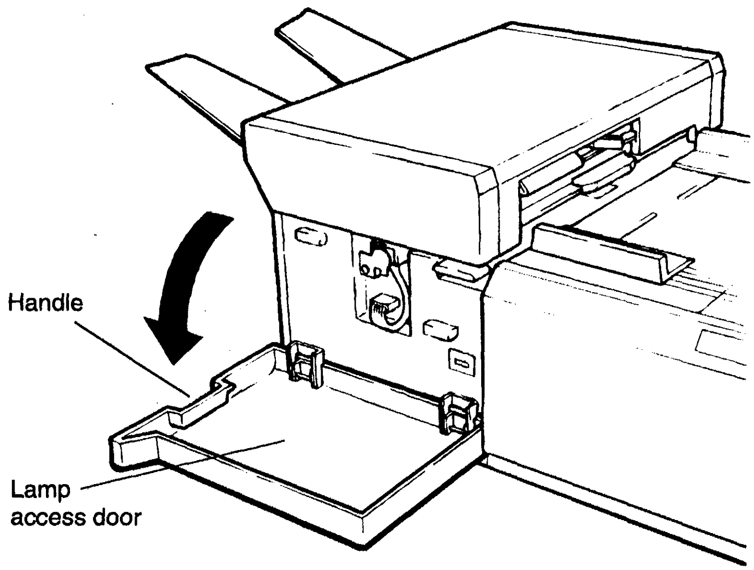
If you want to use a different color lamp to dropout specific colors, Light Source options are available from Ricoh and our authorized dealers. Changing the color of the lamps requires internal adjustments that must be made by a service technician.

WARNING: The fluorescent lamps retain a great deal of heat. DO NOT touch the surface of the lamp immediately after turning it off. Allow at least 2 minutes for the lamp to cool down.

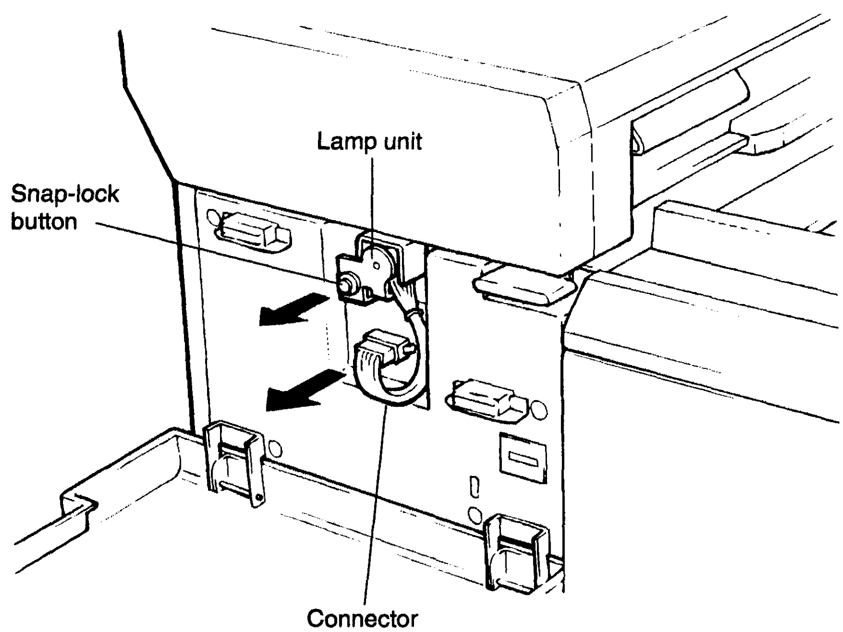
IS510 Scanners

1. Turn the scanner's power switch OFF and wait at least 2 minutes before continuing.

2. Open the lamp access door by pulling on the handle as shown in the figure below.



3. Unplug the connector between the lamp assembly and the scanner.

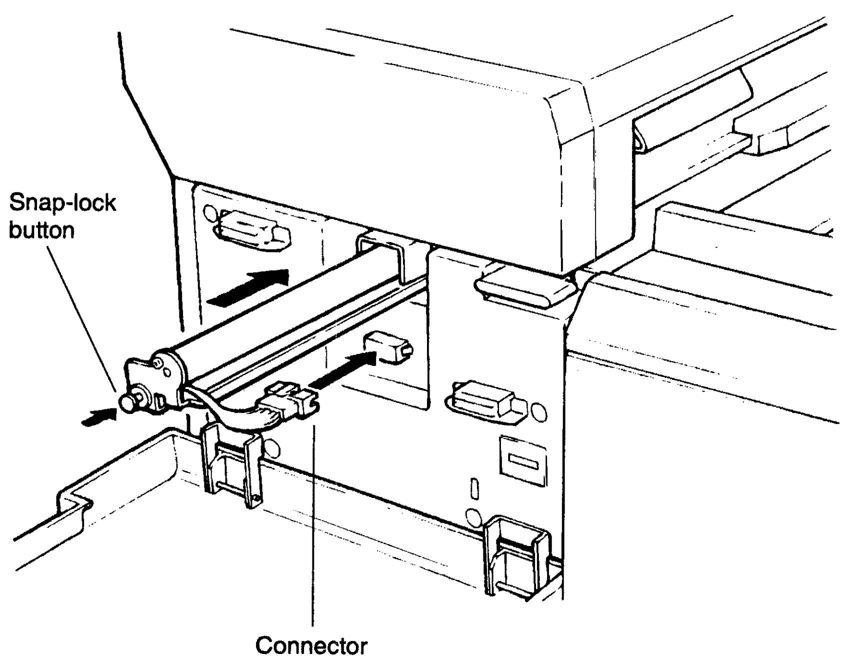


4. Pull straight and slowly on the snap-lock button to slide the lamp unit out of the scanner.

> **CAUTION:** DO NOT pull the lamp unit by the connector or the cable. Always pull it by holding the snap-lock button.

5. Wipe the new lamp with a clean soft cloth to remove any finger-prints or smudges.

6. Align the new lamp unit with the channel in the scanner and insert it straight until it stops. Move the lamp assembly in slowly, do not use force.



Make certain that the lamp assembly fits securely into the channel.

7. Press the snap-lock button and plug in the connector.

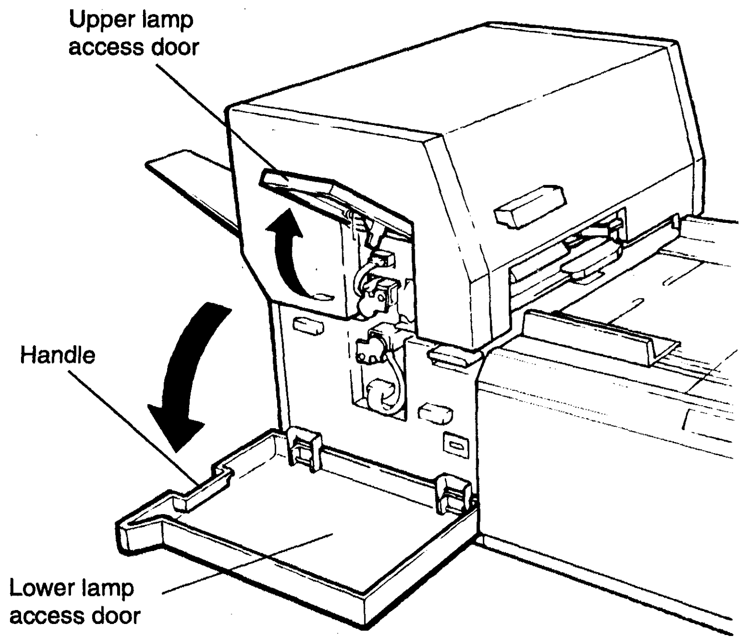
8. Close the lamp access door.

9. To verify the lamp, move the feed lever to the Automatic position and insert a document into the scanner. The lamp should turn on for 1 minute.

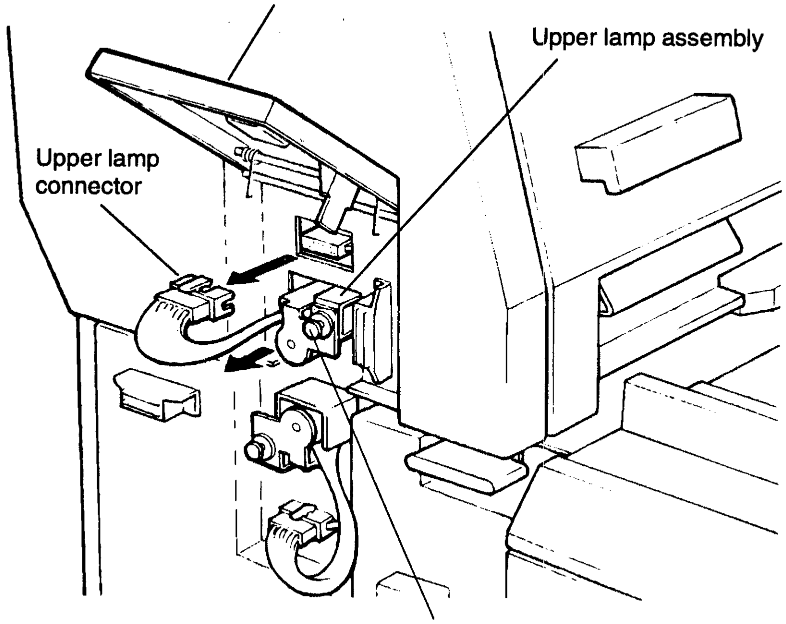
IS520 Scanners

1. Turn the scanner's power switch OFF and wait at least 2 minutes before continuing.

2. First open the lower lamp access door by pulling on the handle as shown in the figure below, then open the upper lamp access door.



3. Unplug the connector between the upper lamp assembly and the scanner.



4. Pull straight and slowly on the snap-lock button to slide the upper lamp assembly out of the scanner.

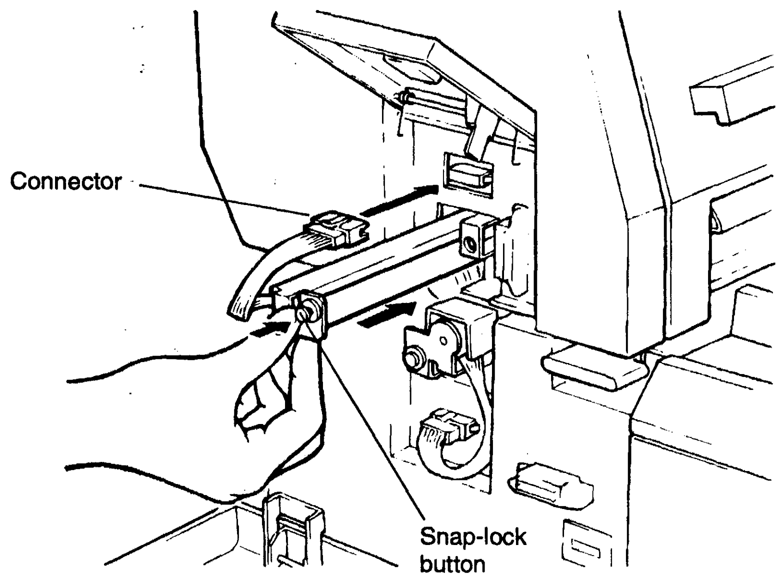
> **CAUTION:** DO NOT pull the lamp assembly by the connector or the cable. Always pull it by holding the snap-lock button.

5. Wipe the new lamp with a clean soft cloth to remove any fingerprints or smudges.

6. Align the new lamp assembly with the channel in the scanner and insert it straight until it stops. Move the lamp assembly in straight and slowly, do not use force.

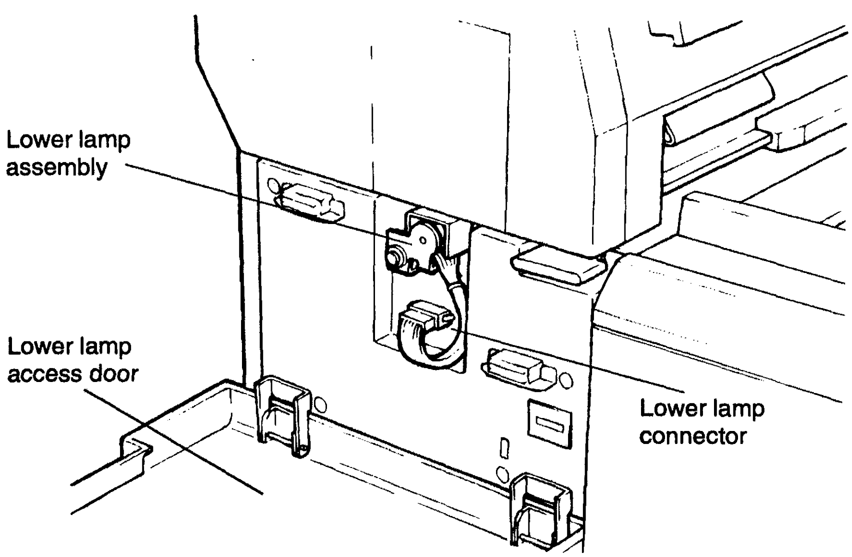
   Make certain that the lamp assembly fits securely into the channel.

7. Press the snap-lock button on the upper lamp assembly and plug in the connector.



8. Close the upper lamp access door.

9. With the lower lamp access door open, replace the lower lamp in the same manner as the upper lamp.



10. Close the lower lamp access door.

11. To verify the lamps, set the feed lever in the Automatic positon and insert a document into the scanner. The lamps should turn on for 1 minute.

IS510 Scanner Specifications

Scanner Type	Desktop
External Dimensions (W x D x H)	25.9 x 17.9 x 12.3 in. (657 x 455 x 313 mm)
Weight	approx. 88 lbs (40 Kg)
Scanning Method	Auto document feeding and manual feeding
Document Feed Capacity	50 sheets of paper maximum
Light Source	Fluorescent lamp
Scanning Resolution	200/300/400/500/600 dpi
Scanning Speed	0.679 sec. at 200 dpi = 12.72 ips 1.006 sec. at 300 dpi = 8.48 ips 1.333 sec. at 400 dpi = 6.36 ips
Image Type	Line art or dithered halftone
Data Compression	Selectable by host commands to: Explicit bit map (no compression) CCITT-G3/1D (MH) CCITT-G3/2D (MR) CCITT-G4 (MMR) Jumper selection of Code reversal (16 bit words)
Interface	SCSI-2 (standard) DR11 Interface (optional) Fujitsu Interface (optional) Video (VSI) Interface (optional) PVSI Interface (optional)
Warm-up Time	approx 10 sec. for first scan

Operating Conditions

Power Source	85 to 132 V 176 to 265 V AC 110/220 (85~264V 47~65Hz) universal input PSU
Power Consumption	Standby: 150 W Operating: 190 W
Ambient Temperature	10-40°C
Ambient Humidity	10-85% RH non-condensing
Current Consumption	Standby: USA 2.9A, Europe 1.5A Operating: USA 3.6A, Europe 2.0A

Document Specifications

Document Type	Sheets (paper), card, roll, opaque and transparent material (film of any translucency)
Document Size	width: minimum: 0.5 in. maximum: 12 in. length: minimum: 2.75 in. maximum: unlimited (roll) 64K scan lines (sheet)
Document Paper Weight	auto feed: 8 lb. to 45 lb. paper stock manual feed: 4 lb. to 80 lb. paper stock
Thickness Of Document	0.002-0.006 in (0.06-0.16mm)
Scanning Area	Document edge repeatability: Main scanning: 10 pixels Subscanning: 20 scan lines Maximum scanning length: Main scanning: 4992 pixels Subscanning: 64K scan lines This information is correct for the 5KCCD. Other numbers apply for the 75K and 6KCCDs.

IS520 Scanner Specifications

Scanner Type	Desktop
External Dimensions (W x D x H)	25.9 x 17.9 x 16.7 in. (657 x 455 x 424 mm)
Weight	approx. 99 lbs (45 Kg)
Scanning Method	Auto document feeding and manual feeding
Document Feed Capacity	50 sheets of paper maximum
Light Source	Two fluorescent lamps
Scanning Resolution	200/300/400 dpi
Scanning Speed **Data based on an A4 size (8.3 in. x 11.7 in.) document scanned in landscape format.**	0.679 sec. at 200 dpi = 12.72 ips 1.006 sec. at 300 dpi = 8.48 ips 1.333 sec. at 400 dpi = 6.36 ips
Image Type	Line art or dithered halftone
Data Compression	Selectable by host commands to: Explicit bit map (no compression) CCITT-G3/1D (MH) CCITT-G3/2D (MR) CCITT-G4 (MMR) Jumper selection of Code reversal (16 bit words)
Interface	SCSI-2 (standard) DR11 Interface (optional) Fujitsu Interface (optional) Video (VSI) Interface (optional) PVSI Interface (optional)
Warm-up Time	approx 10 sec. for first scan

Operating Conditions

Power Source	85 to 132 V 176 to 265 V AC 110/220 (85~264V 47~65Hz) universal input PSU
Power Consumption	Standby: 220 W Operating: 250 W
Ambient Temperature	10-40°C
Ambient Humidity	10-85% RH non-condensing
Current Consumption	Standby: USA 2.9A, Europe 1.5A Operating: USA 3.6A, Europe 2.0A

Document Specifications

Document Type	Sheets (paper), card, roll, opaque and transparent material (film of any translucency)
Document Size	width: minimum: 0.5 in. maximum: 12 in. length: minimum: 2.75 in. maximum: unlimited (roll) 64K scan lines (sheet)
Document Paper Weight	auto feed: 8 lb. to 45 lb. paper stock manual feed: 4 lb. to 80 lb. paper stock
Thickness of Document	0.002-0.006 in (0.06-0.16mm)
Scanning Area	Document edge repeatability: Main scanning: 10 pixels Subscanning: 20 scan lines Maximum scanning length: Main scanning: 4992 pixels Subscanning: 64K scan lines This information is correct for the 5KCCD. Other numbers apply for the 75K and 6KCCDs.

APPENDIX A: Shipping the Scanner

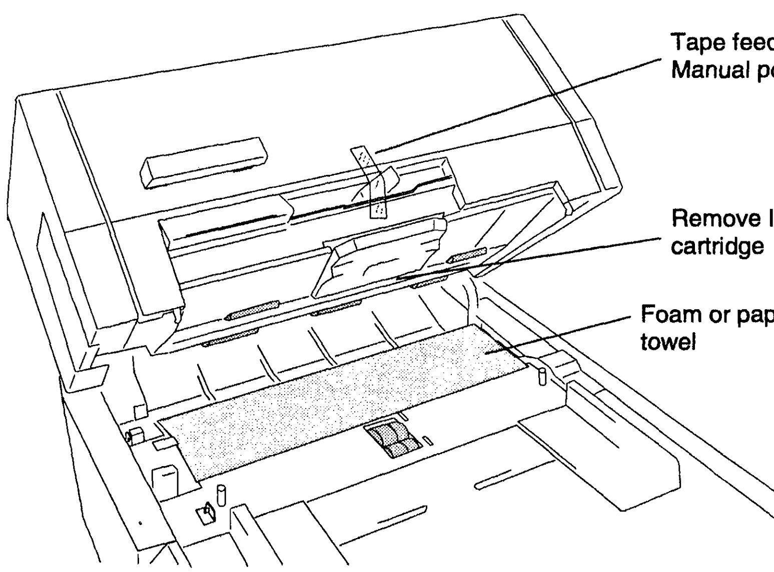
The scanner must be packed carefully to avoid damage during shipment.

Before shipping the scanner to Ricoh or Improvision for repair, call your Service Representative to get authorization and obtain an RMA number.

CAUTION: DO NOT ship the scanner without the proper packing materials. If the original carton and packing materials are not available, contact Ricoh, Improvision or your Service Representative before shipping the scanner.

Before packing the scanner:

- Remove the ink jet cartridge if an ink jet endorser option is installed. If left in, the cartridge may rupture during transit.
- Place the feed lever in the Manual position (toward the rear of the scanner) and tape it to the upper unit. This will prevent damage to the separation cartridge blade and ADF rollers.
- Open the ADF cover and place a thin foam sheet (1/16" thick, approx 2" by 10") over the contact glass. If foam is not available, use a folded paper towel.

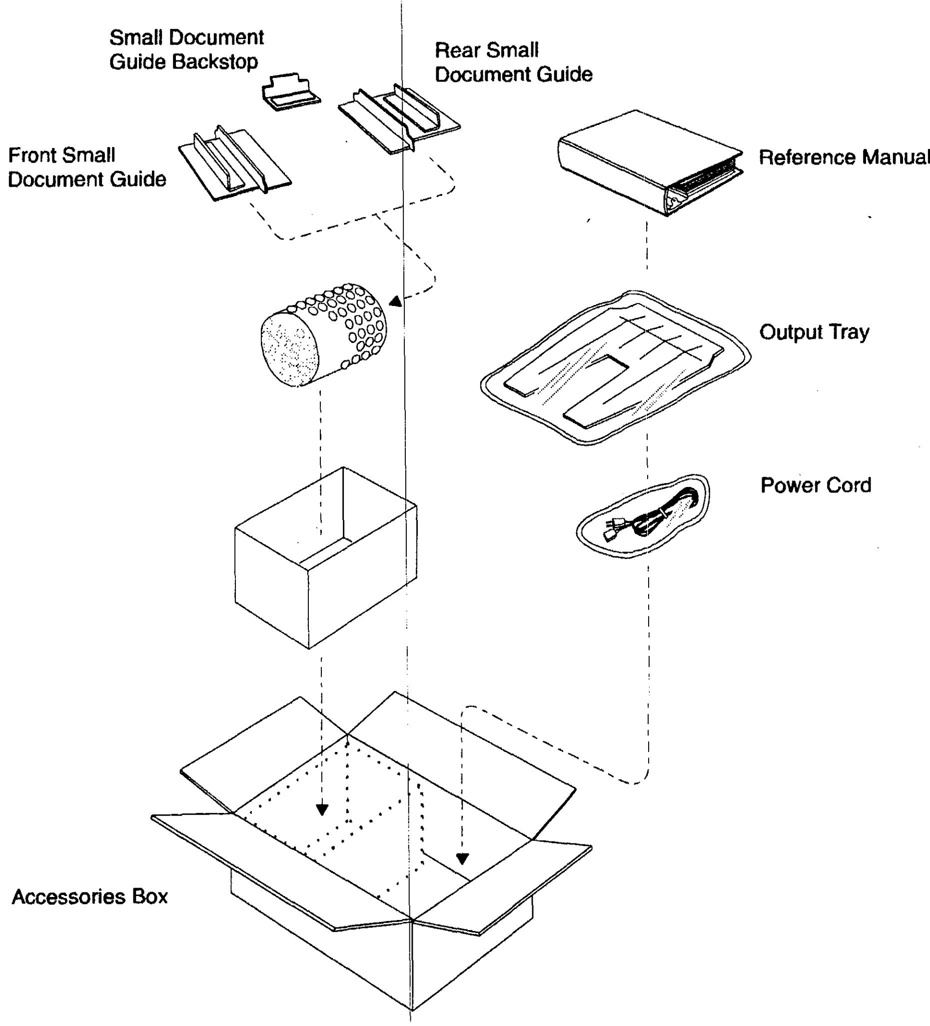


- Close and lock the ADF cover.
- The four packing straps that were shipped in the accessories box are required to secure the scanner for shipment. Contact Ricoh, Improvision or your Service Representative if you need additional packing straps.

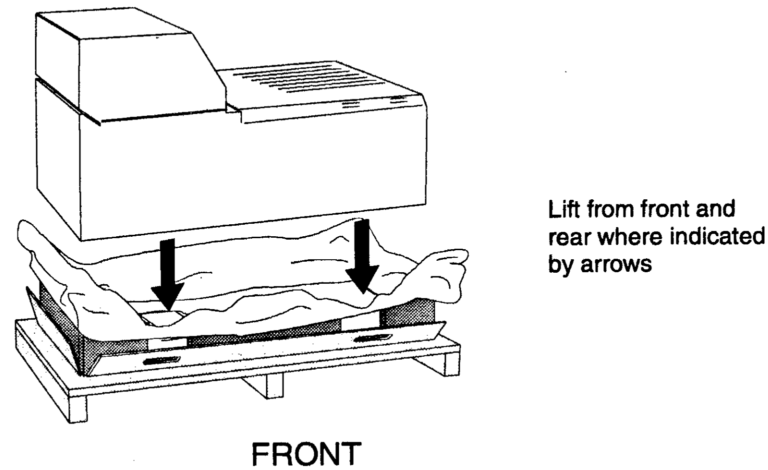
Packing the Scanner

CAUTION: The scanner is heavy. Two people are required to lift the scanner and place it on the wooden pallet.

1. Pack and tape the accessories box.

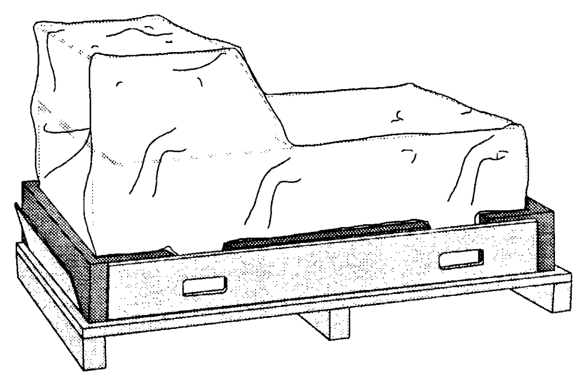


2. With one person in front of the scanner and the other behind, lift the scanner where indicated by the arrows. Set the scanner on the wooden pallet as illustrated. Check to be sure the plastic bag isn't caught under the scanner.

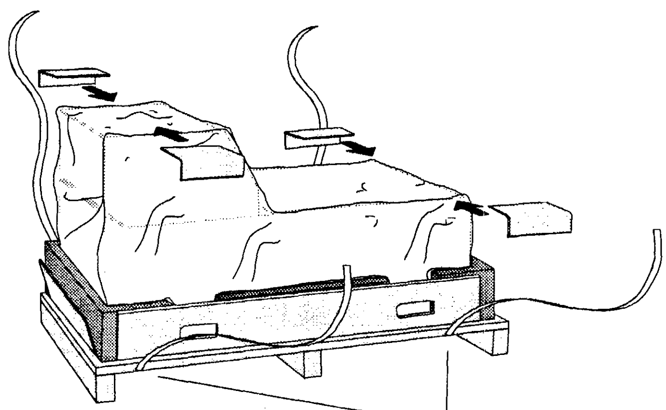


⚠ **CAUTION:** DO NOT lift the scanner by the sides or ADF cover as it could affect the optical alignment.

3. Pull the plastic bag up over the scanner and tape the bag to close it.

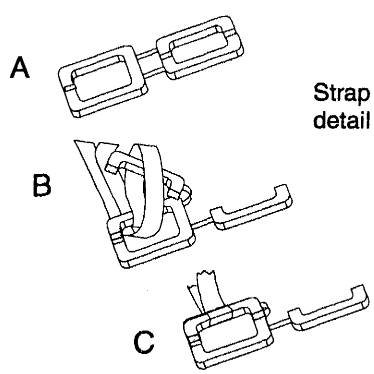


4. Place the four cardboard strap pads as illustrated. Insert two packing straps *under the wooden pallet* and pull them up over the scanner.

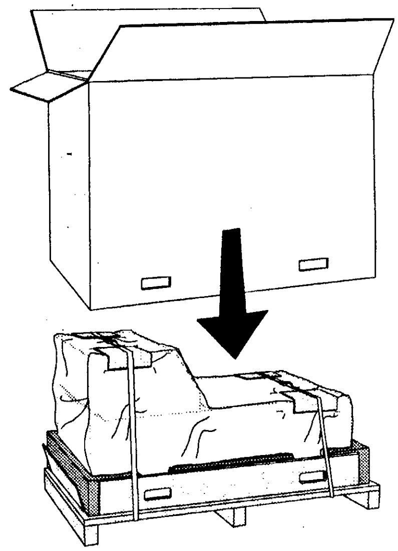


WARNING: Packing straps must go under the wooden pallet. The scanner may shift in shipping if not strapped properly.

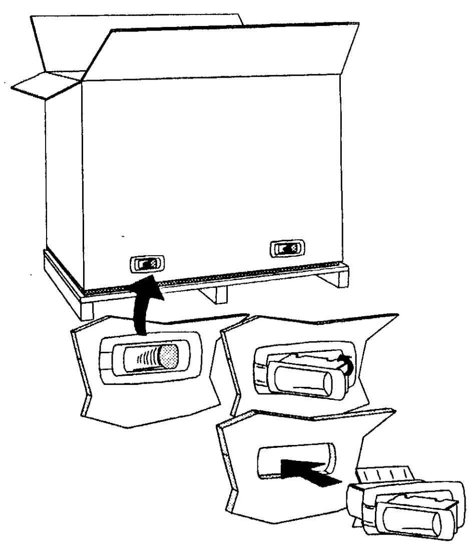
Tighten and lock the packing straps as illustrated.



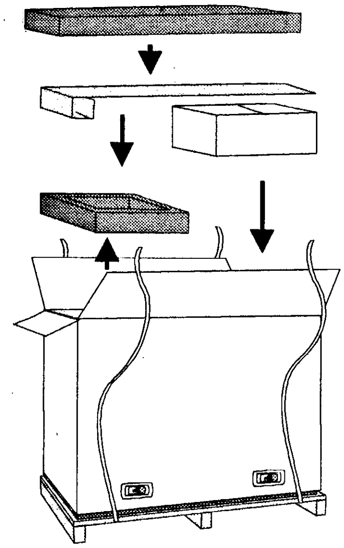
5. Place the box over the scanner.



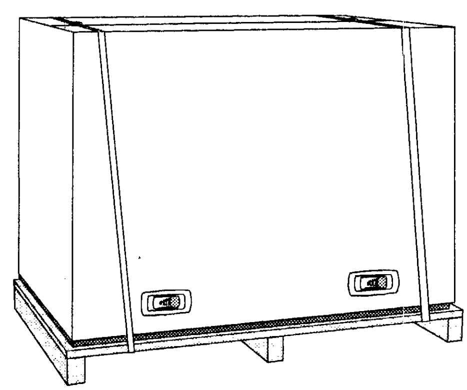
6. Insert the four packing joints (two on each side) into the outside of the box.



7. Insert the foam pads, cardboard insert and the accessories box.



8. Close the box flaps and place two packing straps *under the wooden pallet* and pull up over the top of the box. Tighten and lock the packing straps.



9. Mark the RMA number on the shipping label.

APPENDIX B: Lamp Verification

This appendix describes how to physically check the fluorescent lamp(s) for deterioration and to verify when the image quality is degrading due to lamp aging. The lamp should be replaced as soon as deterioration is noticed rather than waiting for the lamp to burn out.

Physical Characteristics

Open the ADF cover and check the ends of the lamp. If the ends are silver and crusted, replace the lamp.

When using a green fluorescent lamp, replace the lamp when the light changes from green to blue.

Checking the Image Quality

It is recommended that this test be performed on a monthly basis.

1. Select a page to use as your test document and save it so it can be used throughout the life of the lamp. The test document can be anything other than a photograph.

2. When the scanner is initially installed or a lamp is replaced, scan the test document ten times. Make a visual inspection of the image and note the file size. Save the image files for future reference.

   For IS520 scanners, flip the test document over to test the upper lamp.

3. Once a month scan the test document ten times. Make a visual inspection to see if there is any breakage of the image and check to see if the file size increases. These are signs that the lamp needs to be replaced.

APPENDIX C: Optional Equipment

A number of options are available for the IS510 and IS520 scanners to provide the features you need. This appendix provides setup and maintenance procedures that may be required when specific options are installed in the scanner.

Indicator Panel Functions

The functions of some of the Indicator Panel lights change when the following options are installed:

- BMW Electronic Endorser
- Bar Code Recognition (IBCR)
- Large Capacity Input Tray (LCIT)

The indicator lights that are effected by these options are listed below:

Indicator	Function
Feed unit replacement	Disabled
Lamp Lamp A and B	The indicator only comes on when there is a problem with the lamp heater. To determine when the lamp should be replaced due to deterioration, follow the suggestions in Appendix B.
Busy	The indicator lights during scanning only.

Connecting the Cables to Optional Interfaces

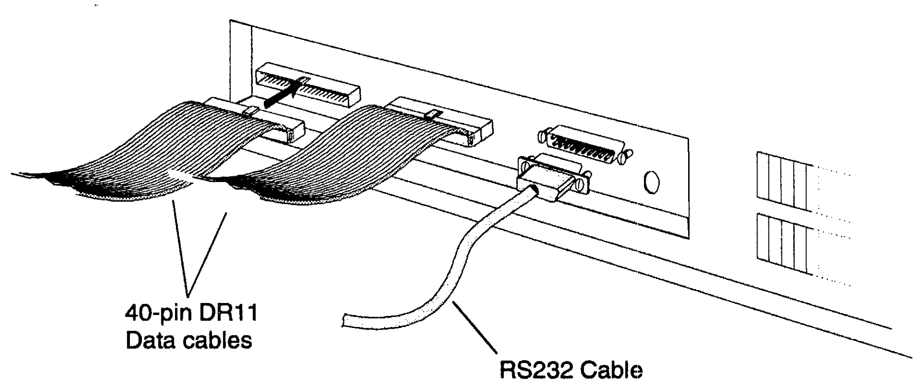
If your scanner is configured with an optional interface, connect the interface cables as described below.

DR11 Interface

Scanners that are configured with the optional DR11 interface have two 40-pin connectors and a 9-pin DP connector that is the host control port. Pin No. 1 of the connector is on the top right side and is marked by a black stripe.

DR11 Cable Requirements

- Two shielded 40-pin DR11 data cables per DEC or Ikon specifications
- Maximum, minimum cable length approximately 75 feet
- One RS232 null modem cable with no handshaking
- Only pins 2, 5 and 3 are wired on the DP connector (Receive, Transmit and Ground)



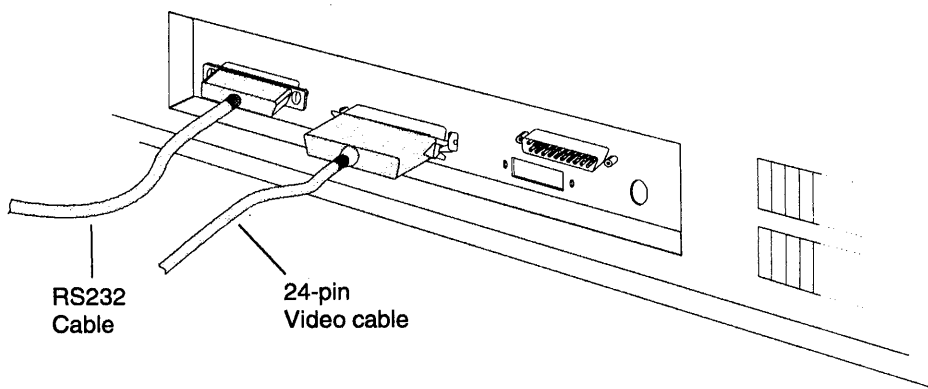
Fujitsu Interface

Scanners that are configured with the optional Fujitsu-compatible interface have a 57F-24F data connector and a 25DS host control connector.

Fujitsu Cable Requirements

- One 24-pin video cable (IEEE 488)
- One RS232 cable (2-3-7 straight through)

Plexus and Seaport provide the cables with the RIP card.

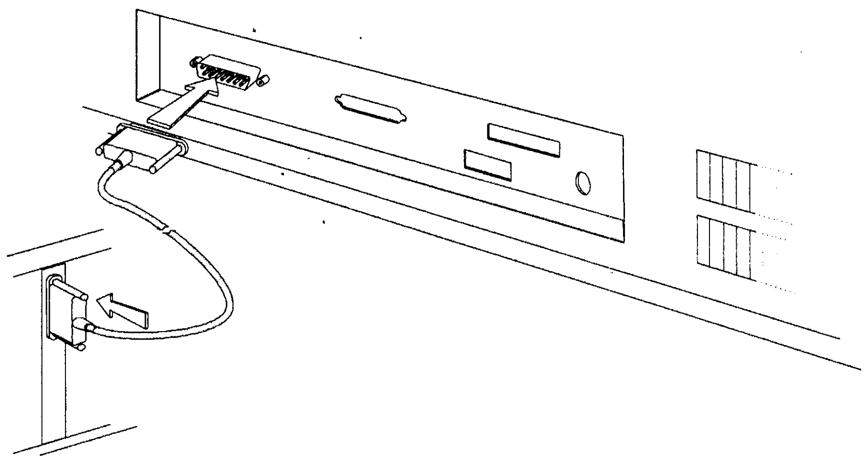


Video Interface

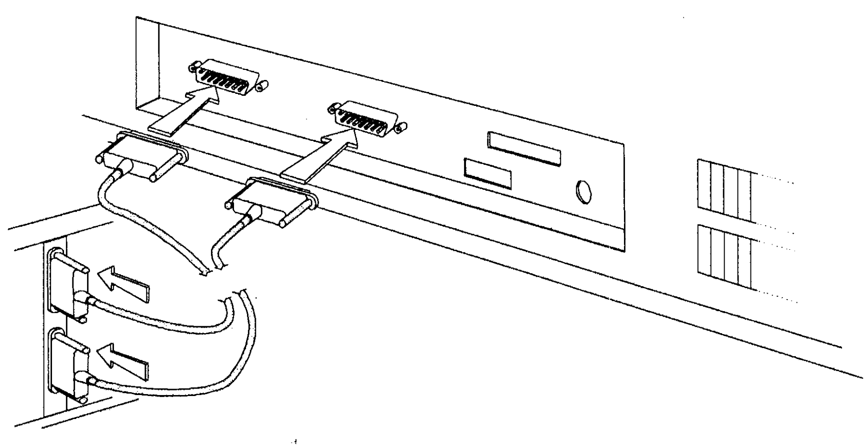
There are two types of Video interfaces, single channel and dual channel. The single channel interface has only one connector and the dual channel interface has two connectors.

Video Interface Cable Requirements

- Single Channel: One 15-pin D straight through video cable
- Dual Channel: Two 15-pin D straight through video cables



Connecting Single Channel Video Interface



Connecting Dual Channel Video Interface

Ink Jet Endorser

Scanners that are equipped with an ink jet endorser print characters on the document as it is scanned. The specific characters that are printed are controlled by the host system. The operator may enable and disable the ink jet endorser as needed.

Poor print quality (fuzzy and uneven characters) is normally due to clogged ink jets. This may occur when the ink jet endorser has not been used for a while. To correct the problem, prime the cartridge and clean the faceplate and pins as described in the "Replacing the Ink Jet Cartridge" procedure. If you continue to have print problems, check to be sure the cartridge is installed properly.

Always remove the cartridge before shipping or storing the scanner.

NOTE . . . The ink may smear when endorsing non-absorbent materials. To avoid this problem, disable the ink jet endorser before scanning documents that cannot absorb the ink.

Replacing the Ink Jet Cartridge

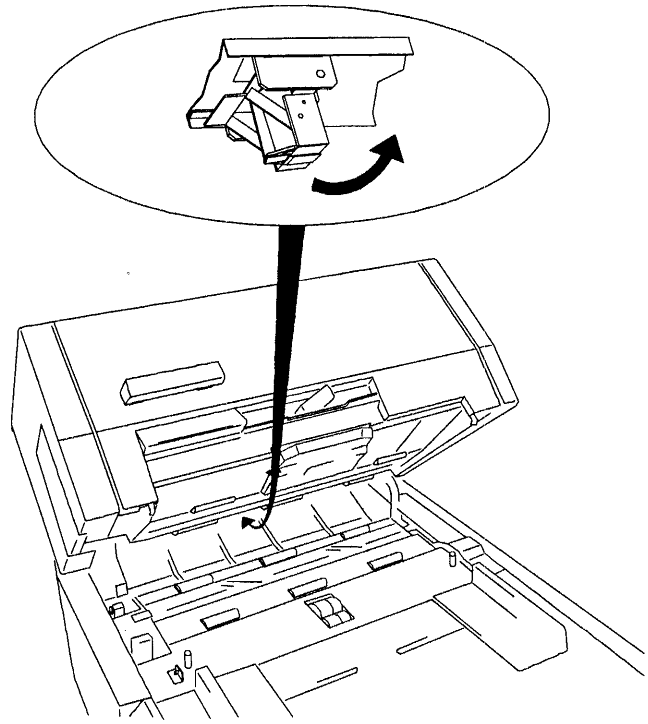
The ink jet cartridge should be replaced when the characters begin to fade or excessive ink sputtering is observed.

The ink jet endorser uses a standard HP51604A black InkJet Cartridge available from most printer supply stores. Colored inks take longer to dry and may smear.

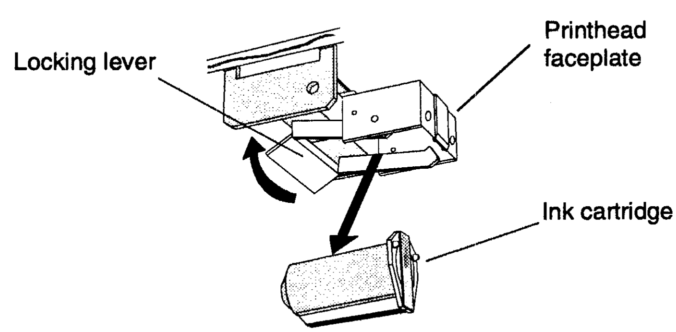
1. Turn the scanner's power switch OFF.

CAUTION: Replacing the ink jet cartridge while the scanner is ON can damage the ink jets and cause white horizontal voids in the print characters.

2. Raise the ADF cover and swivel the ink jet endorser printhead counter clockwise (toward the rear of the scanner).



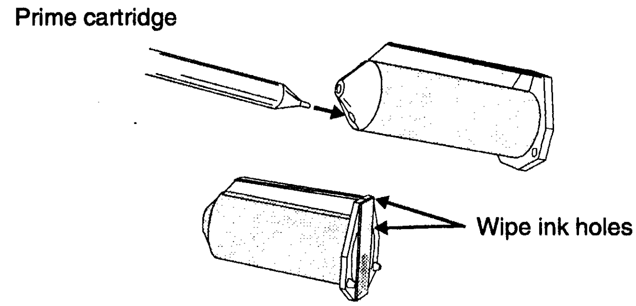
3. Push the locking lever up and remove the old cartridge.



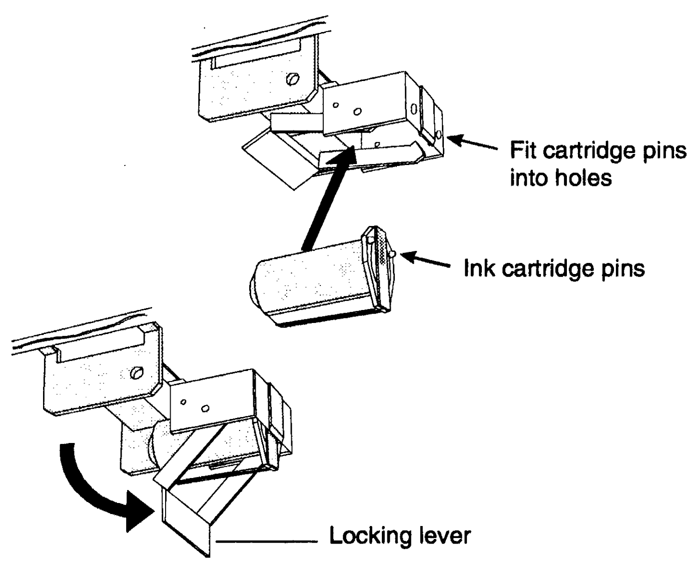
4. Put some alcohol on a lint-free cloth and wipe any excess ink off the printhead faceplate and cartridge pins.

Be careful not to get alcohol on the rubber rollers.

5. Prime the new cartridge by using a pointed dull object, such as a ball point pen, to apply pressure on the ink bladder through the hole in the top of the cartridge. When the nozzle area is covered with ink, use a damp lint-free cloth to wipe it clean.

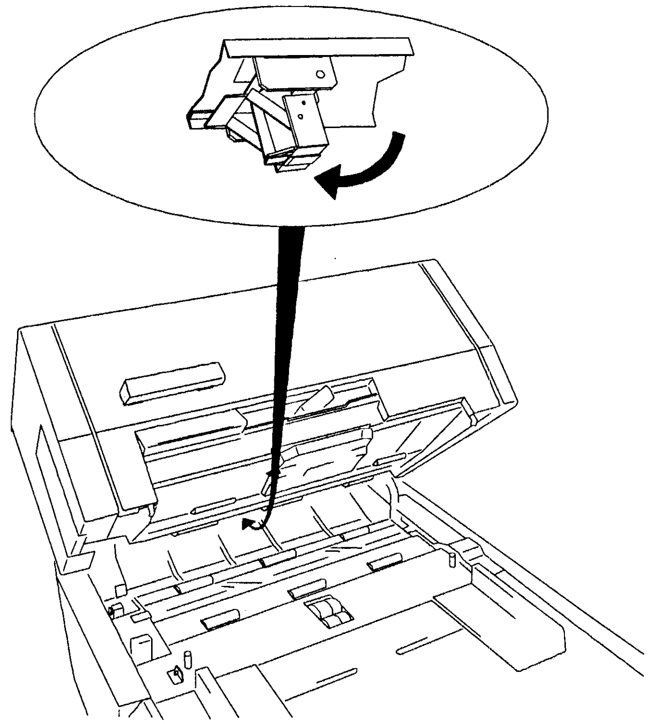


6. Insert the cartridge so its plastic pins penetrate the printhead assembly.



7. Pull the lever down to lock the cartridge in place.

8. Swivel the printhead clockwise (down) until it snaps into its operating vertical orientation as illustrated below.



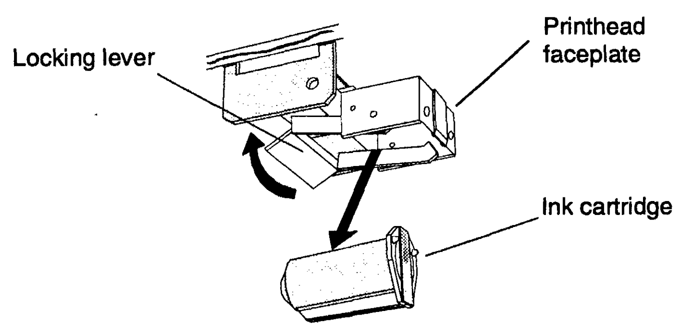
Disabling the Ink Jet Endorser

Follow the procedure below to disable the ink jet endorser so it does not print on the scanned documents.

1. Turn the scanner's power switch OFF.

2. Raise the ADF cover and swivel the ink jet endorser printhead counter clockwise (toward the rear of the scanner).

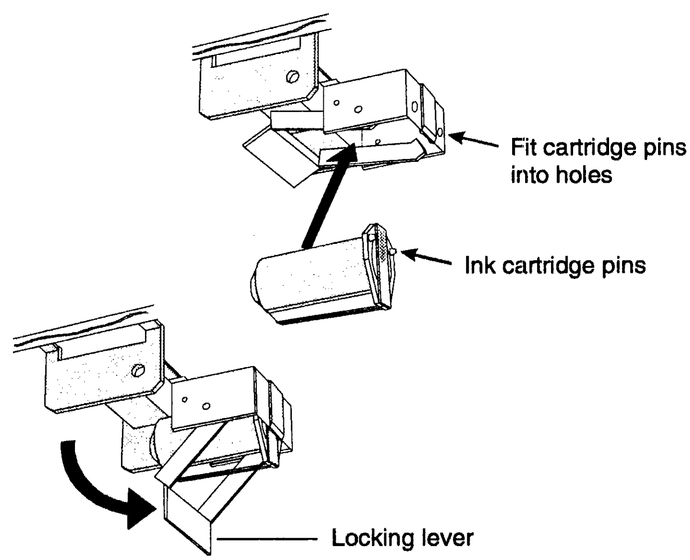
3. Push the locking lever up and remove the cartridge. Leave the printhead in the position illustrated below so it is away from the paper path.



Enabling the Ink Jet Endorser

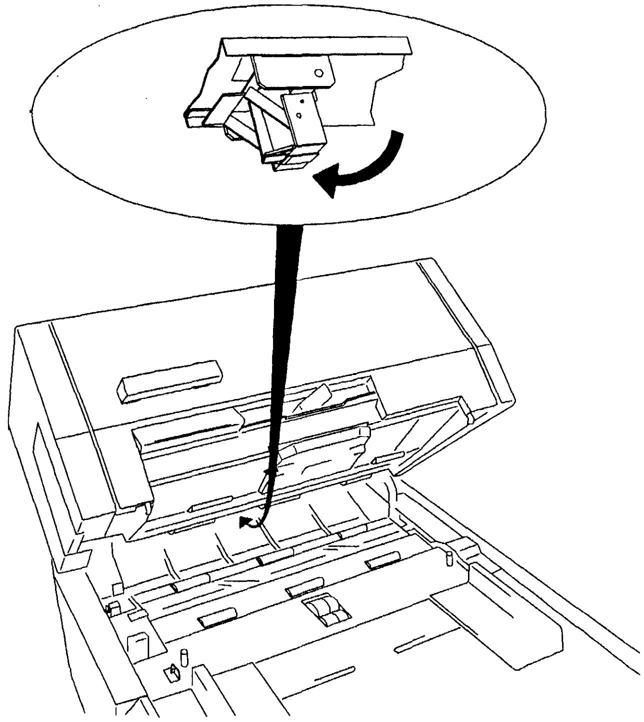
If the ink jet endorser has been disabled, follow the steps below to begin using the endorser again.

1. Turn the scanner's power switch OFF.
2. Raise the ADF cover and swivel the printhead down so you can insert the ink jet cartridge.
3. Prime the ink jet cartridge by using a pointed dull object, such as a ball point pen, to apply pressure on the ink bladder through the hole in the top of the cartridge. When the nozzle area is covered with ink, use a damp lint-free cloth to wipe it clean.
4. Insert the cartridge so its plastic pins penetrate the printhead assembly.



5. Pull the lever down to lock the cartridge in place.

6. Swivel the printhead clockwise (down) to its operating vertical orientation.



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CONFIGURATION FORM

MODEL: ☐ **IS510 (Simplex)** ☐ **IS520 (Duplex)**

SERIAL NO.: ______________________ **DATE:** ______________________

OPTICAL RESOLUTION:

- ☐ 400 dpi (standard)
- ☐ 500 dpi
- ☐ 600 dpi

LIGHT SOURCE:

Lower lamp color: ______________________

Upper lamp color: ______________________

Green (standard)

OTHER OPTIONS:

- ☐ Image Processor (IP)
- ☐ Ink Jet Endorser (SPA)
- ☐ Bar Code Recognition (BCR)
- ☐ Electronic Endorser (BMW)
- ☐ Job Separation (DOCSP)
- ☐ 8-Bit Grayscale (8EQ/DIT)

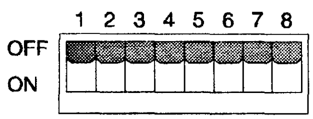
Other: ______________________

INTERFACE:

☐ **SCSI** (standard)

DIP Switch Setting:

The SCSI DIP switch configures the scanner and should not be changed. The default settings for the current configuration are shown below.



Key: Off On (marked with ink)

The person recording the configuration should indicate the On position by filling in the lower portion of the switch with ink.

☐ **DR11 Interface**

☐ **Fujitsu Interface**

☐ **Video Interface (VSI)**

☐ Single Channel ☐ Dual Channel

Image Data Path: ______________________

Host Baud Rate: ______________________

Default Image Format: ______________________

DEFAULT EEPROM-RESIDENT IMAGE FORMATS:

ID	pixels -line	lines -frame	lines-offset	pixel-offset	stepper velocity	skip-factor	1/2X-scaler
9							
10							
11							
12							
13							
14							
15							
16							

Part IV

Service

Rev. A-3 8/15/95

IMPROVISION RESEARCH

RICOH IMAGING
PERIPHERAL PRODUCTS DIVISION

Contents

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Chapter 8: Installing Options

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CHAPTER 1

Theory of Operation

Inside this chapter:

This chapter covers the theory of operation for the basic IS510 or IS520 scanner without options. If options are installed in the scanner, refer to Chapter 7 for information on how the options effect the operation.

1.1 Overview of System Modules

Raster scanner systems for any media type (paper, film, other) can be described as a combination of the following modules:

- Transport
- Optics/Illumination
- Sensor (CCD-based) camera
- System controller
- Data compressor
- Host system interface
- Vertical markets special features
- Host-resident software libraries/API

1.1.1 Transport Module

The transport module comprises all the mechanical aspects of the media handling and is designed to match the scanner's type and purpose. The transport can be described as a set of actuators (motors, solenoids, clutches, breaks) and sensors (linear, limit, contact, non contact) which are operated upon under some defined sequence or algorithm.

1.1.2 Optics/Illumination Module

The optics and illumination provide for media projection onto the image sensor. This module defines the scanner's geometric properties such as true resolution, linearity, repeatability, etc. Also affected by this module are the overall spectral response and camera dynamic range.

1.1.3 Sensor Camera Module

The sensor camera converts incident light reflected from or transmitted through the media into digital data. It is typically based on a linear CCD sensor and may include image processing features such as calibration, binarization, etc.

1.1.4 System Controller Module

The system controller is typically an embedded processor. It controls the transport's electromechanical sequences, camera, illuminator, and image processor in response to commands sent from the host computer system. The controller's firmware may also support debugging, alignment, and maintenance activities for the whole scanner.

1.1.5 Data Compression Module

A data compression module is used to remove redundant data from the formatted images produced by the scanner and to reduce the resulting file size. It would typically support a standard compression algorithm such as CCITT or RLE for binary images, and JPEG for grayscale images.

1.1.6 Host System Interface Module

The interface module converts the scanner's internal data path to a standard definition supported by one or more host computer systems. This module is selected to fit the hardware and software requirements of the host computer. Some examples of interfaces are SCSI, Video, DR11, etc. A SCSI-2 interface is standard in the IS510 and IS520 scanners. Other interfaces are available as options.

1.1.7 Vertical Market Options

Vertical market options are added to a scanner to improve its productivity or utility in specific applications. Some examples are image enhancing and electronic or physical endorsing and barcode recognizers.

1.1.8 Host-resident Software Libraries/APIs Module

The IS510 and IS520 scanners are operated by commands issued from the host system. Software libraries and APIs are available from Ricoh, Improvision, and other vendors to program the host system to operate the scanner.

1.2 Reading a Document

The IS510 and IS520 scanners have a straight document path that moves the pages from the document table, over the contact glass where the document is scanned and out of the scanner into the output tray.

The built-in ADF feeds pages one at a time from the bottom of the stack. Additional pages can be added to the stack while scanning is in process. The feed lever sets the ADF for automatic or manual feeding.

All of the scanning parameters are set by the host system when scanning is initiated.

1.2.1 Document Flow

The document stack is placed face down on the document table. When scanning is initiated, the ADF pickup roller starts moving the document into the scanner where the ADF feed roller and separation blade separate the bottom page. The R1 roller moves the page over the contact glass where it is scanned, then the R2 roller moves the page out of the scanner and into the output tray.

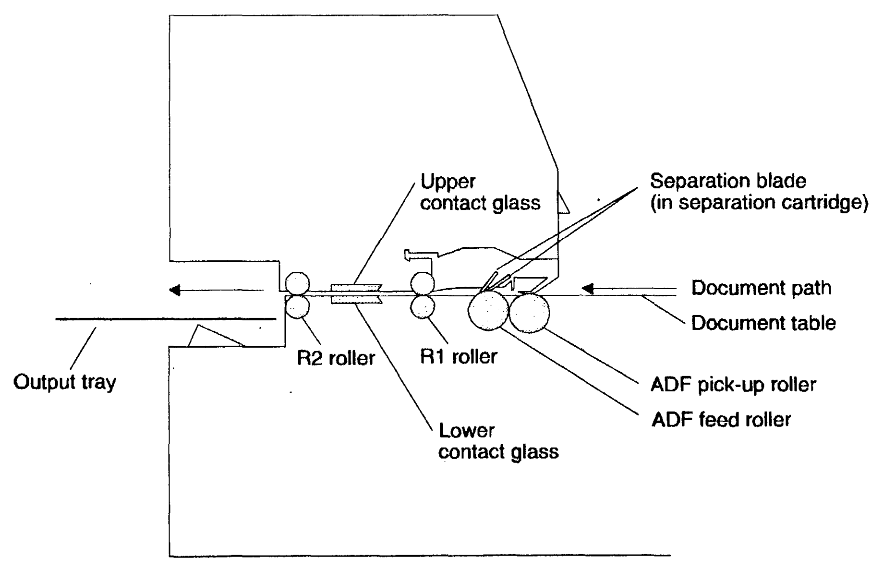
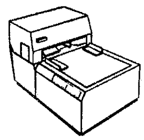


Figure 1-1. Document Flow

1.2.2 Optical Axis

The fluorescent lamp illuminates the downside (front side) of the document and the light reflects on the mirror in the lower unit and is transferred to the CCD via the lens.



In IS520 scanners the light that is reflected from the upper side (back side) of the document reflects on three mirrors before being transferred to the CCD in the upper unit.

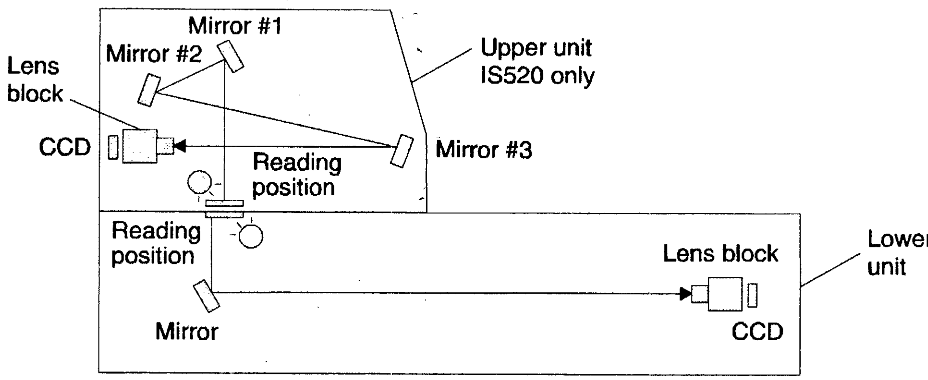


Figure 1-2. Optical Axis

1.2.3 Video Signal Flow

The light reflected to the CCD is photoelectrically converted to a video signal. The signal flow in IS510 and IS520 scanners is different because of the simplex and duplex operation.

IS510

The CCD transmits the video signal through the CCD control board, equalizer board, CPU board, data compression board and SCSI board where it is sent through the SCSI cables to the host system.

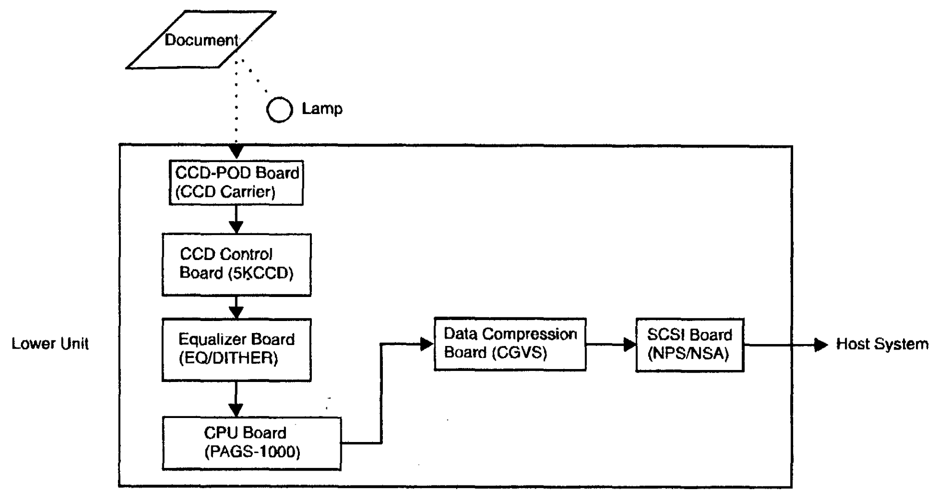
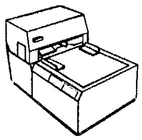


Figure 1-3. IS510 Video Signal Flow



IS520

In IS520 scanners, the data from the upper unit is stored in memory until a full page is transmitted from the lower unit.

The respective CCDs in the upper and lower units transmits the video signal through the CCD control board, image processing board and CPU board. The upper unit transmits the data one page at a time to the memory board.

The signal from the CPU board in the lower unit transmits to the data compression board and SCSI board where it is sent through the SCSI cables to the host system. After a full page is transmitted, the upper unit data from the memory board is transmitted to the data compression board and SCSI board.

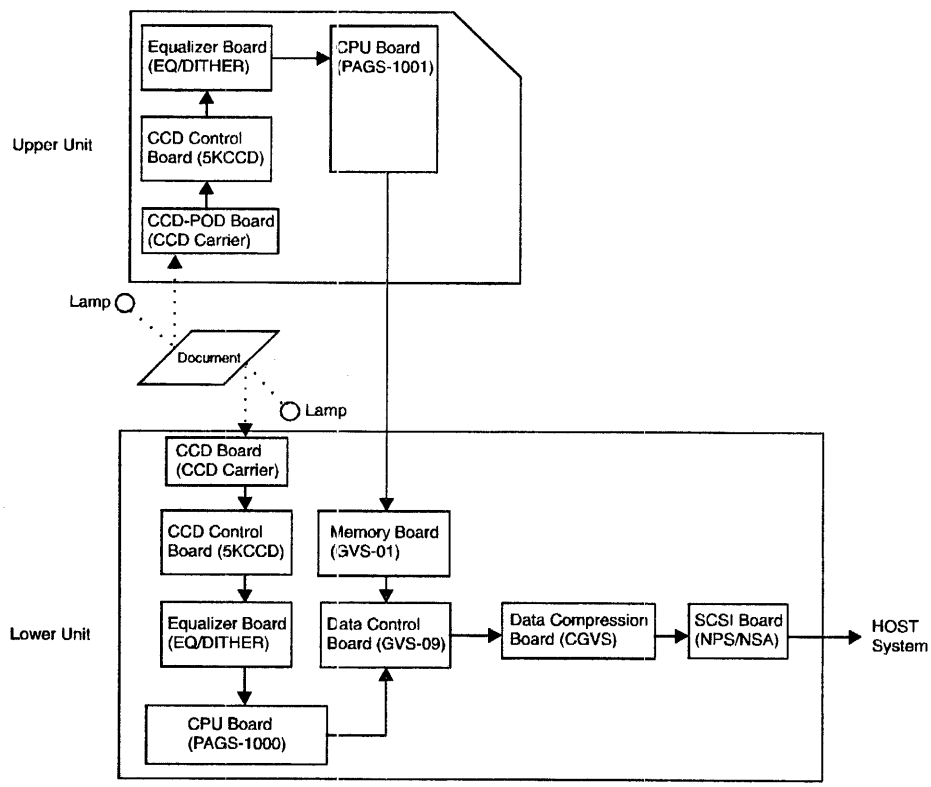


Figure 1-4. IS520 Video Signal Flow

1.2.4 Control Signal Flow

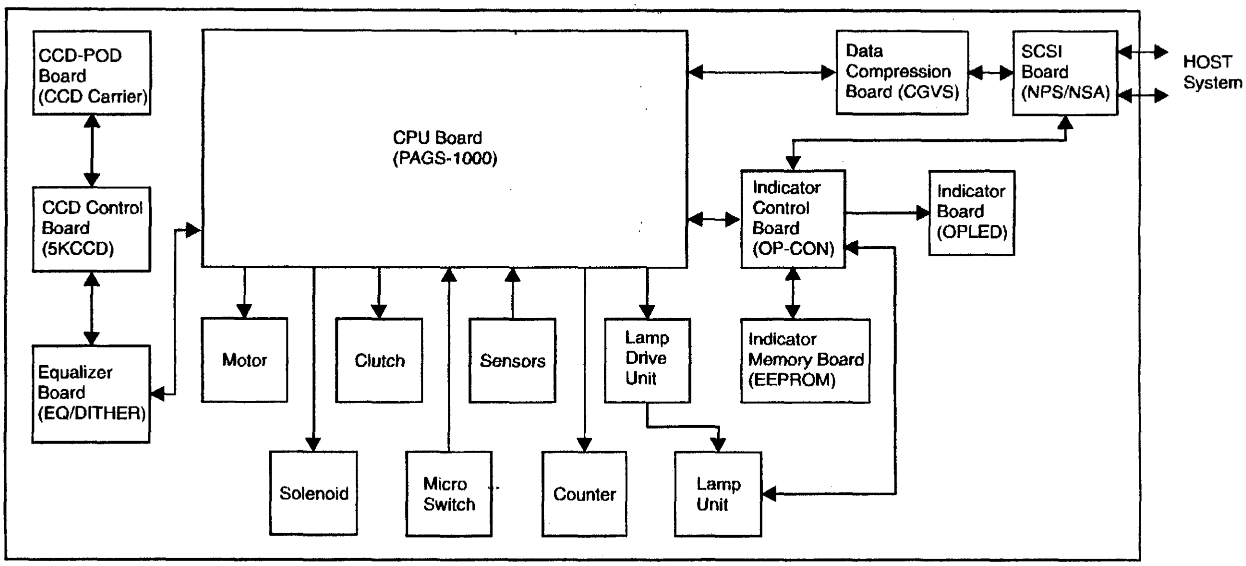


Figure 1-5. IS510 Control Signal Flow

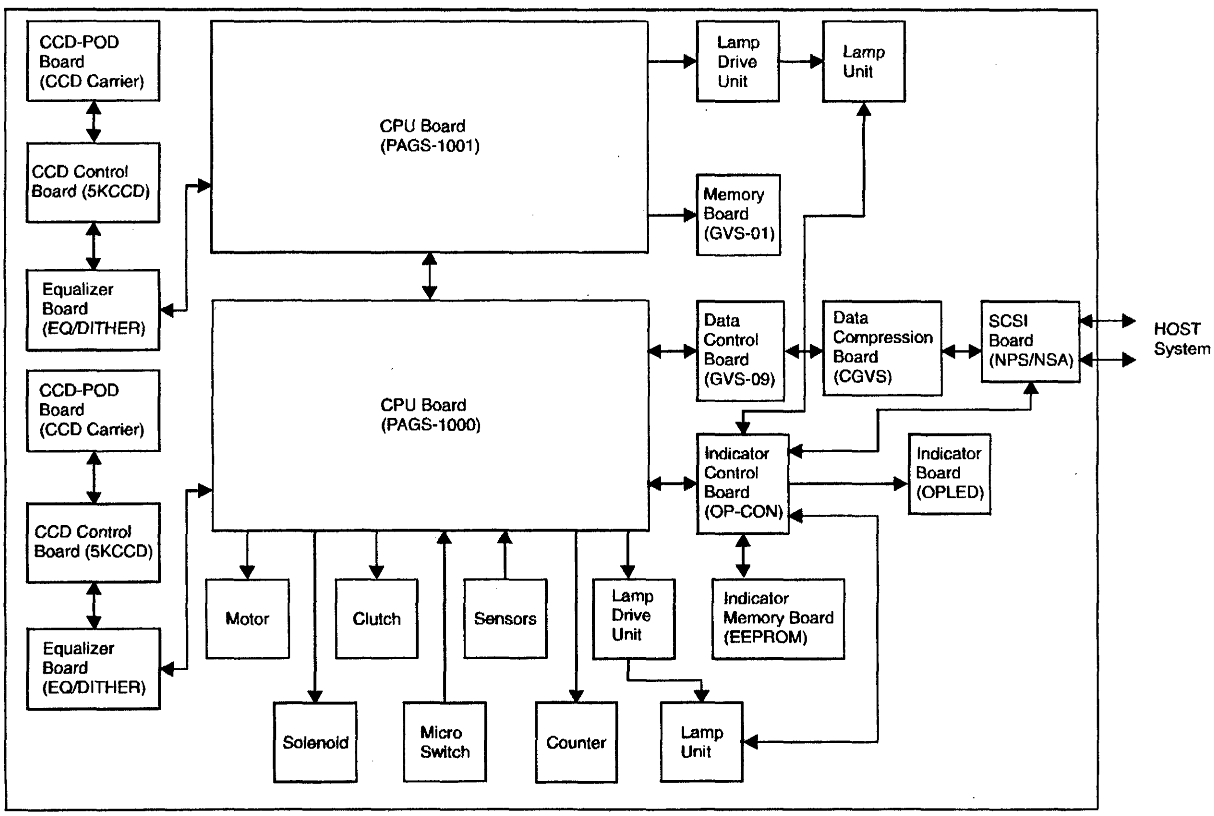


Figure 1-6. IS520 Control Signal Flow

1.3 Document Transport

The components that feed the documents through the scanner are described in the following sections.

1.3.1 Feed Unit

All of the drive sections for the document transport are integrated in the feed unit. The rollers in the feed unit are driven by the motor. The rotation of the ADF pickup roller and ADF feed roller is controlled by the clutch. The up and down movements of the ADF pickup roller is controlled by the solenoid.

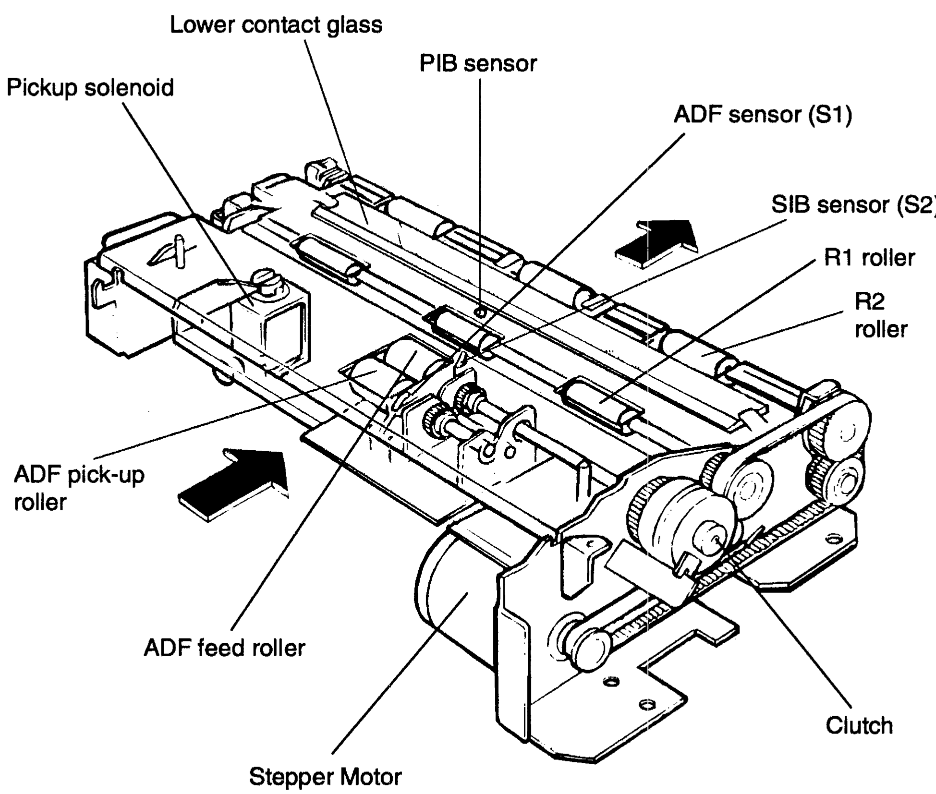


Figure 1-7. Feed Unit

1.3.2 Document Sensing

The actuator in the ADF sensor moves down when a document is placed on the document table and slid into the scanner until a stop is felt. This triggers the indicator panel **Original Set** light to turn on.

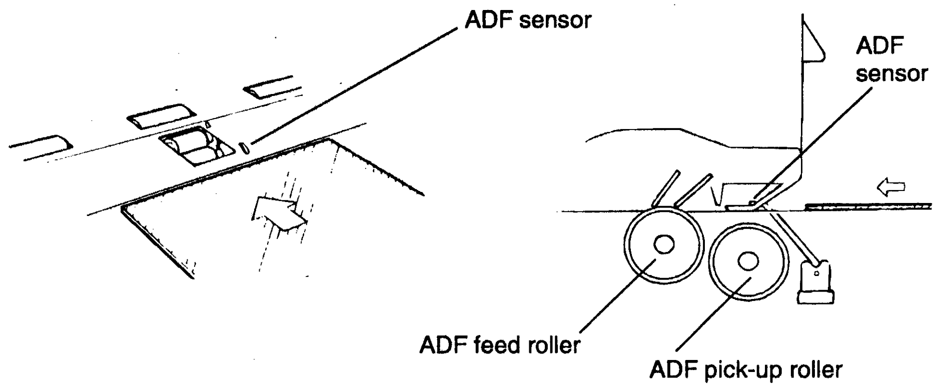


Figure 1-8. ADF Sensor Before Document is Sensed

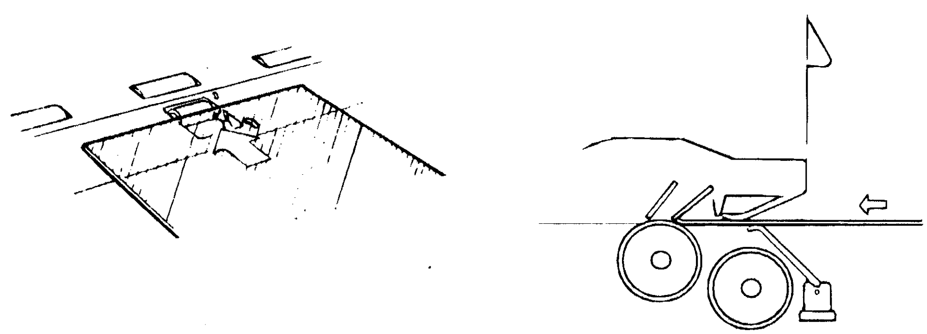


Figure 1-9. ADF Sensor After a Document is Sensed

1.3.3 Page Separation

When documents are inserted into the scanner the upper pages are stopped by the stopper and the lower pages by the ADF feed roller and separation blade (part of the separation cartridge).

When a feed paper command is issued, the ADF pickup roller rises and contacts the bottom page. The pickup and ADF feed rollers rotate at the same time and only the bottom page is fed.

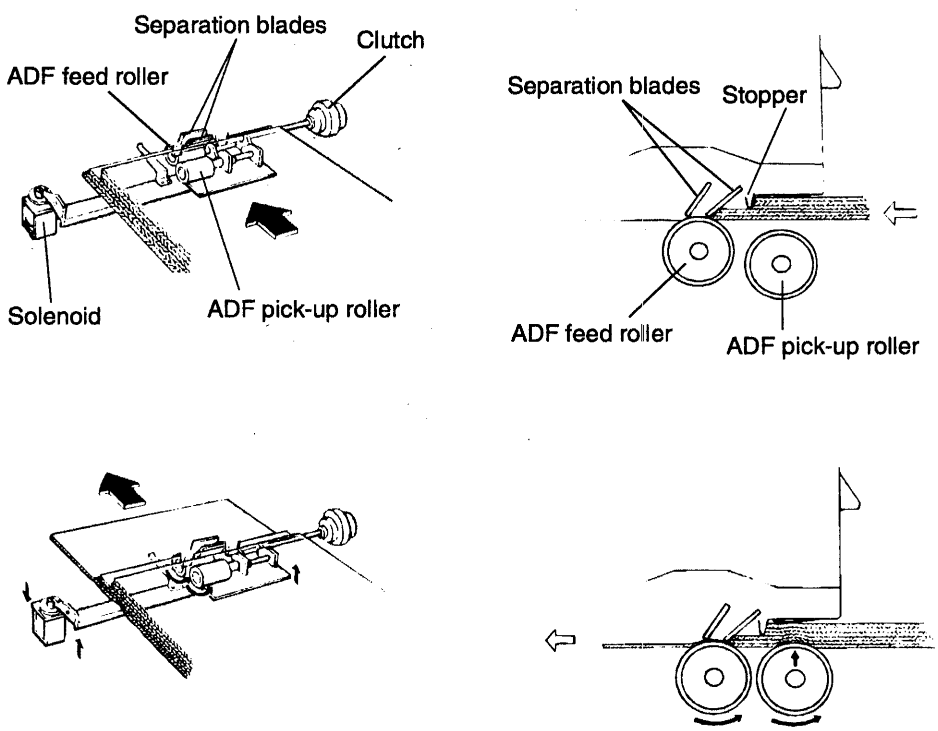


Figure 1-10. Page Separation

1

1.3.4 Manual Feeding

When the feed lever is set in the Manual position, it presses the microswitch inside that triggers the following actions:

- The solenoid switch is turned off and the ADF pickup roller will not rise when a feed paper command is issued.
- The two separation blades that contact the ADF feed roller are lifted up and separate from the ADF feed roller so the document can go through to the R1 roller.

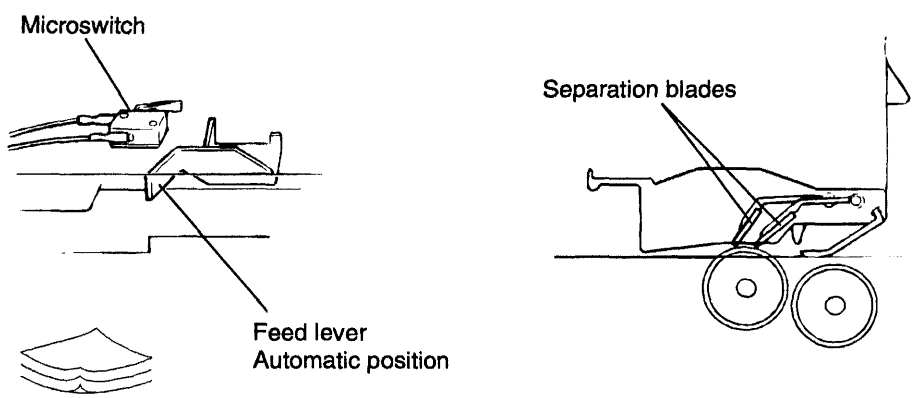


Figure 1-11. Feed Lever in Automatic Position

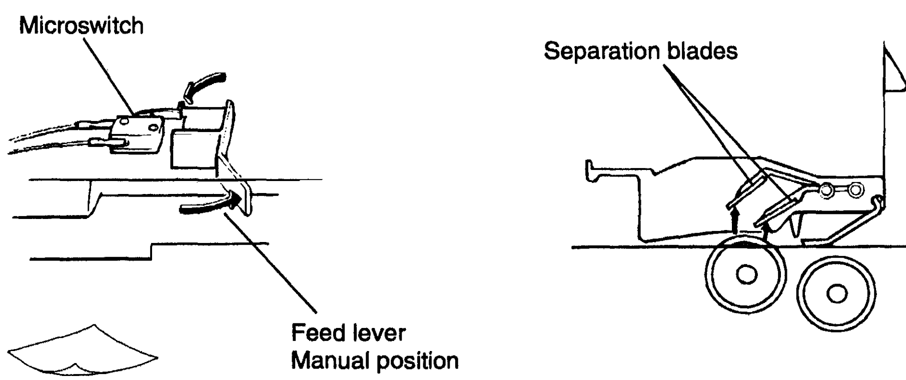


Figure 1-12. Feed Lever in Manual Position

1.4 CCD Linear Array Camera

The cameras used in the IS510 and IS520 scanners are self-contained linear Charge Coupled Device (CCD) modules. The key features of these cameras are:

- Free run or synchronized operation
- Binary and grayscale image data
- Integral image processing (equalizing)

The camera uses a 5000 pixel linear array CCD. The CCD chip combines a linear array of light sensitive elements (sites) with analog shift registers. Incident light is accumulated as electrical charges in the sites, and is transferred periodically in parallel to the shift registers. These electrical charge packets are serially shifted out as analog data representing the light distribution along the CCD.

The serial shift rate of the analog data is referred to as the "pixel rate," and the time between two consecutive parallel transfers to the shift registers is known as "integration time."

All the clock phases required for CCD driving and analog-to-digital conversion are generated locally by the camera from a single reference oscillator. Various pixel rates and integration times can thus be selected by replacing this oscillator.

In the "free running" operation mode, the CCD integration time matches the time it takes to serially shift all the pixels from the camera. In the "synchronized mode" the integration time can be extended independent of the pixel rate, as determined by an external signal. Synchronized operation facilitates the electrical concatenation of any number of cameras so that they appear to represent a very long CCD chip.

Conversion of analog light information into binary image data is done with six bits per pixel accuracy. Since the CCD's elements vary in their light sensitivity, and in order to compensate for uneven light distribution along the CCD axis, the camera can calibrate itself to a given light envelope for later use as the data conversion reference. This process is called "light normalization" and is accomplished in two integration time periods.

In a typical configuration, the camera module is controlled by the CPU system controller module and provides normalized grayscale data as input to the Equalizer board.

1.5 CGVS Scanner Interface and Data Compressor

The CGVS board combines a scanner-to-host interface and an image compression engine. The key features of the CGVS are:

- Concurrent scanner and host data transfers
- Serial and parallel input ports
- Up to 6 MB pre-compression FIFO buffer
- CCITT-G3, G3/2D, G4 compression hardware
- PC/AT, MCA, VME, SBus, QBUS, UNIBUS, TURBO channel support via a DR11 port
- Film, Fiche, Aperture card, A0, Document scanners input

The CGVS facilitates the connection of raster image scanners to a host system via a dual ported FIFO memory coupled with a CCITT compressor. Raster scanners generate data corresponding to the scanned media image on a line-by-line basis. The CGVS can be configured to accept such images generated in bit-serial or word-parallel format.

The CGVS memory is a dual ported first-in-first-out (FIFO) buffer. The CGVS FIFO buffer accumulates image data prior to its processing by the compression engine. Since the buffer has two separate ports for the scanner and compressor, both can operate concurrently. This architecture frees the host from scanner related timing constraints and permits the compressor to slow down when encountering complex image areas. The FIFO is made of 2 MB banks organized as 1 M by 16. Up to three banks may be used for a total buffer size of 6 MB. The FIFO access gives round-robin priority to the scanner and compressor/host. This allows the host processor to read data with zero wait states out of the CGVS.

The CGVS compression engine supports real-time CCITT processing of binary image data. Selection of the compression scheme and image format are done by the host via the CGVS DR11 port.

Image compression and host data transfer at the CGVS can be done concurrently with scanning, or sequentially after scan completion. The concurrent mode is typically used when the image format is fixed. The sequential mode is used when the AIF is turned on (image size is unknown prior to the scan completion).

The CGVS native host port is a 16-bit parallel DMA channel compatible with DEC DR11 and DRV11 definitions. This port is compatible with the SCSI (NSA) interface, and with host adapters on several hardware platforms. Supported environments cover PC (AT and MCA), SUN (SPARC and VME), and DEC (Qbus UNIbus and TURBO channel).

1.5.1 Image Data Accumulation in the CGVS

The CGVS FIFO memory holds the scanned data in 16 bit parallel words prior to submitting it to the VCEP for possible compression. The relationship between raster data (generated by a VSI-compatible source) and CGVS storage format is shown below:

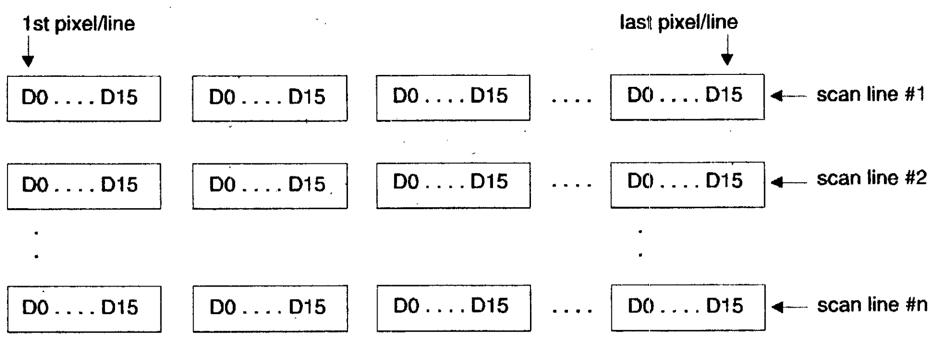


Figure 1-13. CGVS Storage Format

NOTE . . . *The bit order within data words is subject to the position of the jumper on JP4 as described in Section 2.7.1.*

1.5.2 CGVS Jumpers and Indicators

The CGVS board has several jumpers to allow for operating mode selections by the user. Four LED indicators provide visual feedback of the card's state. A summary of the jumpers/LEDs and their functions is given in Sections 2.7.1 and 2.8.1.

1.6 SCSI-2 Interface (NPS/NSA)

The SCSI layer of the IS510 and IS520 scanners consists of the NPS/NSA board. This board implements a SCSI target and translates SCSI bus activities into two internal data paths within the scanner.

The NPS/NSA board communicates with the scanner's CGVS board and with the primary CPU (PAGS-1000) board. The CGVS communications is over a DR11 protocol and is used to manage the FIFO buffers and VCEP compressor. The CPU communications is over RS232C and is used for all parametric scanner setup and scan control.

The SCSI interface implements a SCSI target using a 53C94 (ASC) device which can operate in both asynchronous and synchronous transfer modes. SCSI reselection and phase transitions are performed by the ASC in hardware for reduced SCSI bus overhead.

The SCSI connection is single-ended shielded low-density "A" cable type. Two parallel connectors permit easy chaining and the use of external terminators. The use of a terminator is not mandatory; however, it is strongly recommended that an active terminator be used.

NOTE . . . The SCSI board is shipped with a *TERMPWR fuse installed and a terminator can be used.*

The SCSI interface is managed by a dedicated MPU with specialized hardware for CGVS and other devices support. The hardware includes a DR11 port for CGVS control and a means to read the amounts of image data when passing compressed data from the CGVS to a SCSI initiator.

CHAPTER 2

Hardware Components

Inside this chapter:

2

2.1 Front View

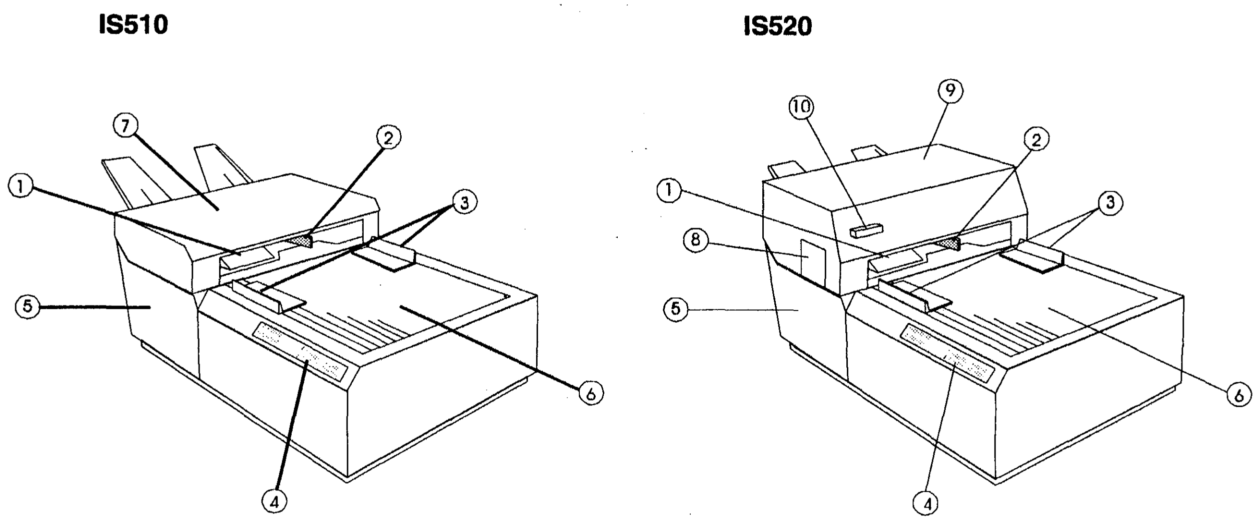


Figure 2-1. IS510 and IS520 Front Views

IS510/IS520

No.	Name	Description
1	Upper unit release lever	Unlocks the upper unit
2	Feed lever	Set this lever toward the rear of the scanner to read documents by manual feeding
3	Document guides	Fixes the document position
4	Indicator Panel	Indicates the machine status
5	Lamp B access door	Open this door when replacing lamp B
6	Document table	Set the document here for scanning

IS510

No.	Name	Description
7	Upper unit (simplex)	Holds down a document from the upper side at document transport

IS520

No.	Name	Description
8	Lamp A access door	Open this door when replacing lamp A
9	Upper unit (duplex)	Scans the upside of a document
10	Handle	Hold when using the release lever.

2.2 Rear View

IS510 **IS520**

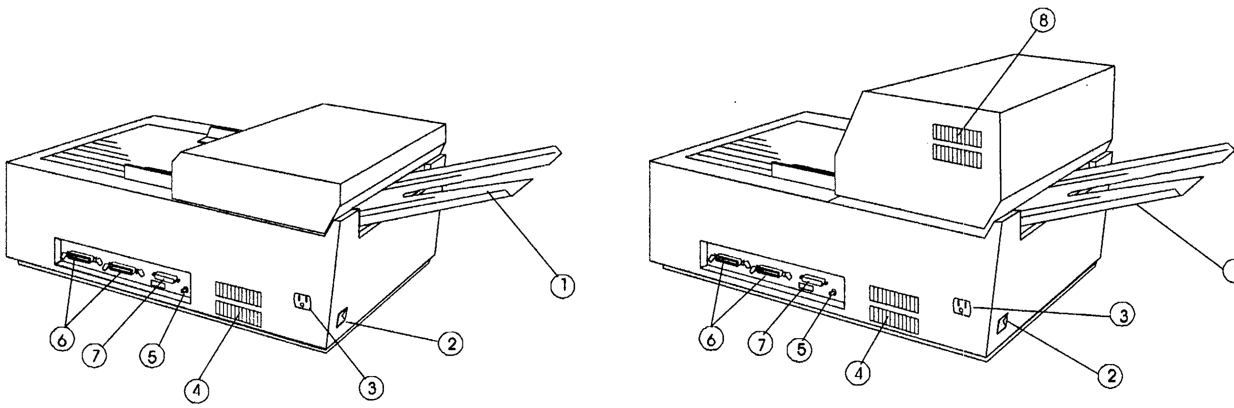


Figure 2-2. IS510 and IS520 Rear Views

IS510/IS520

No.	Name	Description
1	Output tray	The scanned document is transferred to this tray
2	POWER switch	Turns the power on or off
3	AC receptacle	Connect the power cord
4	Lower unit vent	Exhausts hot air from the lower unit
5	SCSI Rotary switch	Sets the SCSI ID
6	SCSI connectors	Connects the SCSI cables and terminator
7	Monitor Port	RS232 port used to control and configure the scanner.

IS520

No.	Name	Description
8	Upper unit vent	Exhausts hot air from the upper unit

2.3 Indicator Panel

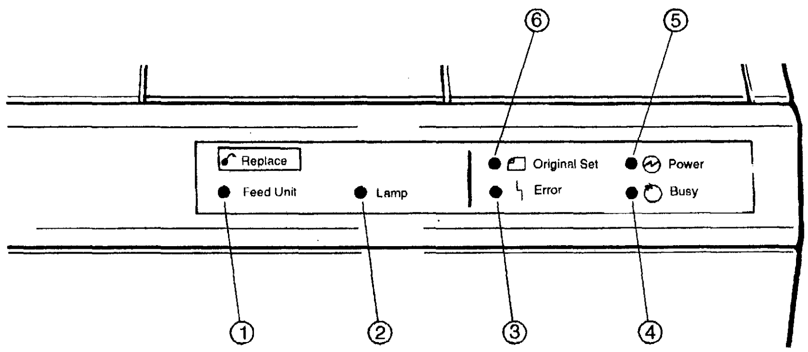


Figure 2-3. IS510 Indicator Panel

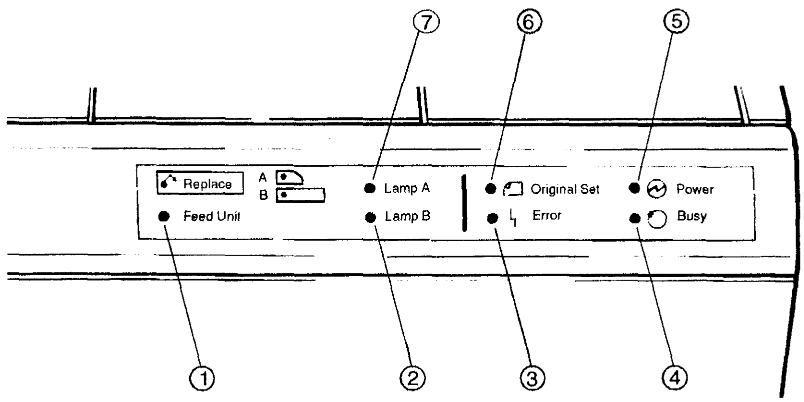


Figure 2-4. IS520 Indicator Panel

IS510/IS520

No.	Name	Description
1	Feed unit	The yellow lamp lights as a reminder to check the ADF rollers for wear after 1 million pages have been scanned.
2	Lamp (IS510), Lamp B (IS520)	The yellow lamp lights when (a) the lamp has reached the normal life span or (b) the lamp heater is broken, not connected or overheating.
3	Error	The red lamp lights when an error such as a jam occurs or a door is open.
4	Busy	The orange lamp lights during communication with host.
5	Power	The green lamp lights when power is supplied.
6	Original set	The green lamp lights when a document is placed on the document table and is in position for scanning.

IS520

No.	Name	Description
7	Lamp A (upper lamp)	See Lamp B above.

NOTE . . . The indicators may function differently when certain options are installed. See Chapter 7 for details.

2.4 Layout of Parts

2.4.1 Parts of Drive Section

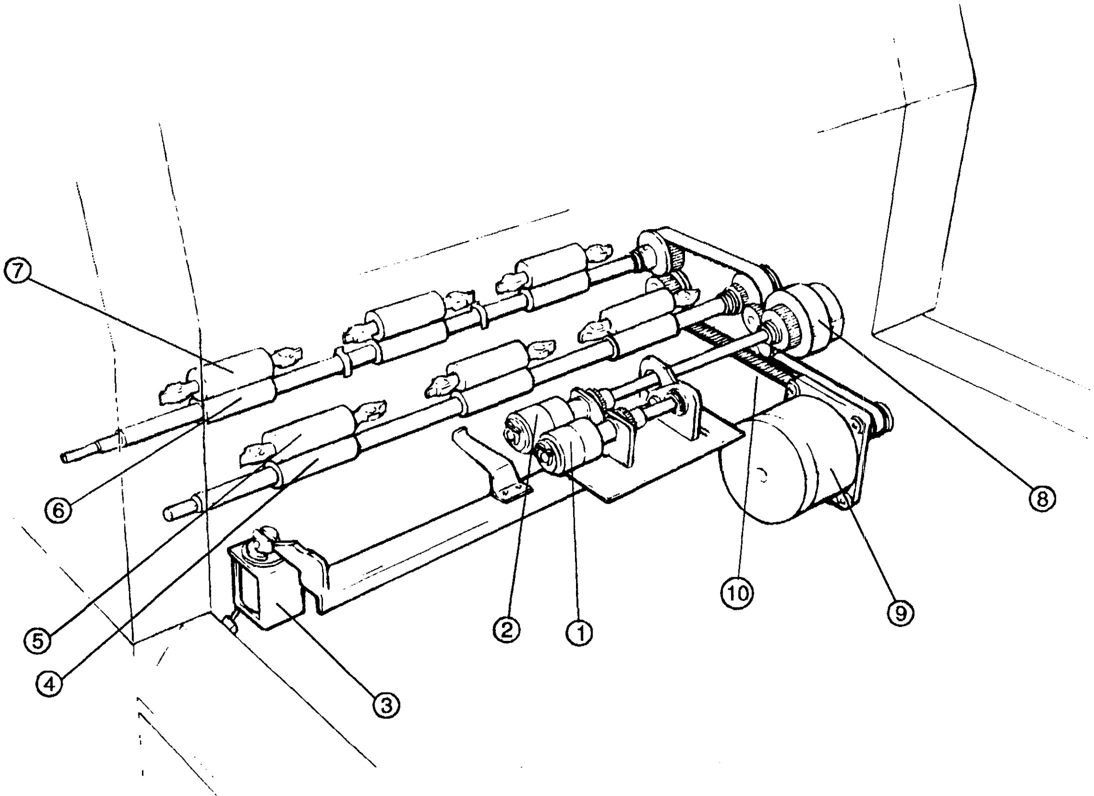


Figure 2-5. IS510/IS520 Drive Section Parts

IS510/IS520

No.	Name	Description
1	ADF pickup roller	Picks up a document.
2	ADF feed roller	Transports a document.
3	Solenoid	Lifts up the pickup roller.
4	R1 roller	Transfers a document to the reading position.
5	R1 idlers	Presses a document against the R1 roller.
6	R2 roller	Outputs a document.
7	R2 idlers	Presses a document against the R2 roller.
8	Clutch	Connects or disconnects the motor drive power to the feed roller.
9	Stepper Motor	Drives all the rollers.
10	Motor belt	Connects the motor drive power to each roller.

2.4.2 IS510/IS520 Boards

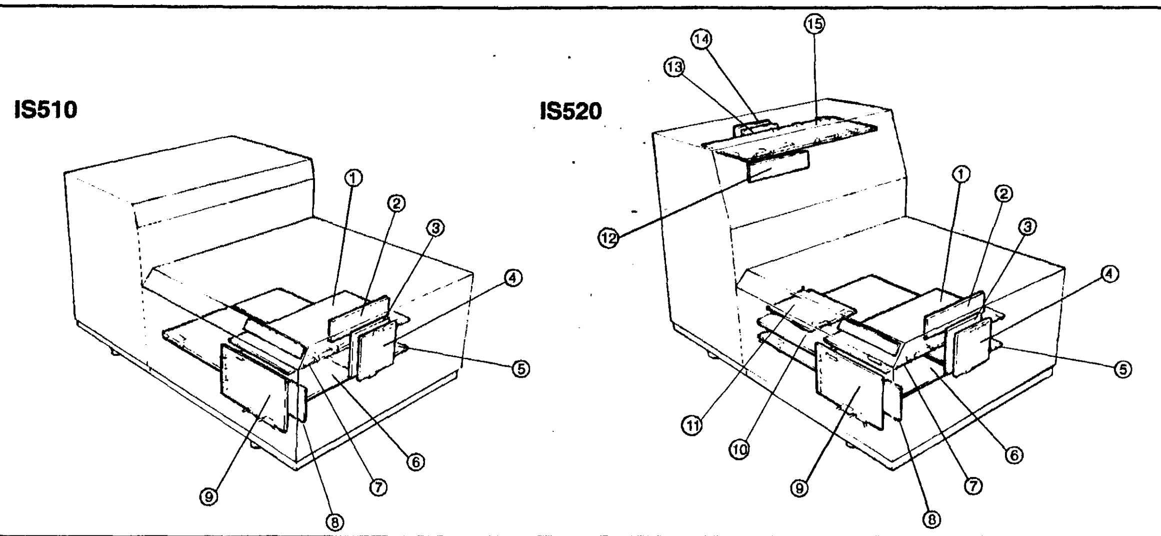


Figure 2-6. IS510/IS520 Boards

IS510/IS520

No.	Name	Description
1	CPU board (PAGS-1000)	Performs document transport, lamp control and image data processing.
2	CCD-POD board (CCD carrier)	Mounts a charge coupled device (CCD).
3	CCD control board (5KCCD)	Controls the CCD.
4	Equalizer board (EQ/DITHER)	Performs image data A/D conversion and data processing.
5	SCSI board (NPS/NSA)	Inputs and outputs data from and to the host.
6	Data compression board (CGVS)	Compresses image data and stores image data from the lower unit.
7	Indicator board (OPLED)	Mounts indicator lamps.
8	Indicator memory board (EEPROM)	Stores the number of scanned sheets.
9	Indicator control board (OP-CON)	Controls the indicator panel.

IS520

No.	Name	Description
10	Memory board (GVS-01)	Stores image data from the upper unit (duplex)
11	Data control board (GVS-09)	Switches image data from the upper unit (duplex) and main unit.
12	CCD-POD board (CCD carrier)	Mounts a charge coupled device (CCD).
13	CCD control board (5KCCD)	Controls the CCD.
14	Equalizer board (EQ/DITHER)	Performs image data A/D conversion and data processing.
15	CP'J board (PAGS-1001)	Performs lamp control and image data processing of the upper unit.

2.4.3 Electric Components

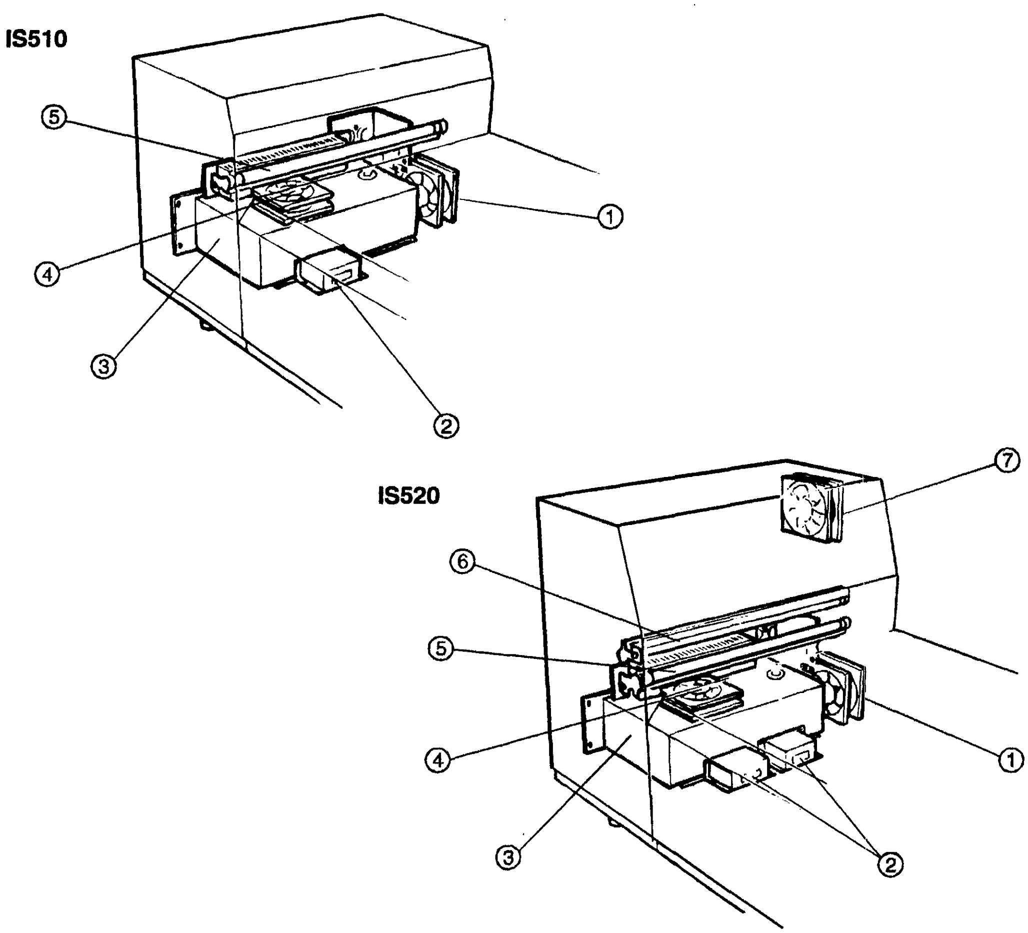


Figure 2-7. IS510/IS520 Electric Components

IS510/IS520

No.	Name	Description
1	Fan (lower)	Exhausts the internal hot air outside.
2	Lamp drive unit	Supplies the voltage to light the fluorescent lamp.
3	Power supply unit (PSU)	Supplies the power to each module.
4	PSU fan	Cools the power supply unit.
5	Fluorescent lamp B (lower)	Lights up the downside of a document.

IS520

No.	Name	Description
6	Fluorescent lamp A (upper)	Lights up the upside of a document.
7	Fan (upper)	Exhausts the internal heat outside.

2.4.4 Sensors

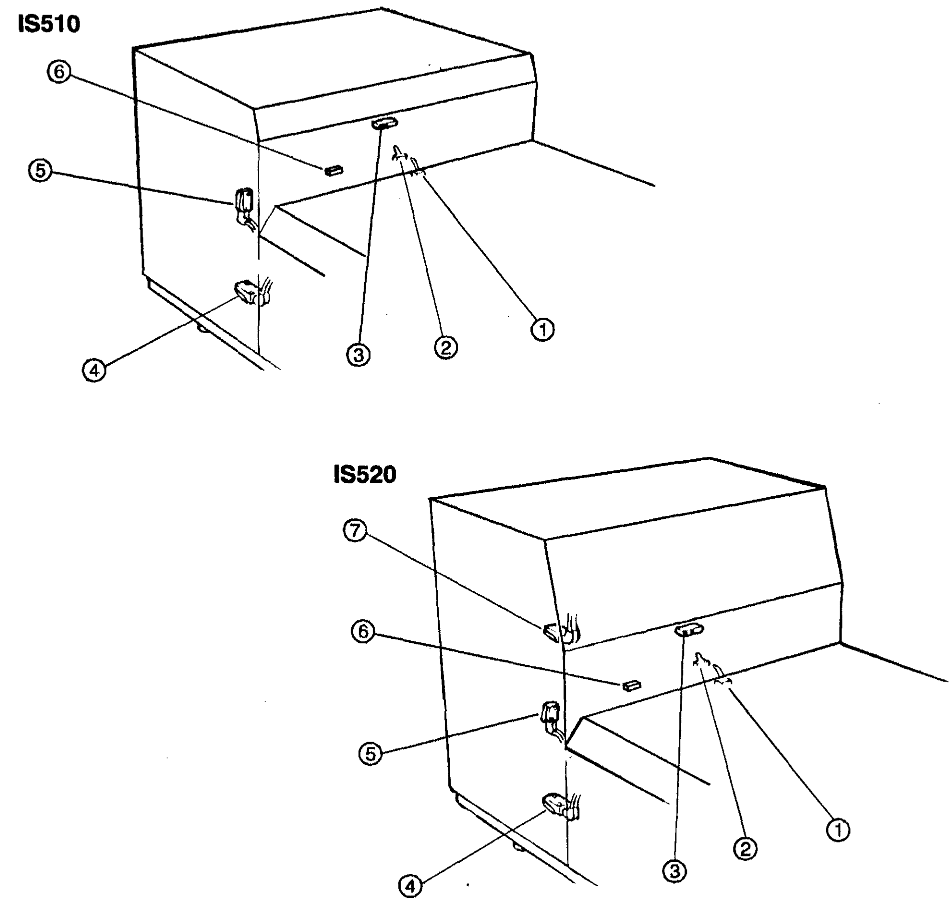


Figure 2-8. IS510/IS520 Sensors

IS510/IS520

No.	Name	Description
1	ADF sensor (S1)	Senses that the document is set in the ADF.
2	SIB sensor (S2)	Senses a document separation problem.
3	PIB sensor (S3)	Measures the timing of the scanning start position.
4	Lamp B access door interlock switch	Cuts off 24V while the lamp B access door is open.
5	Upper unit interlock switch	Cuts off 24V while the upper unit is open.
6	Microswitch	Senses the position of the feed lever.

IS520

No.	Name	Description
7	Lamp A access door interlock switch	Cuts off 24V while the lamp A access door is open.

2.4.5 Optical Parts

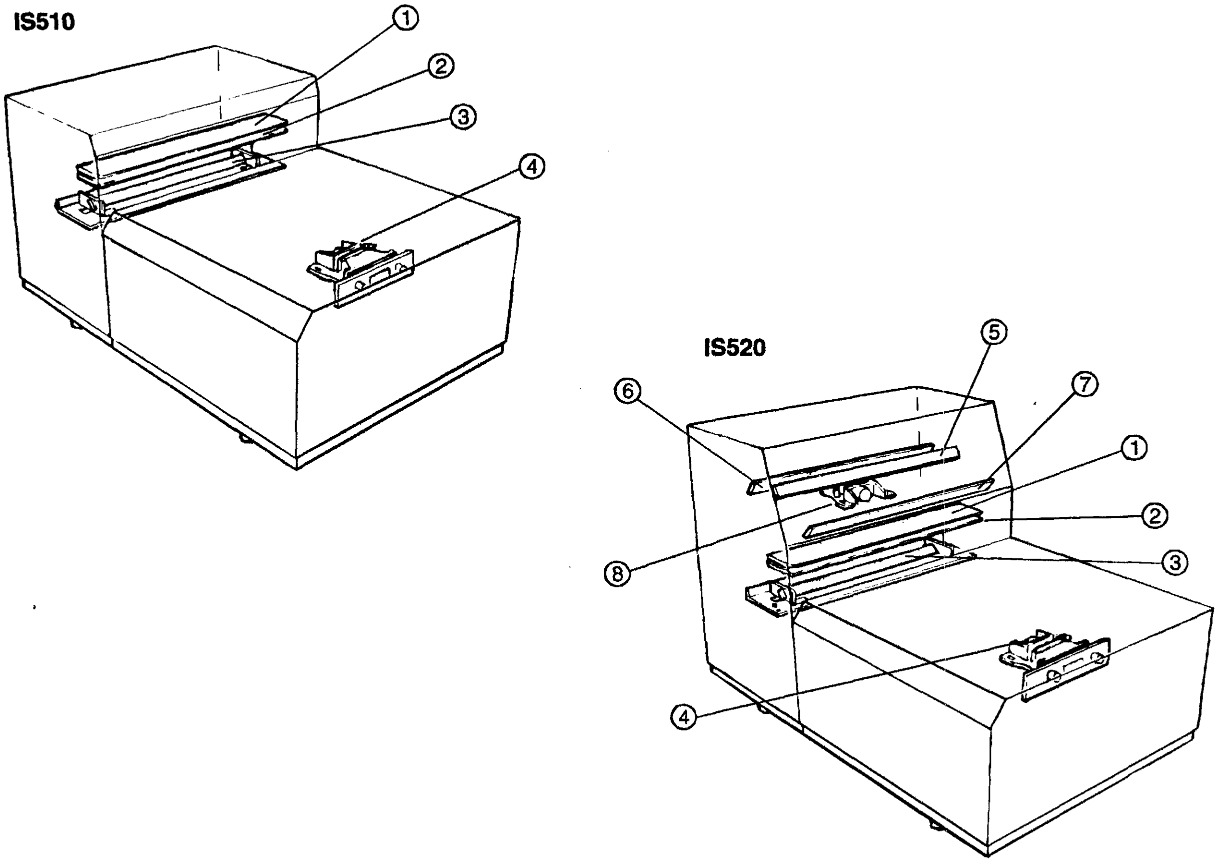


Figure 2-9. IS510/IS520 Optical Parts

IS510/IS520

No.	Name	Description
1	Contact glass (upper unit)	Located in the document reading position.
2	Contact glass (lower unit)	Located in the document reading position.
3	Mirror (lower unit)	Sends the reflected light from a document to the lens of the machine.
4	Lens block (lower unit)	Image-forms the reflected light on CCD.

IS520

No.	Name	Description
5	Mirror #1	Sends the reflected light from a document to mirror #2.
6	Mirror #2	Sends the reflected light from mirror #1 to mirror #3.
7	Mirror #3	Sends the reflected light from mirror #2 to the lens.
8	Lens block (upper unit)	Image-forms the reflected light from mirror #3 on CCD.

2

2.5 PC Boards (PCBs)

2.5.1 CPU Board (PAGS-1000)

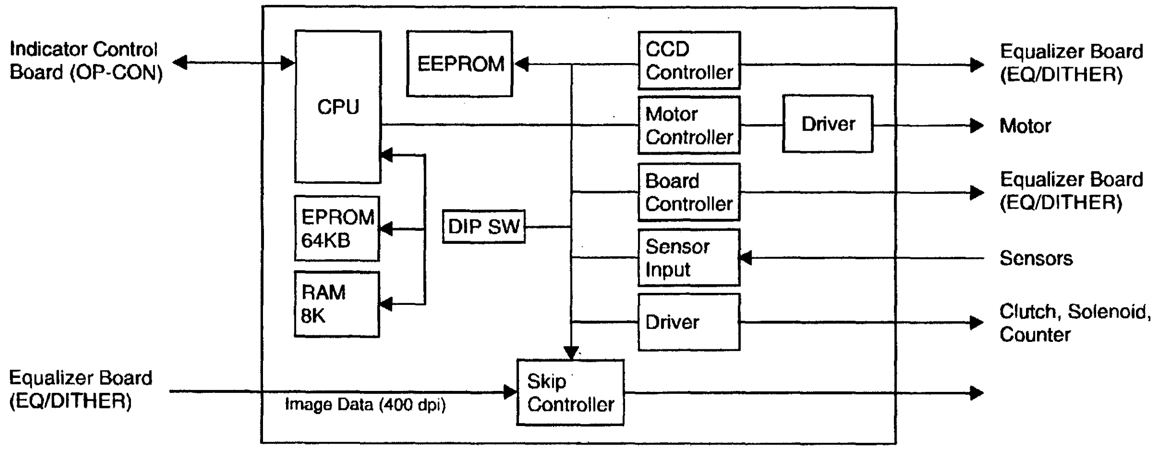


Figure 2-10. IS510 Scanner CPU Board (PAGS-1000) Signal Flow

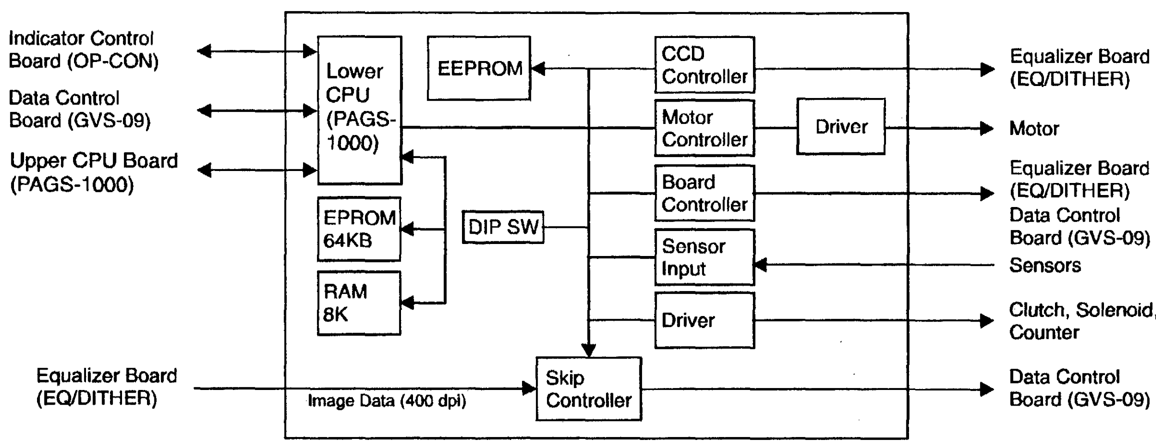
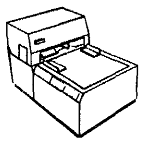


Figure 2-11. IS520 Scanner Upper and Lower CPU Boards (PAGS-1000) Signal Flow

Image data is transferred from the Equalizer board (EQ/DITHER) in the main scanning direction at 400 dpi (500 or 600 dpi in systems with the 500/600 dpi option). If the CPU issues a reduce command, the skip controller skips the image data in the main scanning direction. The reduction of the sub scanning direction is performed by controlling the document transport speed. The CPU then controls contrast, shade processing and equalizing for the Equalizer board (EQ/DITHER), switches data for the Data Control board (GVS-09), and controls the rotation for the motor.



In IS520 scanners, two identical PAGS-1000 boards are used. The lower CPU board is viewed by the upper CPU board as a host. Some, but not all, of the host commands are broadcast to the upper CPU, and monitored by the lower CPU.

2.5.2 Data Compression Board (CGVS)

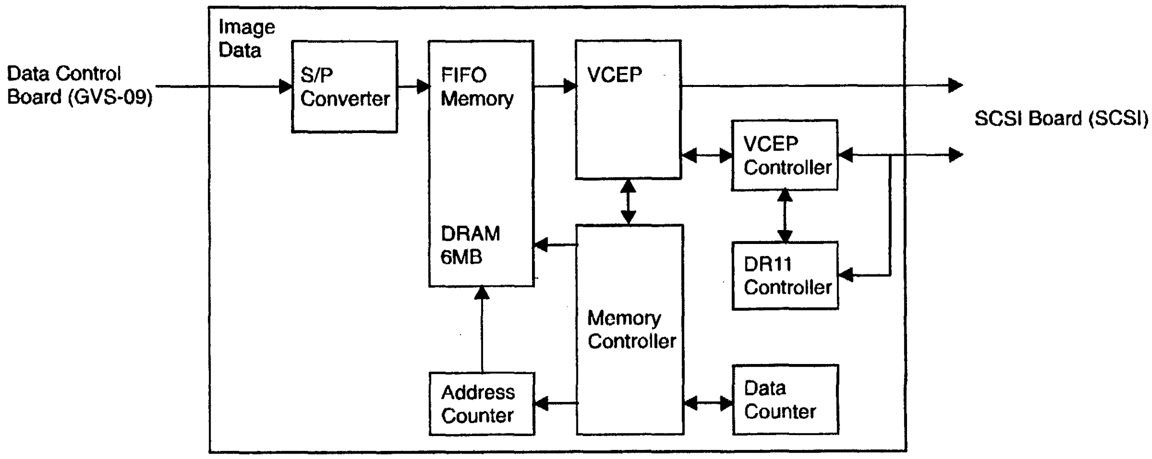
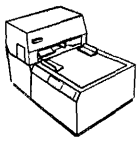


Figure 2-12. Data Compression Board (CGVS) Signal Flow

Image data from the Data Control board is converted from serial data to parallel data and saved in FIFO memory. If the compression mode is set, the data is compressed by VCEP and sent to the SCSI board; otherwise, it is sent to the SCSI board without being compressed.

The memory controller communicates a hand shake signal with the VCEP to control the FIFO memory. The VCEP controller controls the VCEP according to an instruction from the host PC.

2.5.3 Memory Board (GVS-01) - IS520 Only



The image data transferred from the upper CPU board is converted from serial data to parallel data and saved in the FIFO memory.

The capacity of data that can be saved in memory is controlled by the data counter. Read and write addresses are controlled by the address counter. These counters are controlled by the memory controller.

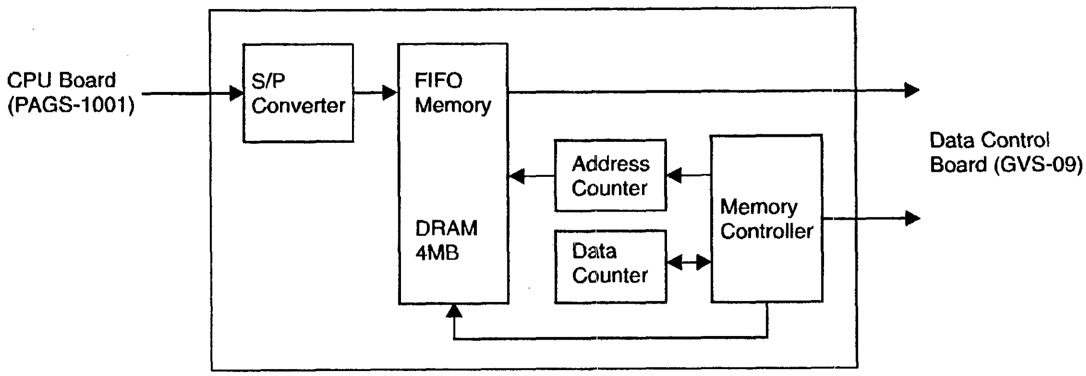


Figure 2-13. Memory Board (GVS-01) Signal Flow

2.5.4 Data Control Board (GVS-09) - IS520 Only

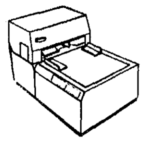


Image data from the downside of a document in the lower unit is sent to the Data Compression board from the lower CPU board via the data selector.

After all this data is sent, image data from the upside of the document in the upper unit is sent in 16-bit parallel from the memory board. It is then converted from parallel data to serial data and sent to the data compression board via the data selector.

The data selector up-down switching is controlled by the controller.

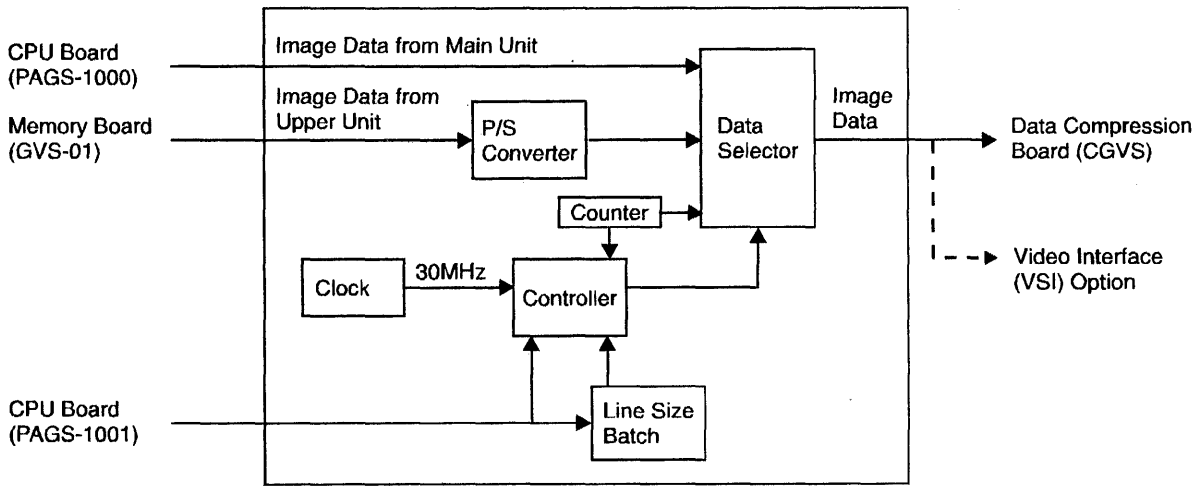


Figure 2-14. Data Control Board (GVS-09) Signal Flow

2.5.5 CCD-POD Board (CCD carrier with a CCD)

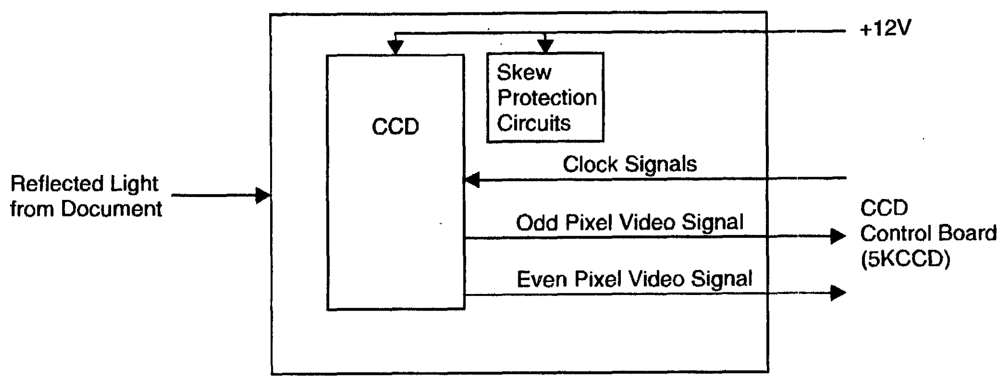


Figure 2-15. CCD-POD Board Signal Flow

The CCD photo electrically converts the reflected light from a document at a timing of the clock signal and transfers it to the CCD control board as analog image data.

2.5.6 CCD Control Board (5KCCD)

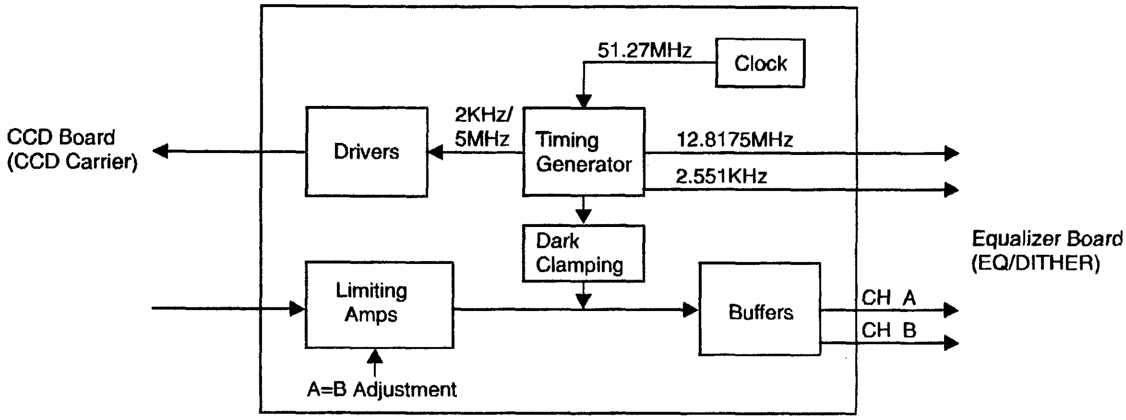


Figure 2-16. CCD Control Board (5KCCD) Signal Flow

The timing generator generates 6.409 MHz, 12.871 MHz and 2.551 KHz on the basis of a 51.27 MHz clock. These signals are used to derive all the clock phases required to operate the CCD chip (MOS levels) and the Equalizer board (TTL levels).

The data photo electrically-converted by the CCD is amplified by an anti-aliasing amplifier. The black level is then clamped to GND in order to reduce temperature dependance of the image. The signals are buffered and impedance matched to drive the flash ADCs of the 6EQ or 8EQ board. The data is further output to the Equalizer board (EQ/DITHER).

2.5.7 Equalizer Board

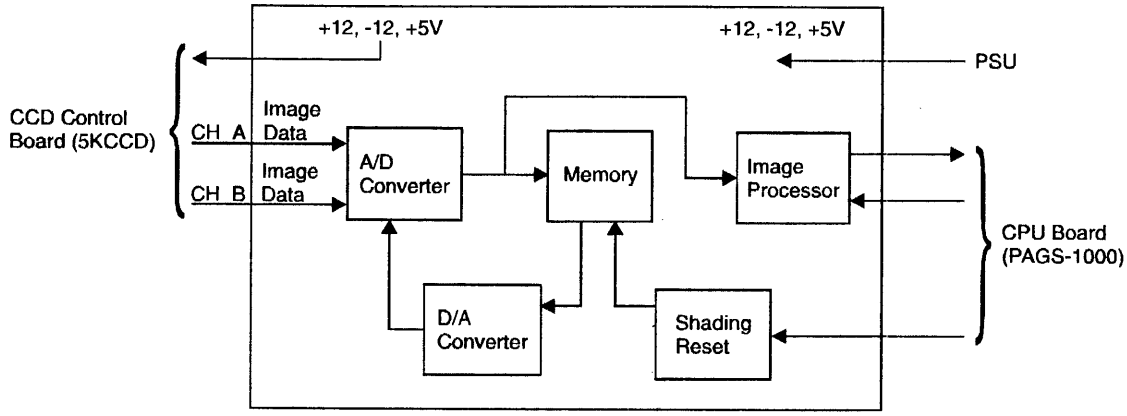


Figure 2-17. Equalizer Board (6EQ/DITHER or NEQ8/DITHER) Signal Flow

The white part in the reverse side of the contact glass is read as each document is scanned. The white data is converted from analog data to digital data and saved in memory.

When the document is scanned, this white data is converted from digital data to analog data and used for shading correction. The scanned document data is converted from analog data to digital data while it is shading-corrected. Halftone, binary or reverse processing is performed according to the command from the CPU board.

The 6EQ or NEQ8 coverts the two analog CCD channel signals to 6-bit or 8-bit digital information. The card also performs pre-scan normalization under CPU control. This is done by storing light information reflected from the scanner white calibration plate when *no paper* is present in the optical path.

The white reference data is used in the subsequent scan to normalize for light source and lens induced inequalities.

2.5.8 SCSI Board (NPS/NSA)

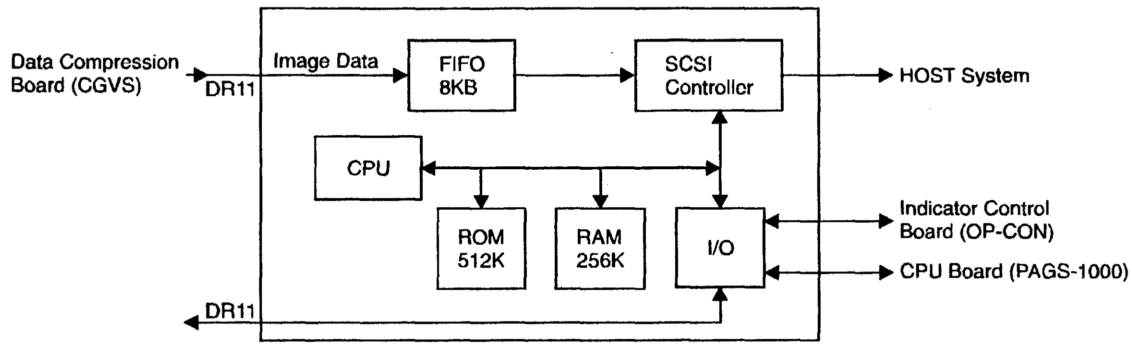


Figure 2-18. SCSI Board (NPS/NSA) Signal Flow

Image data from the data compression (CGVS) board is sent to the host system via FIFO memory and the SCSI controller.

The CGVS interface is DR11 compatible. The SCSI interface is single-ended on a low density 50-pin connector. The SCSI firmware implemented is SCSI-2 asynchronous data transfer.

2.5.8.1 SCSI Board Resource Group Address Map

Addressing of all the hardware on the SCSI (NPS/NSA) board is memory mapped by the MPU. The map is determined by U4 and JP1.

JP1	name	decoded hardware	address range	wait state
open	PROM	27C512-10	0000h 7fffh	yes
open	RAM	TC55257-10	8000h f7ffh	yes
close	PROM	27C512-10	0000h efffh	no
close	RAM	TC55257-10	f000h f7ffh	no
–	UART	88C681 device	f800h f80fh	yes
–	ASC	53C94 device	f810h f81fh	yes
–	HARD2	I/O ports	f820h f82fh	no
–	tbd0	unused I/O group	f830h f83fh	no
–	IOALL	all I/O groups	f800h f8ffh	as needed

The I/O ports decoded under 'HARD2' occupy only 8 of the 16 addressable bytes and by convention are set to the low group.

Wait states are generated for all devices requiring more than 100 Nsec access time. The NPS/NSA design assumes that the CCB IRC1 and IRC0 bits are both set to zero (limit to one wait state).

2.5.8.2 SCSI Board I/O Port Details

The NSA ports are decoded under the 'HARD2' I/O group. Three output ports and three input ports control the CGVS interface and FIFO to ASC data transfers. The ports are listed below.

Output Ports

(/HARD2+0)	NSA to CGVS data low
(/HARD2+1)	NSA to CGVS data high
(/HARD2+2)	CGVS and DMA control lines

Input Ports

(/HARD2+0)	local FIFO counter data low
(/HARD2+1)	local FIFO counter data high
(/HARD2+2)	CGVS status/attn and local FIFO 'full'.

Output Port (/HARD+2) Bit Positions

D0: DR11 'func1'	{== CGVS *data/command}
D1: DR11 'func2'	{== CGVS *port0/port1}
D2: DR11 'func3'	{== CGVS Data_direct}
D3: /clear local FIFO counter	
D4: start DR11 write cycle (positive EDGE)	
D5: /enable local fifo to ASC DMA	
D6: /MR (reset DR11 state machine)	
D7: DR11 'initH'	

Input Port (/HARD2+2) Bit Positions

D0: DR11 'status1'	{== *VCEP_error}
D1: DR11 'status2'	{== VCEP_interrupt latched}
D2: DR11 'attn H'	{== VCEP_interrupt unlatched}
D3: nu	
D4: nu	
D5: nu	
D6: /DR11 word write done	
D7: 'fifo full' flag from local FIFO	

2

2.5.8.3 Addressing of Other NSA Hardware

Addressing of several hardware functions on the NSA is done by the built-in ports of the MPU and DUART. The table below lists these functions and their respective addressing means.

I/O port specification	usage
80C196 P0.0 . . . . P0.3	4 gen purpose DIP switch (*)
88C681 IP4 . . . . IP6	optional 3 DIP switches (*)
80C196 P0.4 . . . . P0.7	Copal S-2131 SCSI ID selector
80C196 P1.0 . . . . P1.6	serial EEPROM, microwire ports.
88C681 OP0 . . . . OP3	LED drivers to OP PANEL
88C681 IP0 . . . . IP3	pull up inputs from OP PANEL
88C681 OP7	general purpose LED.

(*) DIP package sizes of 4 or 8 switches may be installed on the NSA producing the following input address mapping table.

4sw #	8sw #	mapping to
N/A	2	88C681 IP4
N/A	3	88C681 IP5
N/A	4	88C681 IP6
1	5	80C196 P0.0
2	6	80C196 P0.1
3	7	80C196 P0.2
4	8	80C196 P0.3

2.5.8.4 NSA Interrupt Sources

The NSA hardware generates three interrupt sources to the MPU with the following vector and priority data.

Int source	MPU pin	MPU name	priority	vector
CGVS (VCEP)	3	NMI	15	203E
ASC	15	EXTINT1	13	203A
UART	24	HSI.0	4	2008

NOTE . . . *Interrupts are triggered by a positive TTL edge on the respective input lines. This prevents multiple interrupt events while an input is held high.*

2.5.8.5 SCSI Connector Pin Assignment

Pin No.	Signal Name	Pin No.	Signal Name
1	GROUND	26	–DB (0)
2	GROUND	27	–DB (1)
3	GROUND	28	–DB (2)
4	GROUND	29	–DB (3)
5	GROUND	30	–DB (4)
6	GROUND	31	–DB (5)
7	GROUND	32	–DB (6)
8	GROUND	33	–DB (7)
9	GROUND	34	–DB (P)
10	GROUND	35	GROUND
11	GROUND	36	GROUND
12	GROUND	37	GROUND
13	No connection	38	TERMPWR
14	GROUND	39	GROUND
15	GROUND	40	GROUND
16	GROUND	41	–ATM
17	GROUND	42	GROUND
18	GROUND	43	–BSY
19	GROUND	44	–ACK
20	GROUND	45	–RST
21	GROUND	46	–MSG
22	GROUND	47	–SEL
23	GROUND	48	–C/D
24	GROUND	49	–REQ
25	GROUND	50	–I/O
Note: Minus sign prefixed to a signal name indicates an active row.			

2.5.9 Indicator Control Board (OP-CON)

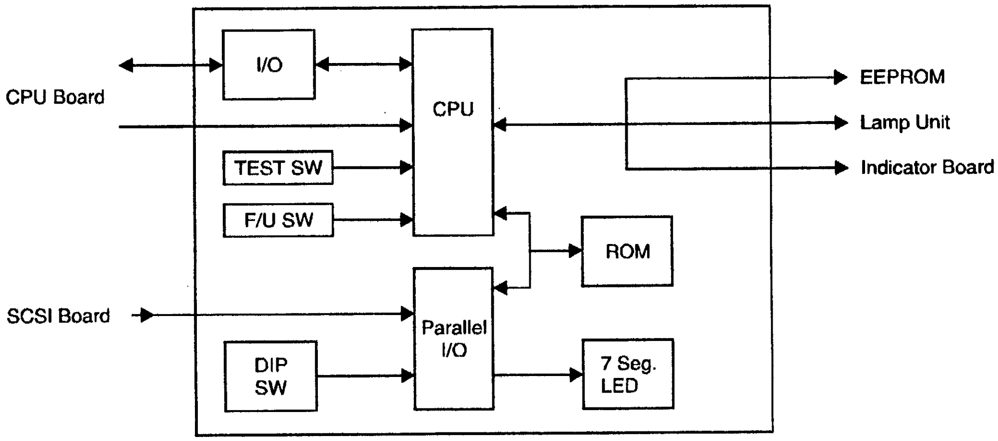


Figure 2-19. Indicator Control Board (OP-CON) Signal Flow

The OP-CON uses error signals from the PAGS-1000 and SCSI board to control the LED indicators on the scanner's indicator panel.

The OP-CON uses a "feed paper" signal from the PAGS-1000 to totalize an accumulated number in its EEPROM. This information is used to turn on the feed unit preventative maintenance lamp once per 1 million pages.

The Indicator Control board is used to control the heater, fuse and thermistor of the lamp unit.

The OP-CON board is not used in scanners equipped with the Bar Code Recognition (IBCR) or Electronic Endorser (BMW) options. Refer to Chapter 7 to verify if this also applies to any new options that may be installed.

2.6 Switch Settings

The following sections describe the switches that are located on the scanner boards.

2.6.1 SCSI Board (NPS/NSA) Switches

A DIP switch and a rotary switch are located on the rear of the scanner and are connected to the SCSI board.

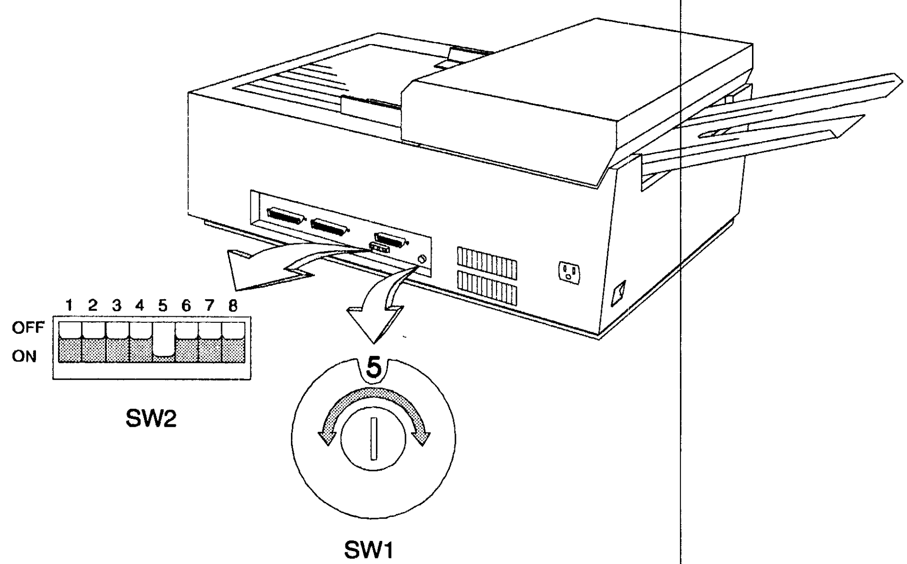


Figure 2-20. Exterior Switches

2.6.1.1 Rotary Switch (SW1) O

The rotary switch sets the SCSI ID. Before changing the rotary switch setting, determine the device ID number for the computer itself and any other SCSI devices that are connected. Set the scanner for an ID number that is not in use by any other device.

NOTE . . . *No two devices on the SCSI chain can have the same ID number.*

1. Turn the scanner OFF (O position).

   If the rotary switch setting is changed while the scanner is turned on, the host system will not sense the ID setting until the scanner power is recycled or a RESET command is issued from the host.

2. Turn the rotary switch knob to set the scanner ID number. The number indicated in the slit of the rotary switch is the selected ID number. The numbers 0 through 7 can be selected. Numbers 8 and 9 should not be used (if they are used, the scanner is set for ID No. 7).

2.6.1.2 DIP Switch (SW2)

This DIP switch is set at the factory and should not be changed unless options are added to the scanner in the field.

Switch	Setting	Function
1	ON OFF (default)	Reserved
2	ON OFF	Send (91) mode = Full enable (SCSI protocols per Improvision) Send (91) mode = Limited enable (SCSI protocols per JIS model)
3	ON OFF (default)	Reserved
4	ON OFF (default)	Reserved
5	ON OFF	Simplex (IS510) mode Duplex (IS520) mode
6	ON OFF (default)	8K Disconnect = Inactive 8K Disconnect = Active
7	ON OFF (default)	Overlap mode = Enabled Overlap mode = Disabled
8	ON OFF	AIF disabled AIF enabled

2.6.2 CPU Board (PAGS-1000) - DIP Switch (SW3)

The DIP switches on the CPU boards are set at the factory and should only be changed if you want to change a function. The functions and states of the DIP switch on the CPU board(s) can be read from the monitor port.

- The switch functions are reported in response to the 'd' command.
- The position may be read as a decimal value by issuing a '4t' command.
- The effect of the DIP switches are reported in response to the '?' command.

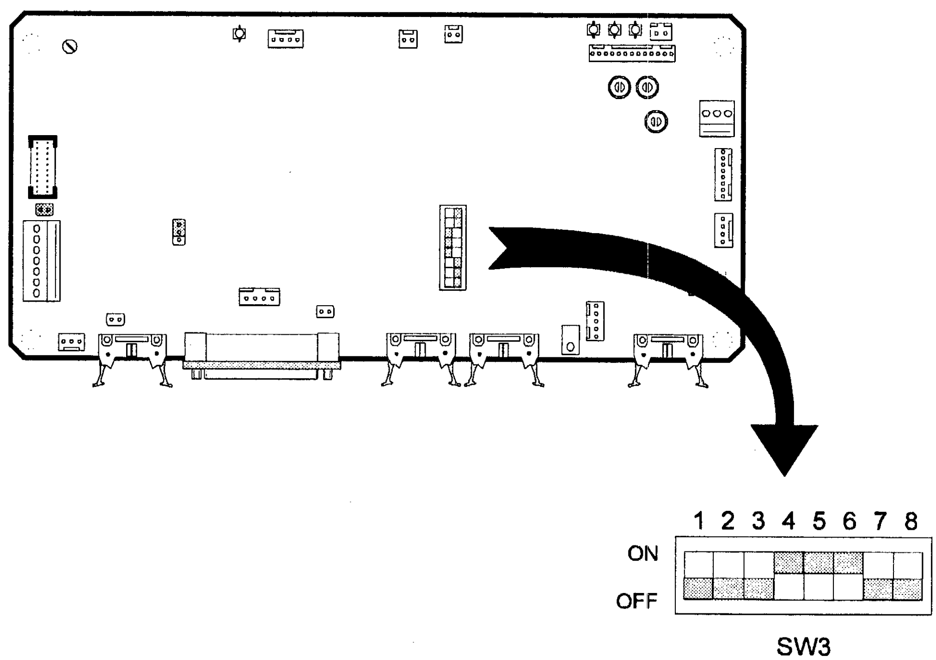
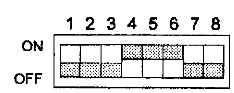


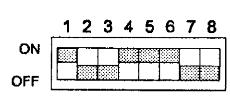
Figure 2-21. CPU Board DIP Switch

Default Settings

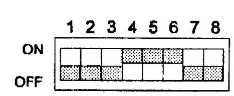
IS510



IS520



Lower CPU (master)



Upper CPU (slave)

Switch	Setting	Function
1	ON OFF	Pass through to slave enabled Pass through to slave disabled
2	ON OFF	<CR> not included <CR> is included
3	ON OFF	Host changes are disabled to velocity, offset, format Host changes are enabled to velocity, offset, format
4	ON OFF	auto eject enabled auto eject disabled
5	ON OFF	prescan normalization is enabled prescan normalization is disabled
6	ON OFF	9600 baud 2400 baud
7	ON OFF	Other resolutions the resolution reported is 400 dpi
8	ON OFF	format ID No. 9 is used format ID No. 4 is used

Switch 1

Enables commands to pass through to the slave UART port. Host commands are enabled only in the lower CPU of IS520 scanners.

In IS510 scanners, set switch 1 OFF.

In IS520 scanners, set switch 1 on the the lower CPU board ON and switch 1 on the the upper CPU board OFF.

Switch 2

Selects inclusion of <CR> in the protocol. This enables the optional inclusion of the <CR> character in the IS5x0 protocol as discussed in the "Command Language" section of Part III, *Programmer's Reference.*

Switch 3

Disables host format control. When using only one image format, the switch may be set ON to fix that format. In normal use, ID changes should be permitted.

Switch 4

Selects auto eject mode. The switch determines if documents are moved beyond the end of scan to clear the rollers to feed the next ADF page or not. If the ADF is empty, full eject will take place to release the last document. Scanners with firmware rev 4.7 or higher are factory set for auto eject.

If auto eject is desired in an IS520 scanner, set switch 4 on the the upper CPU board ON and switch 4 on the the lower CPU board OFF.

Switch 5

Enables CCD pre-scan calibration. For all sheet scanning, the switch should be enabled (set ON). This means that the CCD camera is normalized on an image by image basis. The switch must be disabled for continuous feed (of roll or fan fold paper).

Switch 6

Selects the host control port rate. The switch determines 2400 or 9600 baud setting.

In IS520 scanners, the slave port on the lower CPU board operates at 9600 baud. Therefore, switch 6 on the upper CPU board must be set for 9600 baud. If this is not done, the lower CPU will respond to some of the host commands with a timeout error, and "slave timed out" messages will appear on the monitor port for the lower CPU board.

Switch 7

Identifies the optical resolution of the scanner to be 400 or other dpi. The setting has no direct effect on the scanner, but may be used by a host to properly compute motor speeds and skip factors for given resolutions.

Switch 8

Selects the power-up default image ID to be 4 or 9 (300 dpi A size portrait or a user defined format).

2.6.3 Indicator Control Board (OP-CON) Switches

The OP-CON board has three switches, a DIP switch, test switch and feed unit reset button. The DIP switch and test switch can be used to read the feed unit and lamp use counters. See Section 3.3 for details. The feed unit reset button resets the counter when the feed unit is replaced.

2

WARNING: Do not touch anything other than the switches on the OP-CON board because +5V and +12V are supplied to the board.

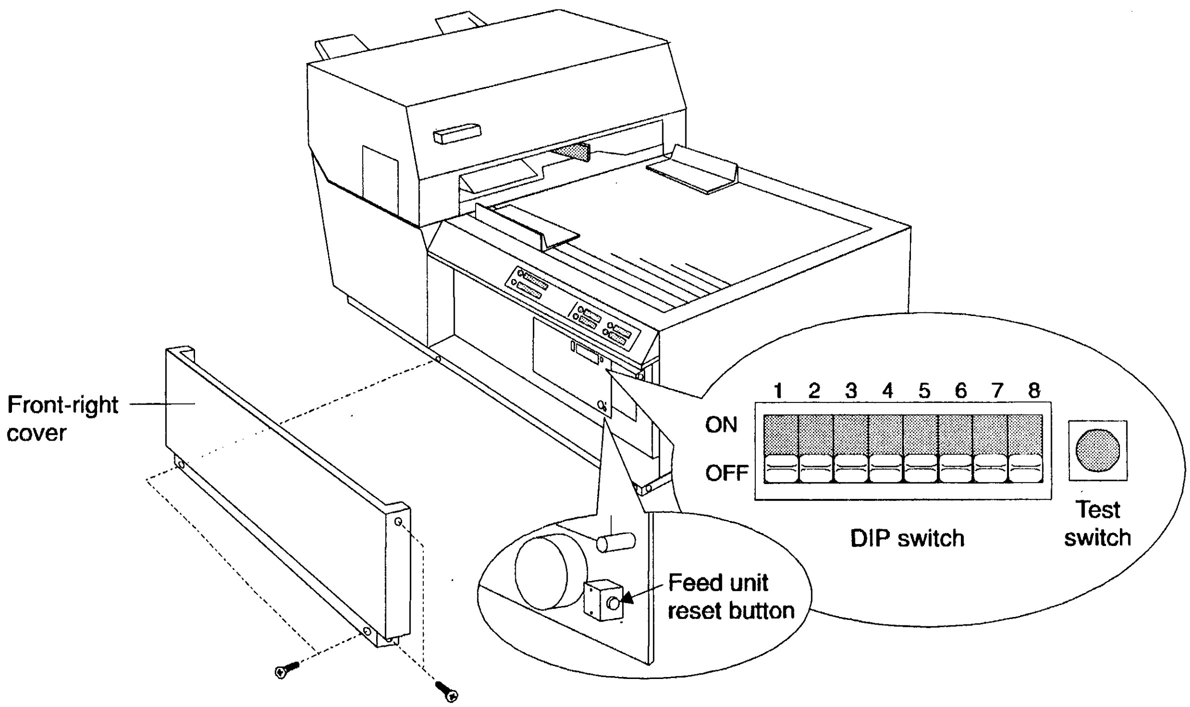


Figure 2-22. Indicator Control Board (OP-CON) Switches

NOTE . . . *All of the DIP switches should be set OFF during normal operation.*

2.7 Jumper Settings Done

The following sections describe the jumpers that are located on the scanner boards and the functions that they perform.

NOTE . . . In the following sections, "open" indicates that no jumper is installed on the pins and "jumped" indicates that a jumper is installed on the pins.

2.7.1 Data Compression Board (CGVS) Jumpers

The CGVS board has ten jumpers for selecting the operating mode.

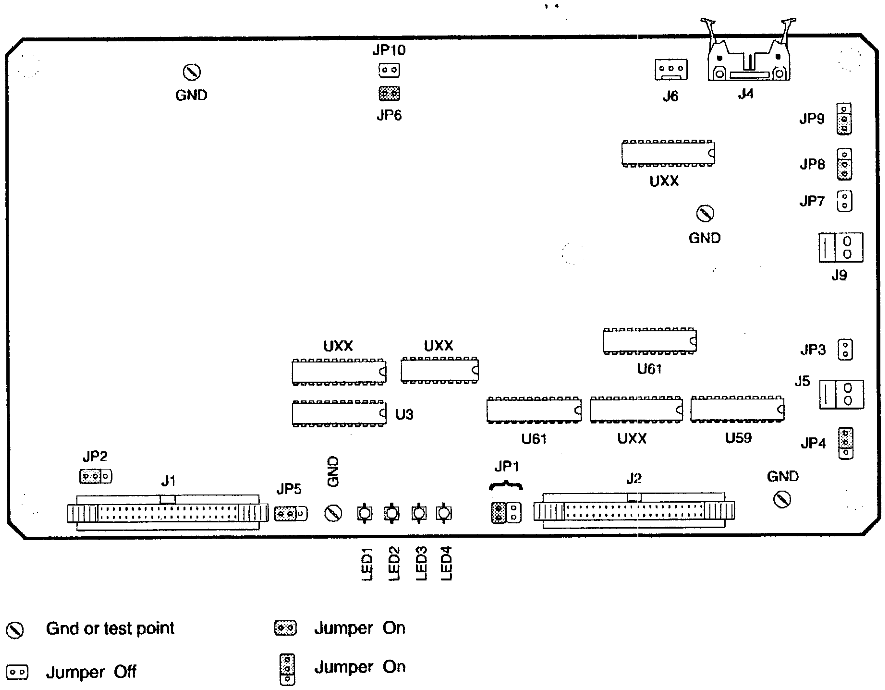


Figure 2-23. Data Compression Board (CGVS) Jumpers and LED Indicators

Jumper	Default	Function
JP1	4M jumped	select FIFO size
JP2	Pins 2-3 jumped	disables DR11 CYREQB
JP3	open	select DR11 (Vs. DRV11)
JP4	Pins 1-2 jumped	straight bit ordering
JP5	Pins 2-3 jumped	interrupt host on page done
JP6	jumped	enables CGVS hard reset
JP7	open	use for test patterns ONLY
JP8	Pins 1-2 jumped	serial input selector
JP9	Pins 1-2 /S jumped	serial input selector
JP10	open	this is a hard RESET input

JP1

This jumper is made of two sets labeled 2M and 4M. These select the active size of the FIFO (rollover address) used by the CGVS. The use of the jumpers is illustrated by the following table:

4M	2M	FIFO address rollover
open	open	2MB - one RAM bank used
open	jumped	2MB - one RAM bank used
jumped	open	4MB - two RAM banks used
jumped	jumped	6MB - three RAM banks used

JP2

A three-position jumper labeled "CYREQ." Jumping the 1-2 position activates the "Cycle Request B" signal with a replica of "Cycle Request A". Jumping the 2-3 position applies GND level to CYREQB.

JP3

This jumper is labeled "DRV." It selects between DR11-W and DRV11-WA operating modes. When jumped, the DRV11-WA mode is assumed, and the "drv" LED turns on. The jumper is installed for all QBUS installations.

JP4

A three-position jumper which selects the bit ordering within data words sent to the host by the CGVS. The jumper position affects the image data ONLY.

When the 1-2 pins are jumped, the host data bits are ordered as stored in the CGVS FIFO (see JP1 above). Installing this jumper on the 2-3 pins will reverse the bit ordering within words.

JP5

This three-position jumper is labeled "ATN SEL." It selects the event that is allowed to generate an ATTN interrupt to the host (or SCSI card) as defined below:

Pins 1-2	Pins 2-3	ATTN Interrupt sense
jumped		VCEP Error completion (also DR11 status A)
	jumped	VCEP Interrupt, ok and error (DR11 status B)
open	open	ATTN Interrupt not used (illegal position!!)

JP6

This jumper is labeled "INITH." When jumped, it enables the reset of all the CGVS functions to a known state by pulsing the INITH line of the DR11.

A minimum pulse width of 50 nSec is required to insure proper operation of the reset circuit (most DR11 cards provide 300 nSec min pulse).

JP7

This jumper is labeled "PATT." It selects the CGVS data source between a scanner, and the local pattern generator. When jumped, the jumper directs test pattern data to the CGVS FIFO, and the "patt" LED turns on to indicate the selection.

NOTE . . . *This jumper must be open for normal image capture operation.*

When generating test patterns, the user must select a serial scanner mode (see JP8/9), and disconnect the scanner cable from the CGVS (J4) in addition to jumping JP7.

JP8/9

These two three-position jumpers are labeled "SR/P." Both jumpers must be at the same position to select a serial (VSI) or parallel scanner as the active source. The SR position selects a serial scanner connected to J4. The P position selects a 16 bit parallel scanner connected to J7 of the CGVS.

JP10

This jumper is labeled "RESET". It may be connected to an external device such as a front panel switch or open collector driver to provide RESET function of the card.

If an open collector driver is used, the drive capacity should be 120 mA (sink) and the pulse duration for a good RESET should be 100 sec min.

2.7.2 CPU Board (PAGS-1000) Jumpers

There are three jumpers on the CPU board. In IS520 scanners the jumpers on the upper and lower CPU boards are the same.

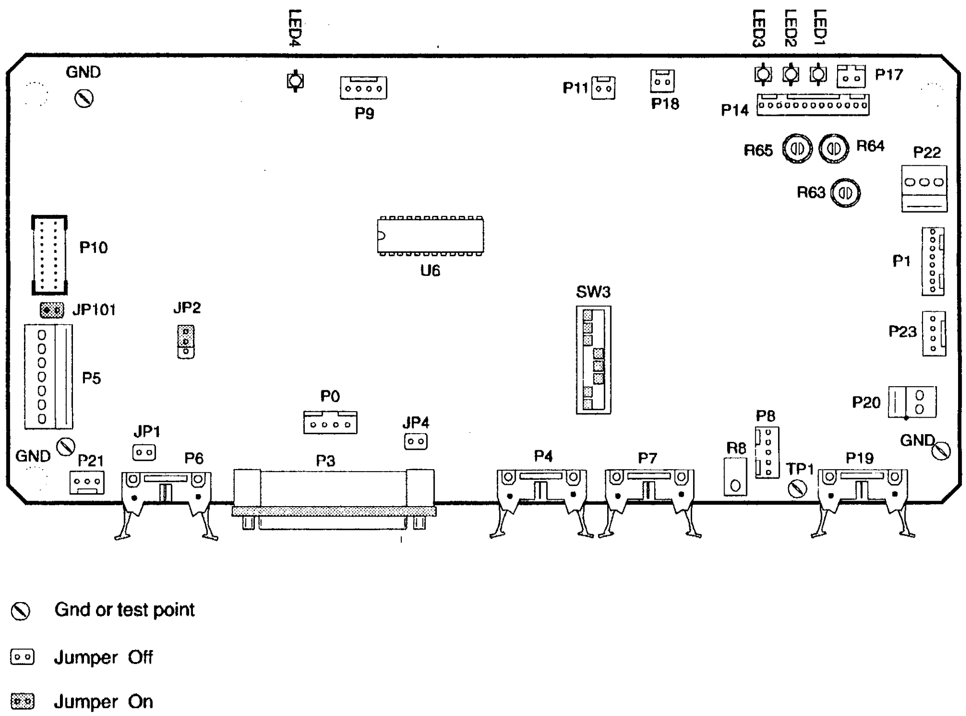


Figure 2-24. CPU Board (PAGS-1000) Jumpers and LED Indicators

Jumper	Default	Function
JP1	open	Hard wire reset
JP2	1-2 jumped	Image data phase select
JP4	open	CPU wait state control
JP101	jumped	Grounding control

2.7.3 CCD Control Board (5KCCD) Jumpers

There is one three-position jumper at J2 on the CCD Control Board. Jumping pins 2 -3 selects self resorting mode. The jumper is installed as shown in *all* standard applications.

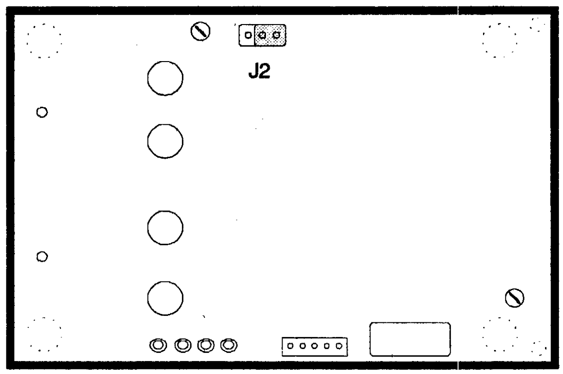
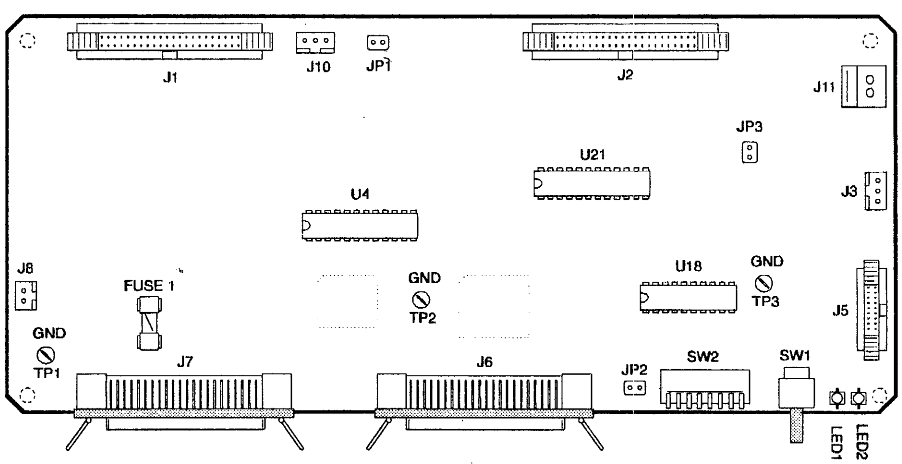


Figure 2-25. CCD Control Board (5KCCD) Jumpers

2.7.4 SCSI Board (NPS/NSA) Jumpers

There are three jumpers and two LED indicators on the SCSI board.



Gnd or test point

Jumper Off

Jumper On

Figure 2-26. SCSI Board (NPS/NSA) Jumpers and LED Indicators

Jumper	Default	Function
JP1	jumped	select RAM/ROM mapping
JP2	open	enables firmware tests
JP3	open	select hardware RESET type

Not

2

JP1

This jumper is labeled "MAP" on the SCSI board. A jumper should be installed to select RAM/ROM mapping.

JP2

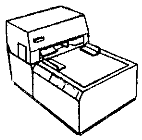
This jumper is labeled "TST" on the SCSI board. It is used to standalone test the CGVS control and data generation. See the "CGVS Software Commands" in Part III, *Programmers Reference*, for test commands. The LED2 indicator lights when a jumper is installed on JP2.

NOTE . . . *The SCSI board should never be in regular use when a jumper is installed on JP2.*

JP3

This jumper is labeled "SEL RES" on the SCSI board. This jumper is not used in IS510 and IS520 scanners and should not be jumped.

2.7.5 Memory Board (GVS-01) Jumpers - IS520 Only



There are eight jumpers and three LED indicators on the GVS-01 board.

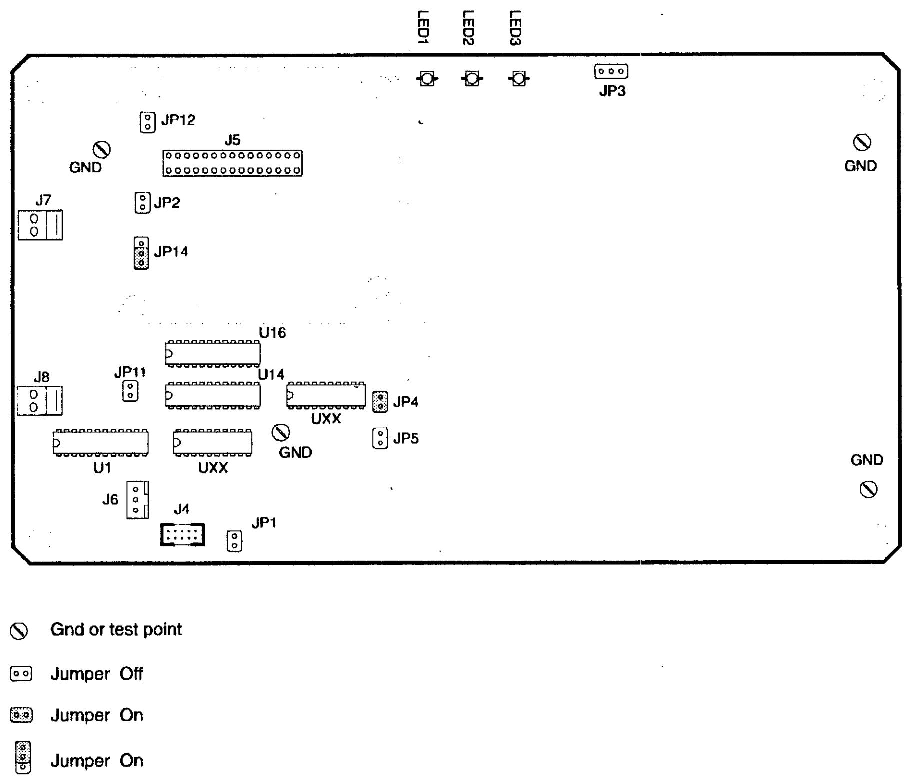


Figure 2-27. Memory Board (GVS-01) Jumpers and LED Indicators

Jumper	Default	Function
JP1	open	Test pattern control. Not used in the IS520.
JP2	open	Not used in the IS520
JP3	open	ATTN signal selector
JP4	jumped	4 MB (selected)
JP5	open	2 MB/8 MB
JP11	open	DRV/DR11 select
JP12	open	CYRQB not used in the IS520
JP14	Pins 2-3 jumped	Piggyback control (GVS-09 or GVS-12)

2.7.6 Indicator Control Board (OP-CON) Jumpers

There are two jumpers at JP1 and JP2 on the OP-CON board. Both of these jumpers should be open (no jumper installed).

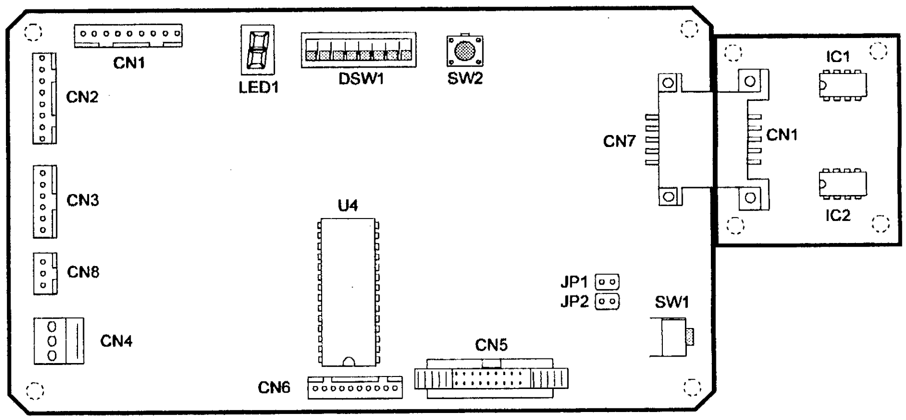


Figure 2-28. Indicator Control Board (OP-CON) Jumpers

2.8 LED Indicators

The LED indicators provide visual feedback of the board's state.

2.8.1 Data Compression Board (CGVS) LEDs

See Figure 2-23 for the location of LEDs on the CGVS board.

LD1	DRV	This LED is on when JP3 is jumped. It indicates a DRV11-WA handshaking protocol in use by the CGVS.
LD2	ERROR	This LED is turned on in response to a VCEP interrupt where the data transfer resulted in an error condition (as indicated by the low CSR value). Note that D6 of "reg1" must be high for the LED to function as described.
LD3	EMPTY	This LED is turned on when the FIFO memory of the CGVS is empty.
LD4	PATT	This LED is turned on when JP7 is jumped. It indicates that the test pattern generator path is selected and may be enabled by the host.

2.8.2 CPU Board (PAGS-1000) LEDs

See Figure 2-24 for the location of LEDs on the CPU board.

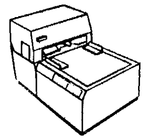
LD1	ADF	Lights when the ADF sensor is on.
LD2	PIB	Lights when the PIB sensor is on.
LD3	SIB	Lights when the SIB sensor is on.
LD4	IAQ	Lights when the CPU is reading a command.

2.8.3 SCSI Board (NPS/NSA) LEDs

See Figure 2-26 for the location of LEDs on the SCSI board.

LD1	FLASH	This LED is addressed as U8, OP7. The target use of this LED is to provide periodic flash as a visual means to indicate the SCSI activity. The LED may be used for any purpose desired.
LD2	TEST	The LED lights when a jumper is installed on J2. The SCSI board should never be in regular use when this LED is on.

2.8.4 Memory Board (GVS-01) LEDs - IS520 Only



See Figure 2-27 for the location of LEDs on the GVS-01 board.

LD1	DRV	Indicates the interface handshake protocol. ON = DRV11-WA, OFF = DR11-W.
LD2	PATT	Indicates the test pattern mode. ON = Test pattern mode, OFF = Normal mode.
LD3	HOST ACTIVE	Not used.

2.8.5 Indicator Control Board (OP-CON) LED

See Sections 3.3 and 4.4 for information on how to use the LED indicator for error indication and to read the counter values.

LED1	Displays error numbers and counter values for the feed unit and lamp usage.

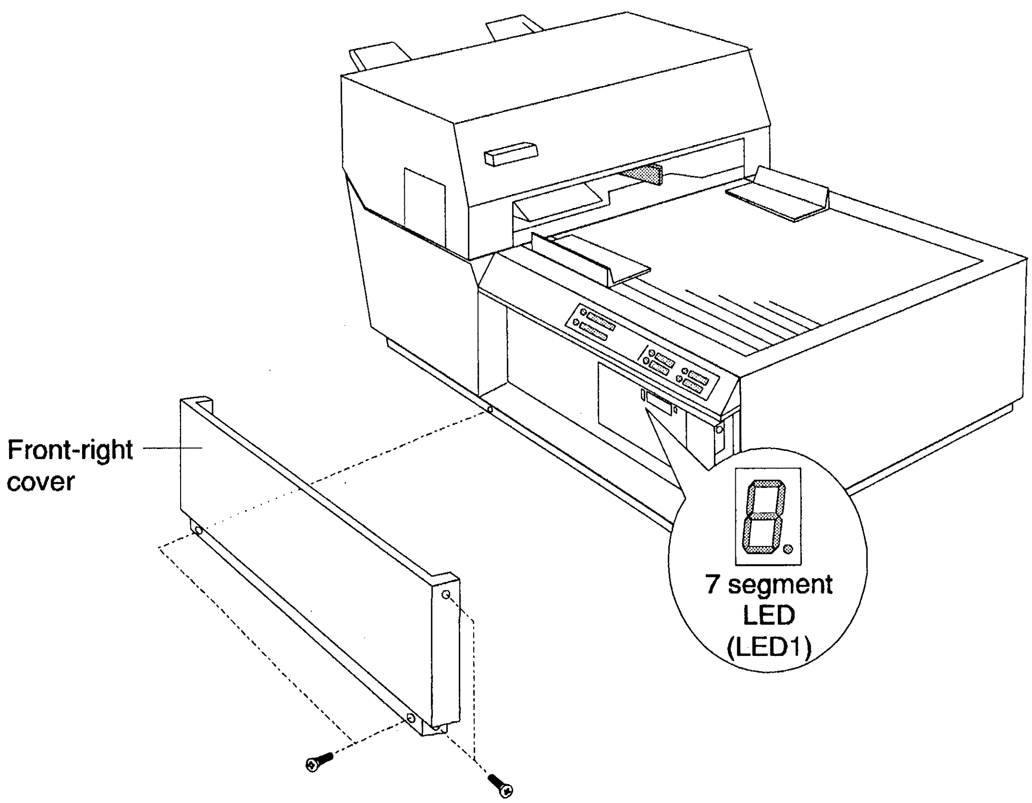
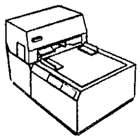


Figure 2-29. Indicator Control Board (OP-CON) LED Indicator

2.8.6 Data Control Board (GVS-09) LEDs - IS520 Only



LD1	PRIME PATH	Displays the selection of the upside data. ON = Selection of downside data.
LD2	WCLK	Displays the selection of the downside data. ON = Selection of upside data. DIMMED = Transfer of upside data.

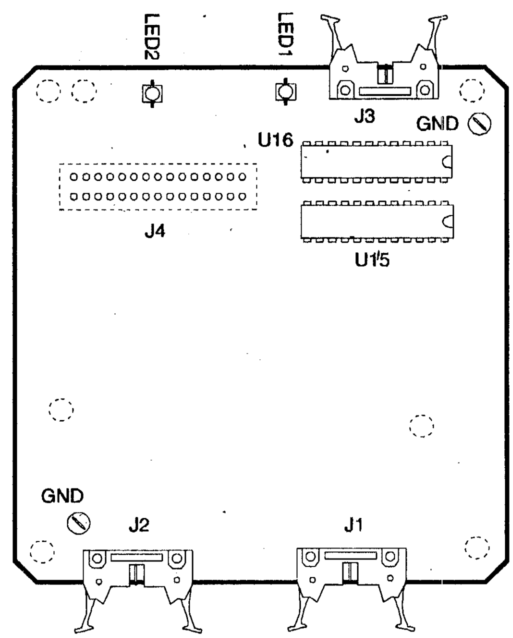


Figure 2-30. Data Control Board (GVS-09) LED Indicators

CHAPTER 3

Preventive Maintenance

Inside this chapter:

The maintenance procedures in this chapter should only be performed by authorized service technicians.

3.1 Operator Maintenance

The following cleaning procedures are covered in Part II, *Setup and Operation.* The service technician should demonstrate the procedures to the operator and emphasize the importance of performing these procedures on a routine basis.

3

3.1.1 Daily Cleaning

As pages are scanned, paper dust and dirt are deposited on the ADF rollers, contact glasses and the surrounding surfaces. For proper operation of the optical system and the ADF, these areas should be kept clean.

Before starting operations at the beginning of each day:

1. Open the ADF cover.

2. Use a clean soft brush, such as a drafting brush or a wide good-quality paint brush, to brush the accumulated dust from the rollers, contact glasses and surrounding surfaces. The brush should be new and only used for this purpose.

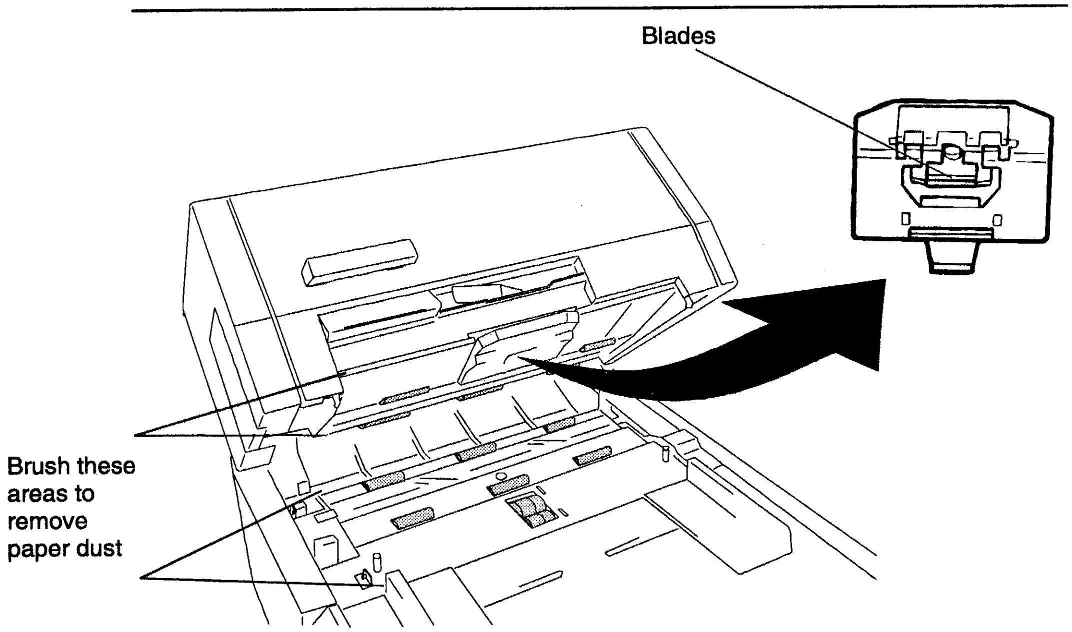


Figure 3-1. Cleaning ADF Surfaces

3. Wipe your finger across the separation cartridge blades to clean them and check to be sure they are even and smooth.

4. Close the ADF cover by firmly pressing down on the cover until the lock lever clicks.

When scanning a high volume, you may want to repeat this procedure several times during the day.

3.1.2 Weekly Cleaning

The rollers and contact glasses should be wiped clean once a week to remove dust and dirt. In most cases the rollers can be cleaned with a clean dry cloth or a cloth moistened with water. Use a separate, glass-cleaning type cloth to clean the contact glasses.

DO NOT use cleaning materials that can leave particles, such as tissue paper or paper towels.

Never spray cleaners directly into the scanner.

DO NOT clean the rollers with a rubber cleaner that contains alcohol or formaldehyde. Alcohol will cause the rollers to harden and lose their grip and formaldehyde will make the rollers swell.

To clean the rollers and contact glasses:

1. Open the ADF cover.

2. Place a sheet of paper over the lower contact glass and rollers to keep foreign matter from falling into the mechanism while you clean the R1 and R2 idler rollers. Rotate the rollers to clean all surfaces.

3. Remove the paper and press the roller activator button to rotate the rollers so all surfaces can be cleaned. The roller activator rotates the lower rollers for 4 seconds each time it is pressed.

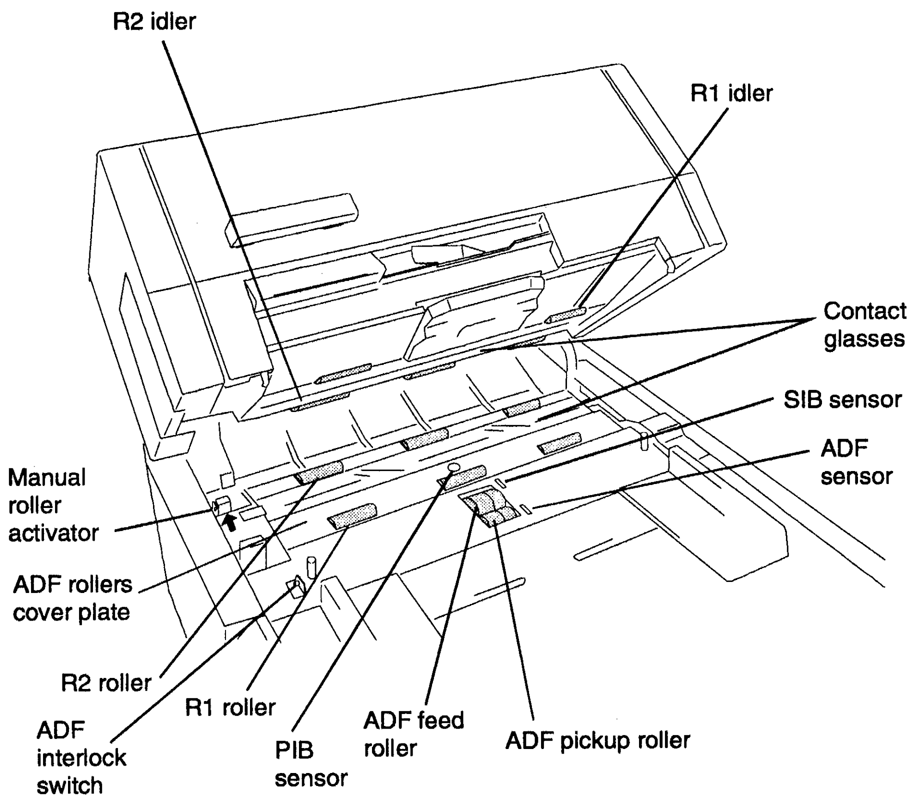


Figure 3-2. ADF Components

Be careful not to break the sensors located near the ADF feed and pickup rollers.

4. Wipe the upper and lower contact glasses with a clean, dry glass-cleaning type cloth. Be careful not to touch the contact glass with your hands. If you accidentally touch the contact glass, clean the glass with one of the recommended glass cleaners.

5. Close the ADF cover by firmly pressing down on the cover until the lock lever clicks.

3.1.3 Replacing the Lamp(s), Separation Cartridge and ADF Rollers

These procedures are covered in Section 5.5 and in Part II, *Setup and Operation*. The service technician should demonstrate the procedures to the operator to be sure they are performed properly.

3.2 Monthly Service Technician Maintenance

The following procedures should be performed by an authorized service technician on a monthly basis and on each service call.

3.2.1 Check the Basic Functions

1. Turn the power switch ON and observe the indicator panel. All of the indicator lights should turn on for 3 seconds, then turn off with only the Power light staying ON.

2. Check to be sure air is flowing from the lower vent on the rear of the scanner.

3. Lift the ADF cover and observe the **Error** light flashing. Lay a sheet of paper (standard weight or heavier) over the contact glass to activate at least one of the two left optical sensors. Slowly close the ADF cover on top of the document and lock it in position. The **Error** light will turn off, the scanner's motor will turn on, and the document will be ejected from the paper path. If the scanner is an IS520, the upper unit fan will also turn on.

4. Set the feed lever to the Automatic position. Place your finger under the right side of the separation cartridge to engage the ADF sensors. The lamp(s) should turn on for 1 minute.

3.2.2 Clean and Check the Rollers

1. Open the ADF cover (upper unit) and use a clean soft brush to brush the paper dust from the rollers, contact glasses and surrounding surfaces.

2. Remove any objects that may be imbedded in the rollers and check them for wear.

   - If the red stripe on the ADF feed roller is no longer visible, replace the feed and pickup rollers. See Section 5.5.3 for the procedure.

   - If pieces are missing from the R1 and R2 rollers, replace the rollers. See Section 5.10.2 for the procedure.

3. Clean the upper idler rollers with a cloth dampened with water.

4. Clean the lower rollers with a cloth dampened with water.

> **CAUTION:** DO NOT use a cleaner that contains alcohol or formaldehyde to clean the rubber rollers.

To rotate the rollers:

- Press the roller activator button (Figure 3-2). The rollers rotate for 4 seconds each time it is pressed.
- To rotate the rollers for a longer time, connect a PC to the monitor port (per Section 4.5) and place something over the SIB sensor to hold it down. Type a 28F command to rotate the rollers for 1 minute.

5. Check the ADF interlock actuator (Figure 3-2). If it is bent, straighten it to the proper position by pushing the tab toward the scanner's rear side.

3

3.2.3 Check the ADF

1. Check the ADF roller cover plate to be sure it is straight. It can be bent if left open when the ADF cover is closed. If needed, straighten as described in Chapter 4.

2. Open the ADF roller cover plate and place a small amount of light white grease (molybdenum) on the ADF feed and pickup roller gears (A).

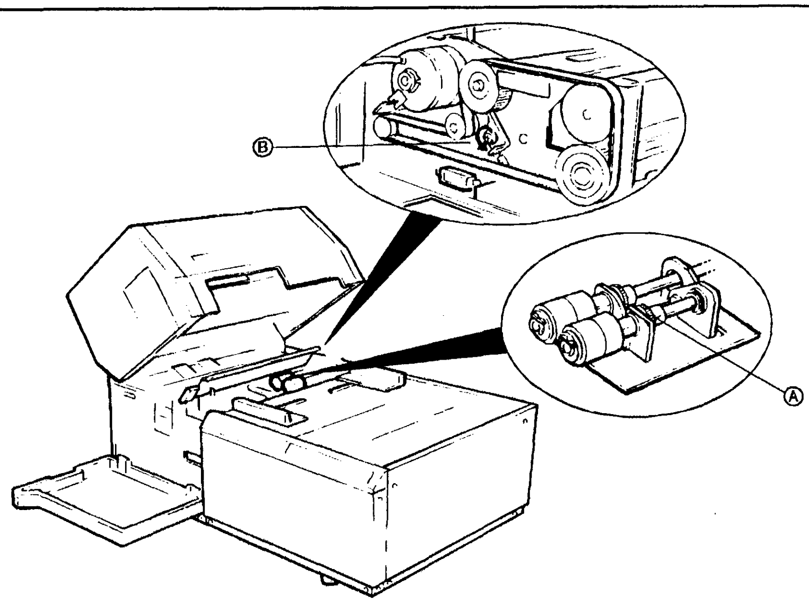


Figure 3-3. ADF Maintenance

3. Remove the rear cover. See Section 5.2.4 for the procedure.

4. Check the motor belt for wear and adjust the tension if it is slack.

   - If the belt is slack, loosen the belt screw (B) to release the spring tension, then tighten the screw until the belt is flat across the bottom.

   - If the belt is worn, replace it according to Section 5.14.

3.2.4 Clean the Contact Glass

1. Clean the upper and lower contact glasses with a glass-cleaning type cloth.

2. If dust has accumulated on the back side of the contact glass, remove the glass according to Sections 5.6.1 and 5.6.2 and wipe the dust from the white reference plate. The white reference plate must be clean for proper operation. Clean the contact glass and replace it.

3.2.5 Check the Separation Cartridge

1. Wipe your finger across the separation cartridge blades to clean them and check to be sure they are even and smooth.

2. If the blades are worn to a wedge or triangle shape, adjust the separation cartridge according to Section 6.1.

3. If the blades are uneven, replace the separation cartridge.

3.2.6 Check the Lamps

As a lamp ages, the image quality will deteriorate due to a decrease in the light being generated by the lamp.

1. Check the ends of the lamp(s) by looking through the contact glass or removing the lamp from the scanner. If the ends of the lamp are silver and crusted, replace the lamp.

2. When using a green lamp, check to see if the light is green or blue. If it is blue, replace the lamp.

The following monthly test is recommended for checking the effects of the lamp on the image quality.

1. Select a page to use as your test document and save it so it can be used throughout the life of the lamp. The test document can be anything other than a photograph.

2. When the scanner is initially installed or a lamp is replaced, scan the test document ten times. Make a visual inspection of the image and note the file size. Save the image files for future reference.

   For IS520 scanners, flip the test document over to test the upper lamp.

3. Once a month scan the test document ten times. Make a visual inspection to see if there is any breakage of the image and check to see if the file size increases. These are signs that the lamp needs to be replaced.

3

3.2.7 Check the Page Counter

The page counter indicates the total number of pages that have been scanned. Open the lamp access door to check the counter. Enter the

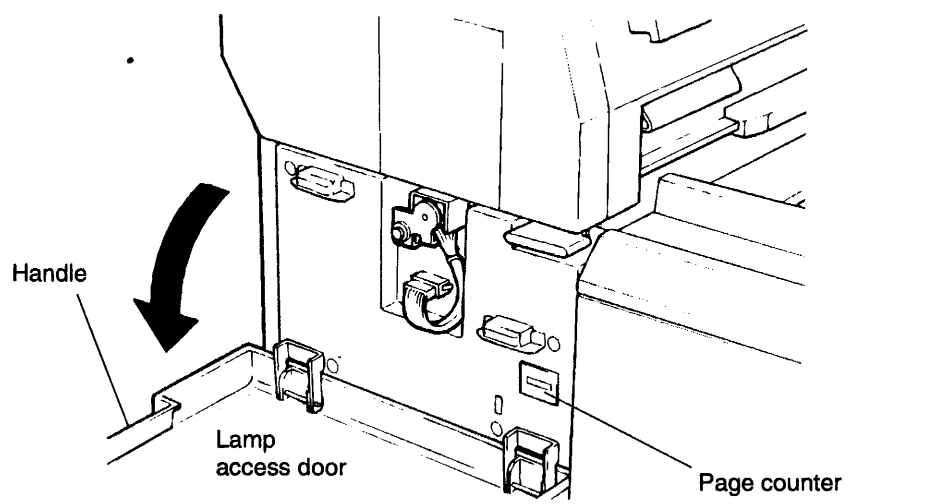


Figure 3-4. Page Counter

page count in your service records. If the operator maintains a log or pages scanned, review it to determine the volume being scanned.

3.3 OP-CON Board LED Settings

The DIP switch setting selects the counter information that will be shown on the 7-segment LED. It can be set to show current or previous feed unit and lamp information.

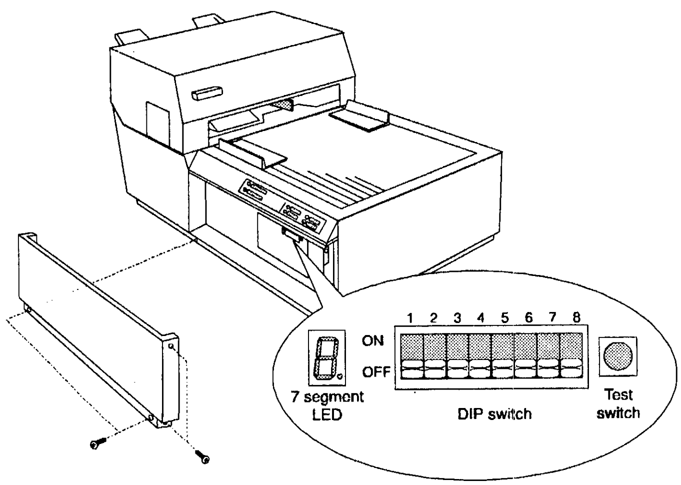
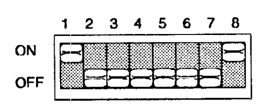
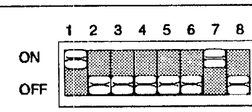
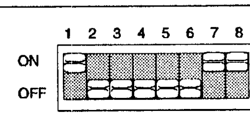
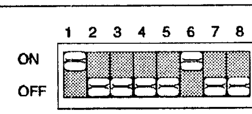
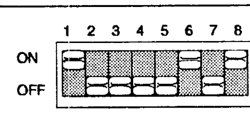
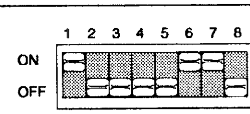


Figure 3-5. OP-CON Board LED and Settings

Set the DIP switch for the counter you want to check.

Read Item	DIP Switch Setting
Number of pages currently transported by feed unit.	
Current Lamp B light-on time.	
Current Lamp A light-on time.	
Number of pages previously transported by feed unit.	
Previous Lamp B light-on time.	
Previous Lamp A light-on time.	

3.3.1 Reading the Counter

The count value on the 7-segment LED is shown on a 1,000 page basis for the number of transported pages and on an hour basis for the lamp time.

1. Set the DIP switch for the counter that you want to read.

2. Press the Test switch seven times. A buzzer sounds each time the Test switch is pressed and the count value is shown with four digits as illustrated below.

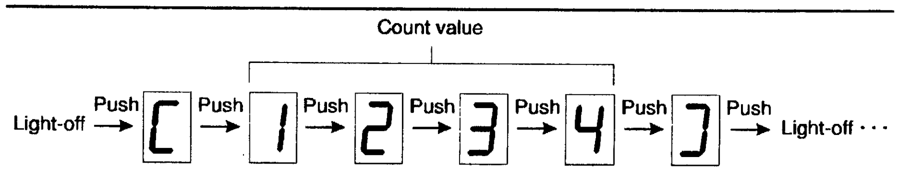


Figure 3-6. Count Value

3. Reset all of the switches on the DIP switch to the OFF position when finished reading the counter.

CHAPTER 4

Troubleshooting

Inside this chapter:

Before replacing parts or making any physical changes to the scanner, perform the following procedures to determine how to solve the problem.

1. Perform the preventive maintenance procedures in Section 3.2.

2. Perform the Level One Troubleshooting procedures to correct common problems.

3. Perform the Level Two Troubleshooting procedures to correct specific problems.

4. Refer any problems not covered in this chapter to a Level Three service technician. Level Three service is available through authorized service centers, Ricoh or Improvision.

4.1 Level One Troubleshooting

The first step when troubleshooting an IS510 or IS520 scanner is to perform a visual test of the basic scanner functionality. This level of troubleshooting can be performed by the operator or a service technician.

Step 1: Power Up Functions

1. Turn the power on and observe the lights on the Indicator Panel.
2. All of the lights should turn on for approximately 3 seconds, then all except the **Power** light should turn off. If the **Error** light is flashing, check to be sure the lamp access door(s) and ADF cover are closed and latched.
3. Check to be sure the fan is blowing air out the lower unit vents on the rear of the scanner (see Figure 4-1).

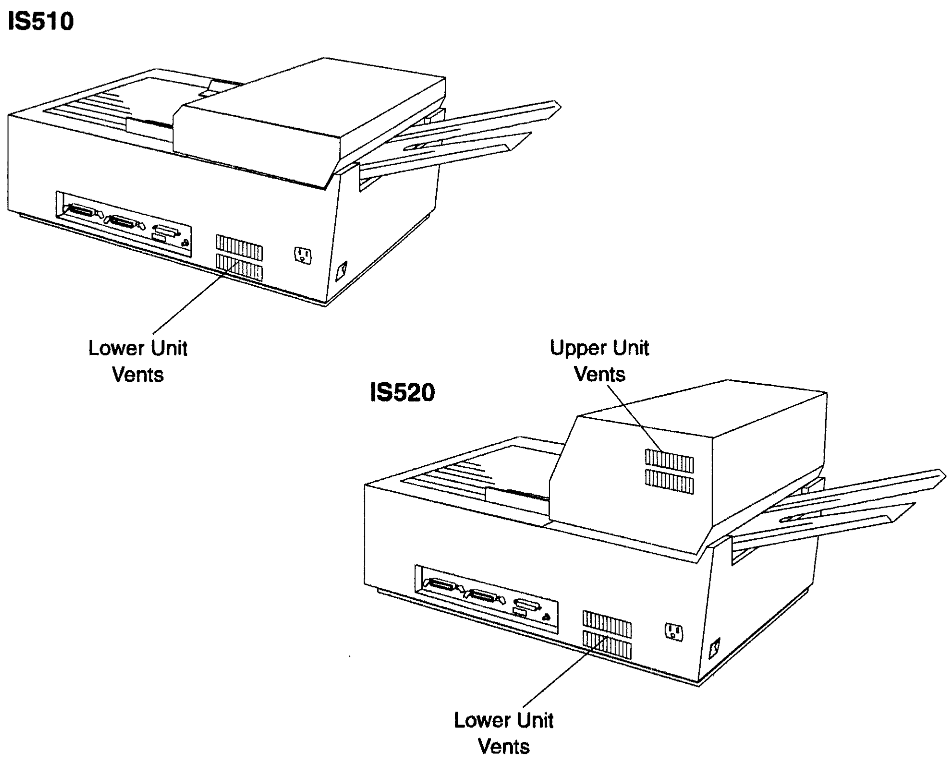


Figure 4-1. Fan Vents

Step 2: Lamp Test

Place your finger over the ADF sensor (see Figure 4-2). This activates the sensor and the fluorescent lamp(s) should turn on.

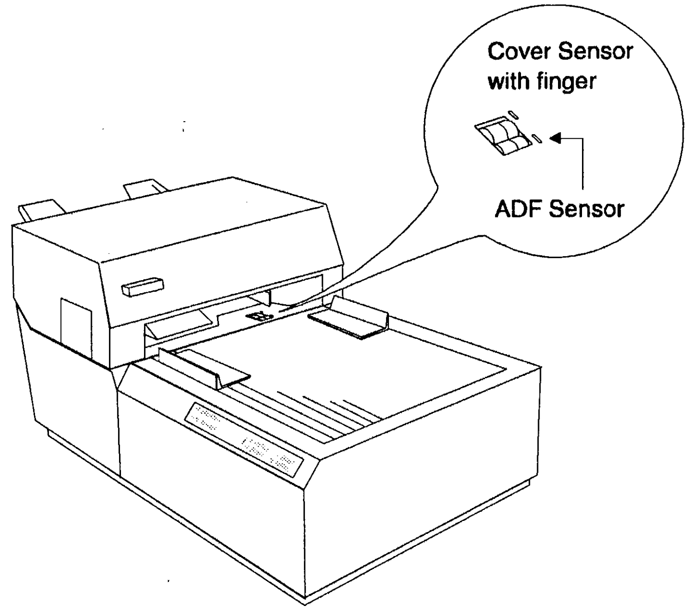


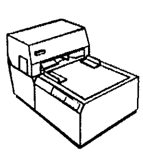
Figure 4-2. Manually Activating ADF Sensor

Step 3: Paper Feed Test

1. Open the ADF cover. The **Error** light should start flashing.
2. Lay a sheet of normal photocopier-quality bond paper over the contact glass (see Figure 4-3). The SIB and ADF sensors are activated when they are covered by the paper.
3. Gently close the ADF cover on top of the sheet of paper. Press down firmly on the cover until the lock lever clicks.

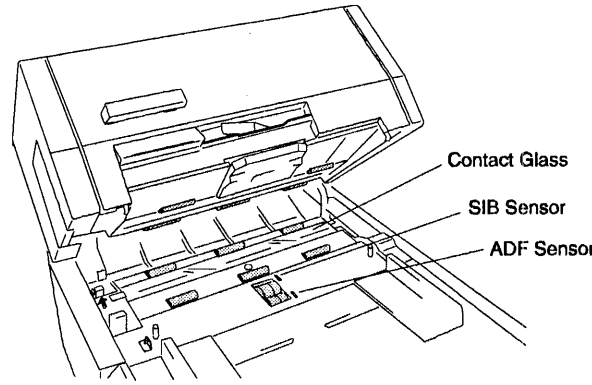
   Check to be sure the following occurs:

   - The **Error** light turns off.
   - The scanner motor turns on and the paper ejects from the scanner.
   - On IS520 scanners, the upper unit fan blows air out the upper unit vents on the rear of the scanner (see Figure 4-1).

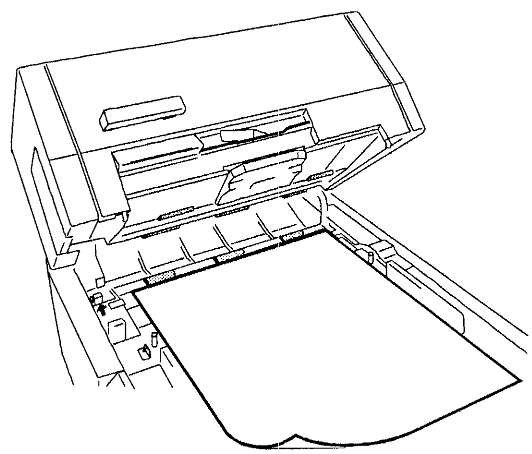


If the scanner fails any of the above tests or has a specific problem, follow the procedures in the "Correcting Problems" section in Part II, *Setup and Operation*.

① Open the ADF cover.



② Place a sheet of paper over the contact glass.



③ Close the ADF cover.

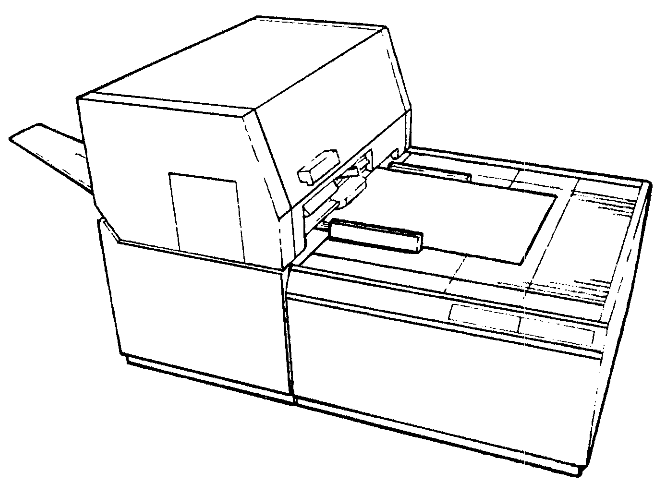


Figure 4-3. Testing Paper Feed

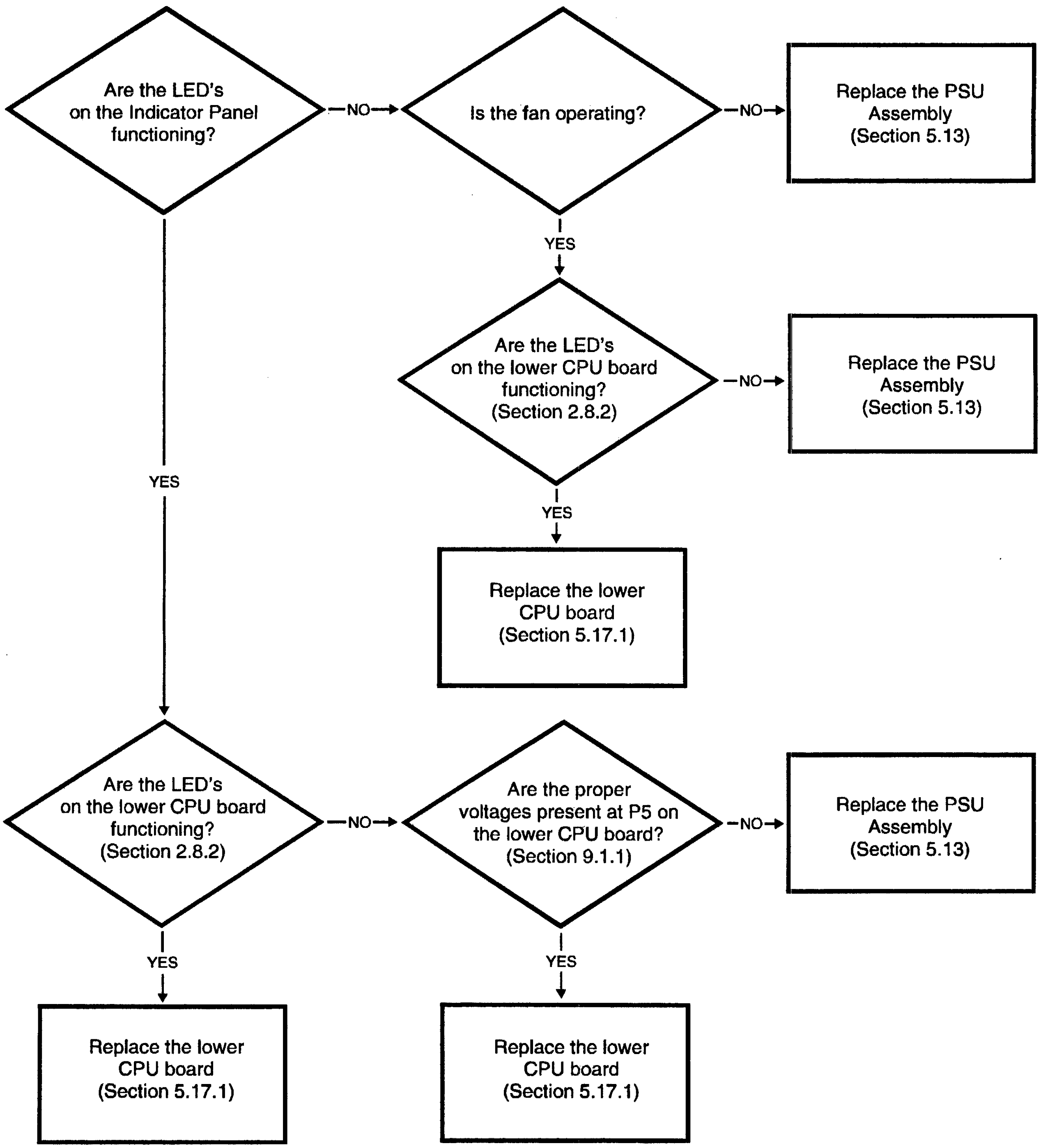
4.2 Level Two Troubleshooting

This level of troubleshooting should be performed by service technicians who are familiar with the basic operation of the IS510 and IS520 scanners, including the theory of operation, locations of parts and assemblies, mechanical adjustments, and component replacement procedures. A copy of the *IS510 and IS520 Document Scanners Service Manual*, including parts lists and wiring diagrams, should be available for all on-site service requirements.

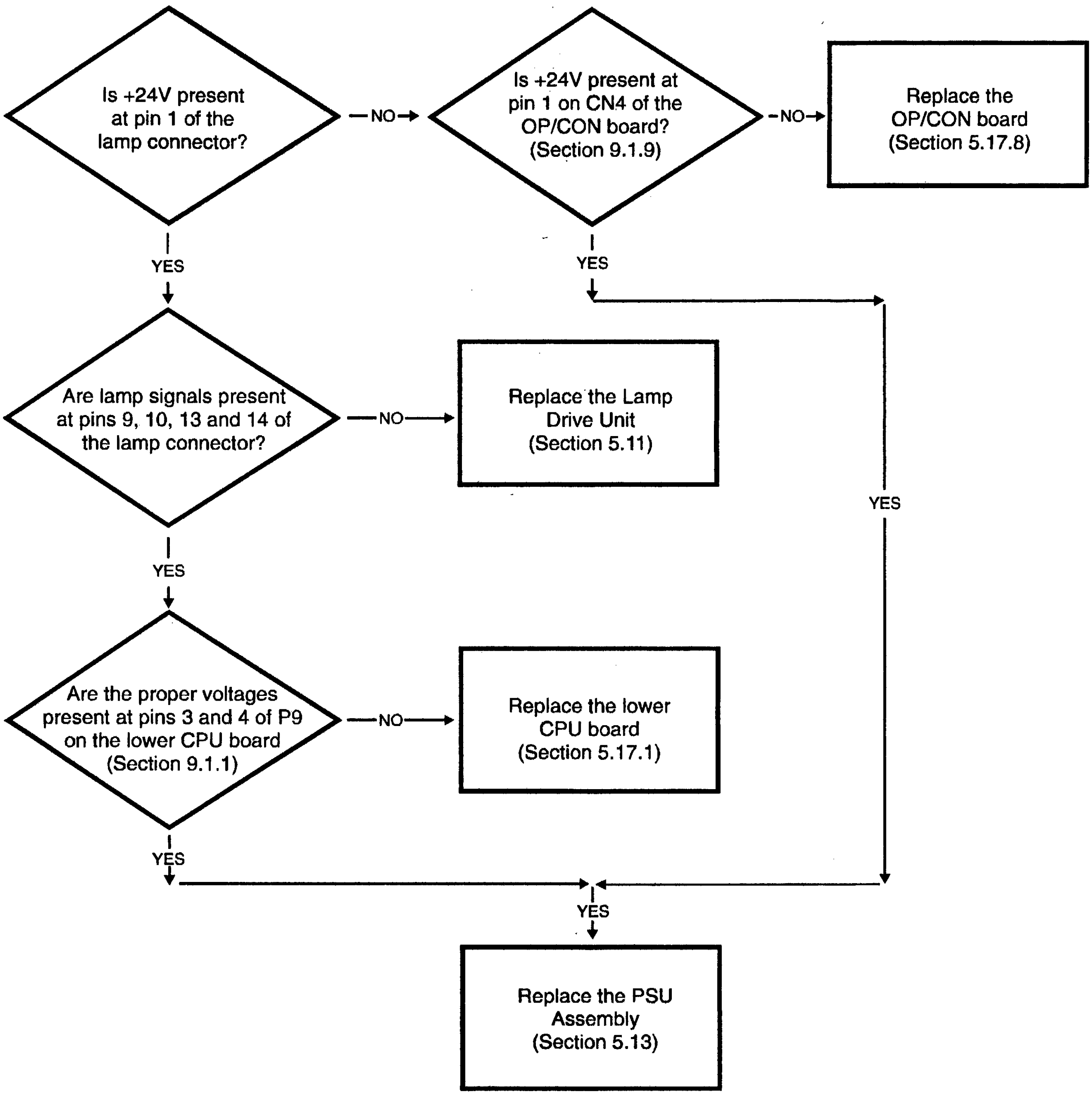
The following flow charts address troubleshooting at this level.

4

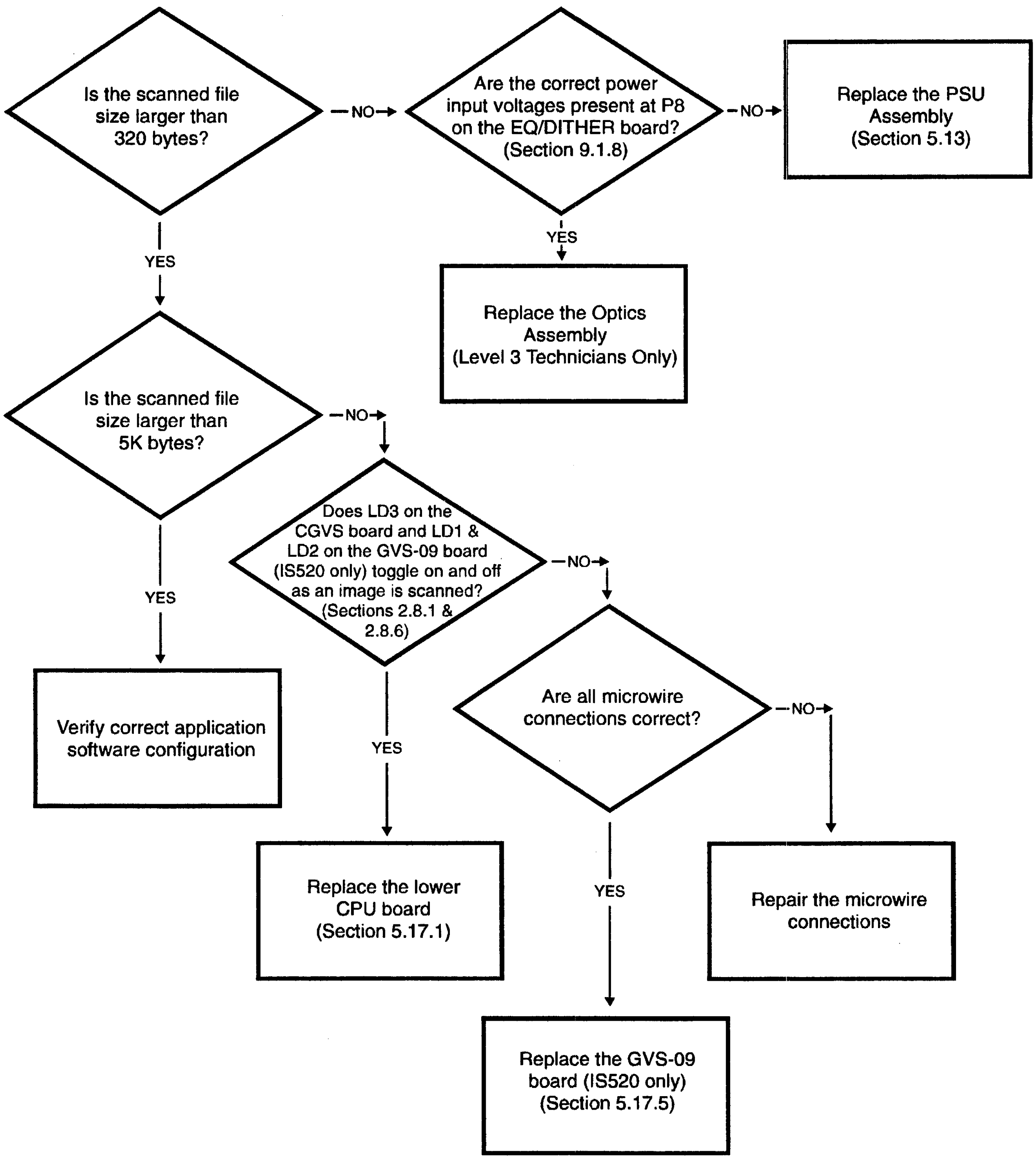
4.2.1 No Power


Are the LED's on the Indicator Panel functioning?
NO
Is the fan operating?
NO
Replace the PSU Assembly (Section 5.13)
YES
Are the LED's on the lower CPU board functioning? (Section 2.8.2)
NO
Replace the PSU Assembly (Section 5.13)
YES
Replace the lower CPU board (Section 5.17.1)
YES
Are the LED's on the lower CPU board functioning? (Section 2.8.2)
NO
Are the proper voltages present at P5 on the lower CPU board? (Section 9.1.1)
NO
Replace the PSU Assembly (Section 5.13)
YES
Replace the lower CPU board (Section 5.17.1)
YES
Replace the lower CPU board (Section 5.17.1)

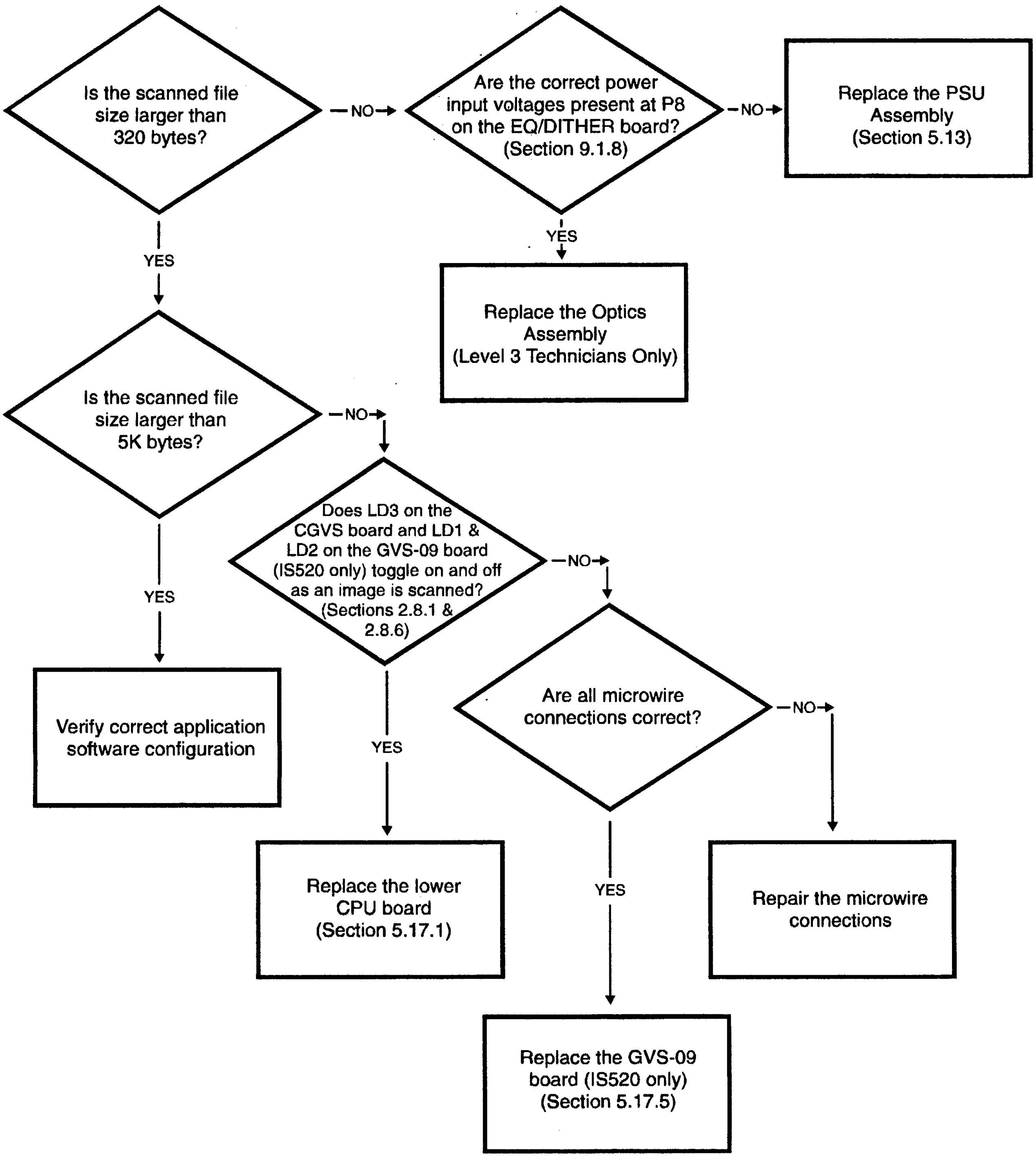
4.2.2 One or More Fluorescent Lamps Don't Turn On



4.2.3 White Image

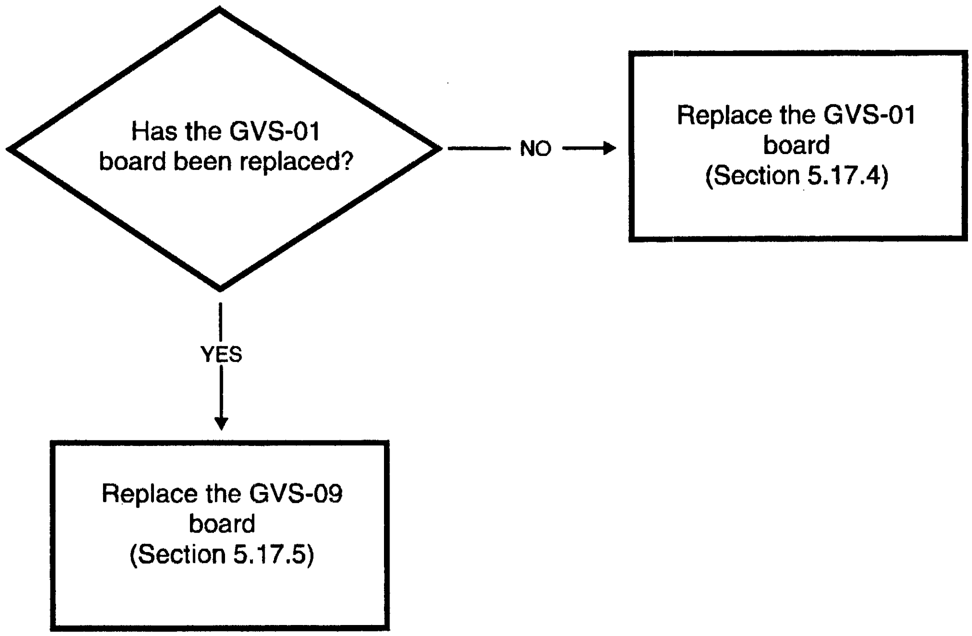


4.2.4 Black Image

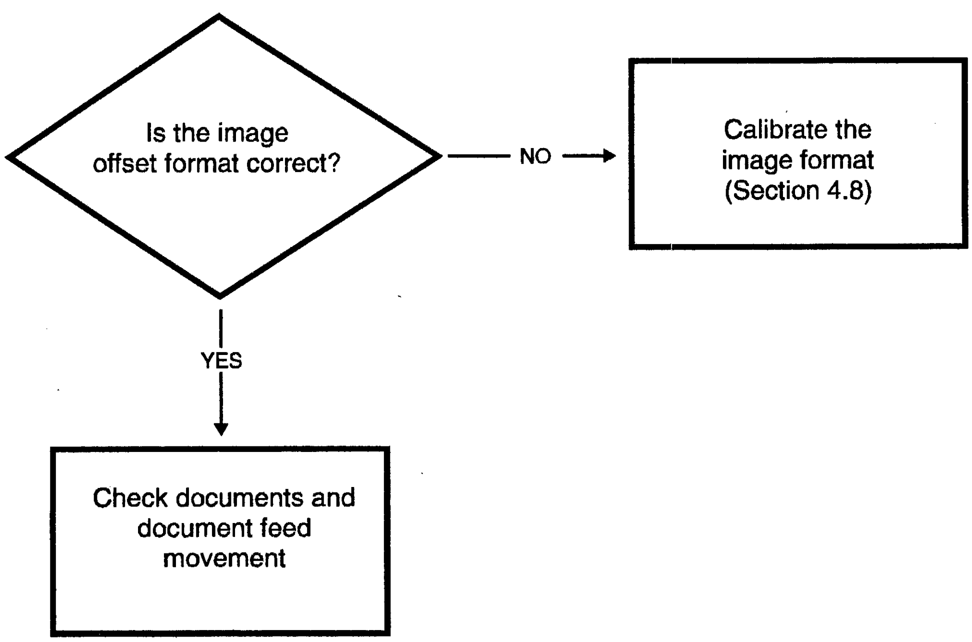


4

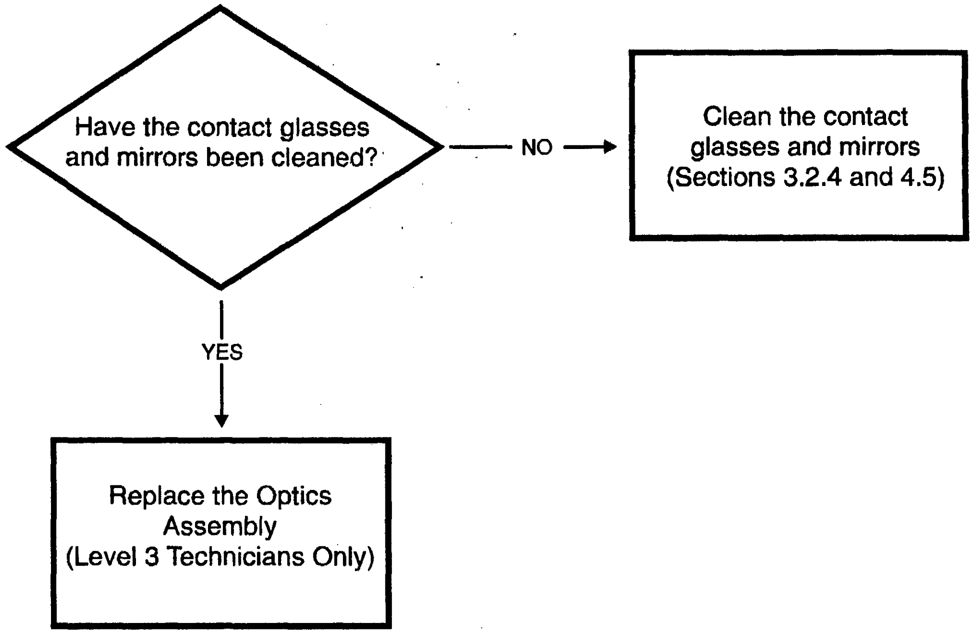
4.2.5 Horizontal Lines Through Image (IS520 only)



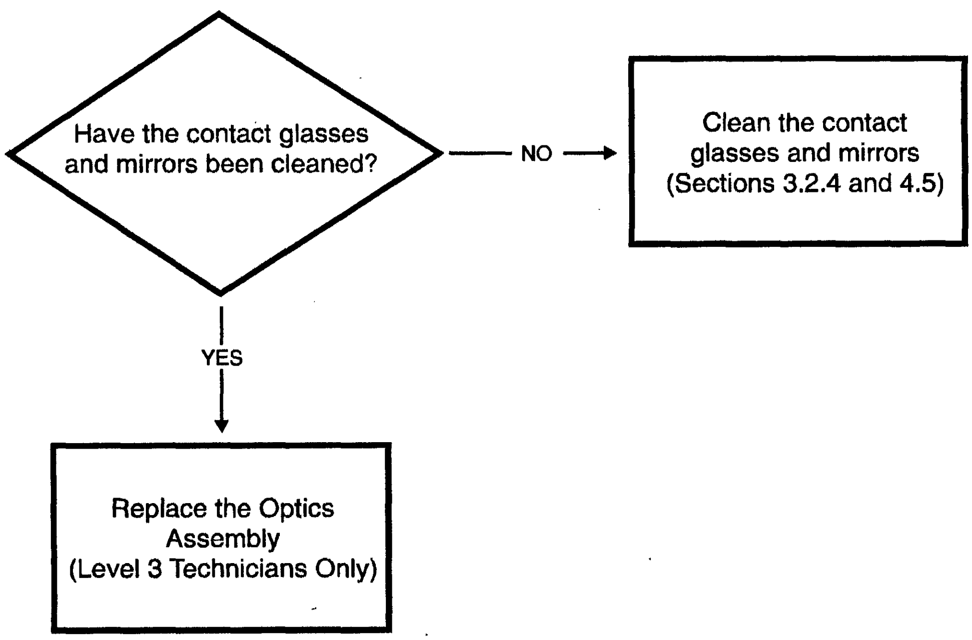
4.2.6 Horizontal Lines on Top or Bottom of Image



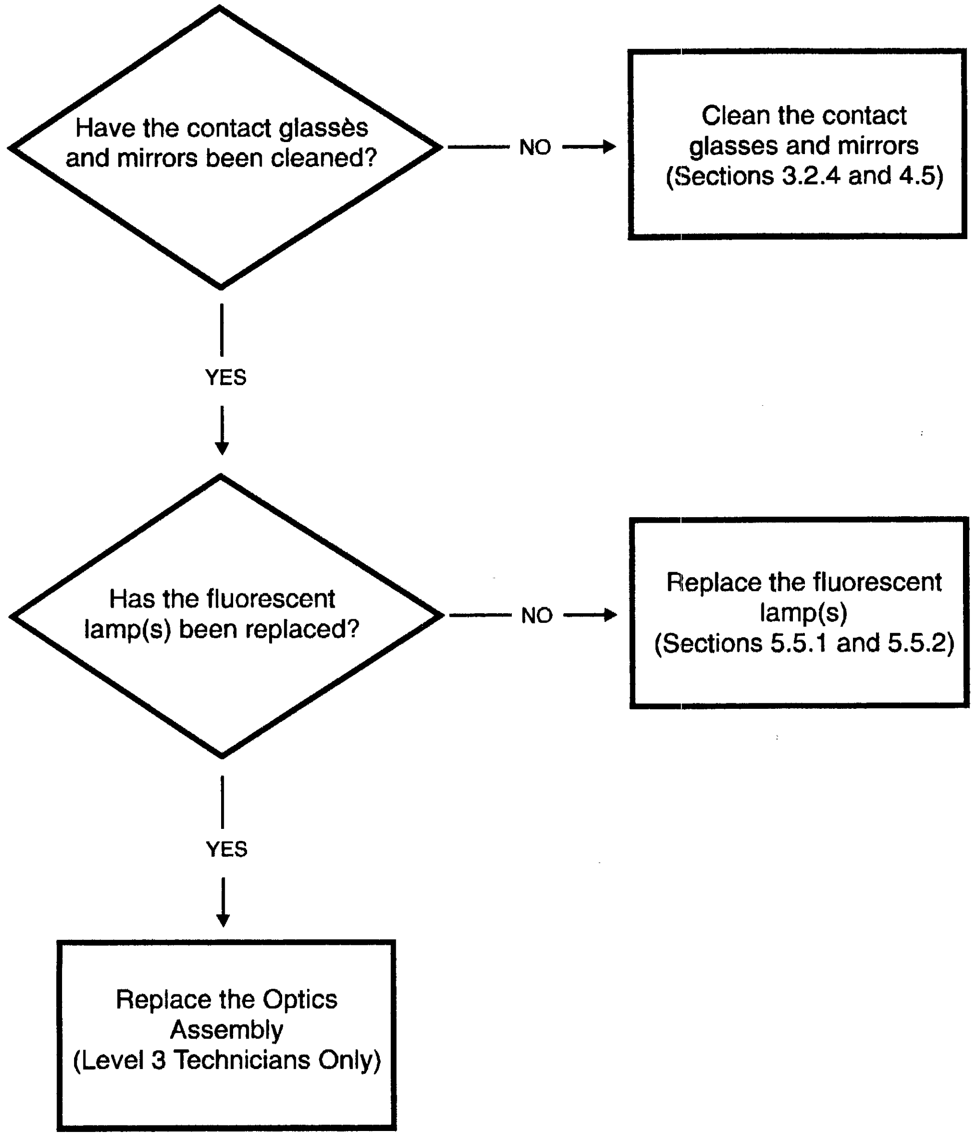
4.2.7 Vertical Lines Through Image



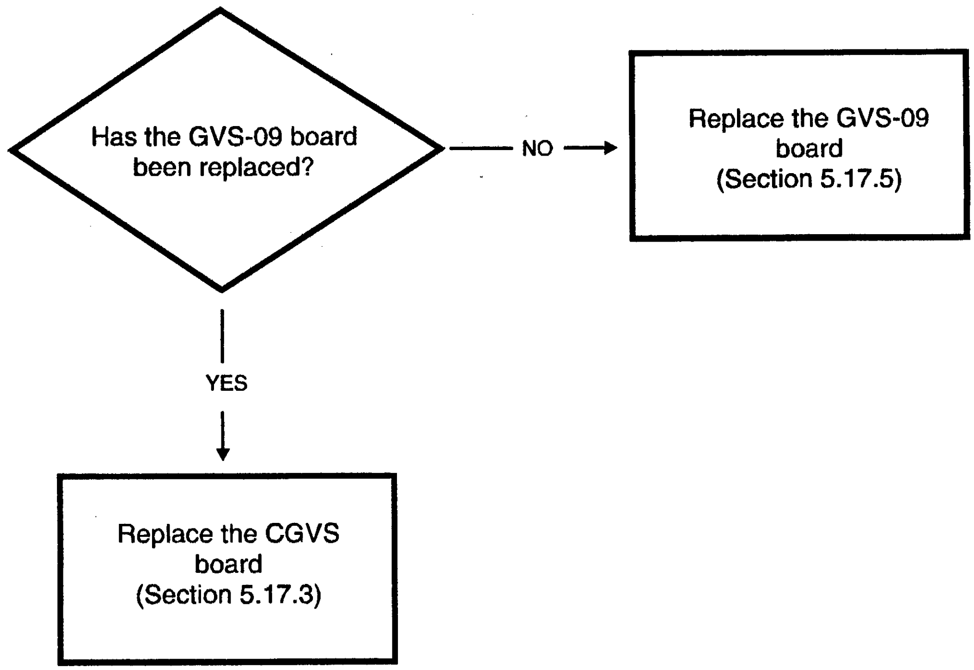
4.2.8 Dirty Images



4.2.9 Uneven Brightness or Contrast

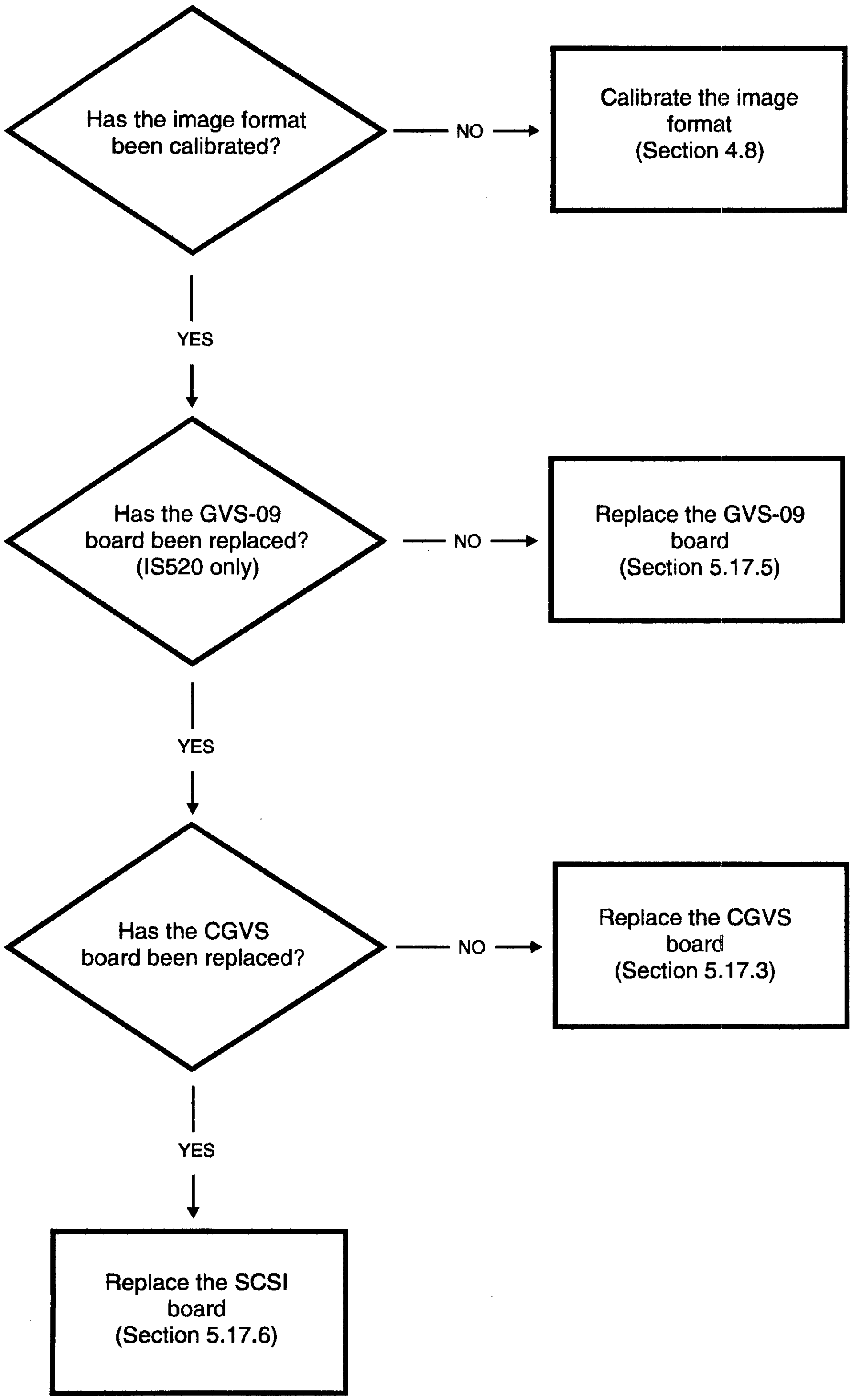


4.2.10 Image Shifts Side to Side (IS520 only)

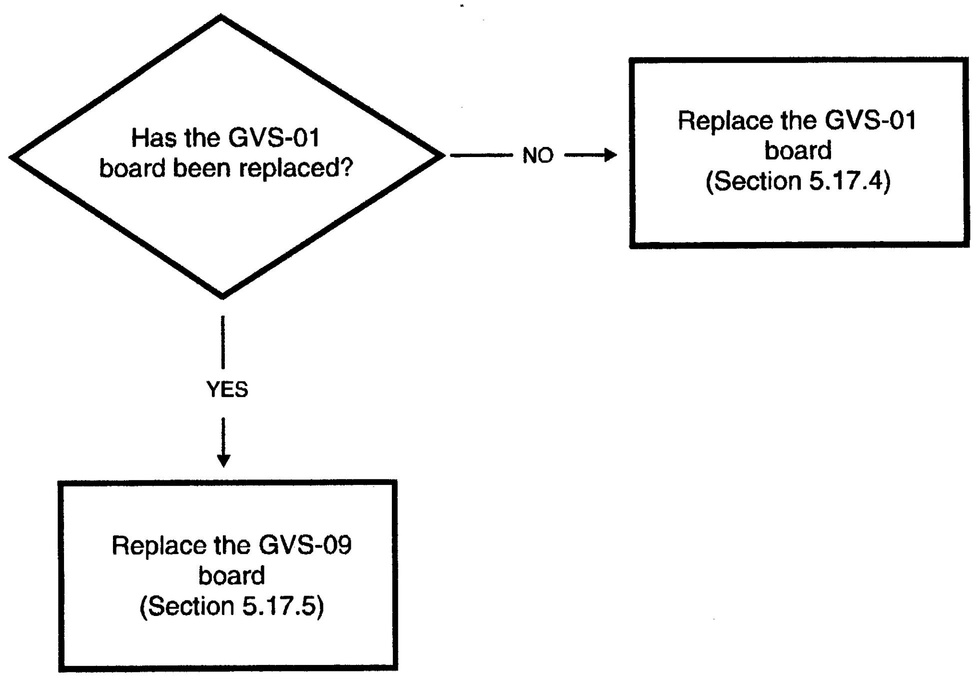


4

4.2.11 Can't Decompress Image

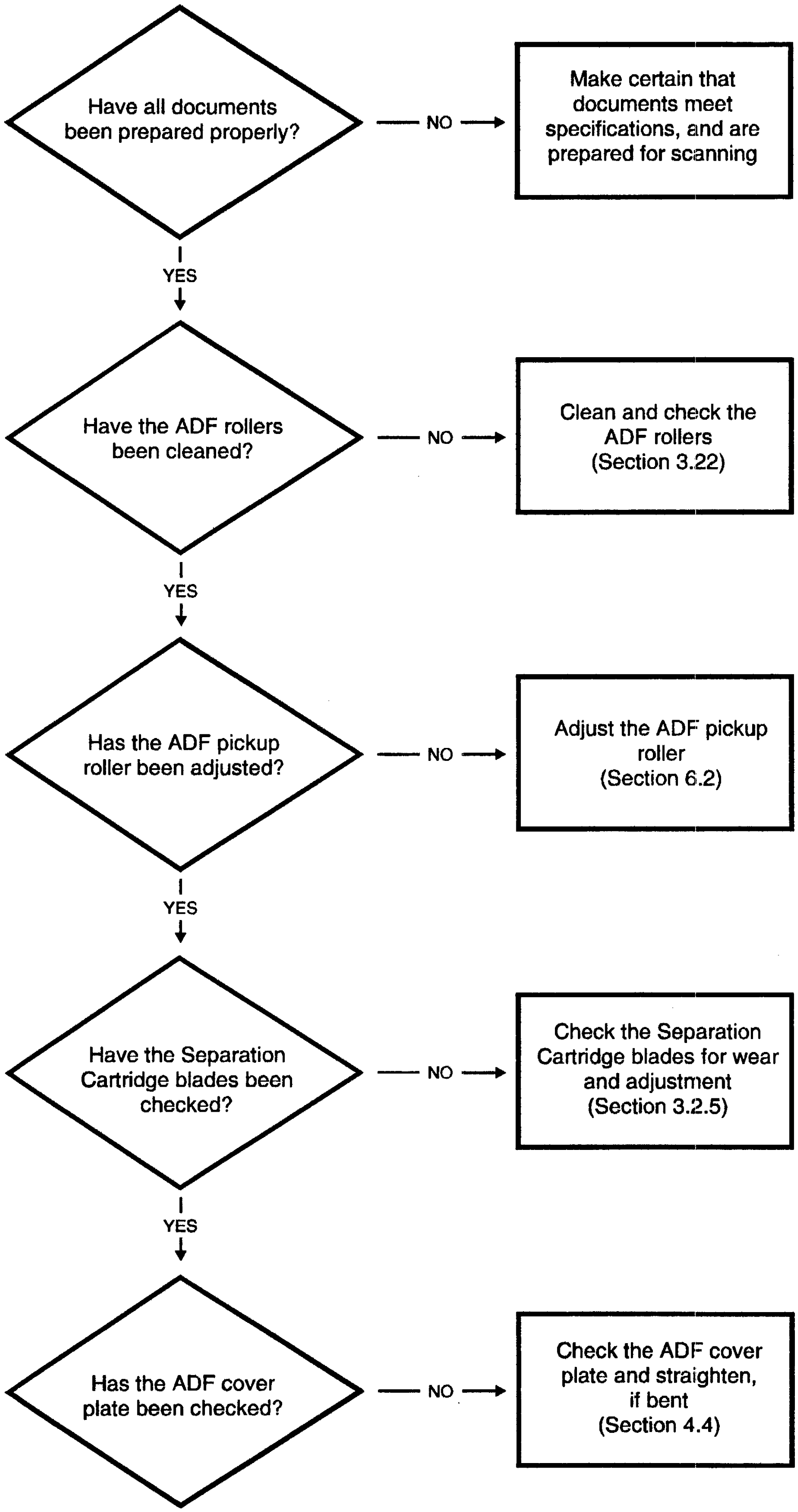


4.2.12 Front and Back Images are not Transferred Correctly (IS520 only)



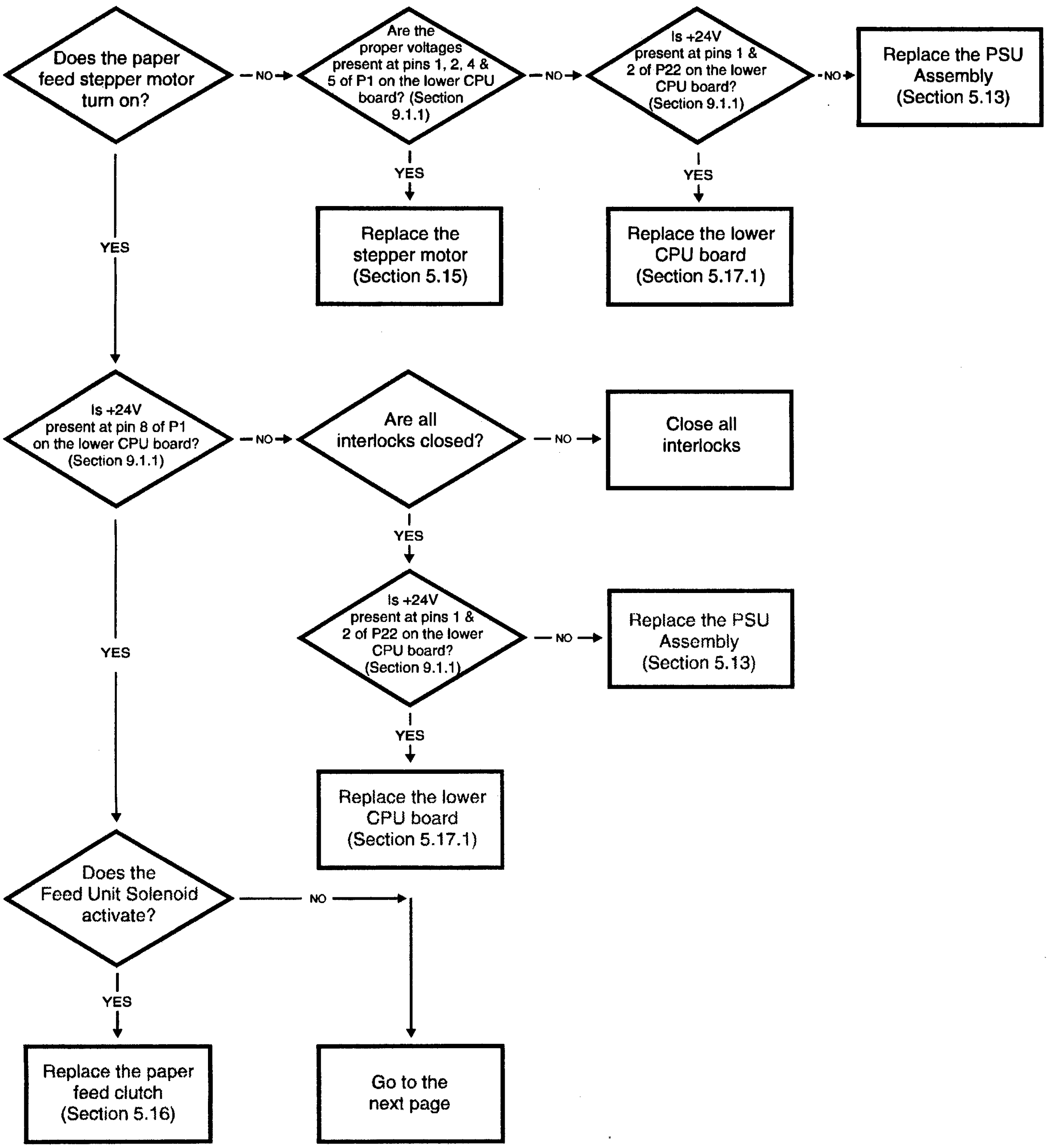
4

4.2.13 Documents Double-Feed or Misfeed

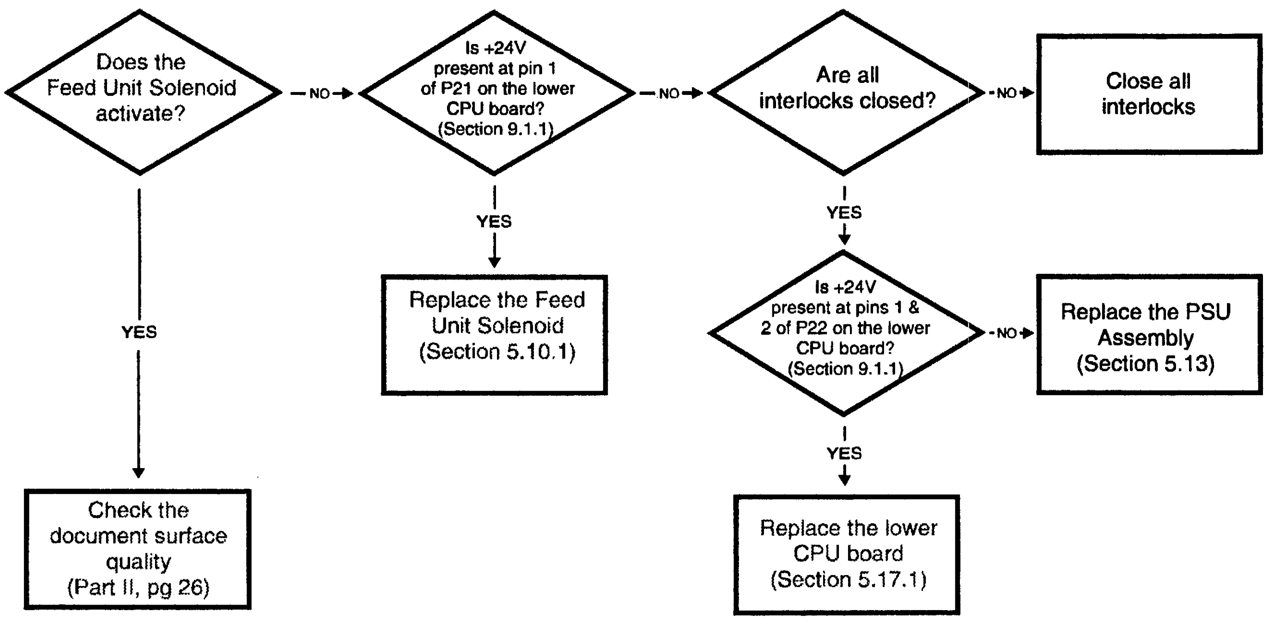


4.2.14 Documents Do Not Feed Properly

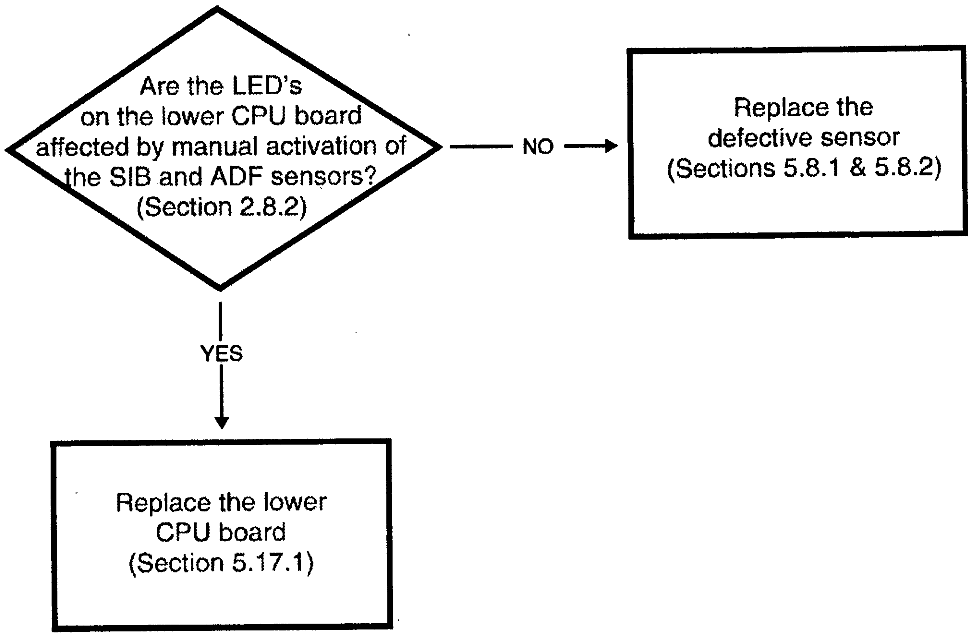
Place scanner in Manual feed mode (see Section 1.3.4).



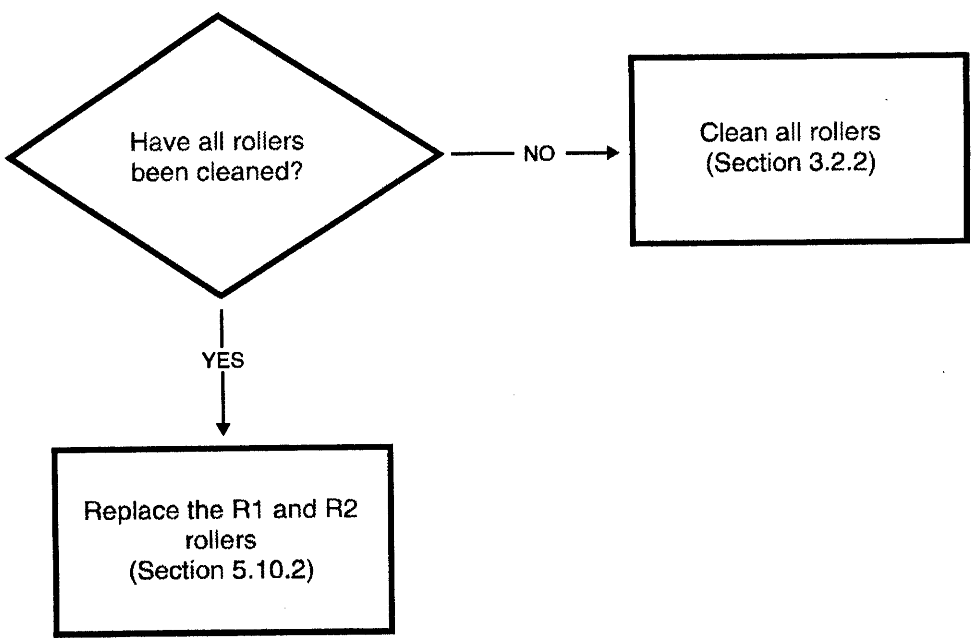
Place scanner in Automatic feed mode (see Section 1.3.4).



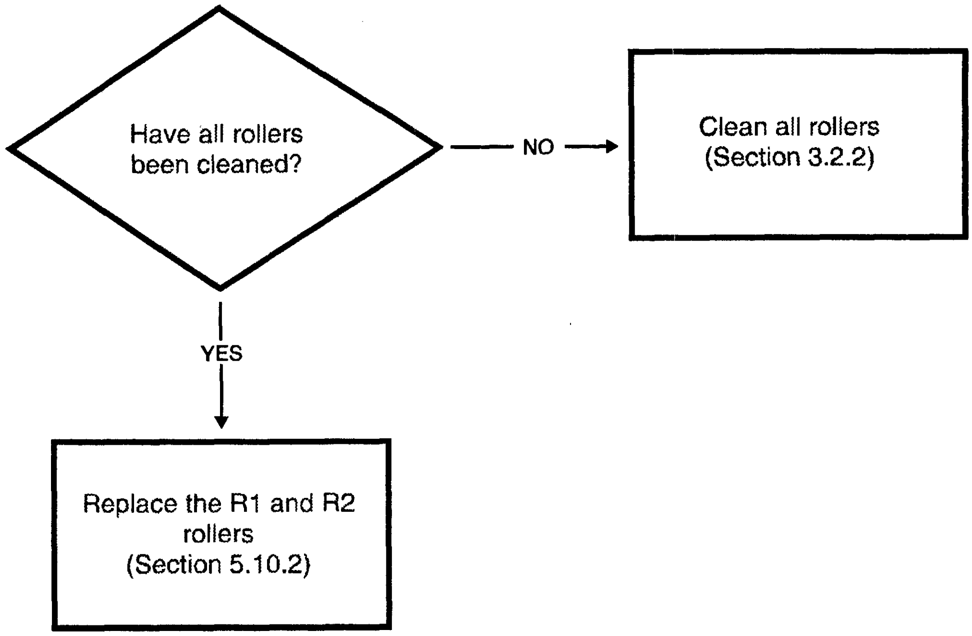
4.2.15 Document Sensing Error



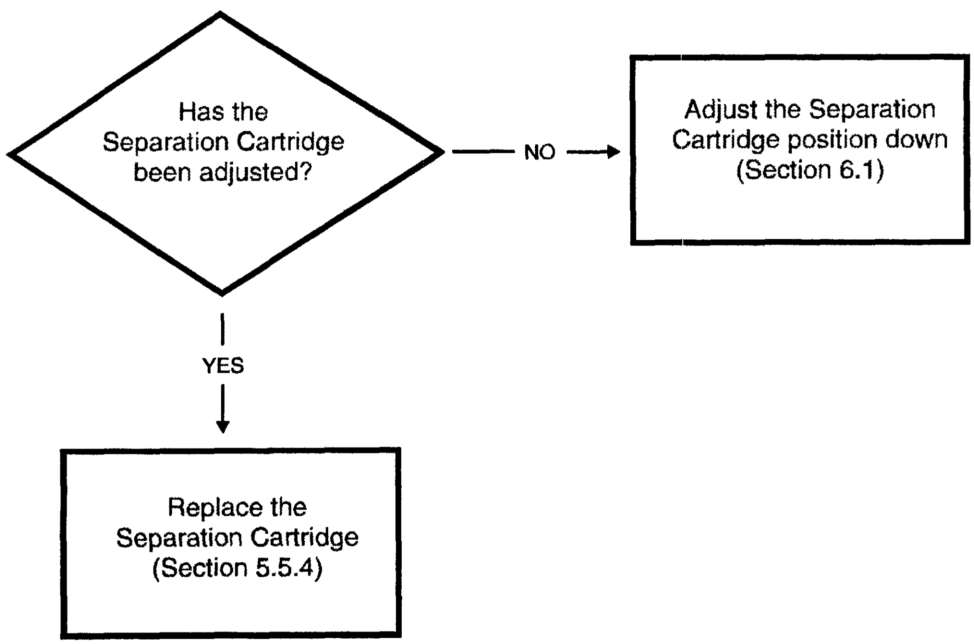
4.2.16 Documents Skew as they are Scanned



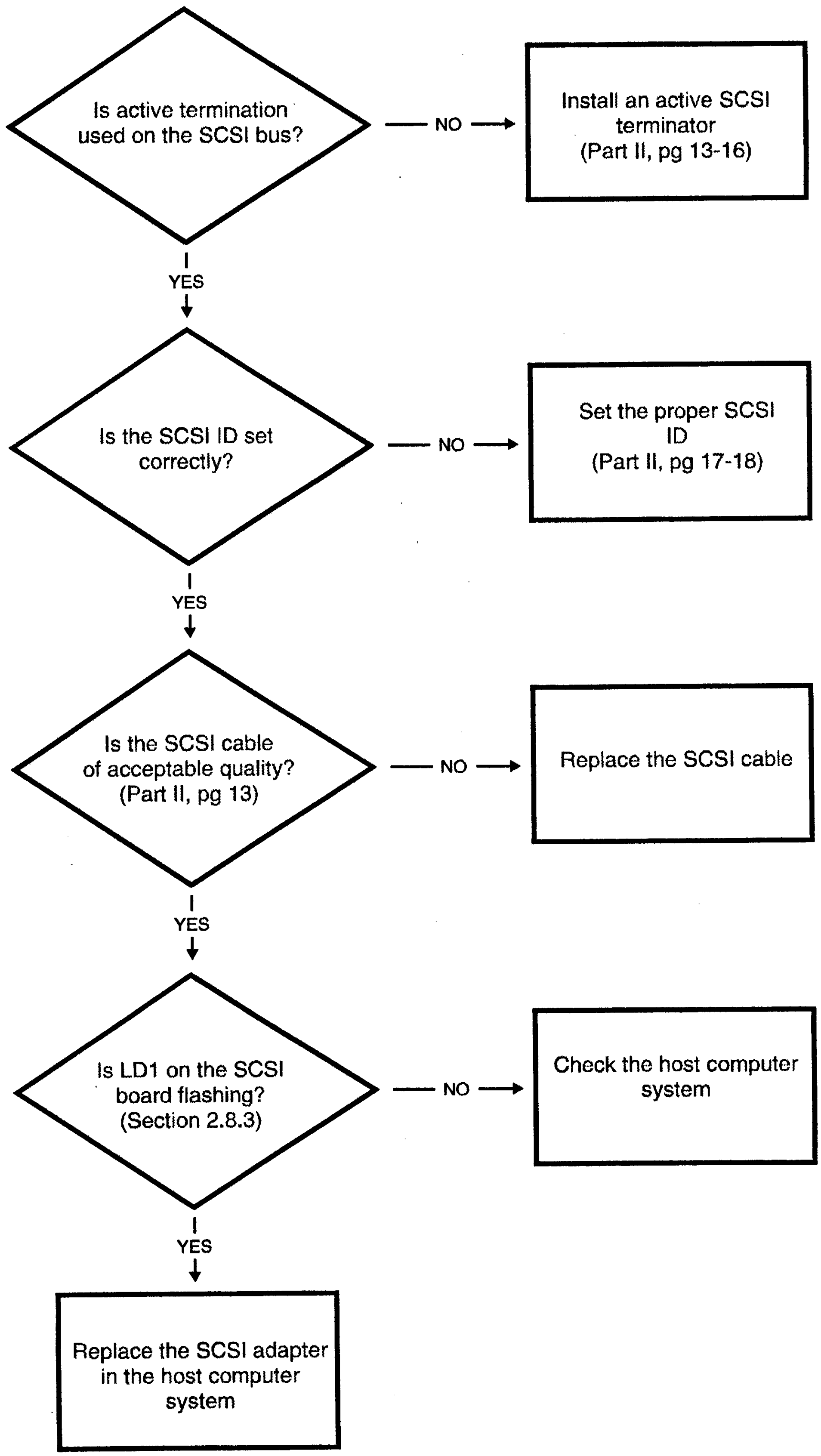
4.2.17 Document Wrinkle or Crease when Scanned



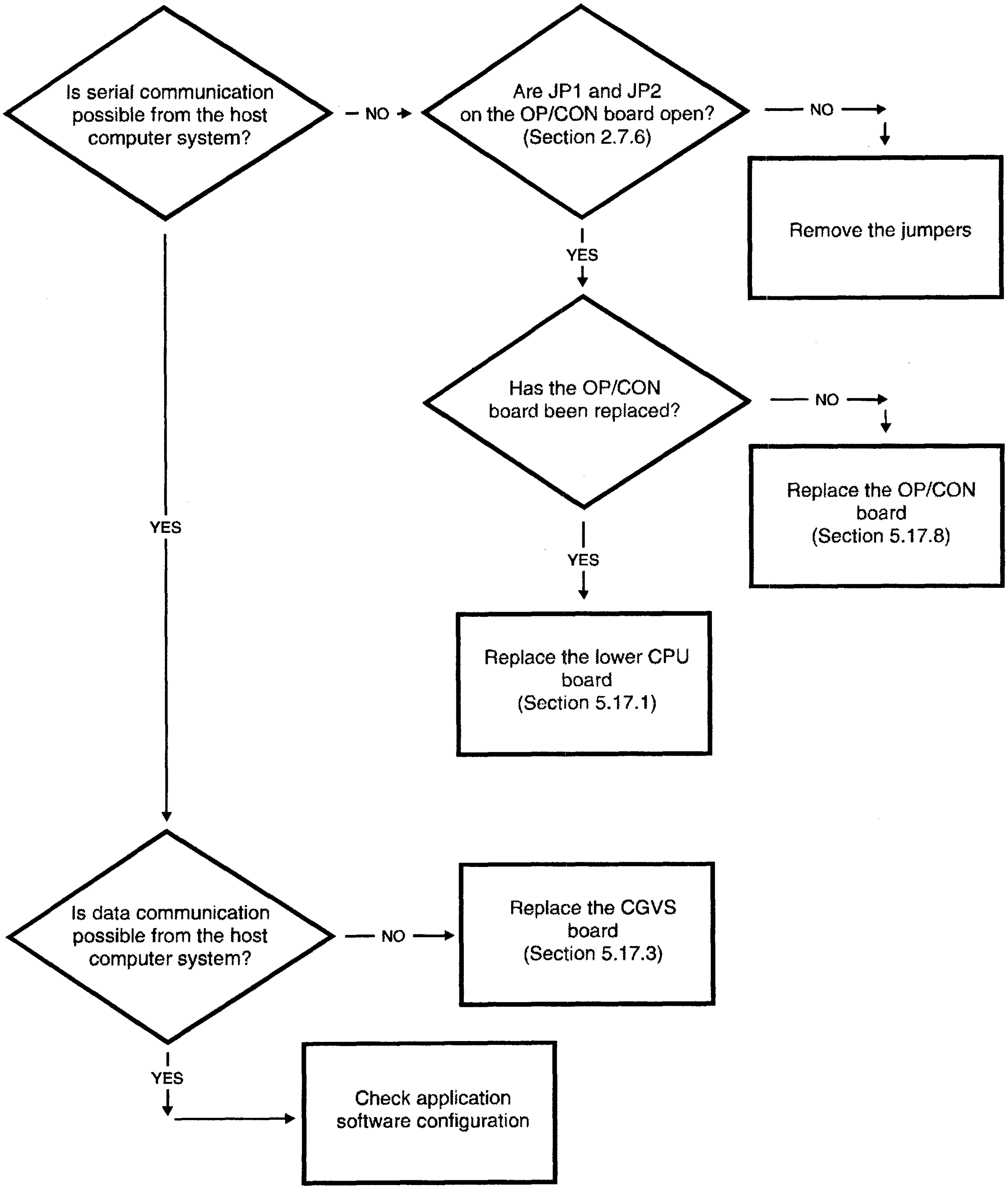
4.2.18 Vibration Noise During Paper Feed



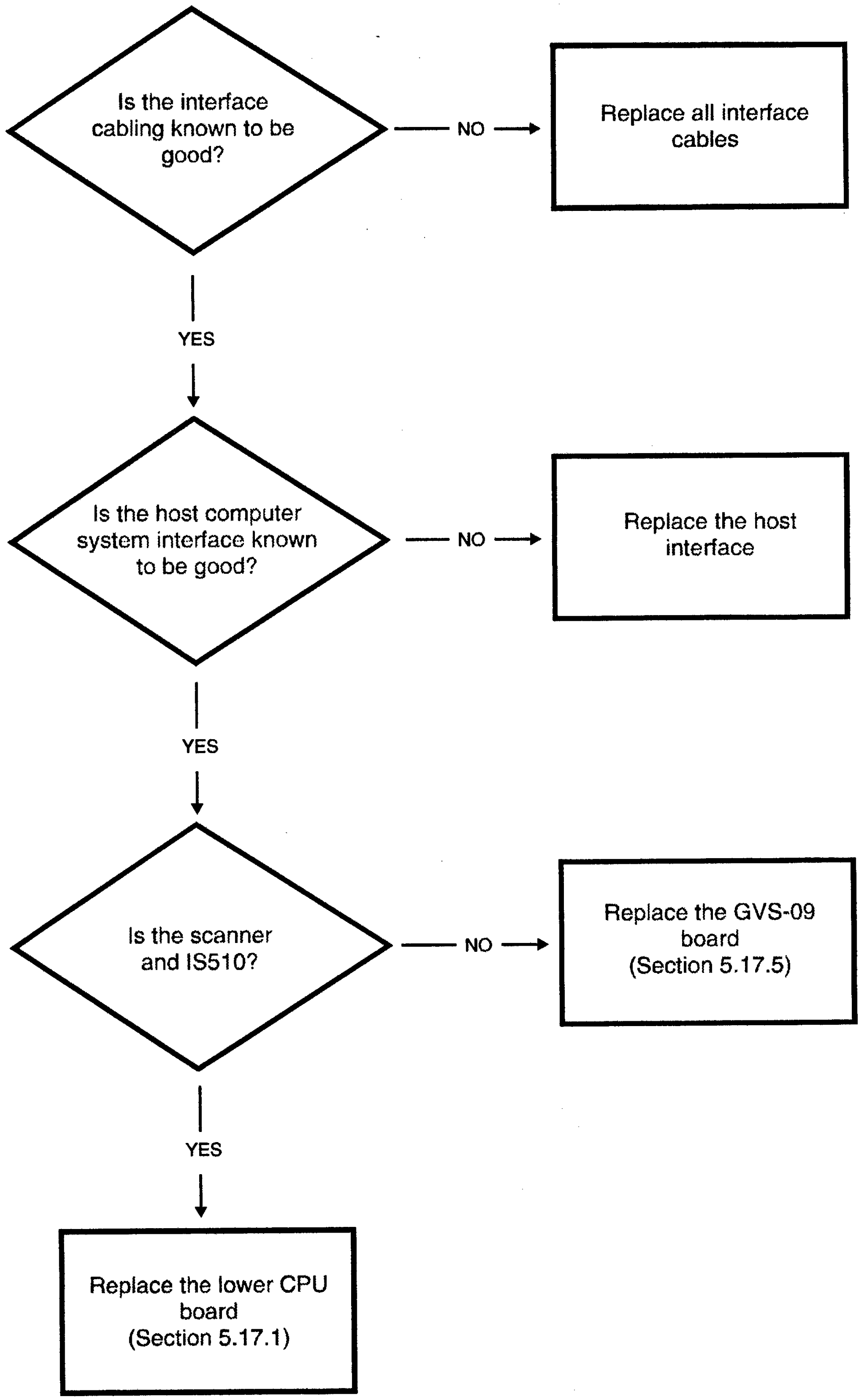
4.2.19 SCSI Communication Error



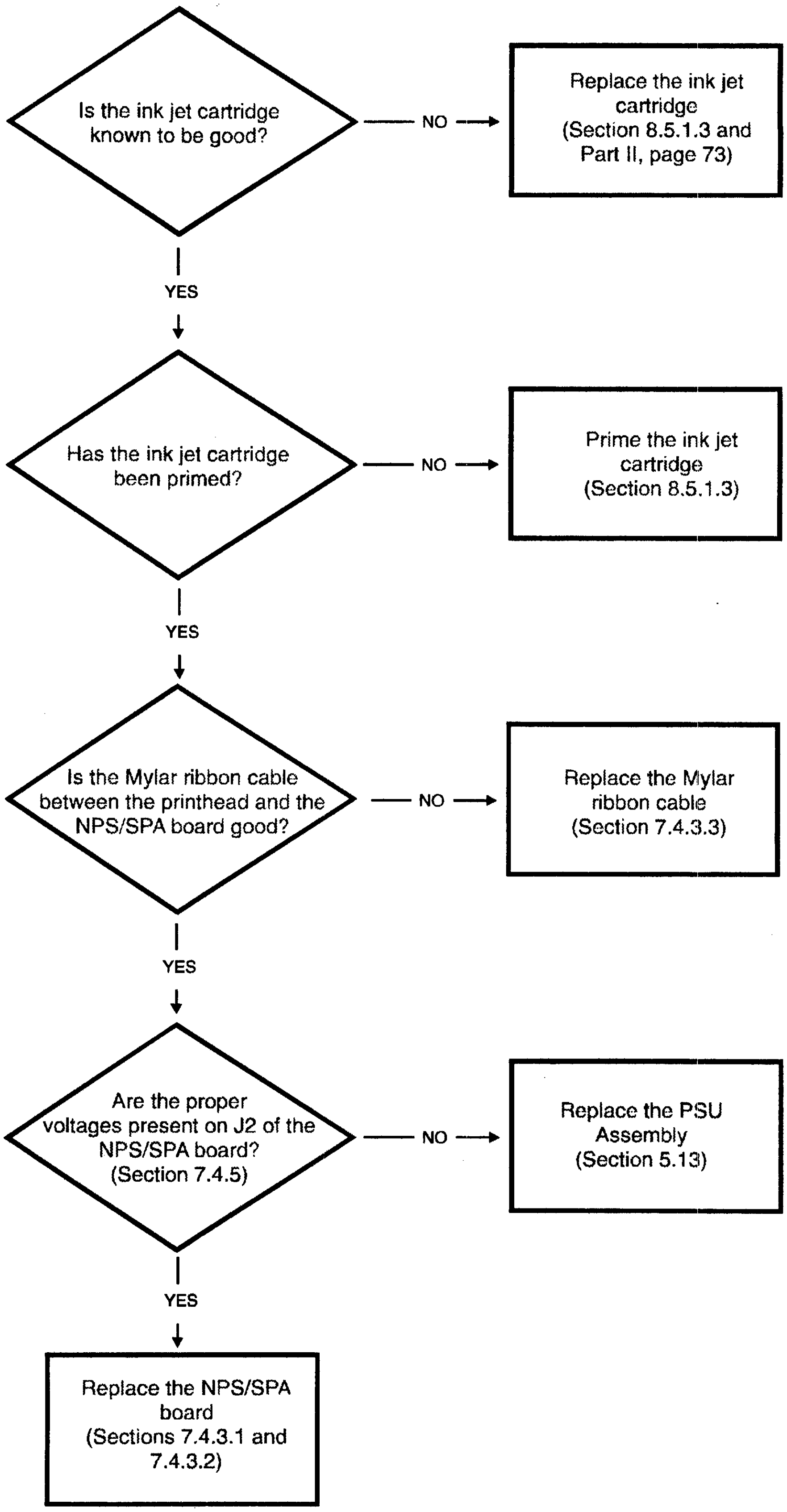
4.2.20 DR-11 Communication Error



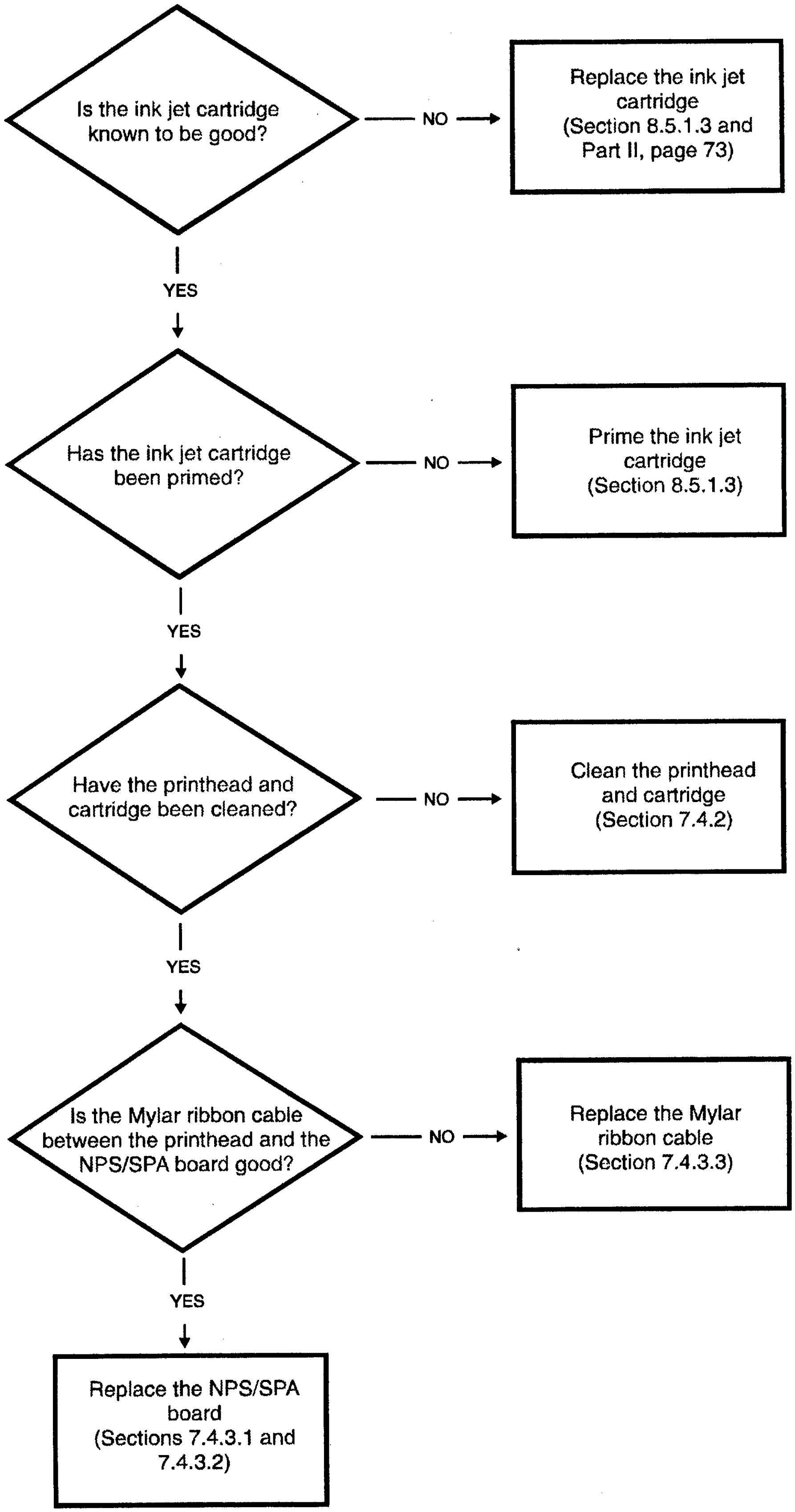
4.2.21 Video Communicaion Error



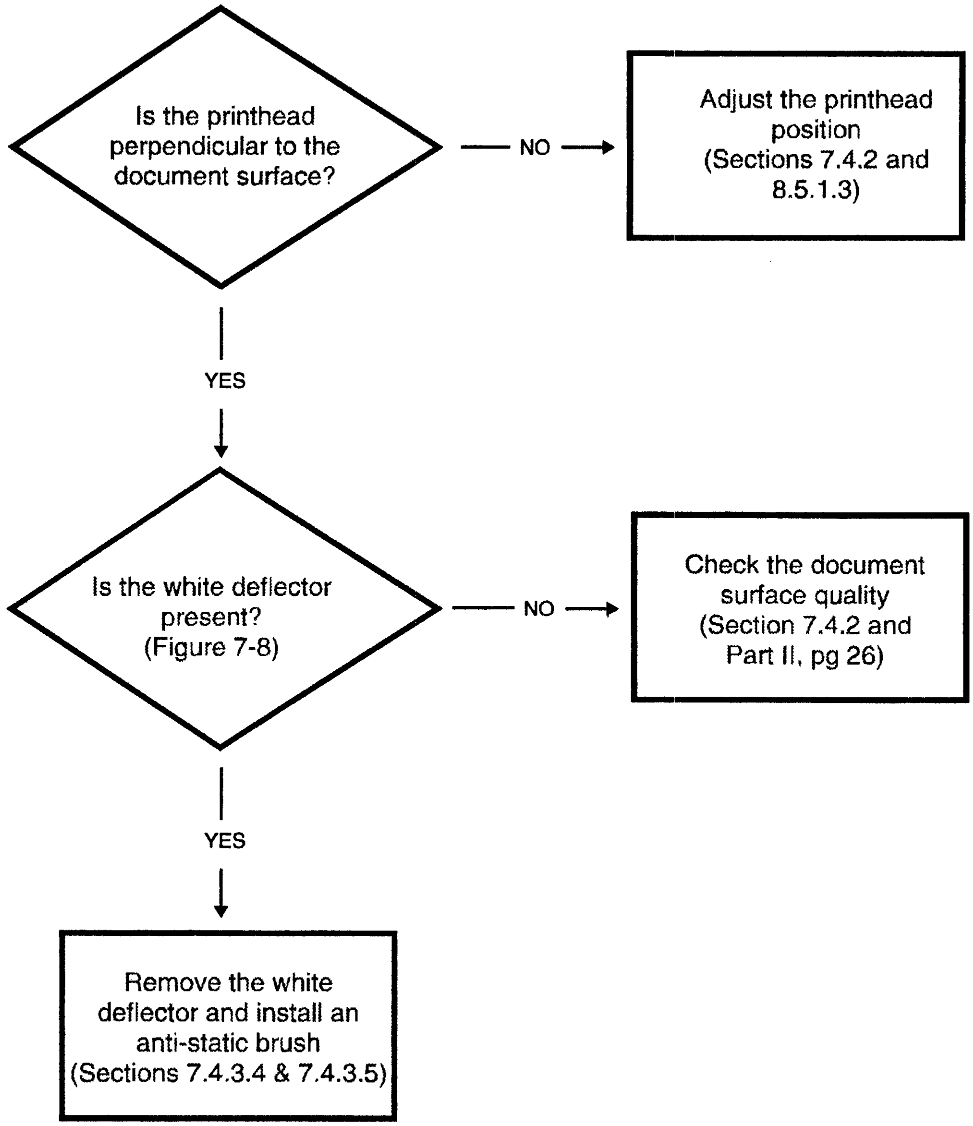
4.2.22 Ink Jet Endorser Does Not Print



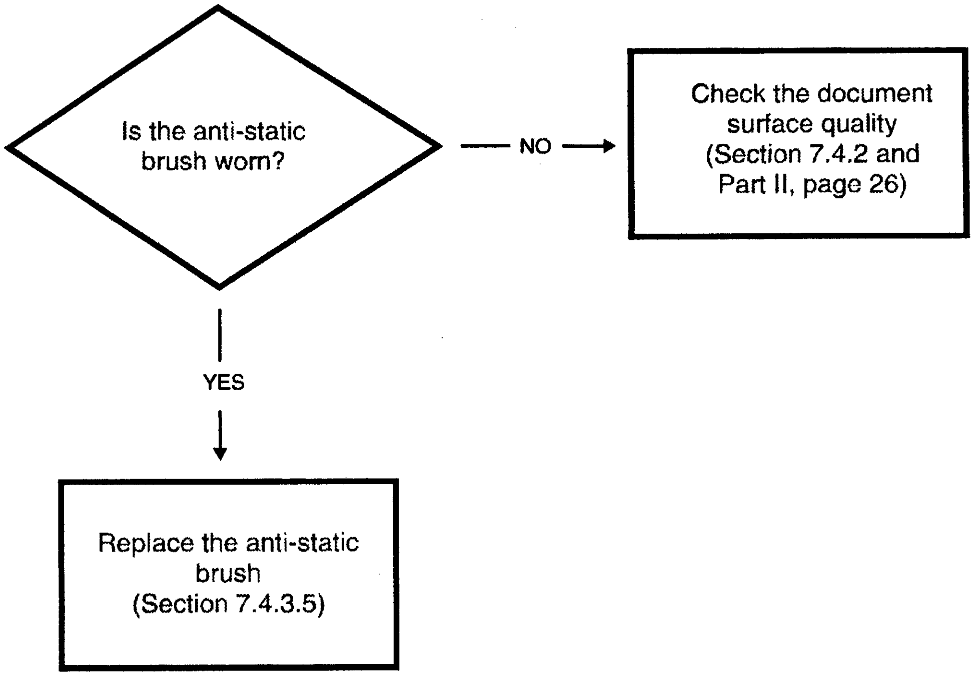
4.2.23 Ink Jet Endorser Prints Partial Characters



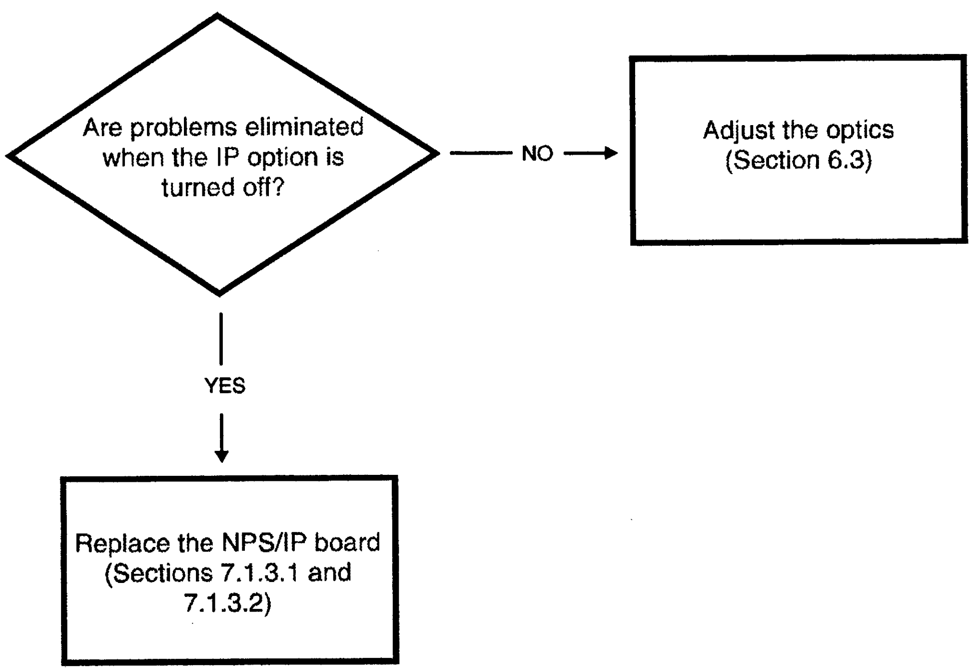
4.2.24 Ink Jet Endorser Characters Overspray or Splatter



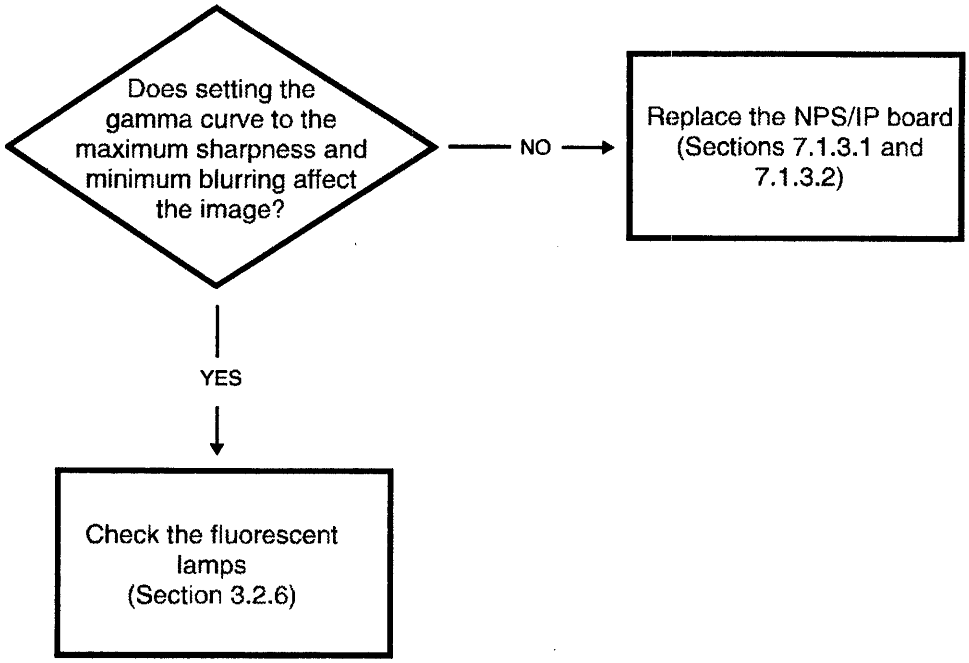
4.2.25 Paper Jams at Ink Jet Endorser



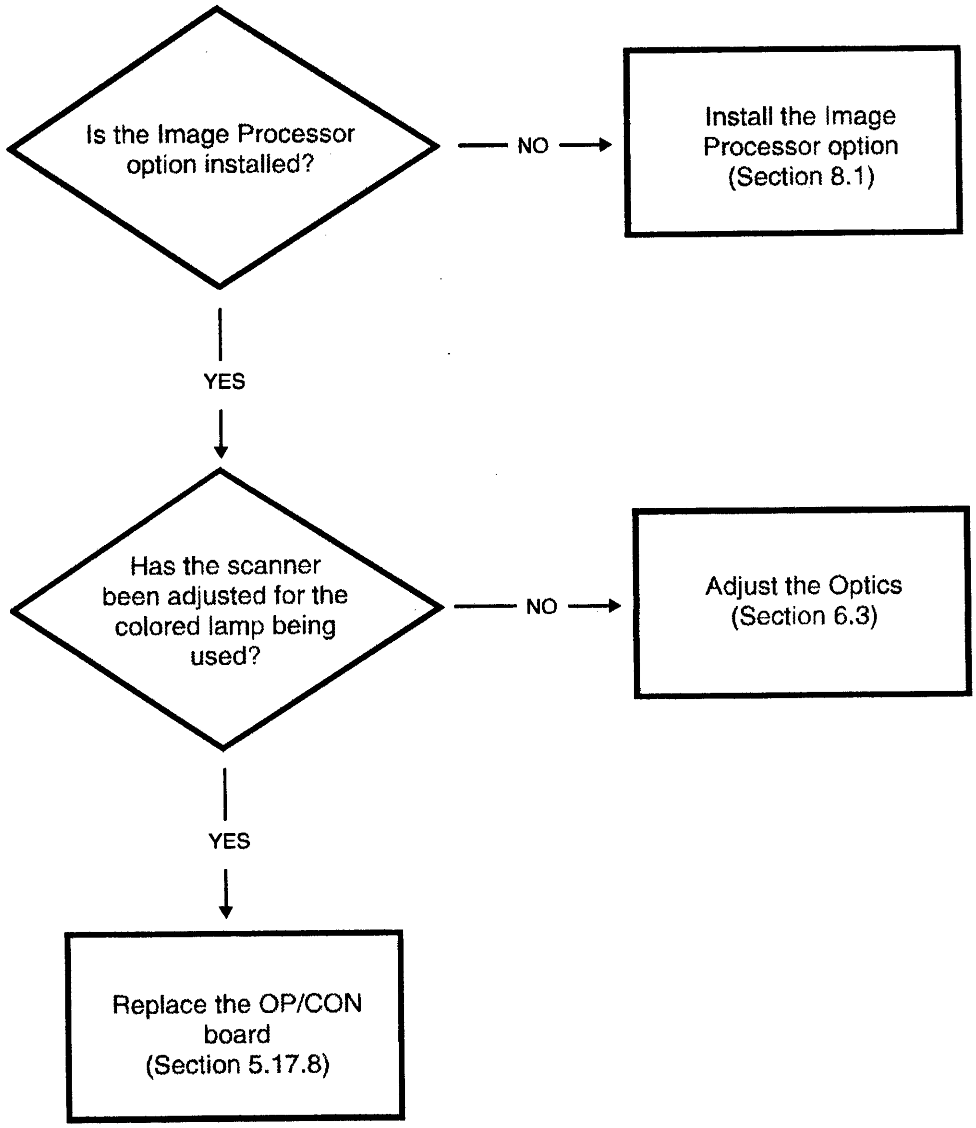
4.2.26 Poor Image Quality when using the Image Processor Option



4.2.27 Problems Setting Image Processor Parameters



4.2.28 Image Quality Problems Using Colored Lamps



4.3 Level Three Troubleshooting

Level Three troubleshooting requires that the service technician be proficient in scanner technology, and the IS510/IS520 scanners in particular. Technicians must have a thorough knowledge and understanding of the following items:

- Scanner technology and terminology as it relates to the IS510/IS520 scanners.
- IS510/IS520 image formats.
- IS510/IS520 internal data paths.
- IS510/IS520 mechanical and optical adjustment requirements and procedures.
- Operation and installation of all IS510/IS520 options.
- Operation and uses of the monitor port on the IS510/IS520 scanners.

Effective troubleshooting and repair of the IS510/IS520 scanners at this level can only be accomplished utilizing the following equipment:

- Laptop PC or other acceptable *terminal emulator* device and an RS232 serial cable to manipulate the monitor port functions of the scanner.
- 100 Mhz or greater oscilloscope.
- Image test charts, including "Tiny Bubbles."
- *IS510 and IS520 Document Scanners Service Manual*, including parts lists and wiring diagrams.

It is also recommended that technicians have the complete Improvision document set, as well as the Programmer's Reference Guide (Part III of the *IS510 and IS520 Document Scanners Service Manual*), and a copy of the **R_Scan** program (attached to the back cover of the *IS510 and IS520 Document Scanners Service Manual*) for calibrating the image format tables.

Contact Ricoh for information on the Level Three procedures.

4.4 Error Indicator

When the Error indicator LED on the indicator panel turns on, the type of error is shown on the 7-segment LED on the OP-CON board or the monitor port. The OP-CON board shows general information, the monitor port will be more specific regarding the scanner's electromechanical section.

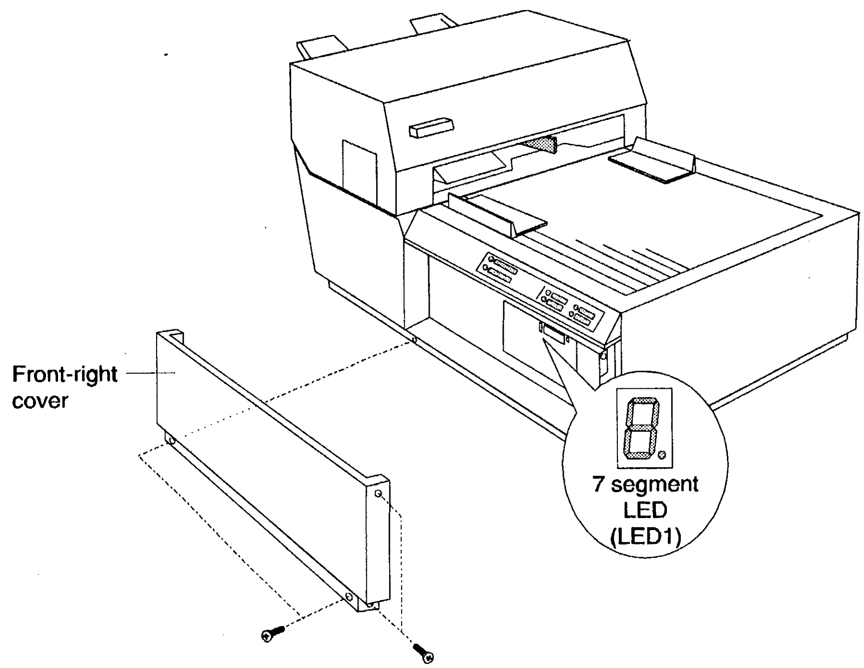


Figure 4-4. Error Indicator LED

The letter "E" and an error number alternately appear on the LED.

Example:

E. → 1 → E. → 1 .....

If two or more errors are detected at the same time, the letter "E" and the error numbers appear in sequence.

Example:

E. → 1 → 2 → 3 → E. → 1 .....

Error No.	Error Name	Description	Corrective Action
1	CPU detection error	Jam, cover open, or mechanical timeout.	Clear the jam, if present. Check to be sure the lamp access doors and upper unit are closed and locked.
2	EEPROM parity error	Parity error that occurred during EEPROM reading.	Send the EEPROM from OP-CON board to the factory for EEPROM reset. See Figure 5-53.
3	Lamp B fuse error	Lamp assembly was replaced with one that is not new.	Replace the lamp B assembly.
4	Lamp A fuse error	Lamp assembly was replaced with one that is not new.	Replace the lamp A assembly.
5	Lamp B time-out error	The lamp B heater did not reach 50°C after being on for 5 minutes or longer.	Replace the lamp B assembly.
6	Lamp B thermistor error	The lamp B thermistor is broken.	Replace the lamp B assembly.
7	Lamp A time-out error	The lamp A heater did not reach 50°C after being on for 5 minutes or longer.	Replace the lamp A assembly.
8	Lamp A thermistor error	The lamp A thermistor is broken.	Replace the lamp A assembly.

4.5 Using the Monitor Port

The monitor port provides a convenient means for testing the scanner's operation. When a PC is connected to the monitor port, you can issue commands from the PC that will do everything except send images to the host system. A detailed explanation of the scanner's response to each command appears on the PC screen.

The monitor port is also a valuable programming aid. A PC can be connected to the monitor port to monitor commands as they are issued from the host system.

The syntax and commands used by the monitor port are fully explained in the "Command Language" section of the *Programmer's Reference* in Part III of this manual.

CAUTION: As the monitor port can access all scanner commands, be careful not to issue any commands to the monitor port *concurrent* with the SCSI interface. This may put the scanner in an undefined state. In all cases do not use the 6F command unless you fully intend to modify the EEPROM format table.

The monitor port is RS232C and is set for 9600 baud, 8 data bits, 1 Stop bit, No parity and does not use any handshake scheme.

4.5.1 Connecting a PC to the Monitor Port

The PC you connect to the monitor port can be either a laptop or standard system. The PC must have communications software that allows it to operate as a terminal. Microsoft Windows has a Terminal program that can be used for this purpose.

1. Connect a straight-through RS232C serial cable with a 25-pin connector with pins 2, 3 and 7 active to the monitor port on the scanner.

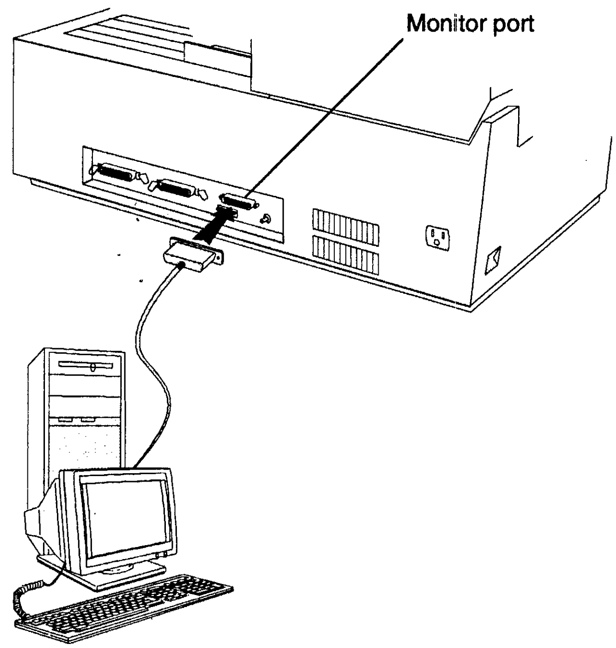


Figure 4-5. Connecting PC to Monitor Port

2. Connect the other end of the cable to either COM1 or COM2 on the PC.

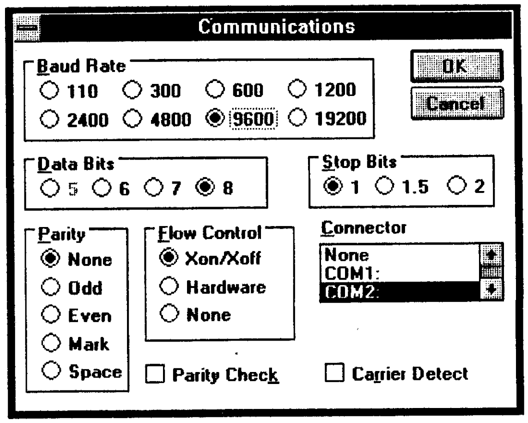
3. Run the PC as a terminal and set the following communication parameters:

Terminal Emulation:	Any, but VT100 not recommended
Baud Rate:	9600
Data Bits:	8
Stop Bits:	1
Parity:	None
Flow Control:	None

To run the PC in terminal mode from Microsoft Windows:

1. Start Windows on the PC and open the Accessories group.

2. Double-click the **Terminal** icon to start the Terminal program. A prompt will appear if the COM port has not been selected. Click **OK**. The Communications dialog box opens. Select the COM port that is being used on the PC and the other options as illustrated below.



3. Choose **Terminal Emulation**, **Communications** and **Terminal Preferences** from the Settings menu to set the communication parameters.

4.5.2 Testing Scanner Operation

The following steps describe how to use the monitor port to test the basic operation of the scanner.

1. Turn the scanner power switch ON.

2. Insert several sheets of paper into the scanner.

3. Type the **7t** command to cycle the scanner and feed the paper.

   NOTE . . . *A "K" response on the monitor screen confirms that the scanner received the command and performed the function.*

4. When finished checking the scanner, exit from terminal mode and disconnect the PC from the monitor port.

Refer to Part III, *Programmer's Reference* if you want to test other functions.

4.6 Verification of the ADF Roller Cover Plate

Verify that the ADF roller hinged cover plate is in good condition by following these steps:

1. Place a straight edge ruler along the cover plate's length (near the front lip and at the rear). Verify that the plate is flat.

2. Slide the straight edge across the cover plate until its edge touches the bottom target glass. Study the point of contact across the beveled section of the glass. Verify that the same point is observed on both ends of the hinged plate.

3. Gently hold the cover plate down using four fingers on the plate's four corners. The plate should rest on its two back hinges and the two front magnetic surfaces without any air gaps.

If the cover plate doesn't meet the above criteria, bend the coverplate to straighten it. Replace the cover plate if it can't be straightened (see Section 5.10.3).

4.7 Cleaning the Mirrors

The mirrors should be cleaned when indicated by the Troubleshooting procedures. The IS520 scanner has mirrors in the upper and lower units.

CAUTION: The mirrors are front surfaced and easily damaged. Care should be taken not to touch this surface when cleaning the mirrors.

4.7.1 Lower Unit Mirror

The lower unit mirror is located below the feed unit. See Figure 2-9 for the location of the mirror assembly.

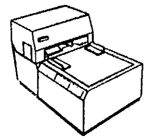
1. Remove the covers and feed unit per Section 5.10.

2. Tilt the mirror assembly up to clear the plastic dust shield and lift it out of the scanner.

3. Clean the mirror with a lens-cleaning type cloth.

4. Replace the mirror assembly, feed unit and covers.

4.7.2 Upper Unit Mirrors - IS520 Only



Clean the upper mirrors if there are problems with the scanned image of the back side of the page. There are three mirrors in the IS520 upper unit. See Figure 2-9 for the location of the mirrors.

1. Remove all of the covers from the upper unit. See Section 5.2.8 for the procedure.

2. Remove the four screws from the upper CPU board (PAGS-1001).

3. Disconnect the cables from P9, P5 and P20 on the CPU board.

   Release the cable clamp holding the P9 cable. This allows enough room to flip the CPU board forward without completely removing it. Flip the CPU board forward.

4. Remove the six screws (three on each side) from the metal shelf located below the CPU board.

   NOTE . . . *If an Image Processor board is installed on the shelf, disconnect the power cable from J6 on the NPS/IP board.*

   If an ink jet endorser board is installed on the shelf, carefully disconnect the Mylar ribbon cable from the NPS/SPA board. See Figure 8-11.

5. Flip the shelf toward the front of the scanner (see Figure 5-28). The three mirrors are now accessible for cleaning.

6. Clean the three mirrors with a lens-cleaning type cloth.

7. Reverse this procedure to reassemble the upper unit.

4.8 Calibrating the Image Format

NOTE . . . This procedure uses the R_Scan program to calibrate the scanner for use with software that utilizes Pixel Translations' driver set.

In order to calibrate the IS510 and IS520 scanners, you must first understand the concept of the scanner's image formats. The IS510 and IS520 scanners have 16 image formats (or format tables); 8 of which are user programmable. Image formats 1-8 are predefined and formats 9-16 are user programmable.

Why are image formats needed? Because the IS510 and IS520 scanners move the paper over a fixed point in the scanner. This is the opposite of flatbed scanners where the optics move and the paper is stationary.

What is an image format? A list of parameters that tell the scanner where and how to look for the image you want to scan.

What are these parameters? This section describes the parameters that are used to calibrate the image format. The other parameters are described in Part III, *Programmer's Reference*, and in the "Formats" document from Improvision.

Study Figure 4-6 to get an idea of what the image position means relative to the scanning window. The physical construction of each scanner makes for small differences in the actual area of scan and document position.

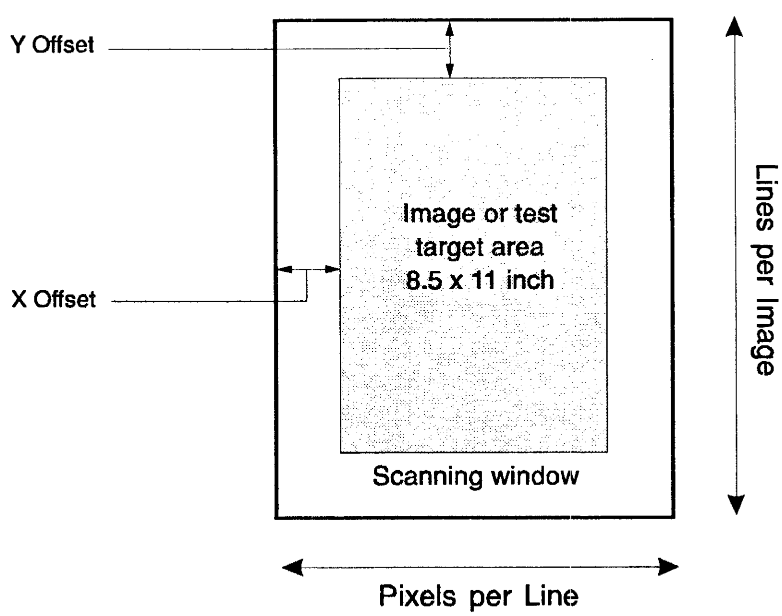


Figure 4-6. Image Position Relative to Scanning Window

What You Need:

- IBM-compatible PC with MS Windows installed. A 1024 x 768 resolution monitor is recommended so you can see the Calibrator dialog box and the scanned image at the same time.
- R_Scan Program. The R_Scan diskette is located on the inside of the back cover of this binder. R_Scan is based on the Pixel Translations' ISIS Tool Kit. The PIXDFLT.DLL is 1.50 and the RICOH520.PXW is 1.37.
- A Target Test Sheet prepared as follows:

  Use a black felt-tip pen to blacken the corners of a sheet of standard white 8-1/2 x 11 inch laser printer paper. Draw black lines hoizontally and vertically to form a cross in the center of the page. Figure 4-7 is an example of what the test sheet should look like.

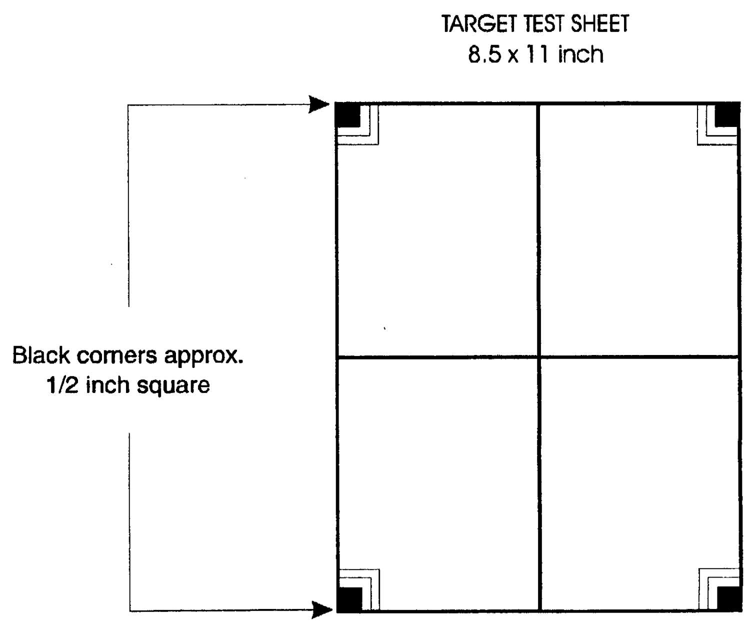
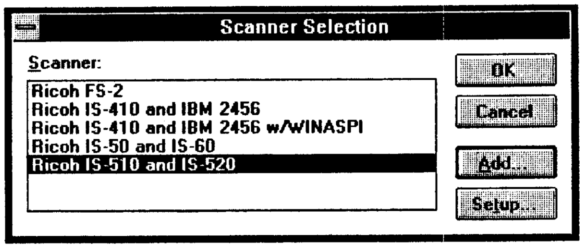


Figure 4-7. Target Test Sheet Example

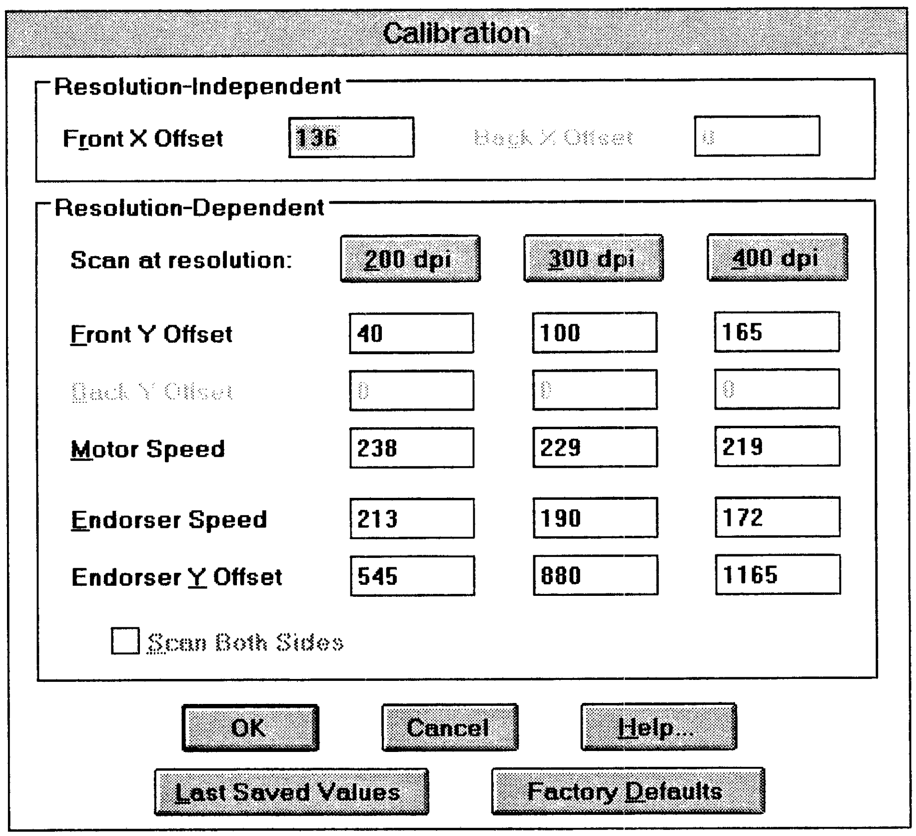
To Calibrate the Image Format:

1. Connect the scanner to the PC and turn the scanner on.
2. Install the R_Scan program as described on the diskette holder or on page 10 of Part II, *Setup and Operation*.
3. Double-click the **R_Scan** icon to start the program.

4. Choose **Select Ricoh Scanner** from the File menu. The Scanner Selection dialog box appears. Select **Ricoh IS510 and IS520** and click **OK**.



5. Choose **Calibrate Ricoh IS510/20** from the File menu. The Calibration dialog box appears. The following is an example of the dialog box for an IS510 scanner. Notice that the Back X Offset, Back Y Offset and Scan Both Sides settings are grayed. These settings are available when using an IS520 scanner.



6. Set the scanner for Automatic feed and insert the Target Test Page into the scanner in portrait orientation. Make sure the paper guides are snug against the page and that the page is inserted all the way into the scanner. You don't want the test page to skew while scanning.

7. Click **200 dpi**, **300 dpi** or **400 dpi** to scan the page at the desired resolution. If **Scan Both Sides** is selected, the IS520 scanner will scan the front and back sides at the same time.

8. Check the scanned image and adjust the settings as needed. For IS520 scanners, adjust the X and Y Offset for the front and back in the same way.

   X Offset. Adjusts the left-to-right image shift. It is resolution independent.

   Y Offset. Adjusts the image registration from top to bottom. It is resolution dependent. The Y Offset is sensitive to the motor speed, so before adjusting the Y Offset, set your motor speeds as follows. These numbers are not cast in stone. Some scanners may be one point higher or lower. (QUESTION: How would they know?)

Motor Speed	200 dpi	300 dpi	400 dpi
With Speed Up Kit	238	229	219
Without Speed Up Kit	233	221	209

4

All Ricoh IS510 and IS520 scanners ship with the Speed Up Kit installed.

Problem	Cause	Action
Left side of image is chopped off	You are starting the scan line too late.	Reduce the X Offset
Right side of the image is missing and there is a white border on the left	You are starting the scan line too early.	Increase the X Offset.
Top of image is chopped off	You are starting the scan line too late.	Decrease the Y Offset.
Bottom of image is chopped off and there is a black line at the top	You are starting the scan line too early.	Increase the Y Offset until you center the image.

9. Rescan the test page to check the adjustment.

   ***NOTE . . .** The Y Offset adjustment must be set for each resolution: 200, 300 and 400 dpi.*

10. When finished making the adjustments, click **OK**. A message appears warning you that the settings have changed. Click **Yes**.

11. Choose **Exit** from the File menu to close R-Scan. A message appears asking if you want to save the 200, 300 and 400 dpi settings. Click **Yes** for each one. The application saves the new parameters to image formats 9, 12 and 13. Pixel Translations uses these image formats for the 200, 300 and 400 dpi settings.

The scanner is now ready to use with any software that utilizes Pixel Translations' driver set.

CHAPTER 5

Removal and Replacement Procedures

Inside this chapter:

This chapter contains removal and replacement procedures for the major assemblies and field replaceable units (FRUs) in the IS510 and IS520 scanners. These procedures should only be performed by qualified service technicians.

NOTE . . . *The procedures that only apply to the IS520 scanner are identified in the section name and marked with an IS520 icon. All other procedures apply to either the IS510 or IS520 scanner regardless of the scanner shown in the figures.*

CAUTION: Before removing any of the covers:

- Turn the scanner's power switch OFF.
- Remove the power cord from the rear of the scanner.
- Turn OFF the host computer and any peripheral devices attached to the scanner.
- Remove the SCSI cables and terminator (if used) or any optional interface cables from the scanner.

5

5.1 Document Table and Top Board Cover

The document table and top board cover can be removed to gain access to other parts.

Observe the above Caution when removing the document table and top board covers.

To install the document table and top board cover, perform these procedures in reverse order.

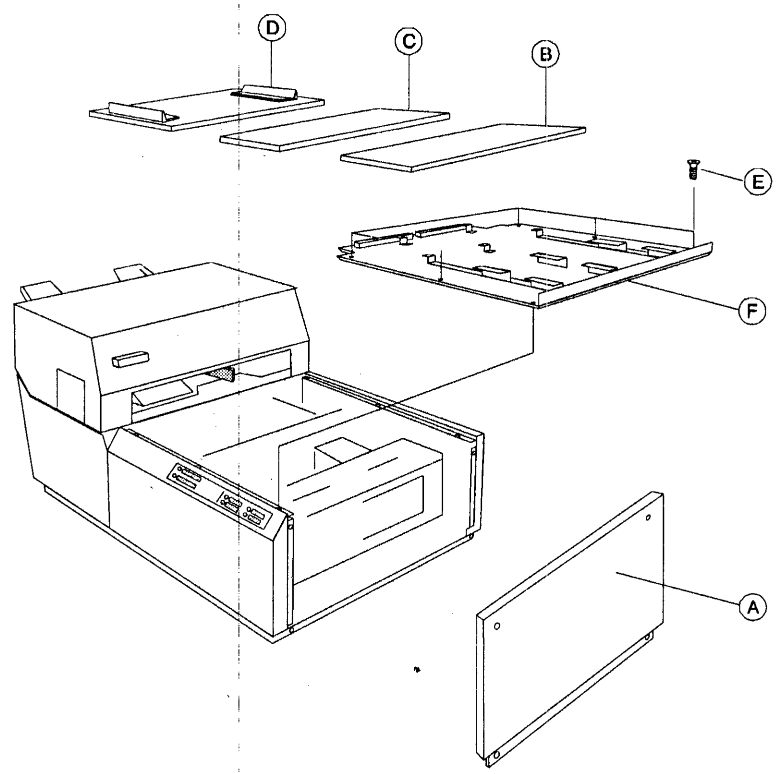


Figure 5-1. Removing the Document Table and Top Board Cover

5.1.1 Document Table Plates

1. Remove the right cover (A) See Section 5.2.2 for the procedure.
2. Lift up the right document table plate (B) and remove it.
3. Lift up the center document table plate (C) and remove it.
4. Lift up the left document table plate (D) be sure to clear the notch on the left rear of the plate and remove it.

5.1.2 Top Board Cover

1. Remove the right cover and document table plates.
2. Remove the six brass screws (E) securing the top board cover.
3. Lift up the right side of the top board cover (F), slide it to the right and remove it.

5.2 Covers

Observe the Caution on page 5-1 when removing any of the covers.

To replace the covers, perform the procedures in the reverse order.

5.2.1 Front-right Cover

1. Remove the four chrome screws (A), at each corner of the bottom edge and at the top and bottom on the cover on the right side.
2. Remove the front-right cover (B).

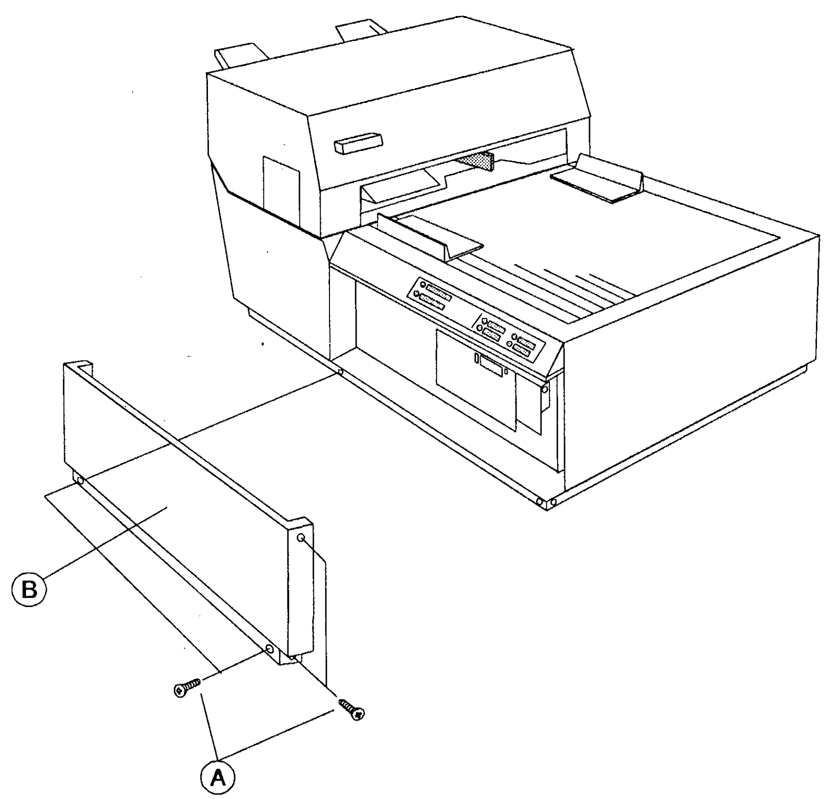


Figure 5-2. Removing the Front-right Cover

5.2.2 Right Cover

1. Remove the four chrome screws (A) securing the right cover to the scanner.

2. Remove the right cover (B).

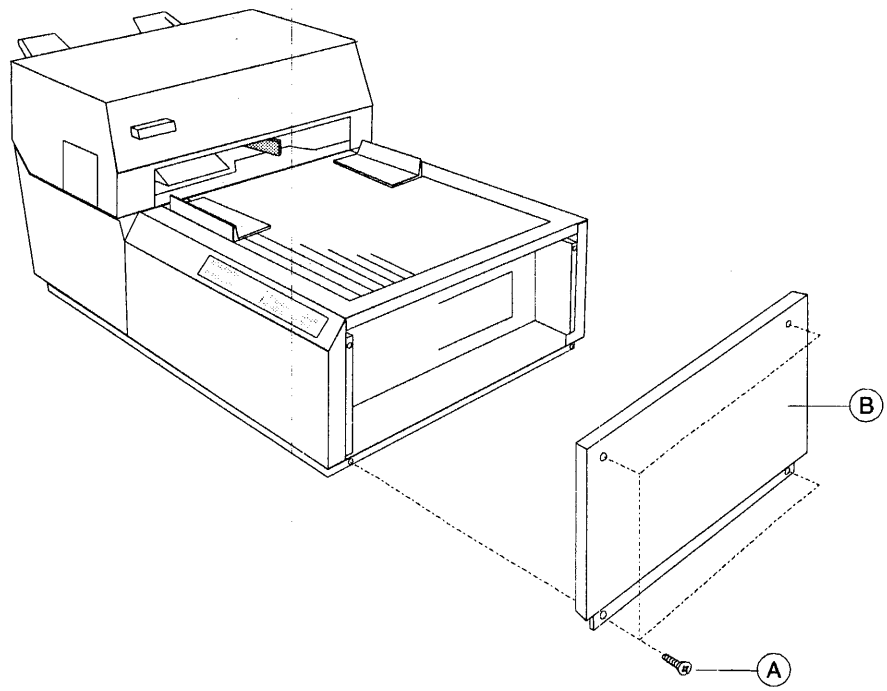


Figure 5-3. Removing the Right Cover

5.2.3 Left Cover

1. Remove the six screws (A), four on the left side and two at the top and bottom of the rear side of the left cover.

2. Remove the left cover (B).

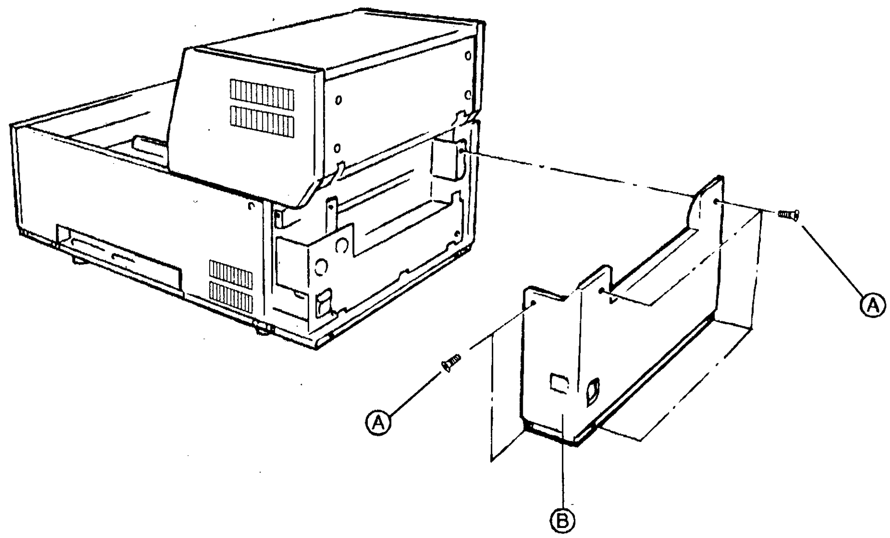


Figure 5-4. Removing the Left Cover

5.2.4 Rear Cover

1. Remove the document table plates (A). See Section 5.1.1 for the procedure.
2. Remove the two brass screws (B-1) securing the top edge of the rear cover.
3. Remove the five chrome screws (B-2), four along the bottom edge and one at the top left corner of the rear cover.
4. Remove the rear cover (C).

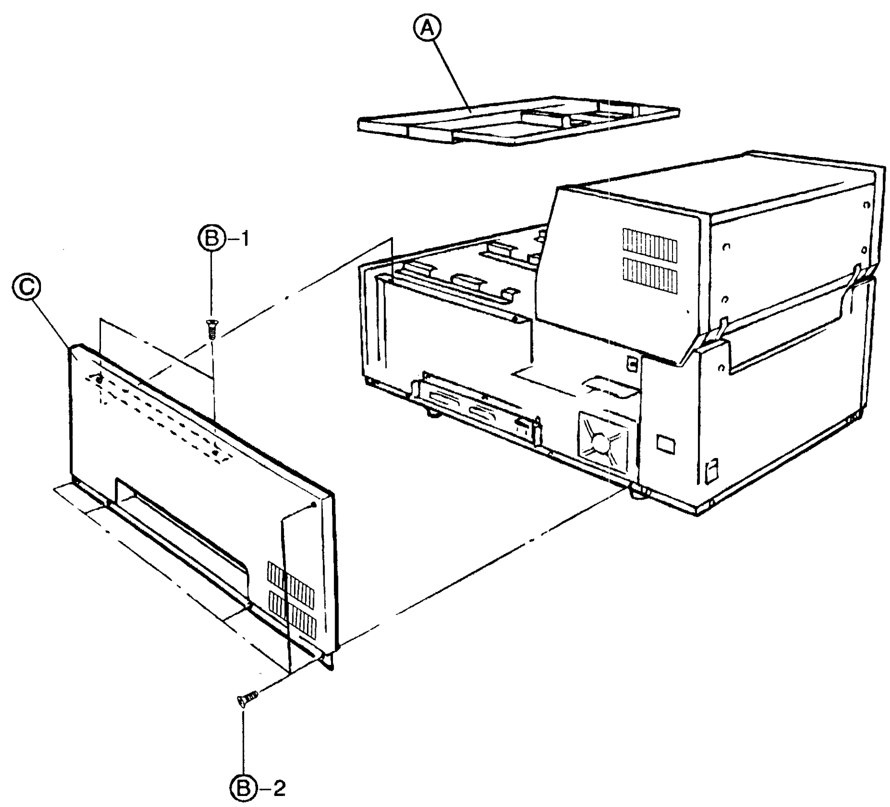


Figure 5-5. Removing the Rear Cover

5.2.5 Front-left Lower Cover

1. Remove the three screws (A) from the front-left lower cover.

2. Remove the front-left lower cover (B).

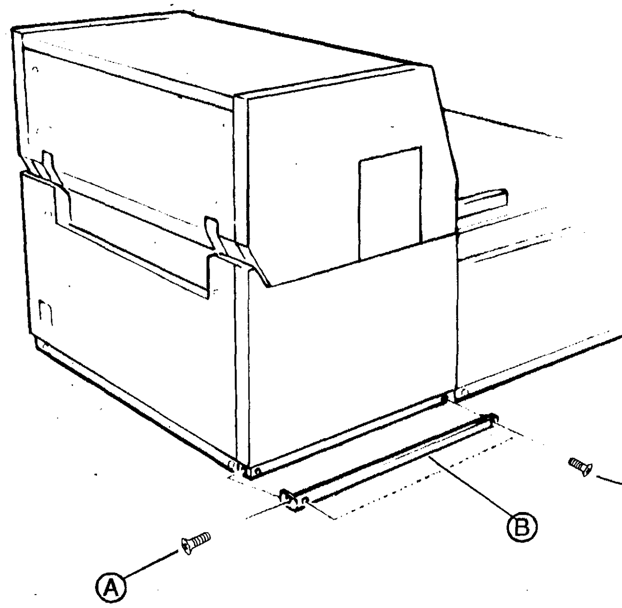


Figure 5-6. Removing the Front-left Lower Cover

5.2.6 Indicator Panel Cover

1. Remove the document table plates (A). See Section 5.1.1 for the procedure.

2. Remove the front-right cover (B). See Section 5.2.1 for the procedure.

3. Remove the six screws (C), three on the top and bottom of the indicator panel cover.

4. Remove the indication panel cover (D).

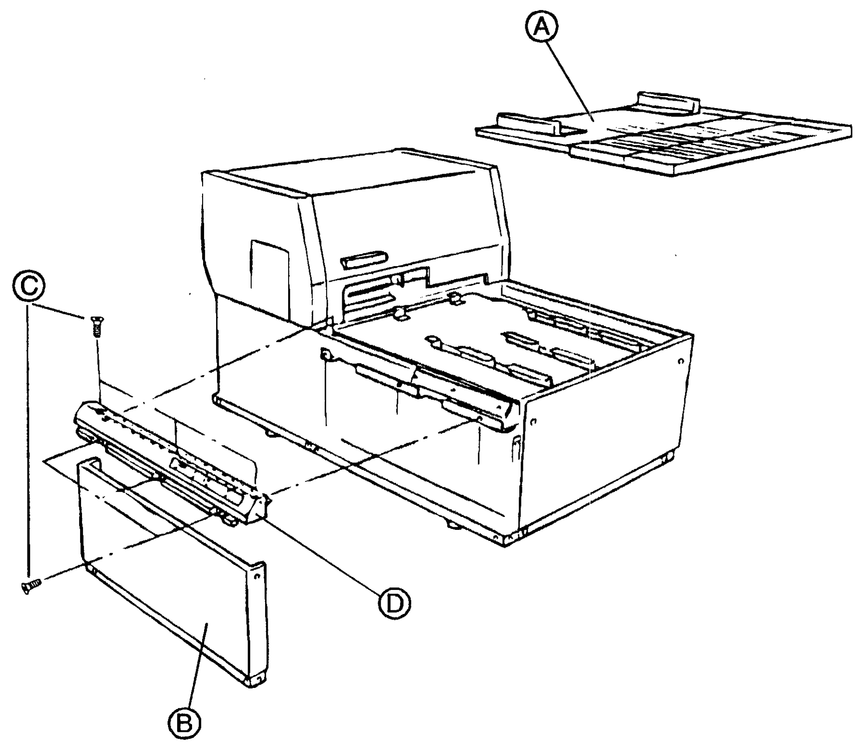


Figure 5-7. Removing the Indicator Panel Cover

5.2.7 IS510 Upper Unit Covers

To remove all of the upper unit covers, perform the procedures in the order given below.

To open the upper unit, place your thumb on top of the upper unit cover and squeeze the release lever to unlock the upper unit so you can raise it.

To close the upper unit, press down firmly on the cover until the lock lever clicks.

To replace the covers, perform the procedures in the reverse order.

5.2.7.1 Front Cover of Upper Unit

1. Open the upper unit (A).
2. Remove the two brass screws (B) located inside the bottom edge of the front cover.
3. Remove the front cover (C) by lifting it up to release it from the clips along the upper edge.

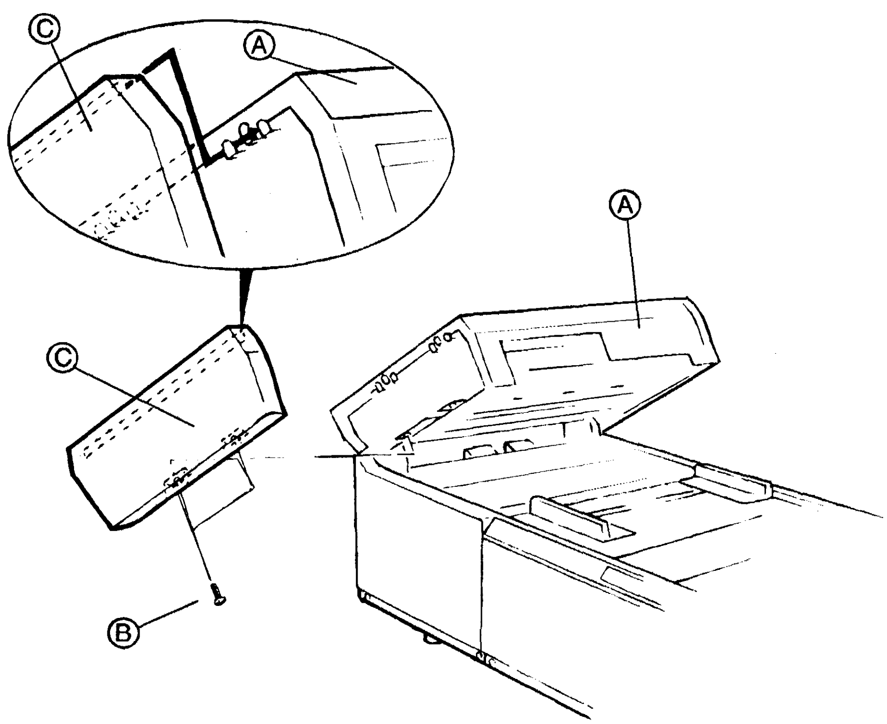


Figure 5-8. Removing Front Cover of IS510 Upper Unit

5.2.7.2 Rear Cover of Upper Unit

1. Open the upper unit (A).

2. Remove the two brass screws (B) located inside the bottom edge of the rear cover.

3. Remove the rear cover (C) by lifting it up to release it from the clips along the upper edge.

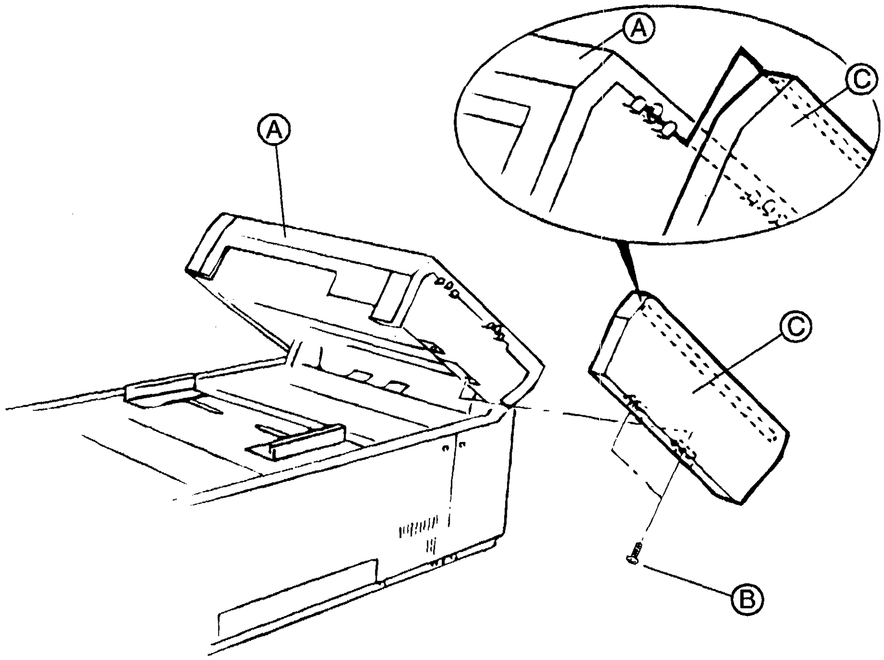


Figure 5-9. Removing Rear Cover of IS510 Upper Unit

5.2.7.3 Top Cover of Upper Unit

1. Remove the front (A) and rear (B) covers from the upper unit.
2. Remove the four brass screws (C) located along the top edge on the front and rear sides of the upper unit.
3. Remove the top cover (D).

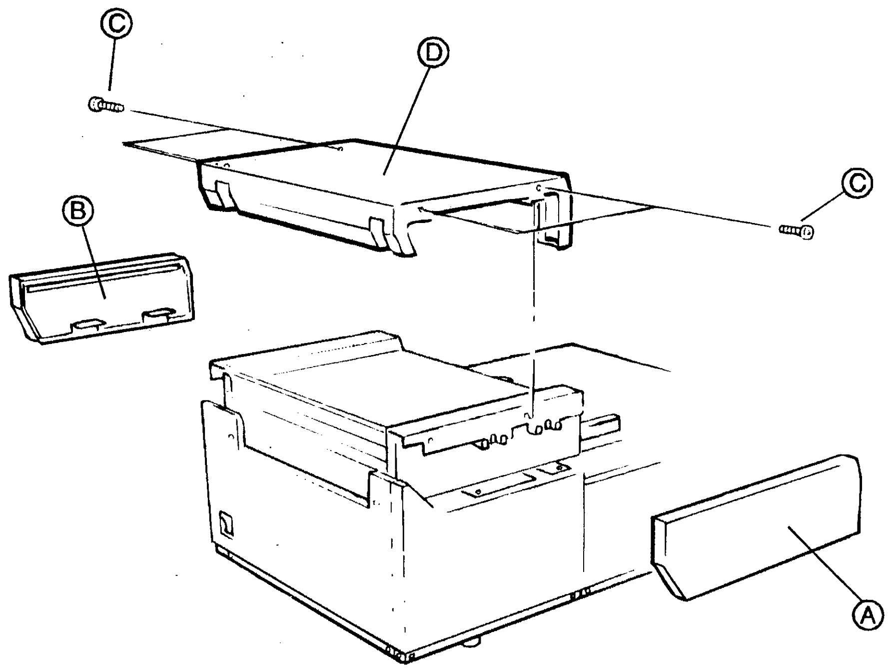
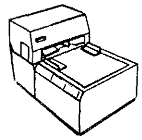


Figure 5-10. Removing Top Cover of IS510 Upper Unit

5

5.2.8 IS520 Upper Unit Covers



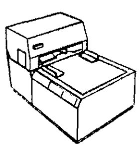
To remove all of the upper unit covers, perform the procedures in the order given below.

To open the upper unit, place your thumb on the handle and squeeze the release lever to unlock the upper unit so it can be raised.

To close the upper unit, press firmly on the cover until the lock lever clicks.

To replace the covers, perform the procedures in the reverse order and install the lamp A assembly.

5.2.8.1 Left Cover of Upper Unit



Remove the four chrome screws (A) securing the left cover of the upper unit and remove the cover (B).

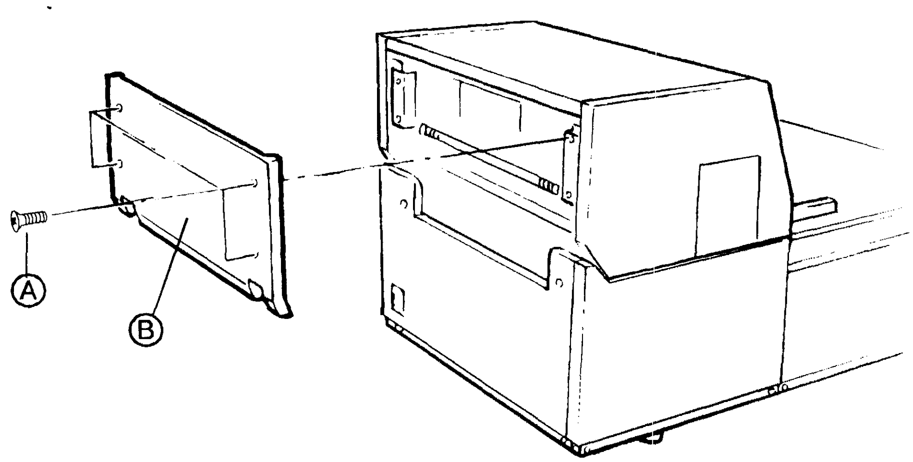
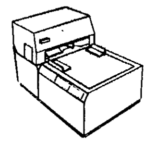


Figure 5-11. Removing Left Cover of IS520 Upper Unit

5.2.8.2 Front Cover of Upper Unit



1. Open the lamp A access door and remove the lamp A assembly (A) per Section 5.5.2 and close the lamp access door.

WARNING: The fluorescent lamp retains a great deal of heat. DO NOT touch the surface of the lamp immediately after turning it off. Allow at least 10 minutes for the lamp to cool down.

---

2. Remove the left cover from the upper unit (B)

3. Remove the brass screw located at the top of the front cover edge (C-1).

4. Open the upper unit (D).

5. Remove the two brass screws (C-2) located inside the bottom edge of the front cover.

6. Remove the front cover (E) by lifting it up to release it from the clips along the upper edge (F).

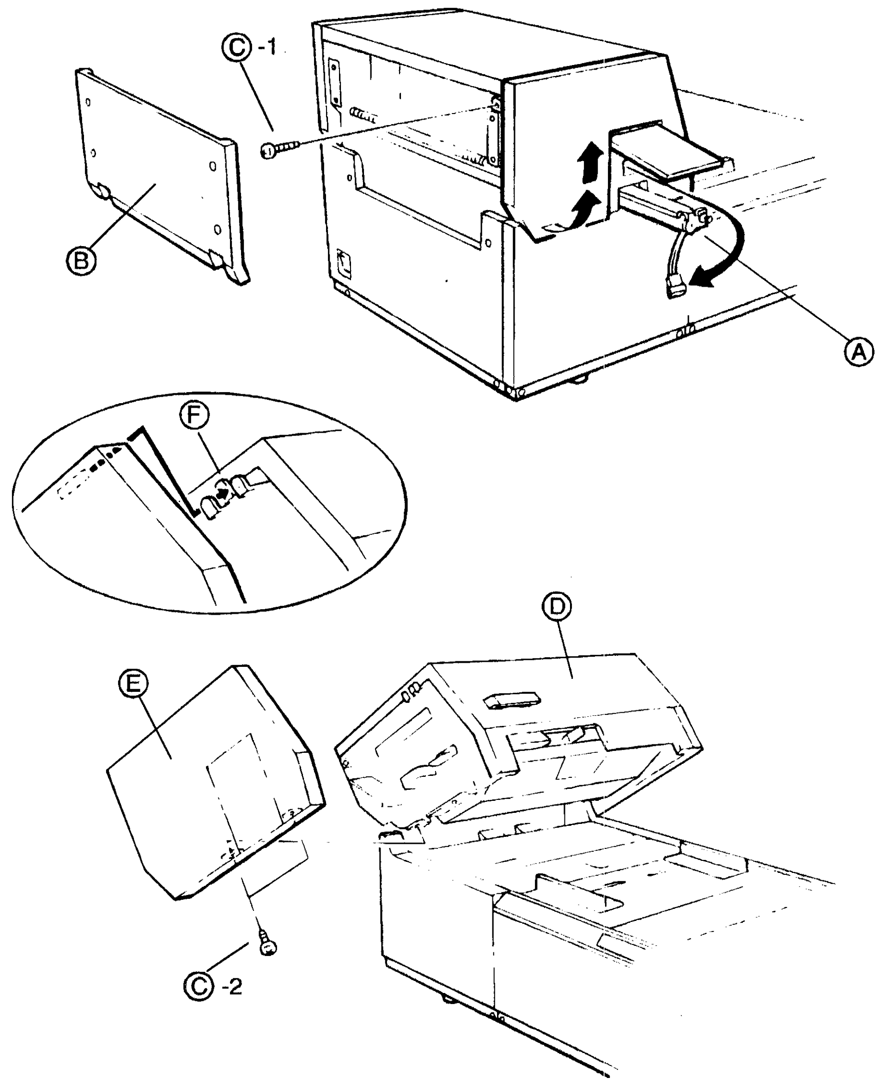
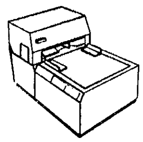


Figure 5-12. Removing Front Cover of IS520 Upper Unit

5.2.8.3 Rear Cover of Upper Unit



1. Remove the left cover from the upper unit (A)

2. Remove the brass screw located at the top of the rear cover edge (B-1).

3. Open the upper unit (C).

4. Remove the two brass screws (B-2) located inside the bottom edge of the rear cover.

5. Remove the rear cover by lifting it up to release it from the clips along the upper edge (D).

5

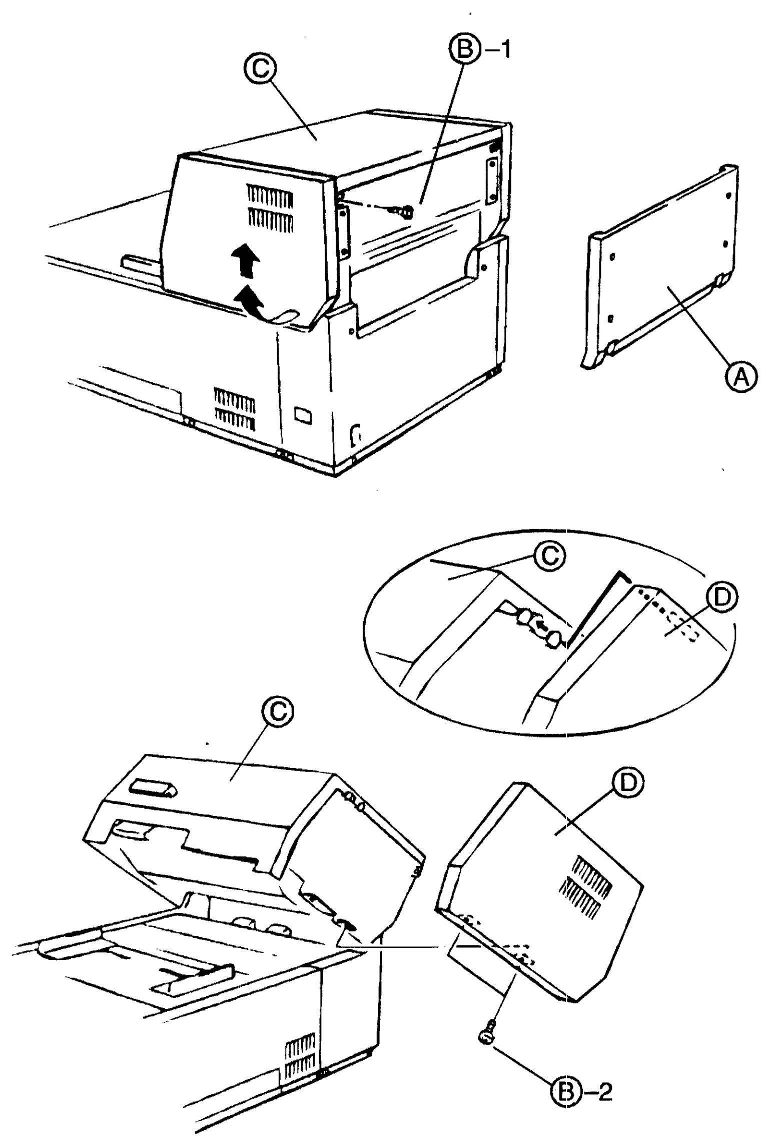
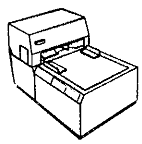


Figure 5-13. Removing Rear Cover of IS520 Upper Unit

5.2.8.4 Top Cover of Upper Unit



1. Remove the left (A), front (B) and rear (C) covers from the upper unit.

2. Remove the four brass screws (D) located along the top edge on the front and rear sides of the upper unit.

3. Remove the top cover (E).

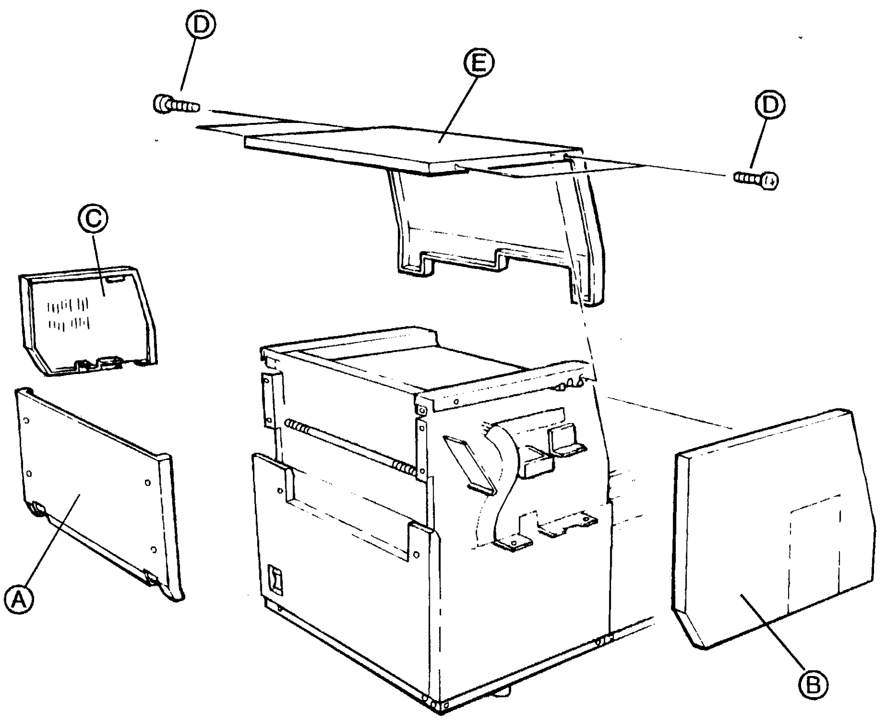


Figure 5-14. Removing Top Cover of IS520 Upper Unit

5.2.9 Lamp B Door Assembly

1. Open the upper unit (A).
2. Open the lamp B access door (B)
3. Remove the lamp B assembly. See Section 5.5.1 for the procedure.
4. Remove the four screws (D) that secure the door assembly to the scanner. Separate the door assembly from the scanner.
5. Disconnect the lamp B connector (F) from the door assembly.
6. Disconnect the counter connector (H).
7. Remove the door assembly (E).
8. Press the counter claw (G) from the inside of the door assembly to remove the counter.

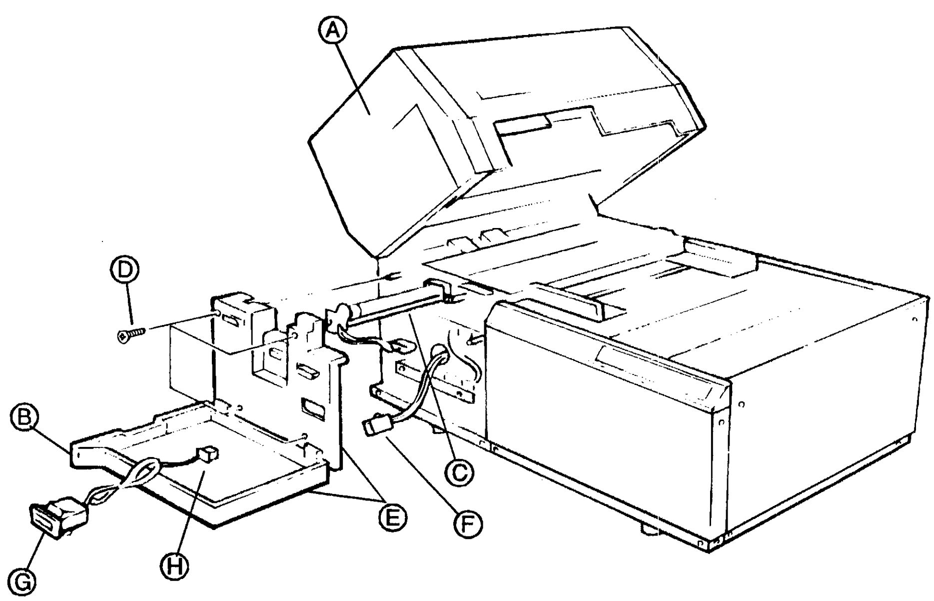
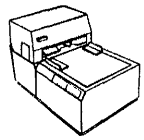


Figure 5-15. Removing the Lamp B Door Assembly

To replace the lamp B door assembly, perform the procedure in the reverse order.

5.3 Removing Upper Unit - IS520 Only



1. Open the lamp A (upper) access door and remove the lamp A assembly (A) per Section 5.5.2. Close the lamp A access door.

WARNING: The fluorescent lamp retains a great deal of heat. DO NOT touch the surface of the lamp immediately after turning it off. Allow at least 10 minutes for the lamp to cool down.

---

2. Remove all of the covers (B), (C), (D) and (H) from the upper unit per Section 5.2.8.

3. Remove the upper CPU board (I). See Section 5.17.2 for the procedure.

   NOTE . . . *If any optional boards are installed in the upper unit, remove them as well.*

4. Remove the lamp B door assembly (E). See Section 5.2.9 for the procedure.

5. Remove the two screws (F) that secure the hinge stopper to the left side of the upper unit. Remove the hinge stopper (G).

6. Open the upper unit 90 degrees.

7. Disconnect the five connectors (J).

8. Remove the rear cover (K). See Section 5.2.4 for the procedure.

9. Disconnect the connector (L) from the rear side of the upper unit.

10. Loosen the two screws (M) on the rear side of the upper unit, then turn the lock plate (N) 90 degrees. Perform the same procedure on the front side.

11. Slowly lift up the upper unit to remove it from the scanner.

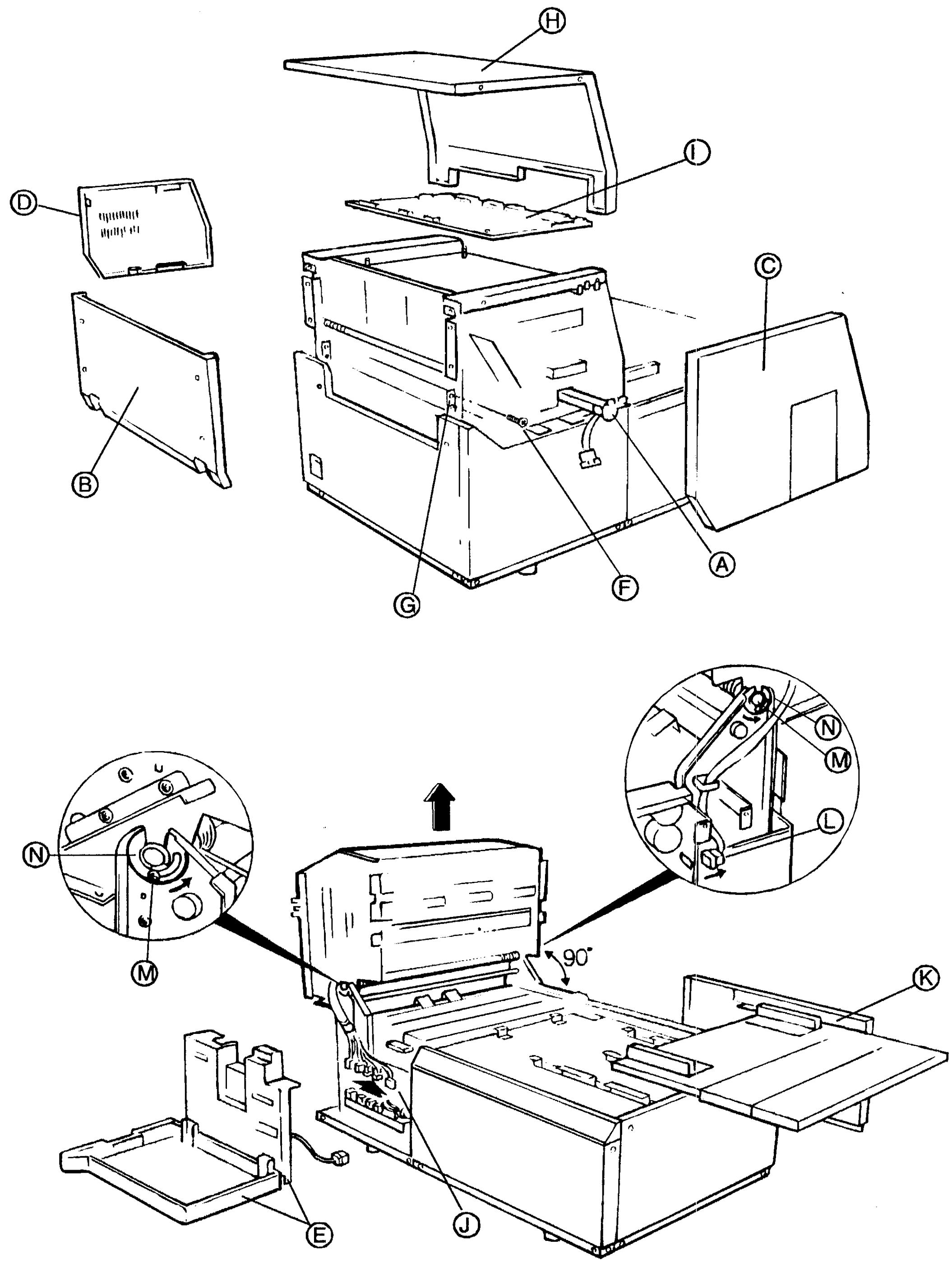


Figure 5-16. Removing IS520 Upper Unit

To replace the upper unit, perform the procedures in the reverse order.

5.4 Output Tray

Pull the output tray (A) from the output tray fixing slit (B).

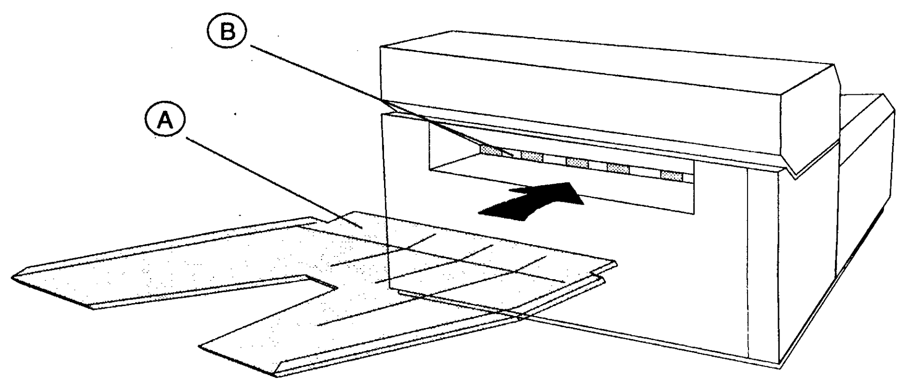


Figure 5-17. Removing the Output Tray

To replace the output tray, perform the procedure in the reverse order.

5.5 User Replaceable Parts

The following components have a limited life and can be replaced by the user.

5.5.1 Lamp B (lower unit)

ADJUSTMENT NOTE: When the lamp is replaced with a different color lamp, the CCD Camera Dynamic Range adjustment must be performed. See Section 6.3.3 and Section 7.5 for details.

WARNING: The fluorescent lamp retains a great deal of heat. DO NOT touch the surface of the lamp immediately after turning it off. Allow at least 2 minutes for the lamp to cool down.

1. Turn the scanner's power switch OFF and wait at least 2 minutes before continuing.

2. Open the lamp B access door (A).

3. Disconnect the connector (B) between the lamp unit and the main unit.

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4. Pull straight and slowly on the snap-lock button (C) to slide the lamp unit out of the scanner.

CAUTION: DO NOT pull the lamp unit by the connector or the cable. Always pull it by holding the snap-lock button.

5. Wipe the new lamp with a clean soft cloth to remove any fingerprints or smudges.

6. Align the new lamp unit with the channel in the lower unit and insert it straight until it stops. Move the lamp unit in straight and slowly, do not use force.

   Make certain that the lamp unit fits securely into the channel.

7. Press the snap-lock button and connect the connector (B).

8. Close the lamp B access door.

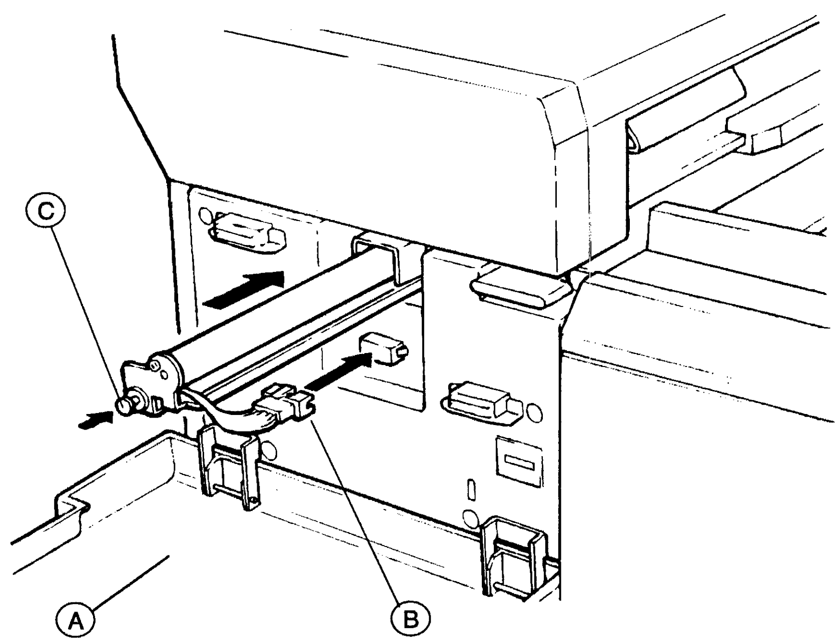
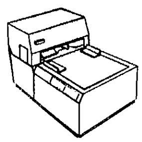


Figure 5-18. Replacing Lamp B

5.5.2 Lamp A (upper unit) - IS520 Only



ADJUSTMENT NOTE: When the lamp is replaced with a different color lamp, the CCD Camera Dynamic Range adjustment must be performed. See Section 6.3.3 and Section 7.5.

WARNING: The fluorescent lamp retains a great deal of heat. DO NOT touch the surface of the lamp immediately after turning it off. Allow at least 2 minutes for the lamp to cool down.

1. Turn the scanner's power switch OFF and wait at least 2 minutes before continuing.

2. Open the lamp A access door (A).

3. Disconnect the connector (B) between the lamp unit and the main unit.

4. Pull straight and slowly on the snap-lock button (C) to slide the lamp unit out of the scanner.

   CAUTION: DO NOT pull the lamp unit by the connector or the cable. Always pull it by holding the snap-lock button.

5. Wipe the new lamp with a clean soft cloth to remove any finger-prints or smudges.

6. Align the new lamp unit with the channel in the main unit and insert it straight until it stops. Move the lamp unit in straight and slowly, do not use force.

   Make certain that the lamp unit fits securely into the channel.

7. Press the snap-lock button and connect the connector (B).

8. Close the lamp A access door.

5

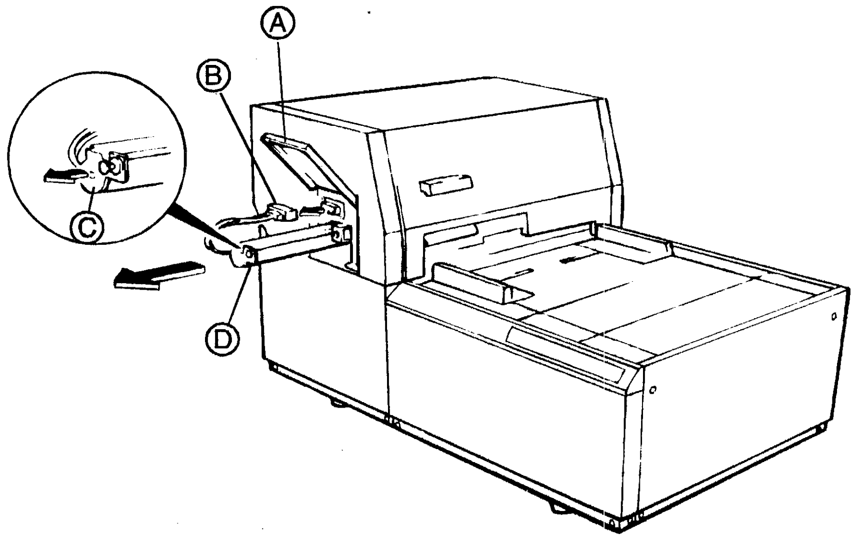


Figure 5-19. Replacing Lamp A

5.5.3 ADF Pickup Roller and ADF Feed Roller

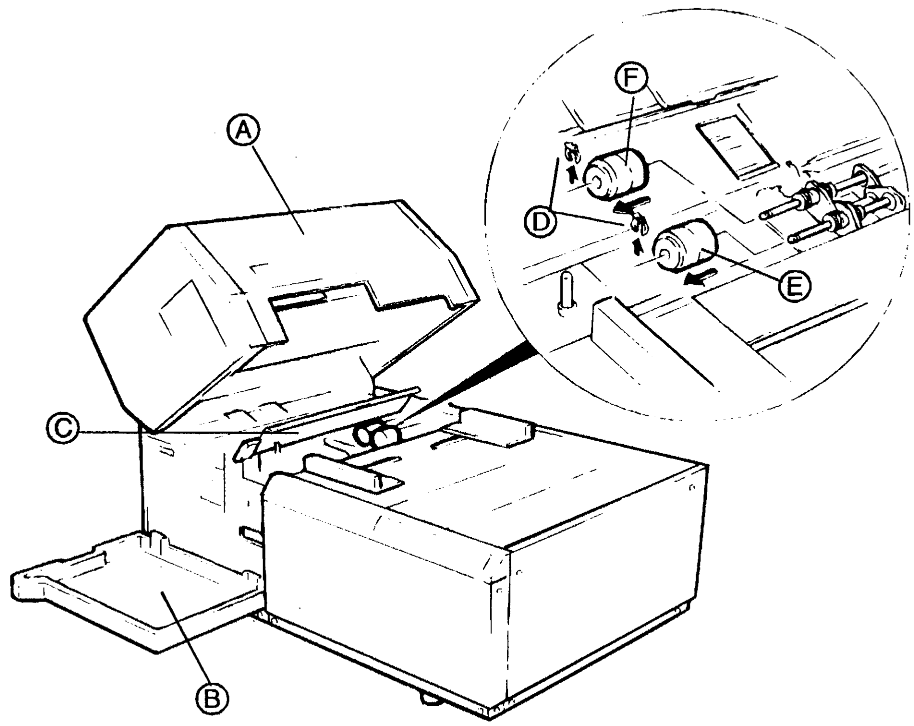


Figure 5-20. Removing the ADF Pickup Roller and ADF Feed Roller

NOTE . . . If the document guide adapters for small documents are installed on the scanner, remove them before replacing the rollers.

1. Open the upper unit (A).
2. Open the lamp B access door (B).
3. Open the feed roller cover (C).
4. Remove the snap rings (D) from the pickup roller (E) and the feed roller (F) by holding the roller with one hand while lifting the claws of the rings upward. Remove the two rollers by pulling them off to the side as indicated by the arrows.

CAUTION: DO NOT drop the snap rings into the scanner when removing and replacing them.

5

5. Insert the new feed roller and pickup roller as indicated by the arrows in the illustration and attach the snap rings. The feed roller has a red stripe.

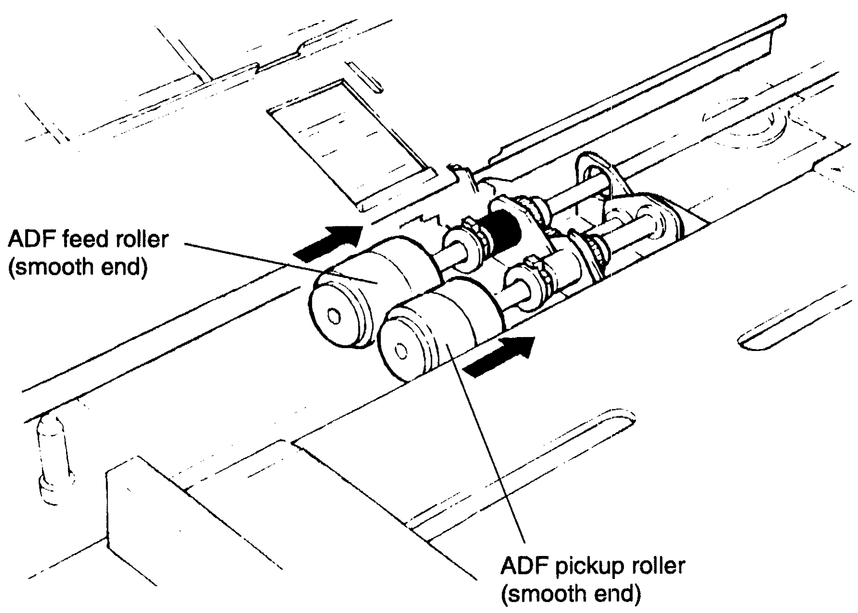


Figure 5-21. Replacing the ADF Pickup Roller and ADF Feed Roller

NOTE . . . When installing the rollers be sure that the smooth end faces toward the front of the scanner.

6. To verify that the rollers are installed properly:

   Gently turn the rollers in the normal paper direction (counterclockwise if viewed from the front side of the scanner). Both rollers should move freely with no resistance applied to the ADF shaft.

   Try to rotate either roller in the opposite direction. A resistance should be felt.

7. Close the feed roller cover, lamp B access door and upper unit.

5.5.4 Separation Cartridge

1. Set the feed lever for automatic feeding (move the lever toward the front of scanner).

2. Open the upper unit (A).

3. Grasp the separation cartridge (B) and pull it out in the direction indicated by the arrow, releasing it from the fixing spring (C).

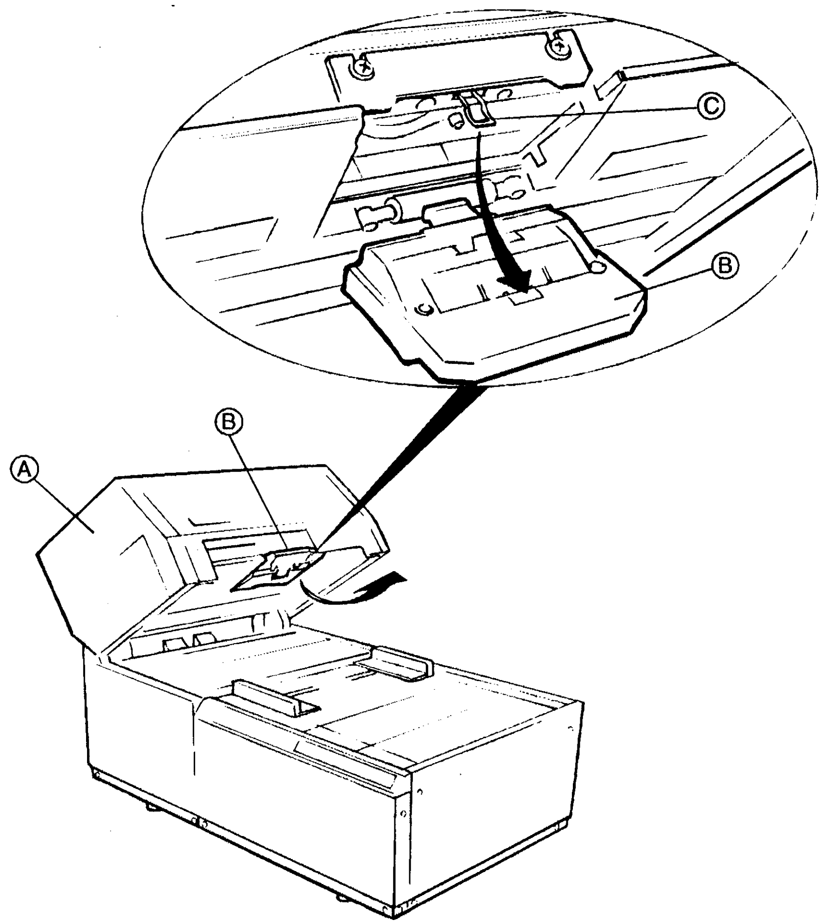


Figure 5-22. Removing the Separation Cartridge

4. Pull the red, arrow-shaped spacer out of the new cartridge.

5. Holding the new cartridge as shown, set the projection on the side of the cartridge into the aperture indicated by the arrow, then press the cartridge firmly until it clicks.

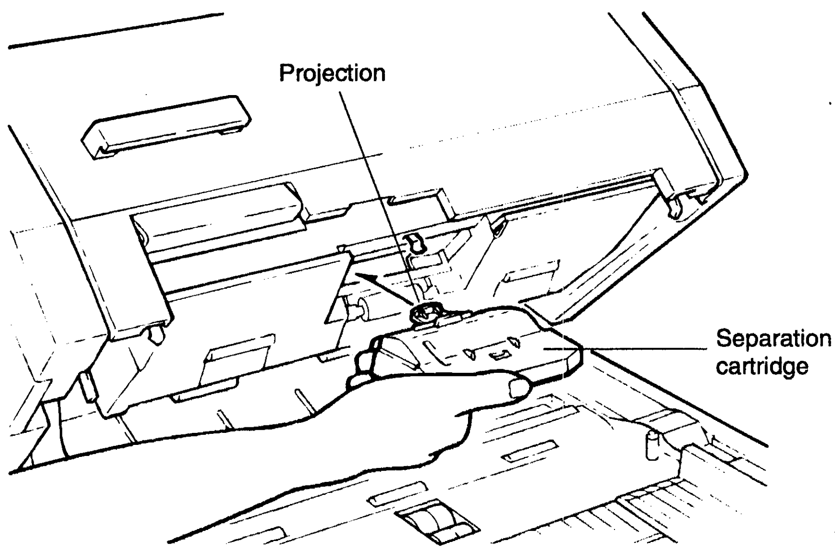


Figure 5-23. Replacing the Separation Cartridge

6. With the upper unit open, move the feed lever between the Automatic and Manual positions. Verify that the movement is not jammed (friction is OK). Note that the two separation blades retract when the feed lever is in the Manual position.

7. Close the upper unit.

5.6 Contact Glasses

CAUTION: Do not touch the surface of the contact glasses with your hands. To clean the contact glasses, wipe with a glass-cleaning type cloth.

5.6.1 Lower Contact Glass

1. Open the upper unit (A).
2. Remove the two screws (B), then remove the two fixing boards (C).
3. Lift the contact glass (D) out of the scanner.
4. Wipe the white reference plate (E) with a clean dry cloth to remove any dust.
5. Hold the replacement contact by the edges or with a clean dry cloth and place it into position.
6. Place the two fixing boards on the contact glass and insert the screws.
7. Close the upper unit.

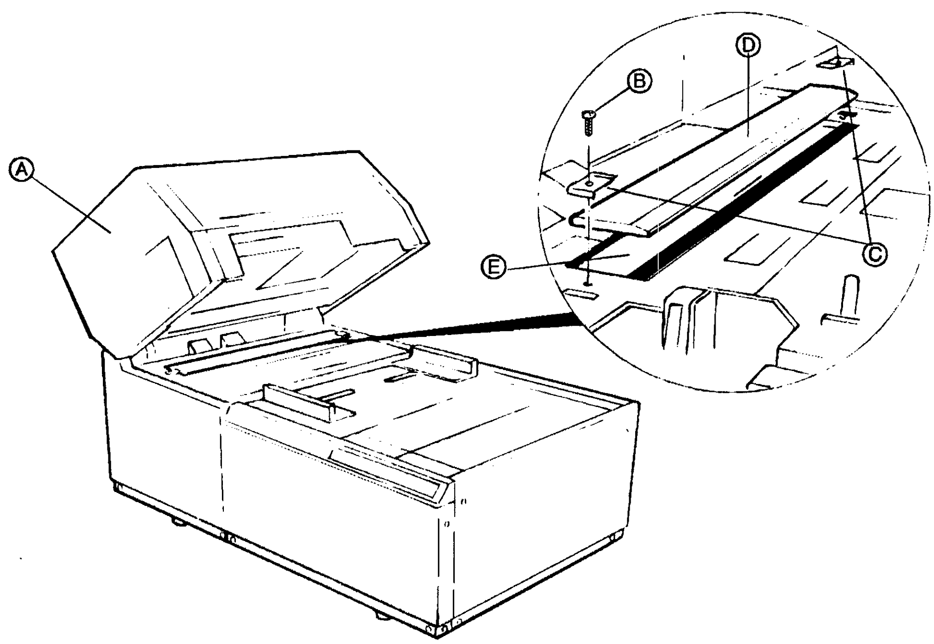


Figure 5-24. Replacing the Lower Contact Glass

5.6.2 Upper Contact Glass

1. Open the upper unit (A).
2. Press the center of the upper contact glass (B) and move toward the front of the scanner.
3. Remove the contact glass (D) from the lock bands (C) and lift it out of the scanner.
4. Wipe the white reference plate (E) with a clean dry cloth to remove any dust.
5. Hold the replacement contact with a clean dry cloth and insert it into the lock bands.
6. Press the center of the contact glass and move toward the rear of the scanner.

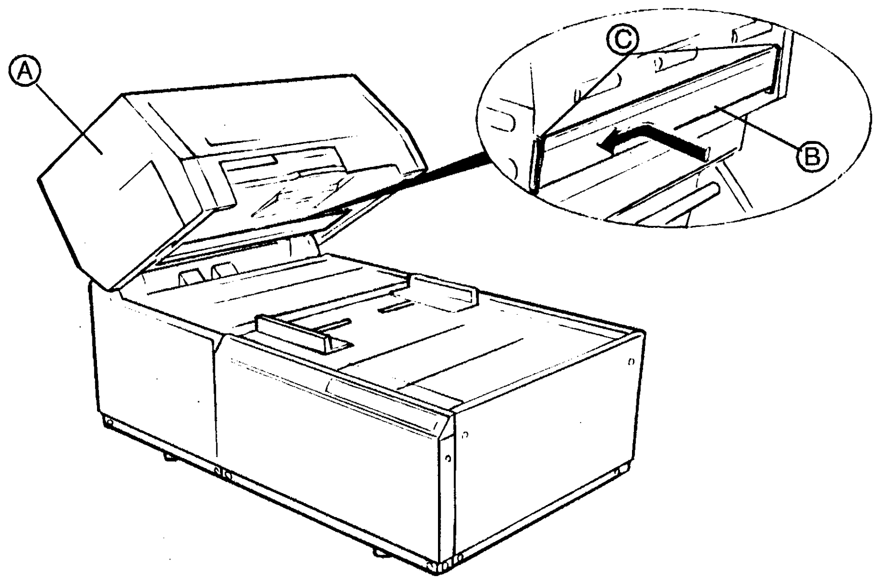


Figure 5-25. Replacing the Upper Contact Glass

The upper and lower contact glasses must be set as shown below.

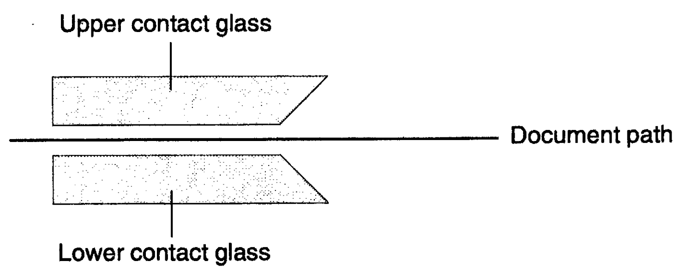


Figure 5-26. Upper and Lower Contact Glass Positions

6. Close the upper unit.

5.7 Mirrors

5.7.1 Lower Unit Mirror

The mirror is located below the feed unit. See Figure 2-9 for the location of the mirror assembly.

1. Remove the covers and feed unit per Section 5.10.
2. Tilt the mirror assembly up to clear the plastic dust shield and lift it out of the scanner.
3. Remove the spring clips (A) from the ends of the mirror (B) and slide the mirror out of the bracket.

To replace the mirror:

1. Slide the replacement mirror into the bracket and lock it in position with the spring clips.

CAUTION: The mirror is front surfaced and is easily damaged. Care should be taken not to touch this surface. Hold the mirror by the edges or wrap a lint-free cloth around the mirror.

2. The easiest way to fit the mirror assembly behind the plastic dust shield is to insert the mirror assembly from the front side with the right end of the bracket behind the plastic shield, then slide the assembly across the scanner. Check to be sure the shield isn't caught on bent.
3. Fit the mirror assembly over the two alignment pins.
4. Clean the mirror with a lens cleaning type cloth.
5. Replace the feed unit.

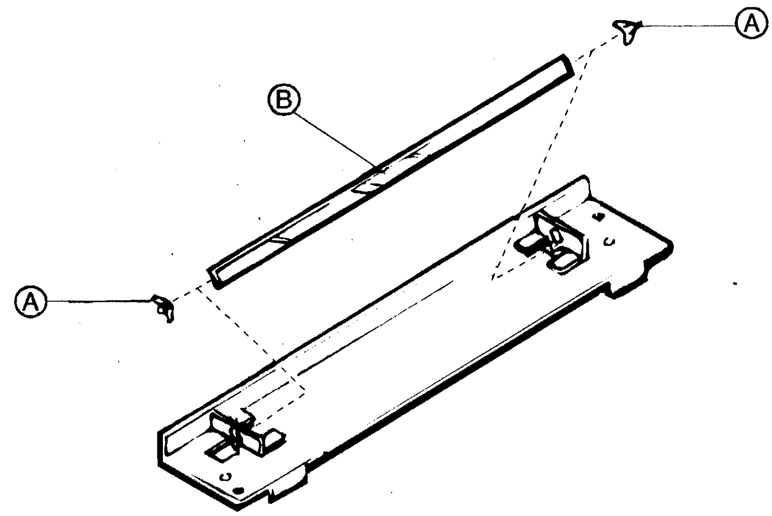
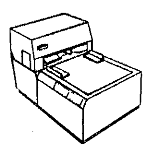


Figure 5-27. Replacing Mirror Assembly

5.7.2 Upper Unit Mirrors - IS520 Only



There are three mirrors in the IS520 upper unit.

Observe the caution on page 5-1 when removing the covers.

1. Remove all of the covers from the upper unit. See Section 5.2.8 for the procedure.

2. Remove the four screws from the upper CPU board (PAGS-1001).

3. Disconnect the cables from P9, P5 and P20 on the CPU board. Release the cable clamp (A) holding the P9 cable. This allows enough room to flip the CPU board forward without completely removing it. Flip the CPU board forward.

   NOTE . . . *If only mirror No. 3 (D) is being replaced, steps 4 through 6 are not required.*

4. Remove the six screws (three on each side) from the metal shelf located below the CPU board.

   NOTE . . . *If an Image Processor board is installed on the shelf, disconnect the power cable from J6 on the NPS/IP board.*

   If an ink jet endorser board is installed on the shelf, carefully disconnect the Mylar ribbon cable from the NPS/SPA board. See Figure 8-11.

5. Flip the shelf toward the front of the scanner (A). The mirrors are located as illustrated in Figure 5-28: mirror No. 1 (B), mirror No. 2 (C) and mirror No. 3 (D).

6. Remove the upper unit fan (E) per Section 5.9.2.

7. Remove the two screws from the retaining bracket (F) on the fan end of the mirror.

8. Remove the retaining spring (G) from the fan end of the mirror. Hold the spring on the opposite side of the mirror in position so it doesn't pop out when you move the mirror.

9. Remove the retaining spring from the opposite side and slide the mirror out of the scanner.

> **CAUTION:** The mirror is front surfaced and is easily damaged. Care should be taken not to touch this surface. Hold the mirror by the edges or wrap a lint-free cloth around the mirror.

10. Remove the other mirrors in the same way.

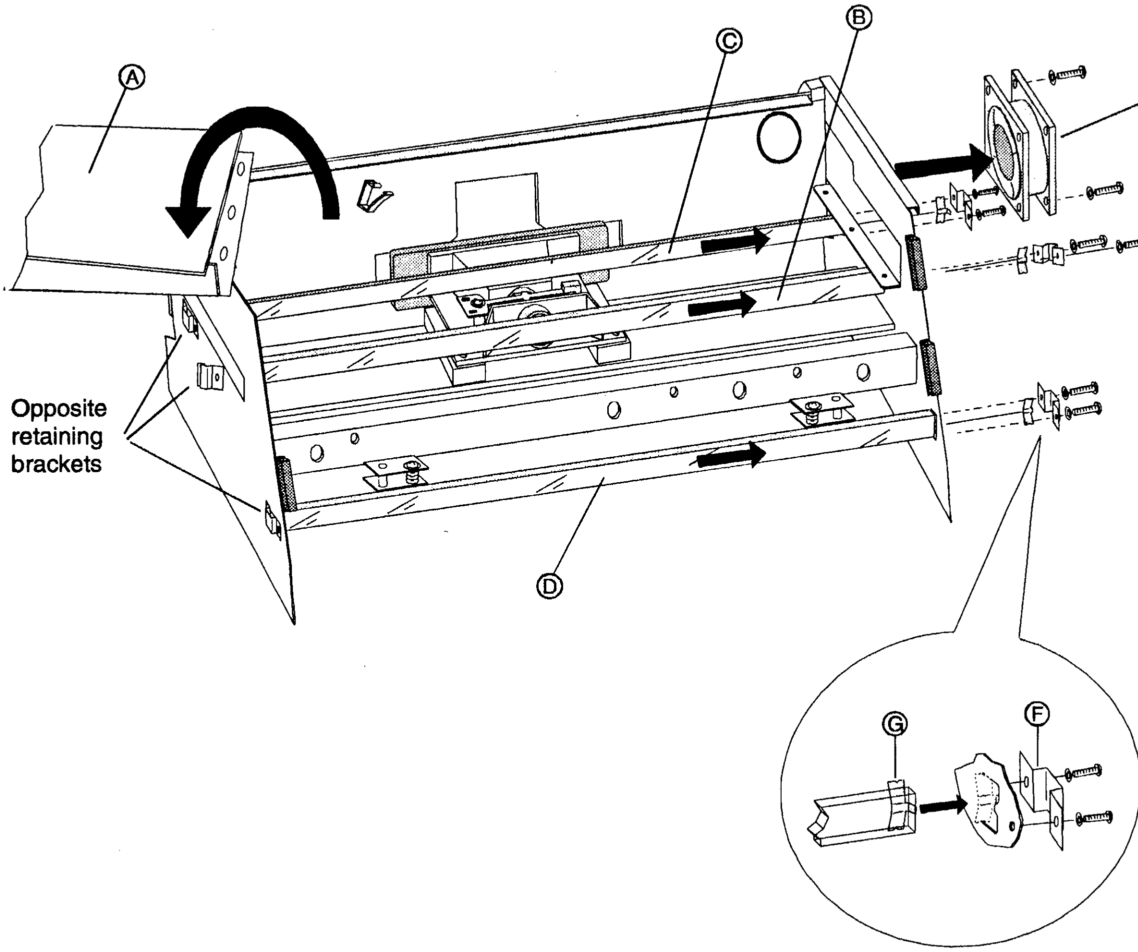


Figure 5-28. Replacing the IS520 Upper Unit Mirrors

To replace the mirrors, perform this procedure in the reverse order.

To mount a mirror, push its glass side into the retaining bracket on the front side of the scanner, then attach the spring and bracket on the fan side. Compress and slide the spring into the front side after the mirror is secured.

CAUTION:

- To mount a mirror correctly, turn its reflecting side down. There is a stamp on the back side of the mirror. Use this stamp to determine the reflecting and backside of the mirror.
- DO NOT touch the reflecting side of the mirror. If the reflecting side is dirty, wipe it with a soft, dry glass-cleaning type cloth.

5.8 Sensors

5.8.1 ADF Sensor

1. Open the upper unit (A).
2. Open the lamp B access door (B).
3. Open the ADF roller cover plate (C).
4. Disconnect the connector (D) from the ADF sensor (E).
5. Remove the ADF sensor by pressing on the tabs with a flat-blade screwdriver.

To replace the ADF sensor, perform the procedure in the reverse order.

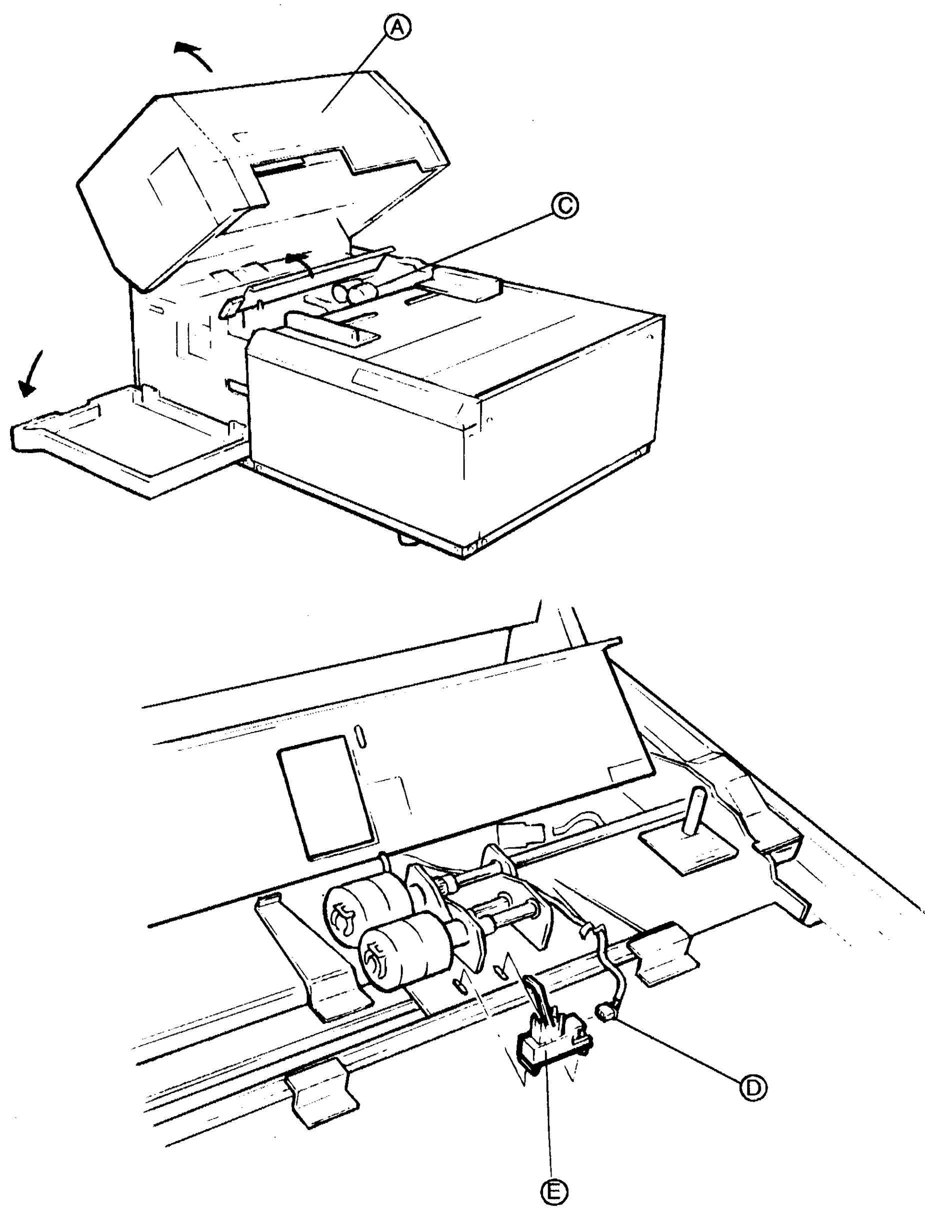


Figure 5-29. Replacing the ADF Sensor

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5.8.2 SIB Sensor

Observe the caution on page 5-1 when removing the covers.

1. Remove the covers and feed unit (A) per Section 5.10.
2. Remove the screw (A) that secures the ADF roller cover plate (B). Remove the ADF roller cover plate.
3. Remove the two screws (C) that secure the belt cover (D), then remove the belt cover.
4. Remove the two screws (E) that secure the contact glass (F). Remove the contact glass and the two leaf springs (G) together.

   CAUTION: Do not touch the surface of the contact glass with your hands. To clean the contact glass, wipe with a glass-cleaning type cloth.

5. Remove the two screws (H) that secure the guide plate (I), then remove the guide plate.
6. Remove the screw (J) and the SIB sensor bracket (K).
7. Disconnect the SIB sensor connector (L).
8. Remove the SIB sensor (M) from the bracket.

To replace the SIB sensor, perform the procedure in the reverse order.

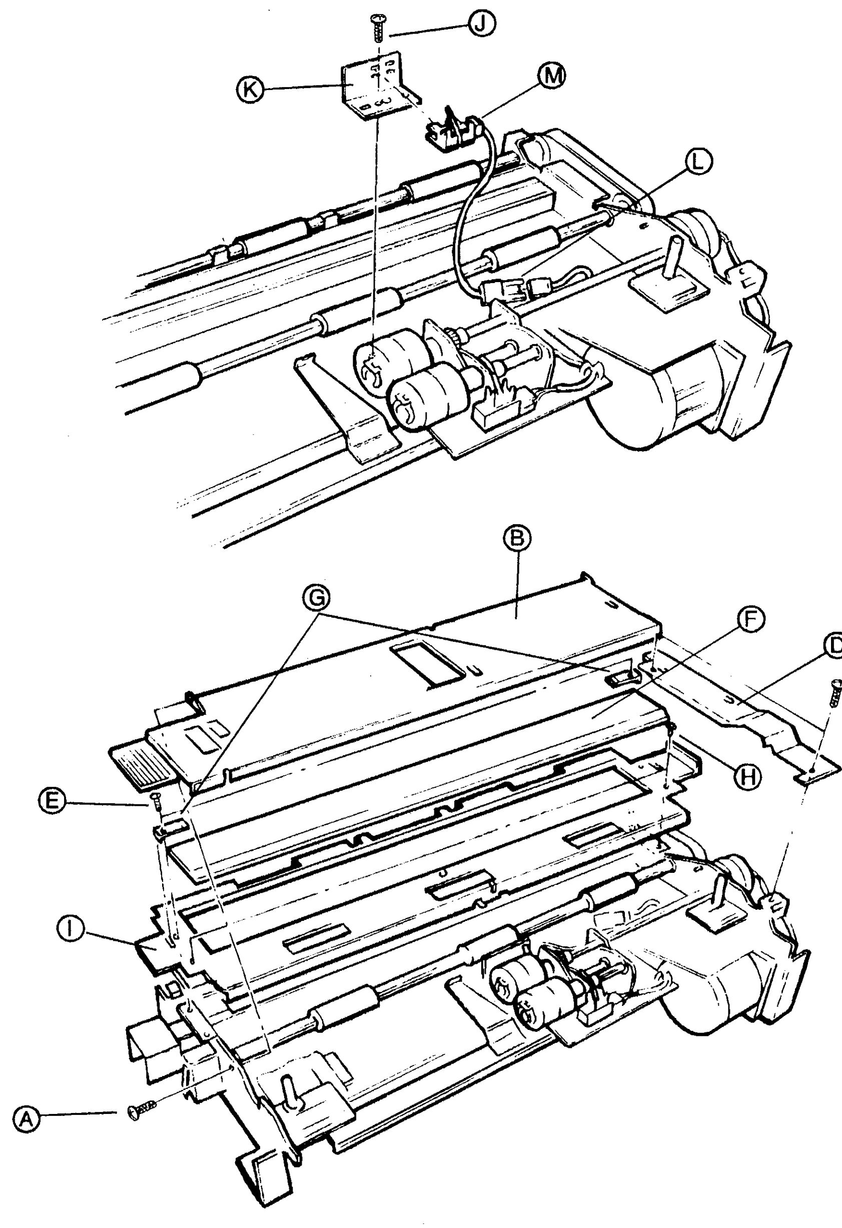


Figure 5-30. Replacing the SIB Sensor

5.8.3 Interlock Switch SW1 (Lamp B Access Door)

The interlock switch SW1 is located behind the lamp B door assembly.

Observe the caution on page 5-1 when removing the lamp B door assembly.

1. Remove the lamp B door assembly (A). See Section 5.2.9 for the procedure.
2. Disconnect the two connectors (B).
3. Remove the two screws (C) that secure the interlock switch (D), then remove the switch.

To replace the interlock switch, perform the procedure in the reverse order.

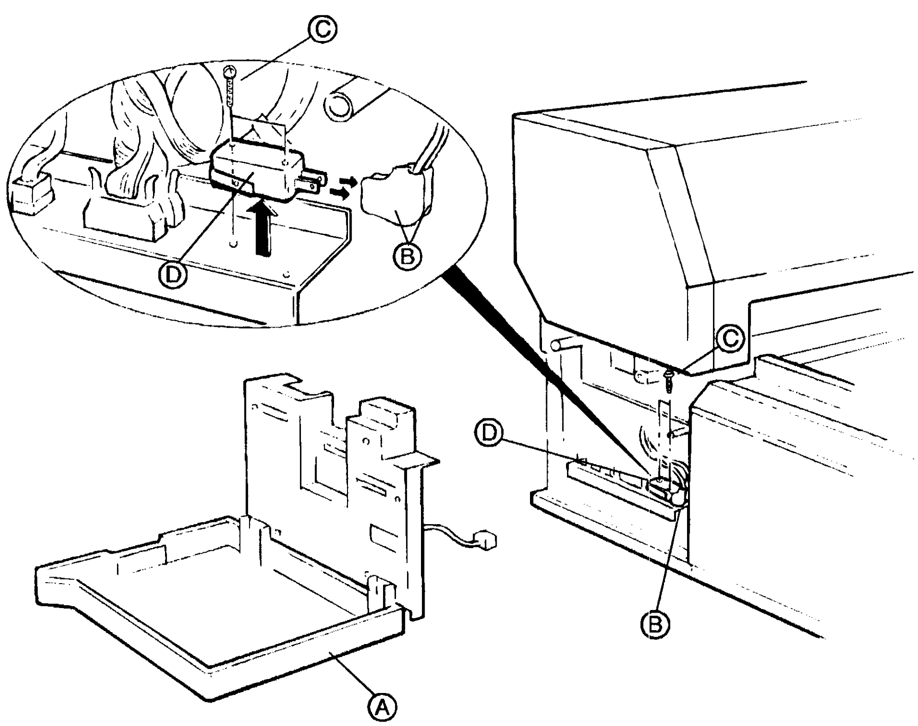
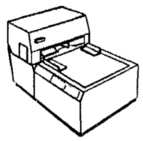


Figure 5-31. Replacing Interlock Switch SW1

5.8.4 Interlock Switch SW3 (Lamp A Access Door) - IS520 Only



The interlock switch SW3 is located behind the front cover on the upper unit.

Observe the caution on page 5-1 when removing the front cover from the upper unit.

1. Remove the front cover (A) from the upper unit. See Section 5.2.8.2 for the procedure.
2. Disconnect the two connectors (B) from the interlock switch.
3. Remove the two screws (C), then remove the interlock switch (D).

To replace the interlock switch, perform the procedure in the reverse order.

5

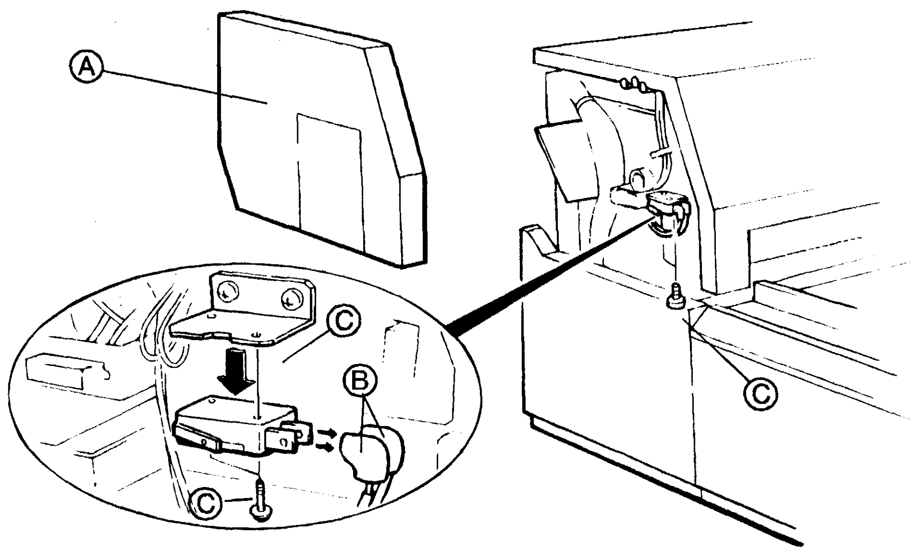


Figure 5-32. Replacing Interlock Switch SW3

5.9 Fans

Observe the caution on page 5-1 when removing the covers to gain access to the fans.

5.9.1 Lower Unit Fan

The lower unit fan is located behind the vent on the rear cover.

1. Remove the document table plates. See Section 5.1.1 for the procedure.
2. Remove the rear cover. See Section 5.2.4 for the procedure.
3. Disconnect the fan connector (C).
4. Remove the four screws (D), then remove the fan (E).

To replace the fan, perform the procedure in the reverse order.

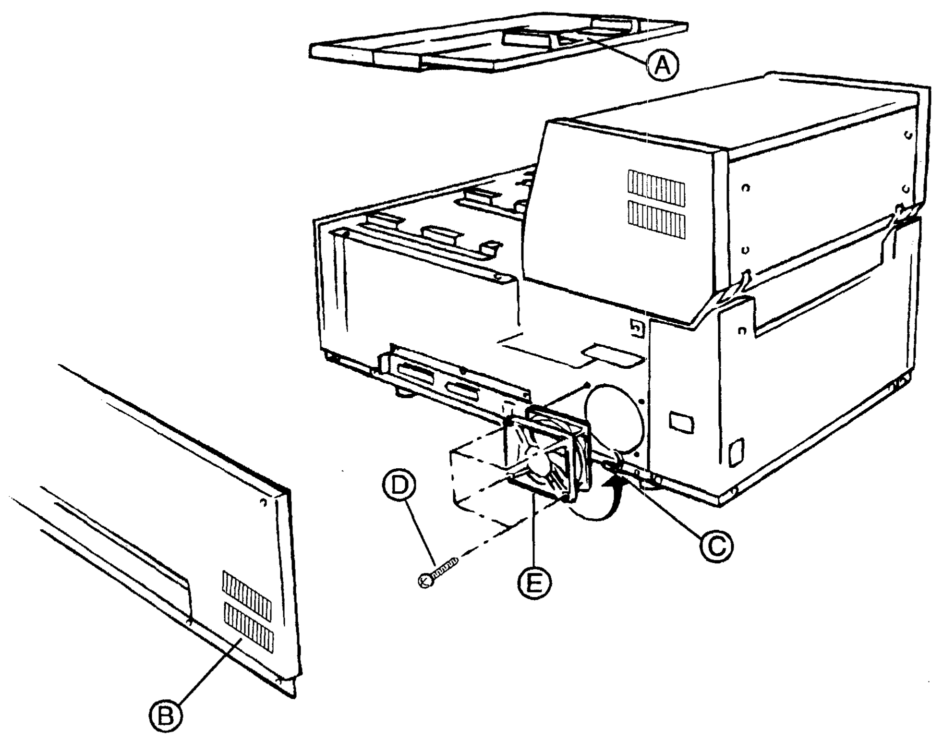
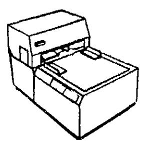


Figure 5-33. Replacing Lower Unit Fan

5.9.2 Upper Unit Fan - IS520 Only



The upper unit fan is located behind the vent on the rear cover of the upper unit.

1. Remove the rear cover (B) from the upper unit. See Section 5.2.8.3 for the procedure.

2. Disconnect the fan connector (C).

3. Remove the two screws (D), then remove the fan (E).

To replace the fan, perform the procedure in the reverse order.

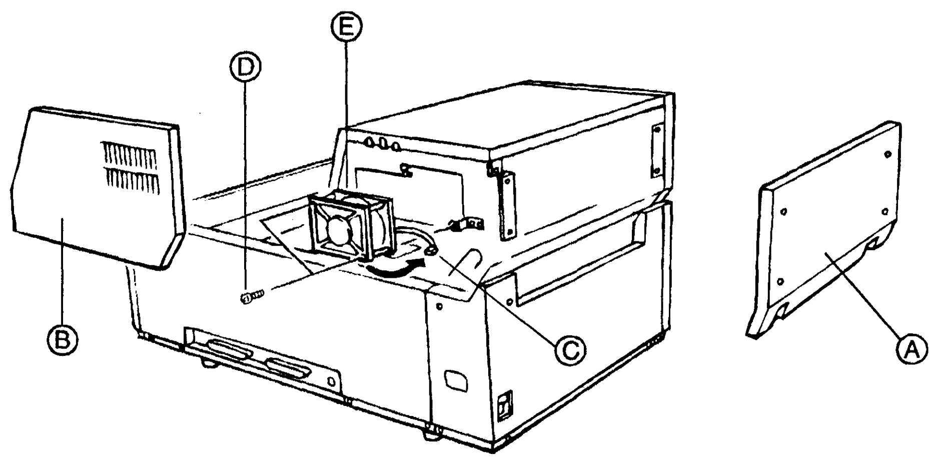


Figure 5-34. Replacing IS520 Upper Unit Fan

5

5.9.3 Power Supply Unit (PSU) Fan

1. Remove the power supply unit (A) per Section 5.13.
2. Remove the two screws (B) and disconnect the PSU fan connector (C).
3. Remove the PSU fan (C).

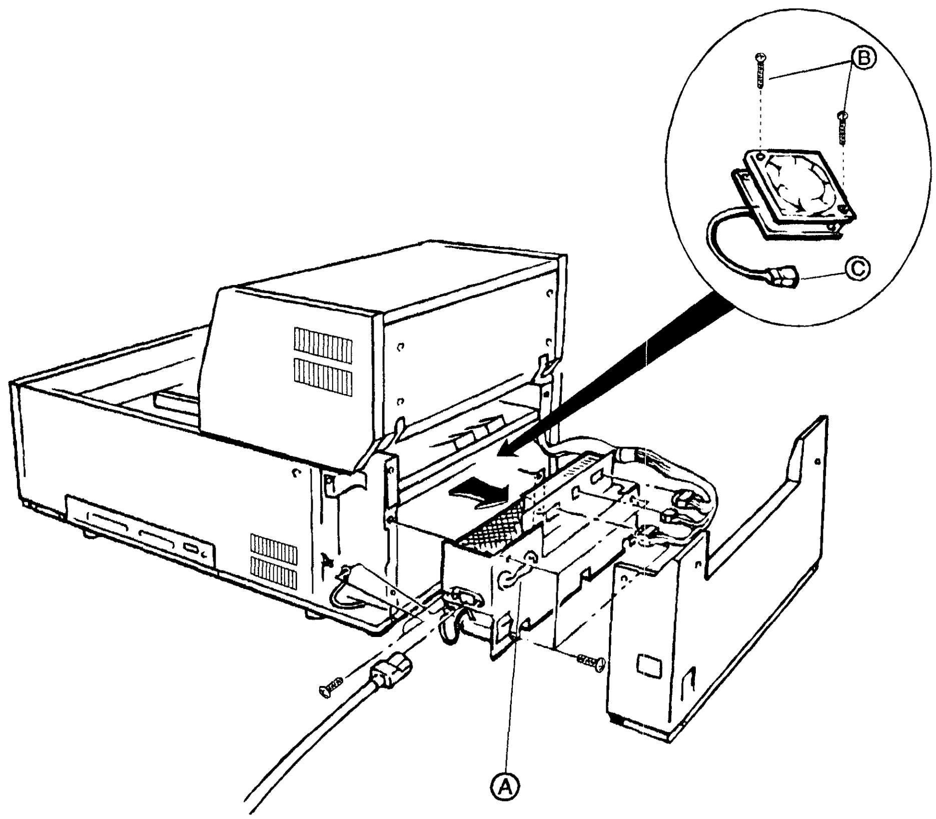


Figure 5-35. Replacing PSU Fan

To replace the PSU fan, perform the procedure in the reverse order.

5.10 Feed Unit

Observe the caution on page 5-1 when removing the covers.

☞ **ADJUSTMENT NOTE:** The position of the separation cartridge must be adjusted after the feed unit is replaced or if it is removed to gain access to other parts.

1. Remove the document table (A) and top board cover (B). See Section 5.1 for the procedure.
2. Remove the front-right cover (C). See Section 5.2.1 for the procedure.
3. Remove the right cover (D). See Section 5.2.2 for the procedure.
4. Remove the rear cover (E). See Section 5.2.4 for the procedure.
5. Remove the front cover (F) from the upper unit (H). See Section 5.2.7.1 for IS510 scanners and Section 5.2.8.2 for IS520 scanners. For IS520 scanners the left cover (G) must be removed before the front cover.
6. Remove the two screws (I) from the hinge stopper (J), then open the upper unit 90 degrees.
7. Disconnect the lamp connector (K) and remove the lamp B assembly (L). See Section 5.5.1 for the procedure.
8. Remove the lamp B door assembly (M). See Section 5.2.9 for the procedure.
9. Disconnect the six connectors (N) from the feed unit. There are three connectors on each side of the feed unit.
10. Remove the four screws (O) that secure the feed unit (P). There are two screws on each side of the feed unit.
11. Open the ADF roller cover plate (Q).
12. Slowly lift up the feed unit and remove it.

To replace the feed unit, perform the procedure in the reverse order.

Before replacing the feed unit:

Clean the lower mirror with a lens cleaning type cloth. See Figure 2-9 for the location of the mirror.

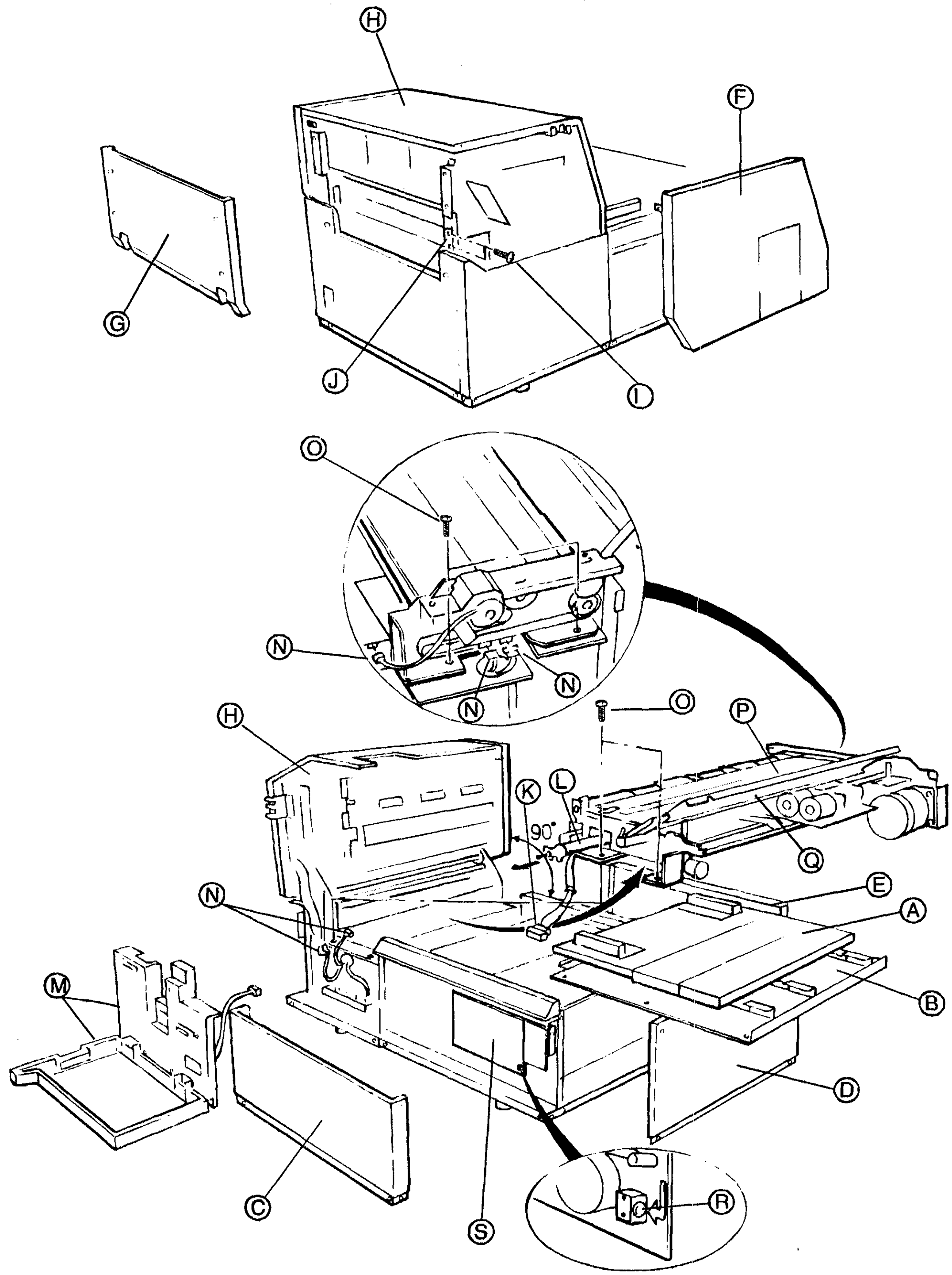


Figure 5-36. Removing the Feed Unit

After replacing the feed unit:

1. If the feed unit has been replaced with a new unit, push the reset button (R) on the OP-CON board (S) to reset the feed unit counter. Hold the reset button for 3 seconds or more until "0" appears on the 7 seg LED.

WARNING: Do not touch anything other than the switch on the OP-CON board because +5V and +24V are supplied to the board.

2. Adjust the position of the separation cartridge. See Section 6.1 for the procedure.

5.10.1 Feed Unit Solenoid

The feed unit solenoid is located below the feed unit on the front side of the scanner. Refer to Figure 1-7 for the location.

ADJUSTMENT NOTE: After replacing the feed unit solenoid, the ADF pickup roller position must be adjusted.

1. Remove the document table and top board cover. See Section 5.1 for the procedure.
2. Lift up the ADF roller cover plate.
3. Remove the three screws (A) then remove the plate (B) that supports the front side of the ADF roller cover plate.
4. Remove the four screws (C) that secure the solenoid assembly.
5. Slide the lever bar (D) away from the solenoid.

   NOTE . . . *When replacing the solenoid, be sure to place the lever bar under the center pin in the solenoid bar (E).*

6. Rock the solenoid and pull down (F) to work it out of the slot. Use care not to pull on the wires.
7. Disconnect the solenoid connector (G) located behind the solenoid. Pull on the connector to release it (the connector is a friction fit and is not locked).

8. Remove the solenoid assembly (H).

9. Remove the three screws (I) that secure the solenoid to the solenoid bracket (J). Remove the solenoid from the bracket.

To replace the feed unit solenoid, perform the procedure in the reverse order.

After replacing the solenoid:

☞ Adjust the ADF pickup roller position according to Section 6.2.

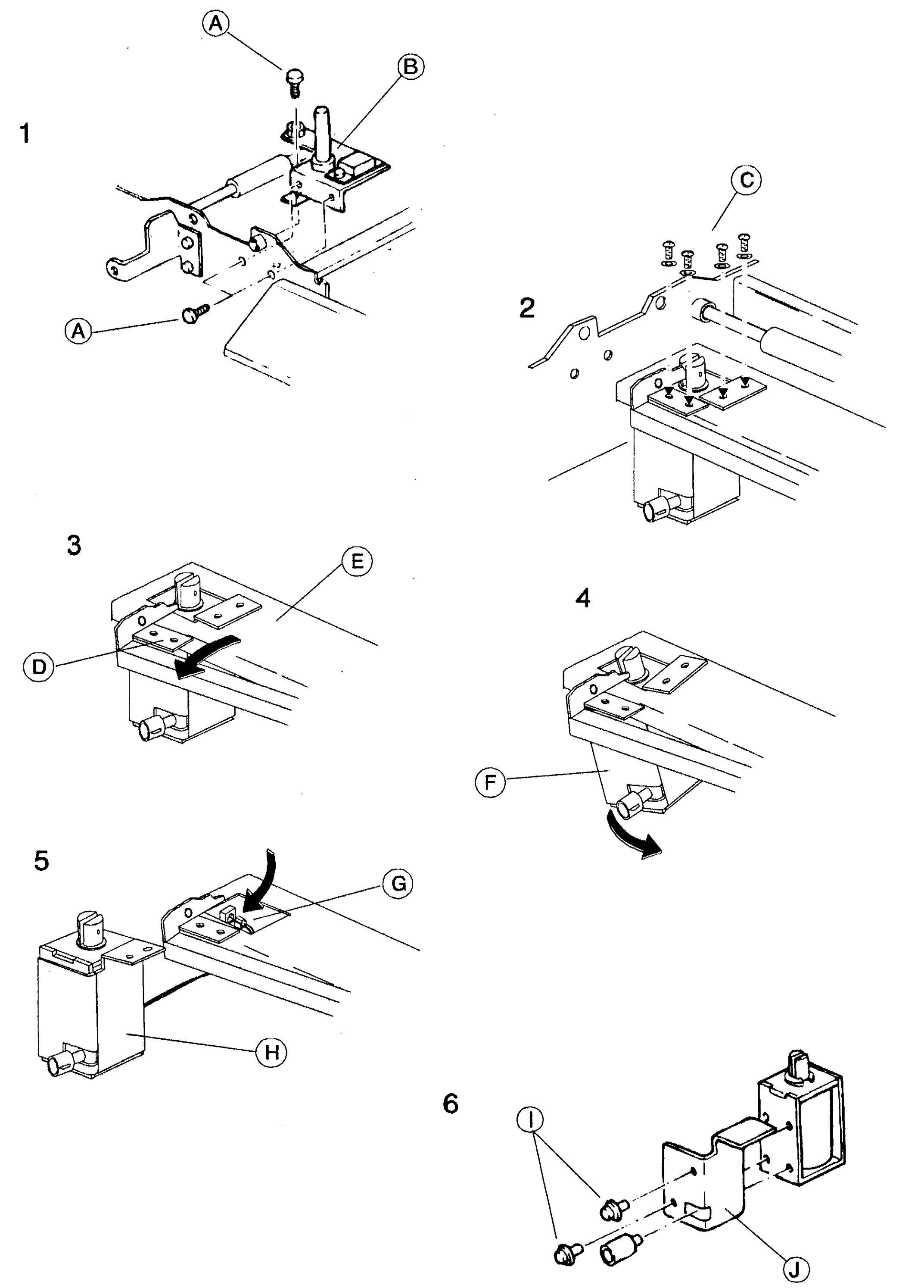


Figure 5-37. Replacing the Feed Unit Solenoid

5.10.2 R1 and R2 Rollers

The R1 and R2 rollers are located on the top of the feed unit.

1. Remove the covers and feed unit per Section 5.10.
2. Place the feed unit on a suitable work surface to disassemble.
3. Remove the motor belt cover and belt (A) per Section 5.14.
4. Remove the lower contact glass (B) per Section 5.6.1.
5. Remove the two screws from the ends of the black guide plate (C) and remove the guide plate from the feed unit.

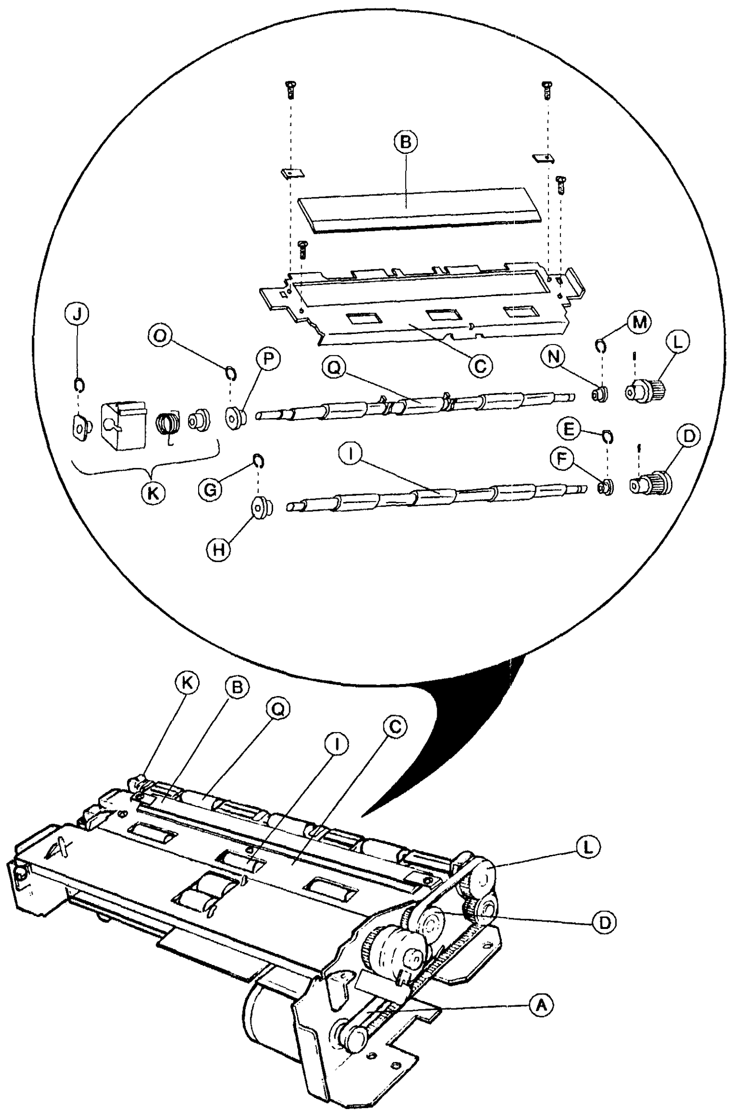


Figure 5-38. Replacing the R1 and R2 Rollers

5.10.2.1 R1 Roller

1. Loosen the R1 roller gear's set screw and remove the gear (D) from the R1 roller shaft.
2. Remove the C-clip (E) and rear bushing (F) from the R1 roller shaft.
3. Remove the C-clip (G) and front bushing (H) and from the R1 roller shaft.
4. Remove the R1 roller assembly (I).

To replace the R1 roller:

1. Insert the R1 roller assembly (I) into the feed unit.
2. Replace the front bushing (H) on the R1 roller shaft and secure it with the C-clip (G).
3. Replace the rear bushing (F) on the R1 roller shaft and secure it with the C-clip (E).
4. Install the gear (D), aligning it to match with the clutch gear.
5. Hold the front of the R1 roller shaft to prevent it from moving while you push the gear on as far as it will go. Tighten the gear's set screw. There should be no side-to-side movement of the R1 roller shaft.

5.10.2.2 R2 Roller

1. Remove the C-clip (J) from the front of the R2 roller shaft.
2. Remove the manual roller activator assembly (K) from the R2 roller shaft. (Note the location of the bushings and spring on this assembly prior to removing it.)
3. Loosen the R2 roller gear's set screw and remove the gear (L) from the R2 roller shaft.
4. Remove the C-clip (M) and rear bushing (N) from the R2 roller shaft.
5. Remove the C-clip (O) securing the middle R2 roller shaft bushing to the front edge of the feed unit frame.
6. Remove the middle bushing (P) from the R2 roller shaft.
7. Remove the R2 roller assembly (Q).

To replace the R2 roller:

1. Insert the R2 roller assembly (Q) into the feed unit.

2. Replace the rear bushing (N) on the R2 roller shaft and secure it with the C-clip (M).

3. Replace the middle bushing (P) on the R2 roller shaft and secure it with the C-clip (O).

4. Install the gear (L), aligning it to match with the adjoining gear.

5. Hold the front of the R2 roller shaft to prevent it from moving while you push the gear on as far as it will go. Tighten the gear's set screw. There should be no side-to-side movement of the R2 roller shaft.

6. Install the manual roller activator assembly (K) on the R2 roller shaft. Make certain that the bushings and spring are aligned properly.

7. Install the C-clip (J) on the front of the R2 roller shaft.

After replacing the R1 and R2 rollers:

1. Install the black guide plate (C) and secure with the two screws.

2. Clean and install the lower contact glass (B) per Section 5.6.1.

3. Replace the motor belt (A) and and adjust the tension per Section 5.14.

4. Install the motor belt cover.

5. Install the feed unit per Section 5.10. Check all paper feed adjustments before installing the covers.

5.10.3 ADF Roller Cover Plate

1. Remove the screw from the end of the cover plate and lift it out of the scanner.

2. Insert the new cover plate and secure it with the screw.

5.11 Lamp Drive Unit (Inverter)

The lamp drive unit is located below the feed unit.

1. Remove the covers and feed unit (A) per Section 5.10.
2. Remove the mirror assembly per Section 5.7.1.
3. Disconnect the two lamp drive connectors (C).
4. Remove the screws (D) from the lamp drive units (E). The IS520 scanner has two lamp drive units and the IS510 scanner has one. Remove the lamp drive units.

To replace the lamp drive unit, perform the procedure in the reverse order.

5

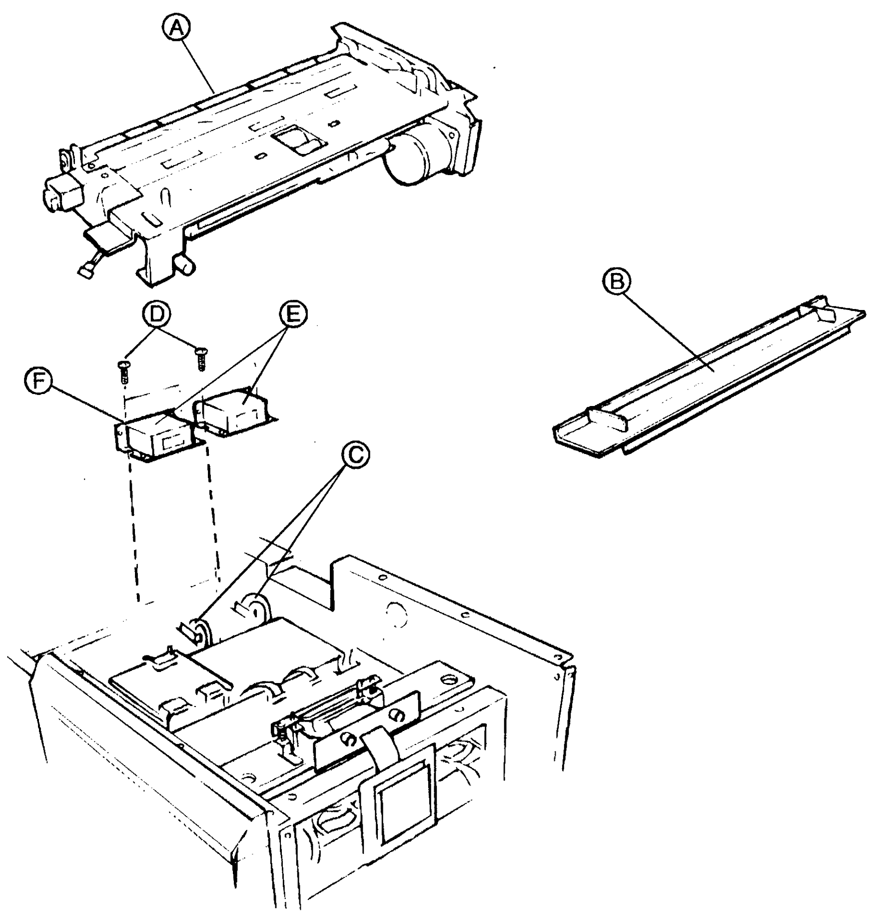


Figure 5-39. Replacing the Lamp Drive Unit (Inverter)

After replacing the lamp drive unit and feed unit, perform the adjustments per Section 5.10.

5.12 Idler Unit

The idler unit is located on the bottom of the upper unit.

Observe the caution on page 5-1 when removing the covers.

☞ **ADJUSTMENT NOTE:** The separation cartridge position must be adjusted after the idler unit is replaced.

1. Open the upper unit and remove the separation cartridge. See Section 5.5.4 for the procedure.
2. Remove the front and rear covers from the upper unit. See Sections 5.2.7.1 and 5.2.7.2 for IS510 scanners and Sections 5.2.8.2 and 5.2.8.3 for IS520 scanners. For IS520 scanners the left cover must be removed before the front cover.
3. Remove the two screws (A) that secure the hinge stopper to the left side of the upper unit. Remove the hinge stopper (B). See Figure 5-40.
4. Open the upper unit 90 degrees.
5. Remove the six screws (C), then separate the idler unit (D) from the upper unit.
6. Remove the two manual feed switch connectors (E), then remove the idler unit from the scanner.

To replace the idler unit, perform the procedure in the reverse order.

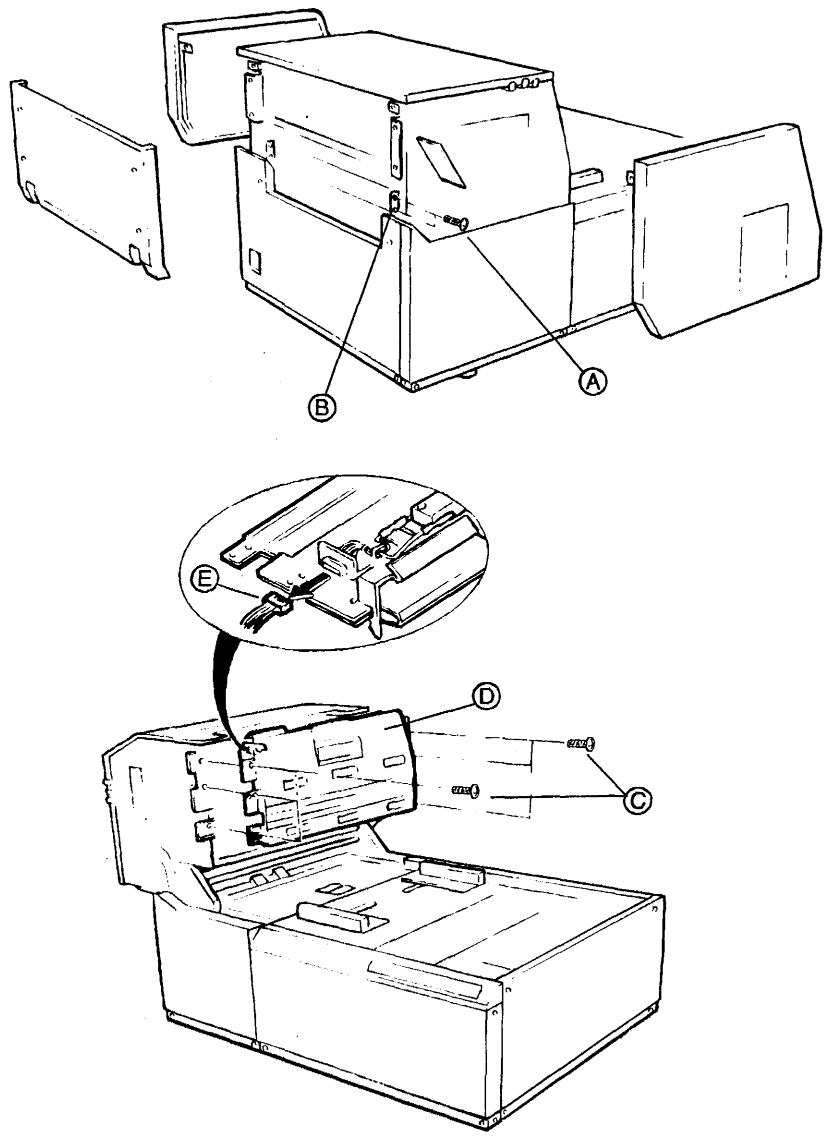


Figure 5-40. Replacing the Idler Unit

After the idler unit is replaced:

☞ Adjust the separation cartridge according to Section 6.1.

5.13 Power Supply Unit (PSU)

The PSU is located behind the left cover.

Observe the caution on page 5-1 when removing the left cover.

1. Disconnect the power cord (A).
2. Remove the left cover (B). See Section 5.2.3 for the procedure.
3. Disconnect the three connectors (C) from the power supply unit (E).
4. Remove the six screws (D) and remove the power supply unit.

To replace the power supply unit, perform the procedure in the reverse order.

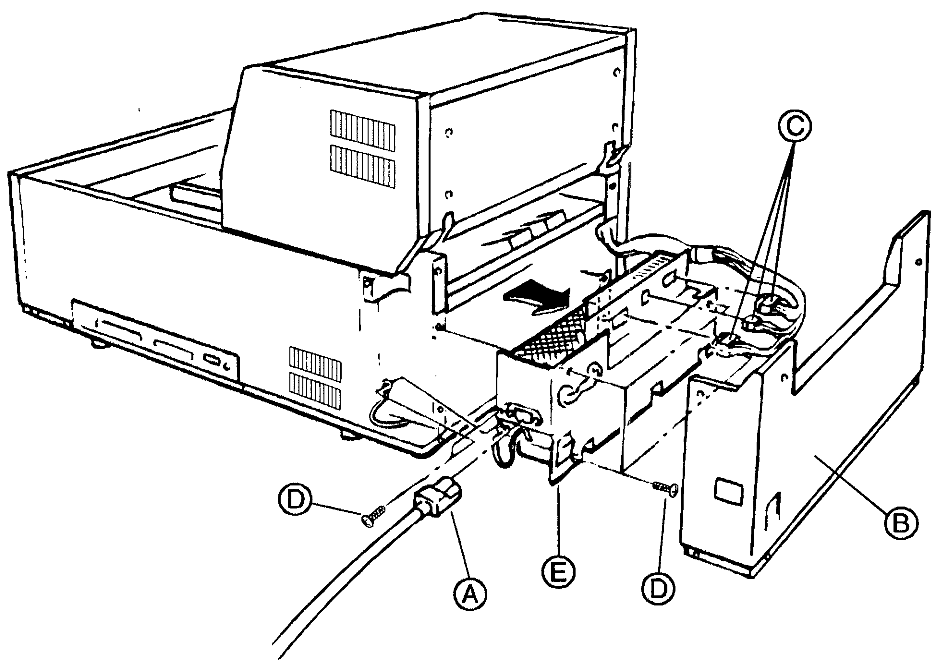


Figure 5-41. Replacing the Power Supply Unit

5.14 Motor Belt

1. Remove the covers and feed unit per Section 5.10.

   NOTE . . . If you prefer, the motor belt can be replaced without completely removing the feed unit. Remove the screws on each side of the feed unit so the rear side of the feed unit can be raised.

2. Remove the two screws from the feed unit belt cover (A) and remove the cover.

3. Loosen the belt screw (B) to release the spring tension so the belt can be removed.

4. Remove the belt (C) starting with the upper right gear that doesn't have a flange.

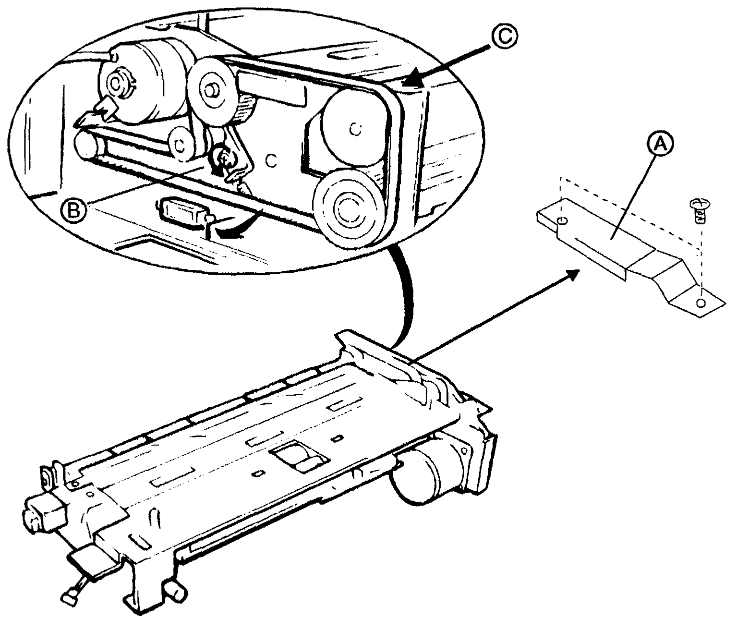


Figure 5-42. Replacing the Motor Belt

To replace the belt:

1. Route the belt over the gears as illustrated, putting it over the upper right gear last.

2. Tighten the screw until the slack is taken out of the belt. DO NOT put too much tension on the belt.

3. Replace the feed unit belt cover and install the feed unit and covers.

5.15 Stepper Motor

1. Remove the covers and feed unit (A) per Section 5.10.
2. Remove the belt (B) according to Section 5.14.
3. Disconnect the motor connector (C).
4. Remove the two screws (D) and remove the motor (E).

To replace the motor, perform the procedure in the reverse order.

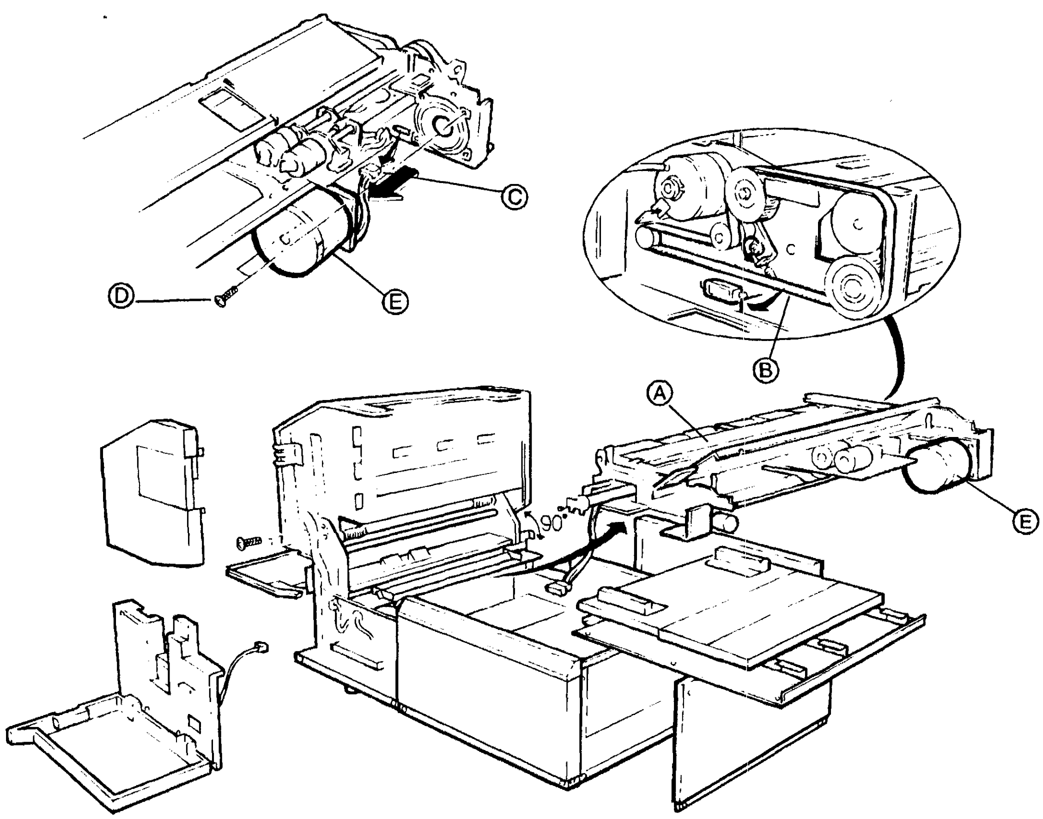


Figure 5-43. Replacing the Stepper Motor

When replacing the motor:

Be sure to set the motor so the wires extended from the motor are on the left side of the left side of the front main body.

5.16 Clutch

1. Remove the covers and feed unit (A) per Section 5.10.
2. Loosen the screw (B) that secures the clutch (C) to the end of the feed unit.
3. Pull out and remove the clutch along the shaft.

To replace the clutch, perform the procedure in the reverse order.

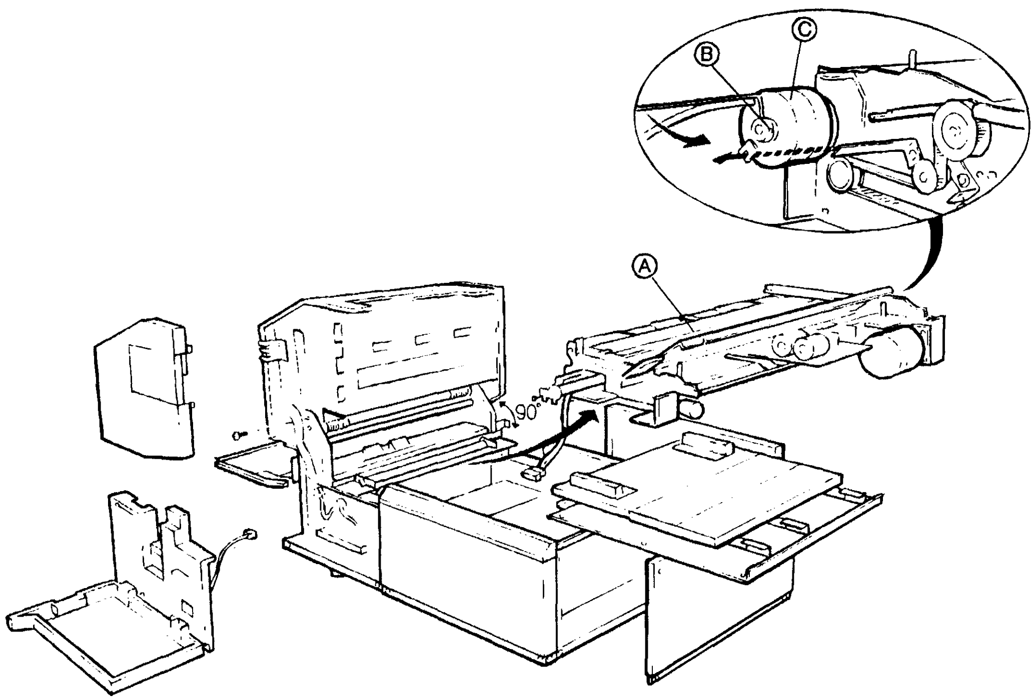


Figure 5-44. Replacing the Clutch

When replacing the clutch:

Be sure to put its plectrum in the fixed board.

Tighten the screw (B) using a hex wrench so the screw hits the D-cut part of the shaft.

5.17 PC Boards (PCBs)

The following sections describe how to remove and replace the PCBs that are standard in the IS510 and IS520 scanners. Some of these boards are
removed when options are installed. Refer to Chapter 7 for details on the boards that are installed with the various options.

Observe the caution on page 5-1 when removing the covers to gain access to the PCBs.

5.17.1 Lower Unit CPU Board (PAGS-1000)

The lower CPU board is located below the top board cover.

A long-handled metric Philips screw driver (magnetic tip preferred) is required to remove the CPU board.

1. Remove the document table and top board. See Section 5.1 for the procedure. The lower electronics are now exposed showing the CPU board and optical unit.

> **CAUTION:** Do not move the CCD camera assembly to gain access to the CPU board connectors. Realignment is required when the camera is moved.

2. To simplify finger access to the front connectors on the CPU board, disconnect the four cables from the EQ/DITHER and CCD camera boards and remove the four screws from the CCD camera board bracket (A). See Figure 5-45.

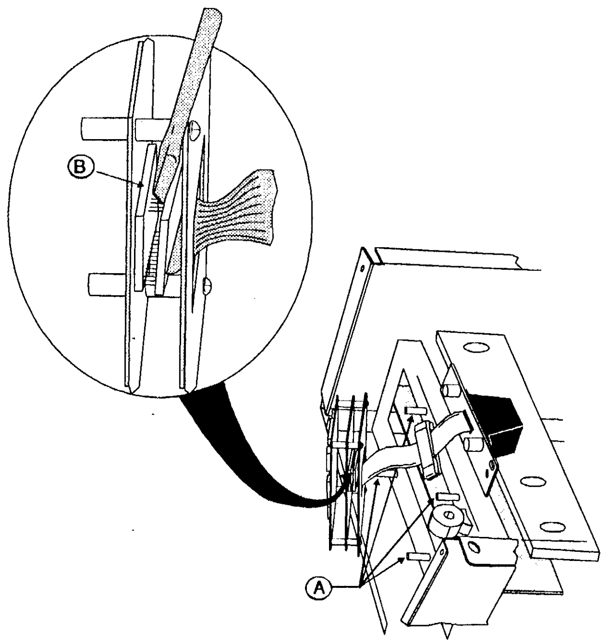


Figure 5-45. Removing the CCD Camera Boards

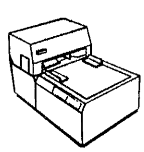
Insert a small flat-blade screwdriver between the bracket and the CCD board and gently pry the ribbon cable connector from the board (B).

> **CAUTION:** Pulling the ribbon cable out of the CCD board by the cable can break the pins and damage the connector.

3. Disconnect the 14 connectors from the CPU board. See Figure 5-46.

4. Remove the four 3mm screws from the corners of the CPU board and remove it. Set the screws aside.

See Figure 5-47 for the CPU board layout.



NOTE . . . The upper and lower CPU boards are identical.

5

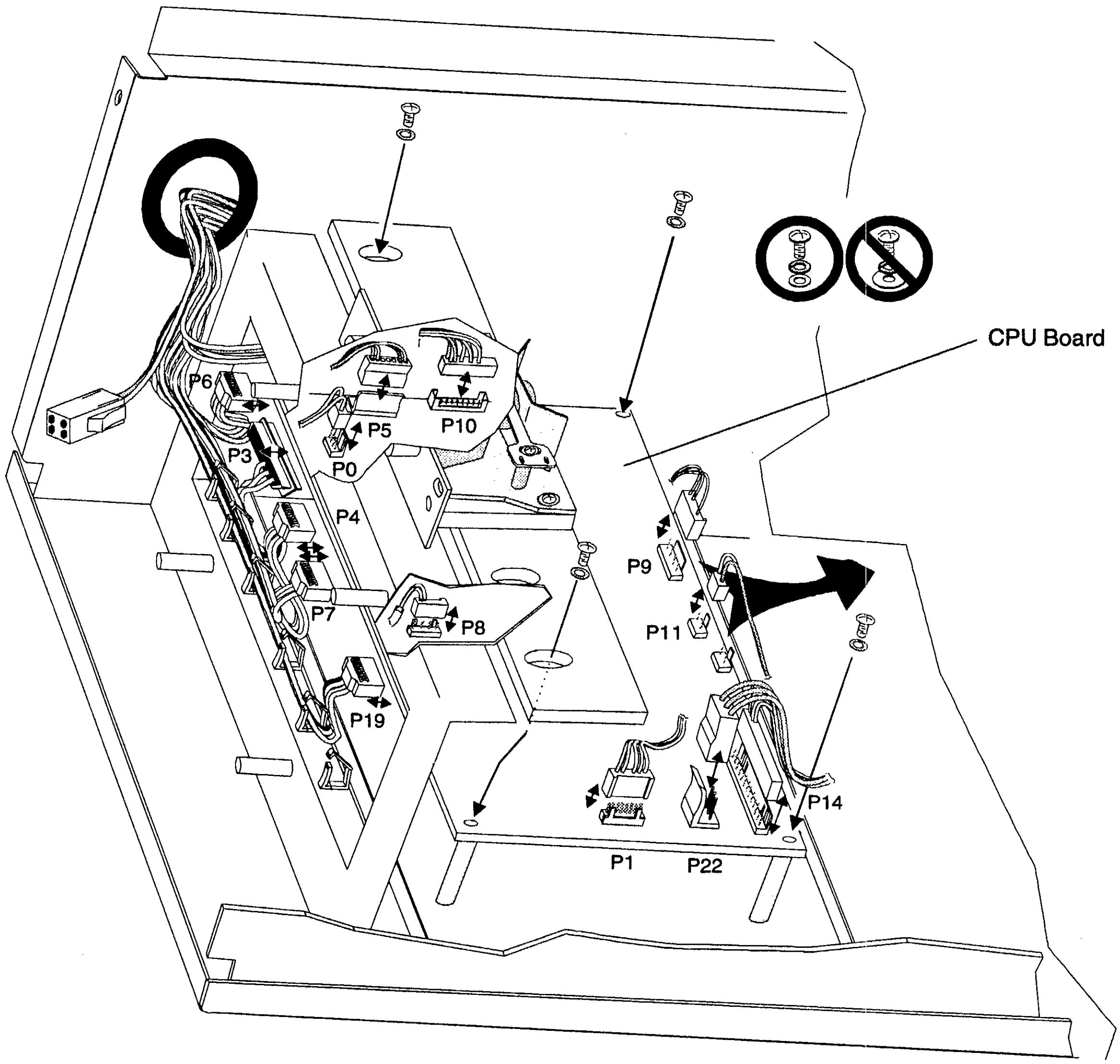
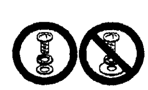


Figure 5-46. Removing the Lower CPU Board (PAGS-1000)

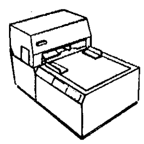


CAUTION: When replacing the CPU board, DO NOT use the screws with a large flat washer to secure the CPU board. The washers on these screws can cause the board to short out.

To replace the CPU board, perform the procedure in the reverse order.

After replacing the CPU board, carefully connect the ribbon cable to the CCD camera board and use a small flat-blade screwdriver to gently seat the cable in the connector. Install the CCD camera assembly bracket and connect the cables to the EQ/DITHER and CCD camera boards.

5.17.2 Upper CPU Board (PAGS-1000) - IS520 Only

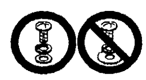


The upper CPU board is located under the top cover of the upper unit.

1. Remove all of the covers from the upper unit (A-D). See Section 5.2.8 for the procedure. The upper CPU board (PAGS-1000) is exposed.

2. Disconnect the eight connectors (E) from the CPU board (G).

3. Remove the four 3mm screws (F) from the corners of the CPU board and remove it. Set the screws aside.



CAUTION: When replacing the CPU board, DO NOT use the screws with a large flat washer to secure the CPU board. The washers on these screws can cause the board to short out.

To replace the CPU board, perform the procedure in the reverse order.

5

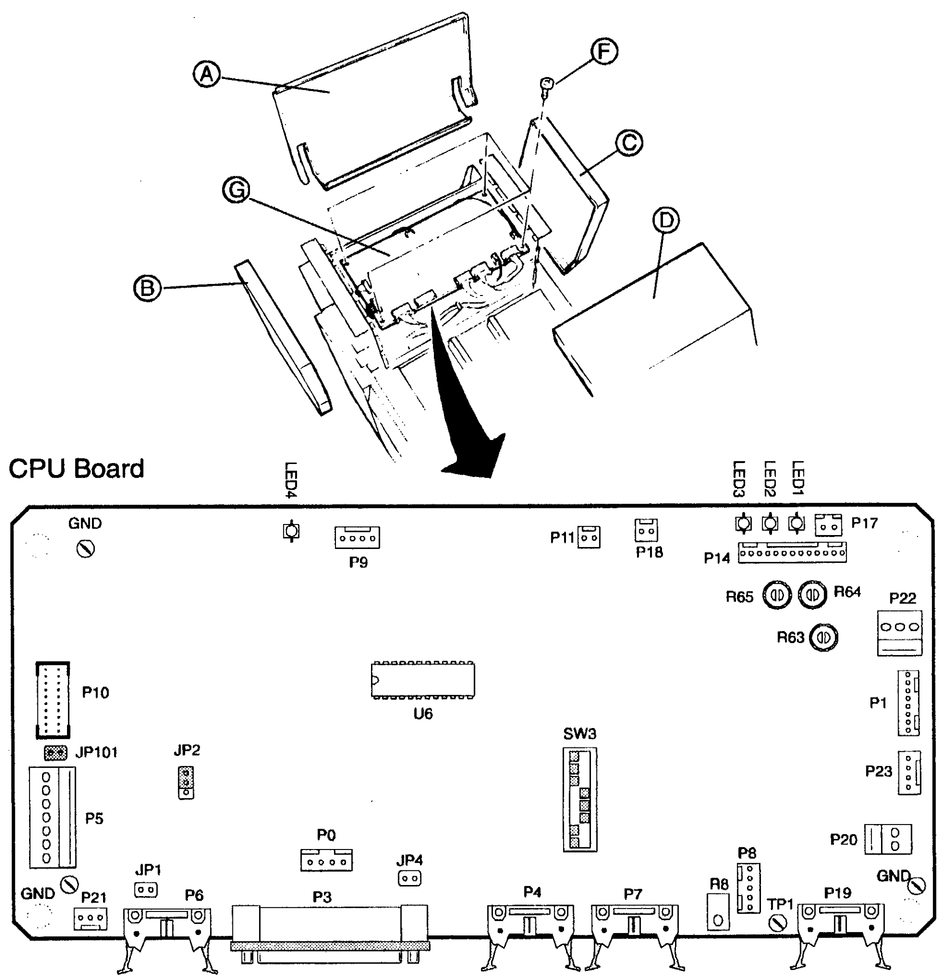


Figure 5-47. Removing the Upper CPU Board (PAGS-1000)

5.17.3 Data Compression Board (CGVS)

The CGVS board is located on the interface tray which is behind the rear cover.

1. Remove the document table plates. See Section 5.1.1 for the procedure.

2. Remove the rear cover. See Section 5.2.4 for the procedure.

3. Remove the seven 3mm screws (A) attaching the interface tray to the scanner's inner chassis wall. See Figure 5-48.

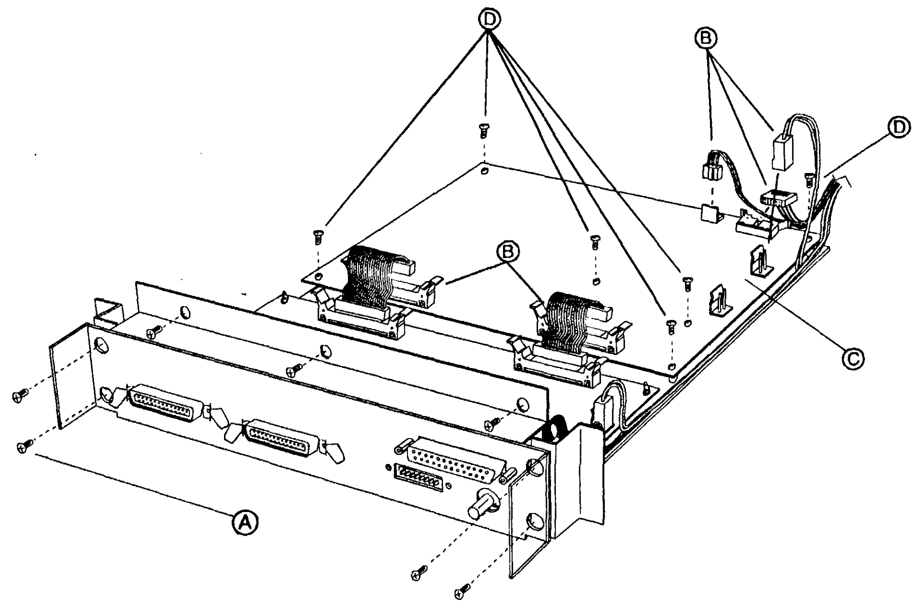
4. Hold the interface tray by the side tabs and slide it out of the scanner just far enough to gain access to the CGVS board. Guide the wiring harness through the opening so it doesn't bind.

5. Disconnect the five connectors (B) from the CGVS board (C).

6. Remove the six screws (D) from the CGVS board and lift it away from the interface tray.

To replace the CGVS board, perform the procedure in the reverse order.

- Be sure to align the CGVS board so the mounting studs are centered within their respective CGVS ground areas.
- Carefully slide the interface tray back into the scanner, guiding the wiring harness so it doesn't bind on the chassis.



CGVS Board

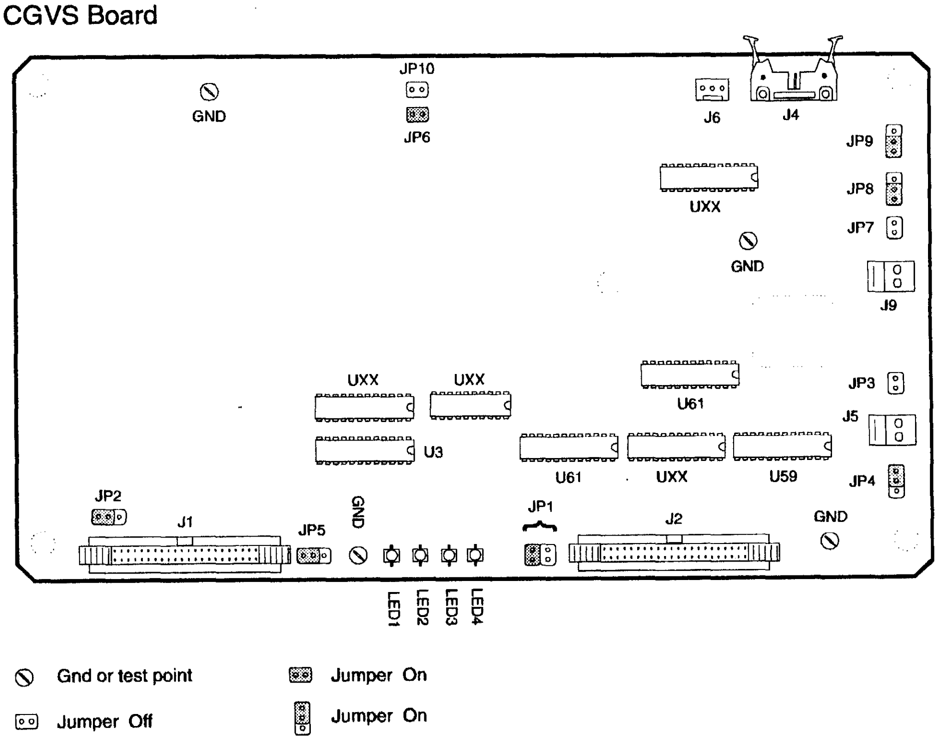
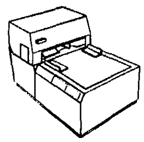


Figure 5-48. Removing the Data Compression Board (CGVS)

5.17.4 Memory Board (GVS-01) - IS520 Only

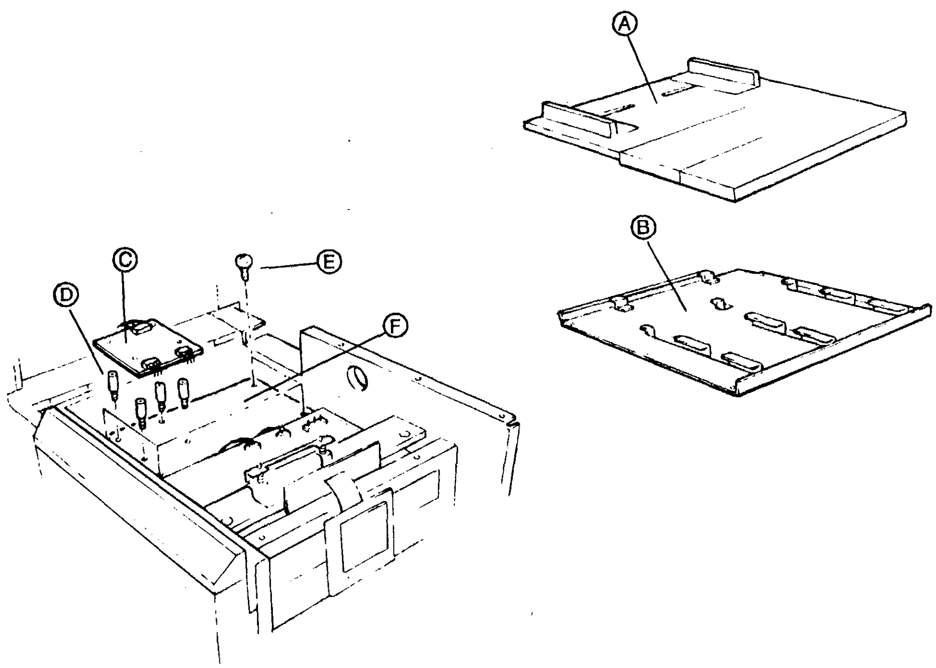


The memory board is located below the top board cover. The GVS-09 data control board is piggyback connected to the memory board.

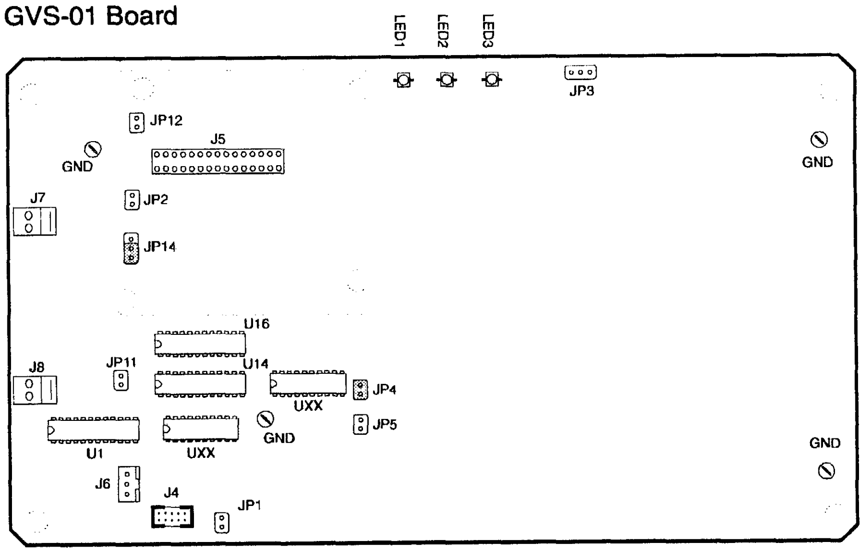
A 90 degree right-angle Philips screwdriver is required to remove the memory board.

1. Remove the document table (A) and top board (B). See Section 5.1 for the procedure.
2. Disconnect the three connectors from the GVS-01 memory board (F).
3. Remove the four posts (D) from the memory board.
4. Remove the four screws (E) from the corners of the memory board. Carefully lift the memory board out of the scanner.
5. Remove the GVS-09 board (C) from the GVS-01 board. See Section 5.17.5 for the procedure.

To replace the memory board, perform the procedure in the reverse order.



GVS-01 Board



Gnd or test point

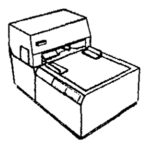
Jumper Off

Jumper On

Jumper On

Figure 5-49. Removing the IS520 Memory Board (GVS-01)

5.17.5 Data Control Board (GVS-09) - IS520 Only



The GVS-09 board is located below the top board cover and is piggy-back connected to the GVS-01 board.

A 90 degree right-angle Philips screwdriver is required to remove the GVS-09 board.

1. Remove the document table (A) and top board (B). See Section 5.1 for the procedure.

2. Disconnect the three connectors from the GVS-09 data control board (C).

3. Remove the four 3mm screws (D) attaching the GVS-09 board to the GVS-01 posts. Gently pull the GVS-09 board out of the connector on the GVS-01 board.

To replace the GVS-09 board, perform the procedure in the reverse order.

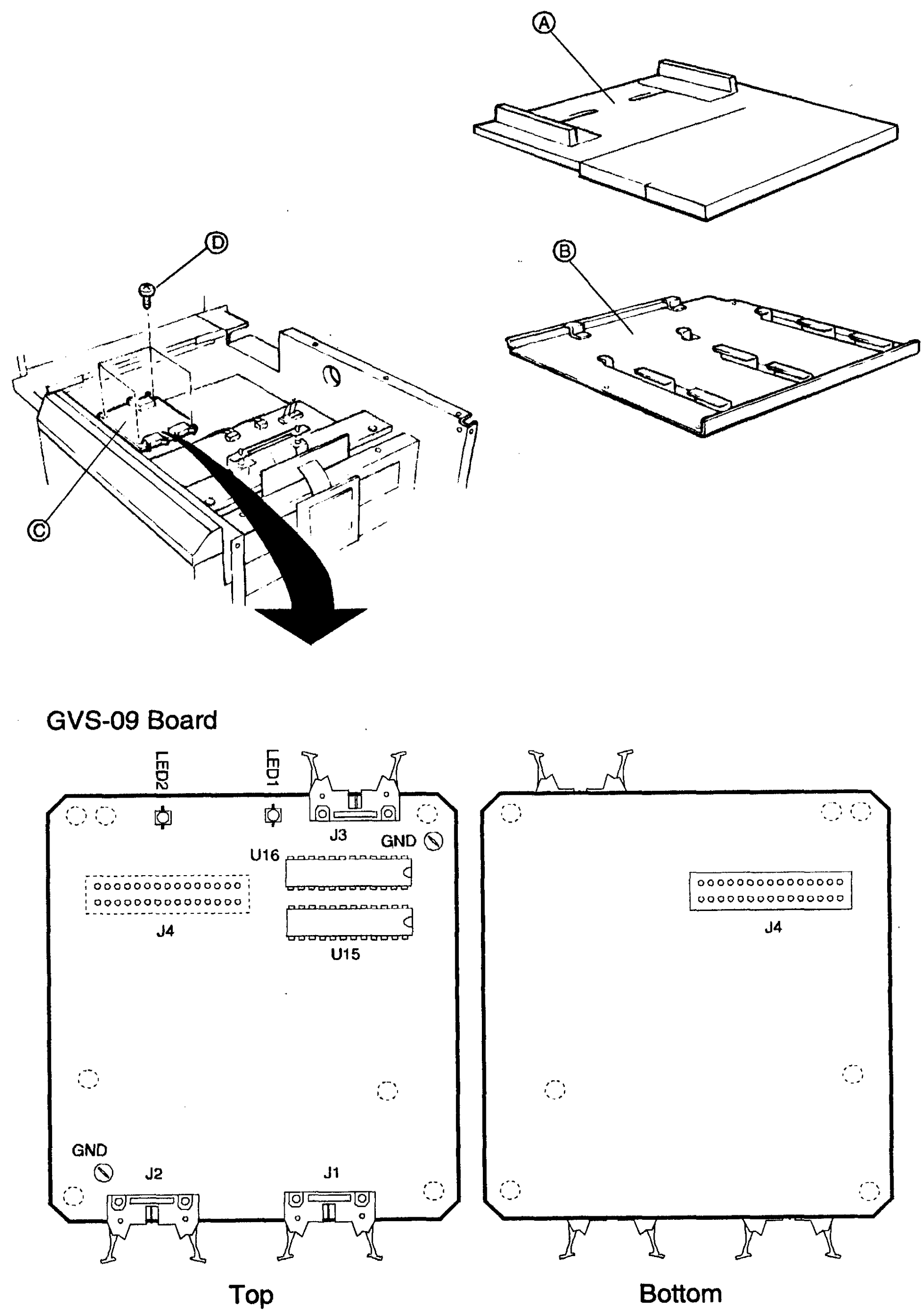


Figure 5-50. Removing the IS520 Data Control Board (GVS-09)

5

5.17.6 SCSI Board (NPS/NSA)

The SCSI board is located on the interface tray which is behind the rear cover.

1. Remove the document table plates. See Section 5.1.1 for the procedure.

2. Remove the rear cover. See Section 5.2.4 for the procedure.

3. Remove the seven 3mm screws (A) attaching the interface tray to the scanner's inner chassis wall. See Figure 5-51.

4. Hold the interface tray by the side tabs and slide it out of the scanner just far enough to gain access to the SCSI board. Guide the wiring harness through the opening so it doesn't bind.

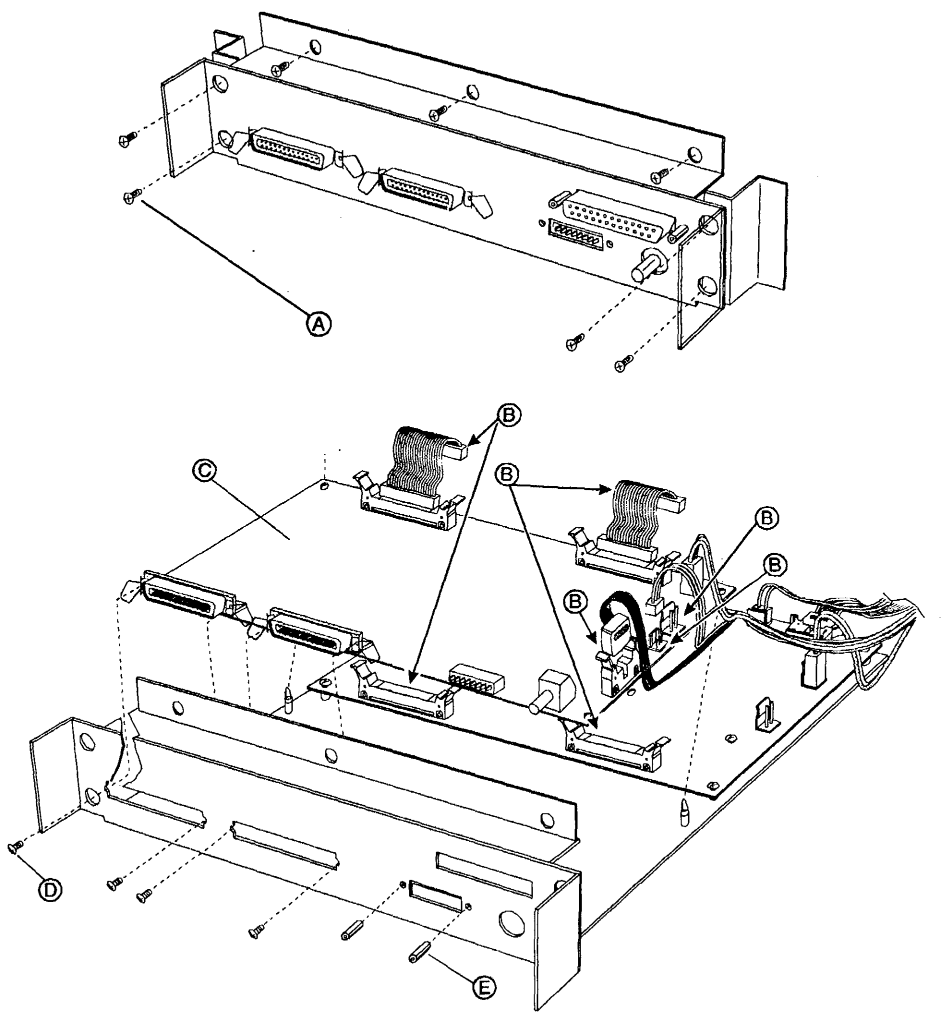
5. Disconnect the five connectors (B) from the SCSI board (C).

6. Remove the four 3mm screws (D) attaching the SCSI connectors to the interface tray.

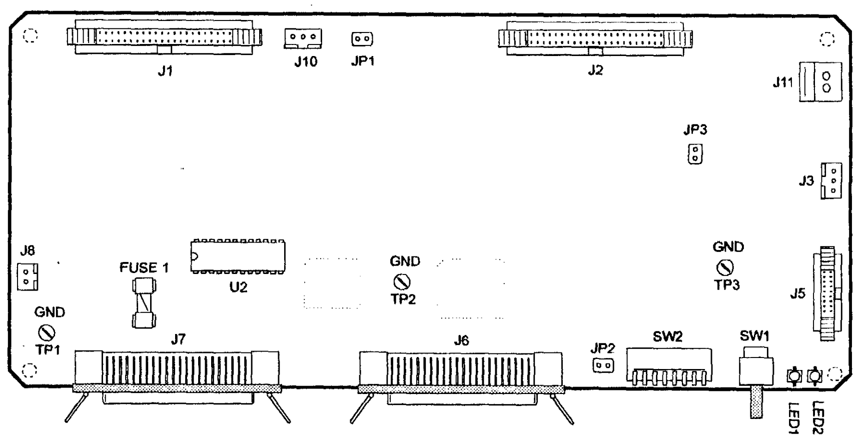
7. Remove the two screws (E) that attach the SCSI DIP switch cover plate to the interface tray.

8. Use a pair of small needle nose pliers to squeeze the four plastic standoff posts on the SCSI board. Lift the SCSI board with the connectors attached away from the interface tray.

To replace the SCSI board, perform the procedure in the reverse order. Carefully slide the interface tray back into the scanner, guiding the wiring harness so it doesn't bind on the chassis.



SCSI Board



Gnd or test point

Jumper Off

Jumper On

Figure 5-51. Removing the SCSI Board (SCSI)

5.17.7 Indicator Board (OPLED)

The OPLED board is located below the indicator panel.

1. Remove the document table plates (A). See Section 5.1.1 for the procedure.
2. Remove the front-right cover (B). See Section 5.2.1 for the procedure.
3. Remove the indicator panel cover (C). See Section 5.2.6 for the procedure.
4. Disconnect the connector (D) from the indicator board (F).
5. Remove the three screws (E) from the indicator board and lift it out of the scanner.

To replace the indicator board, perform the procedure in the reverse order.

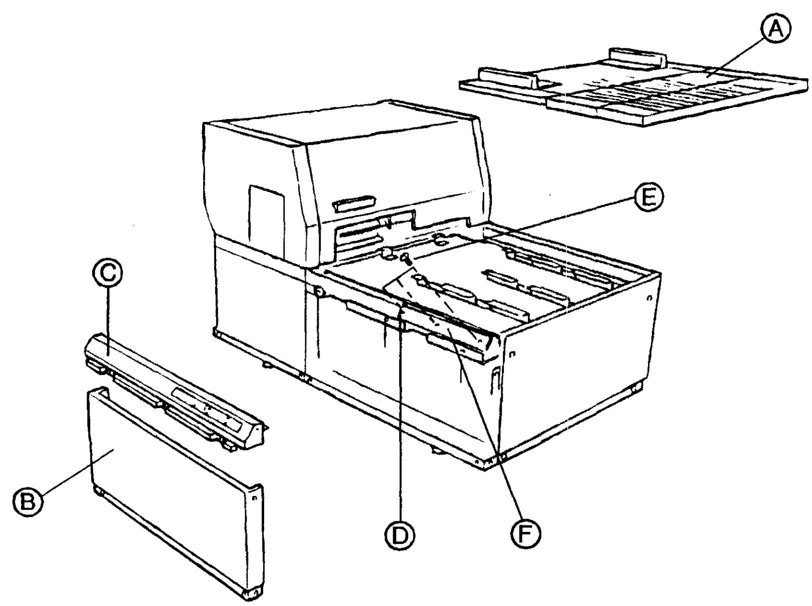


Figure 5-52. Removing the Indicator Board (OPLED)

5.17.8 Indicator Control Board (OP-CON)

The OP-CON board is located behind the front-right cover.

1. Remove the front-right cover (B). See Section 5.2.1 for the procedure.
2. Remove the seven connectors (B) from the OP-CON board (D).
3. Remove the four screws (C) from the corners of the OP-CON board and lift it out of the scanner.

To replace the indicator control board, perform the procedure in the reverse order.

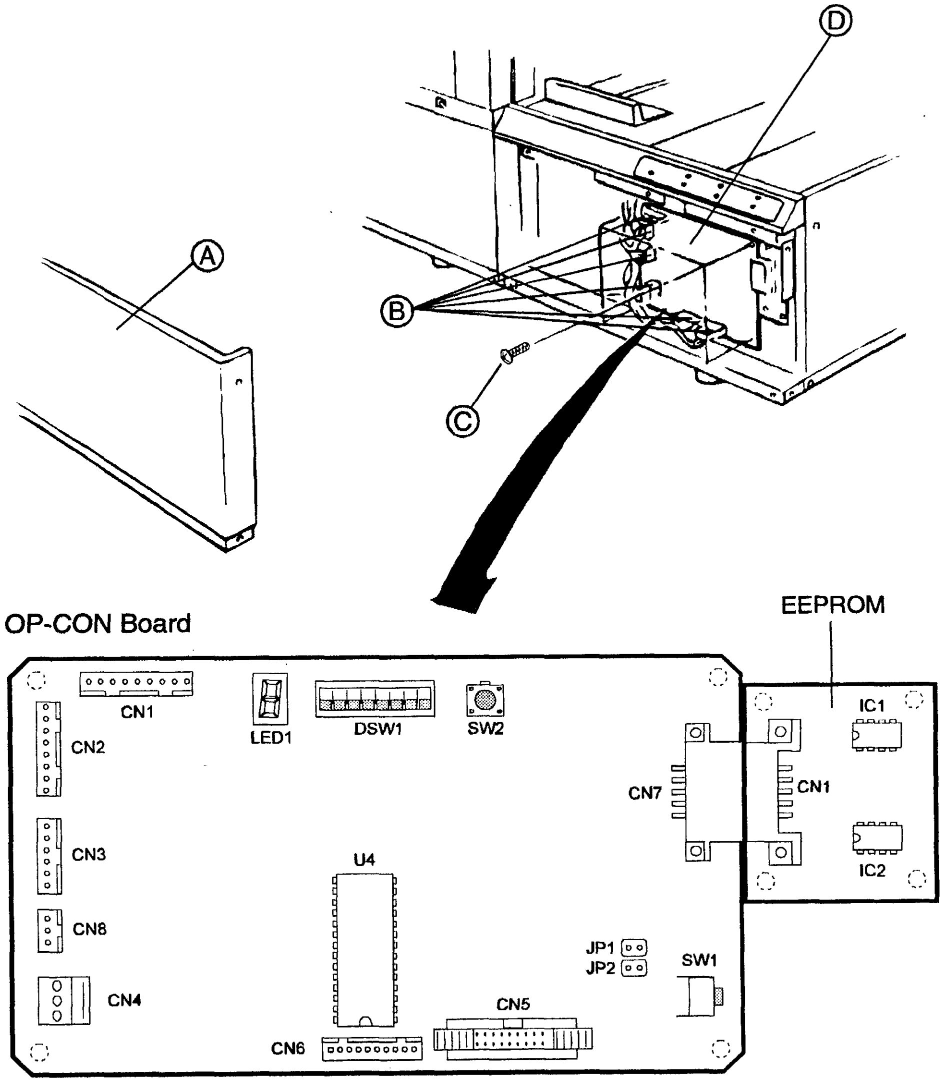


Figure 5-53. Removing the Indicator Control Board (OP-CON)

5

5.17.9 EQ/DITHER and 5KCCD Boards

The Equalizer (EQ/DITHER) and CCD Control (5KCCD) boards are located below the top board cover and behind the right cover.

☞ **ADJUSTMENT NOTE:** Optical adjustment is required after the EQ/DITHER and 5KCCD boards are replaced.

1. Remove the document table and top board cover per Section 5.1.
2. Disconnect the four connectors from the boards, P8, P3, P4 and P1.
3. Remove the four screws (A) that attach the CCD camera board bracket (B) to the scanner.
4. Insert a small flat-blade screwdriver between the bracket and the 5KCCD board (C) and gently pry the ribbon cable connector (D) from the board.

⚠ **CAUTION:** Pulling the ribbon cable out to the CCD boards by the cable can break the pins and damage the connector.

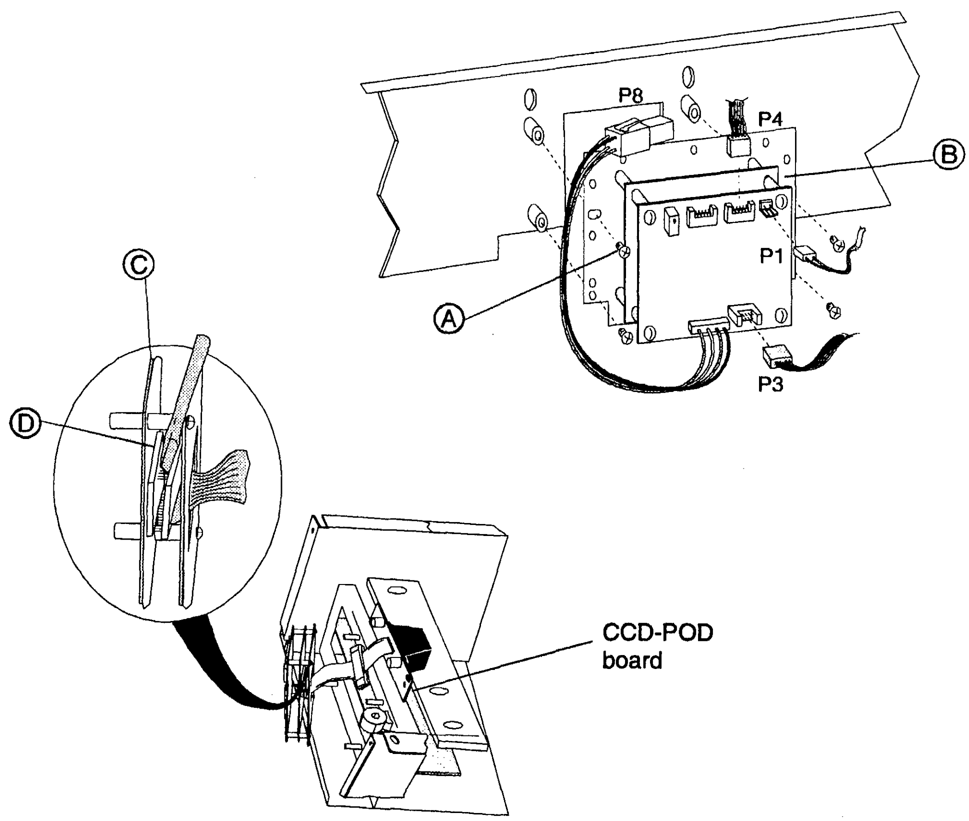


Figure 5-54. Removing the Lower CCD Board Assembly

5. Remove the four brass screws (A) that attach the boards to the cover plate. See Figure 5-55.

6. To remove the 5KCCD board, remove the four threaded standoffs (B) from the back of the 5KCCD board.

   To remove the EQ/DITHER board, remove the four brass screws (C) from the corners of the EQ/DITHER board.

7. Gently pull the two boards apart being careful not to bend the pins (D).

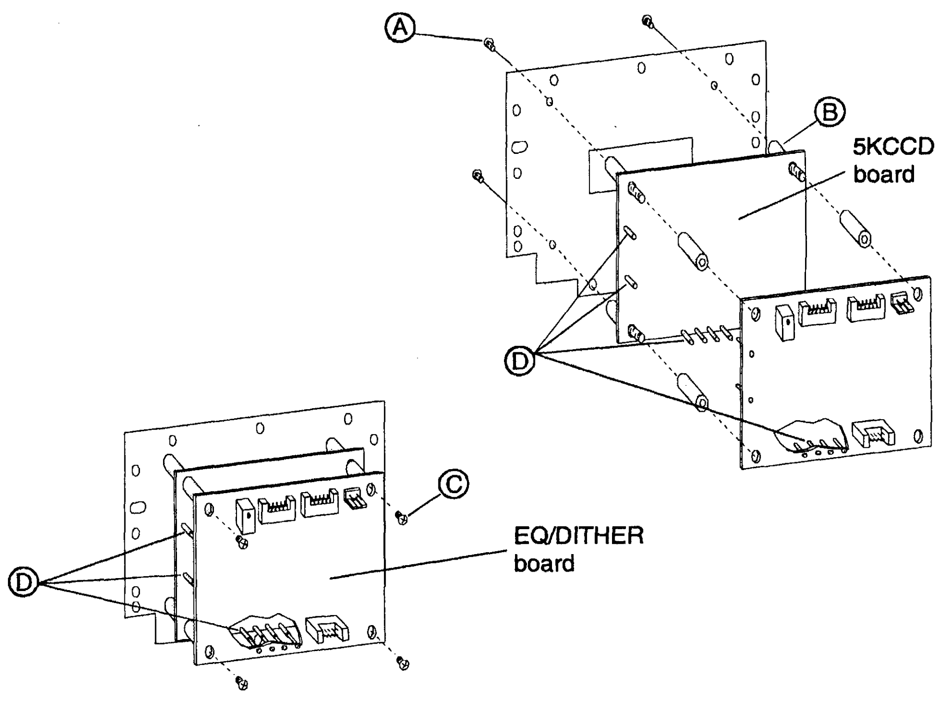


Figure 5-55. Replacing the EQ/DITHER and 5KCCD Boards

To replace the EQ/DITHER and 5KCCD boards:

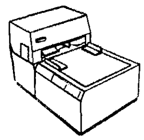
1. Align the pins and carefully press the boards together to seat the pins before installing the screws.

2. Carefully connect the ribbon cable to the CCD camera board assembly and use a small flat-blade screwdriver to gently seat the cable in the connector.

3. Install the CCD camera board assembly and connect the cables to the boards.

4. Perform the optical adjustment procedures in Section 6.3.

5.17.10 Upper EQ/DITHER and 5KCCD Boards - IS520 Only



The upper CCD boards are located behind the left cover of the upper unit.

ADJUSTMENT NOTE: Optical adjustment is required after the EQ/DITHER and 5KCCD boards are replaced.

1. Remove all of the covers from the upper unit per Section 5.2.8.

2. Remove the 12 screws (A) from the CCD camera cover on the left side of the upper unit. See Figure 5-56.

3. Disconnect the four cables from the CCD camera boards. See Figure 5-54.

4. Remove the four screws (B) from the CCD camera board bracket. See Figure 5-56.

5. Insert a small flat-blade screwdriver (C) between the bracket and the CCD board and gently pry the ribbon cable connector from the board.

CAUTION: Pulling the ribbon cable out of the CCD board can break the pins and damage the connector.

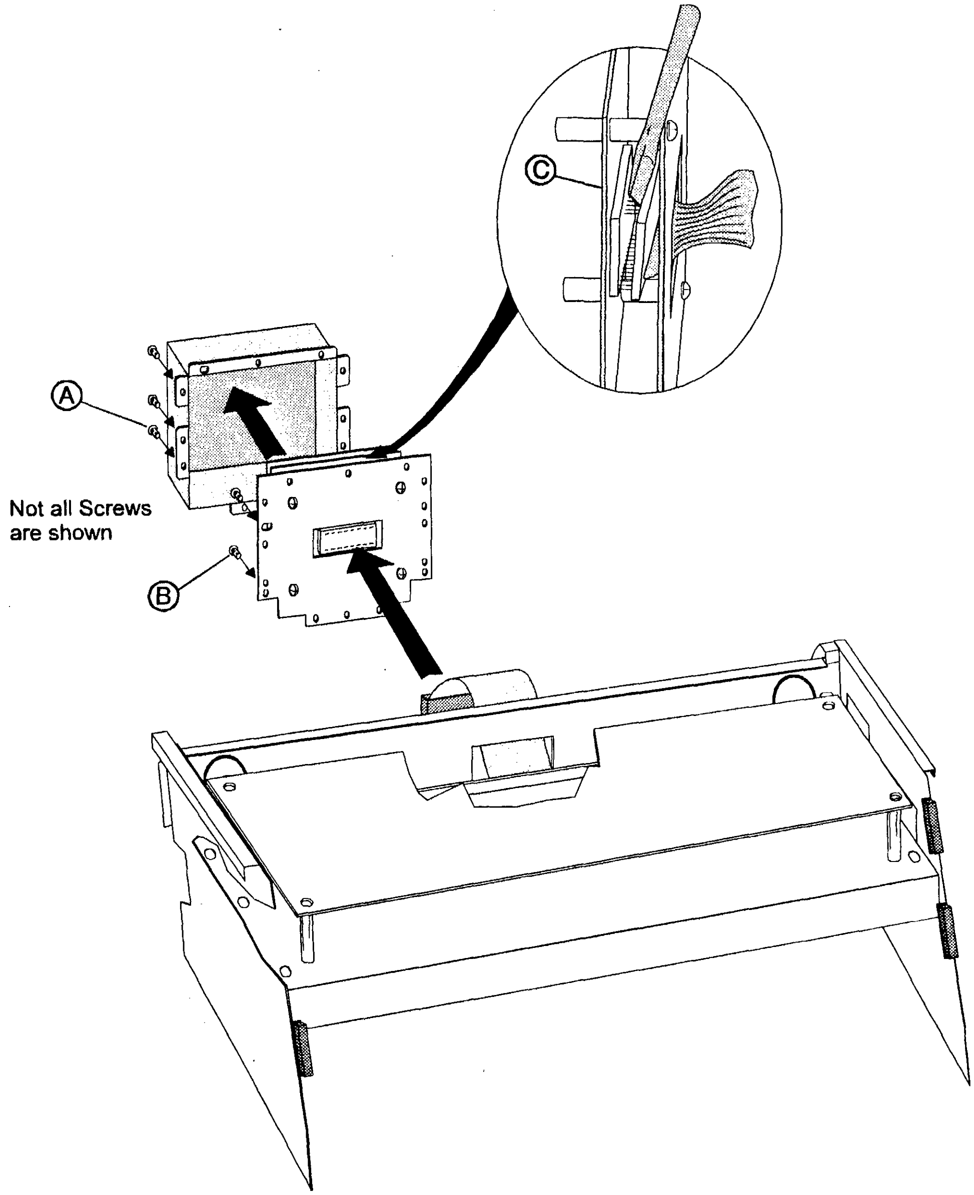


Figure 5-56. **Removing the Upper CCD Board Assembly - IS520 Only**

6. Perform steps 5 through 7 in Section 5.17.9 to remove the EQ/DITHER or 5KCCD board.

To replace the EQ/DITHER and 5KCCD boards:

1. Align the pins and carefully press the boards together to seat the pins before installing the screws.

2. Carefully connect the ribbon cable to the CCD camera board assembly and use a small flat-blade screwdriver to gently seat the cable in the connector.

3. Install the CCD camera board assembly and connect the cables to the boards.

4. Perform the optical adjustment procedures in Section 6.3.

5.17.11 CCD-POD Board (CCD Carrier)

ADJUSTMENT NOTE: Optical adjustment is required after the CCD-POD board is replaced.

1. Remove the document table and top board cover per Section 5.1.

2. Remove the lower CCD board assembly according to steps 2 through 4 in Section 5.17.9.

3. Remove the two set screws (A) and the two white inner knobs (C) from the CCD-POD board (B). See Figure 5-57.

4. Insert a small flat-blade screwdriver between the lens block and the CCD-POD board and gently pry the ribbon cable connector from the board.

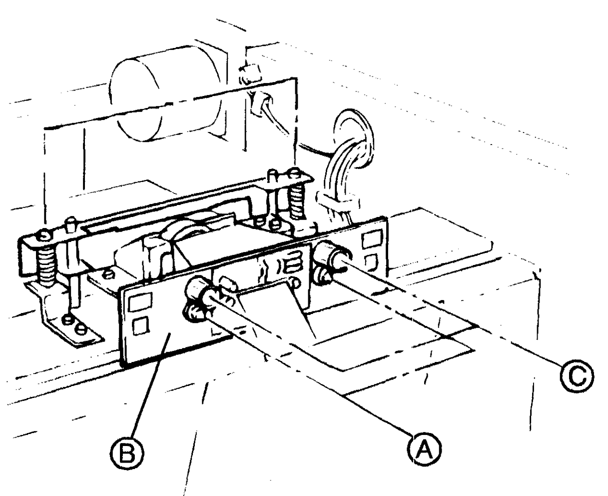


Figure 5-57. Replacing the CCD-POD Board

To replace the CCD-POD board:

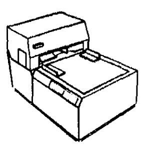
1. Carefully connect the ribbon cable to the CCD-POD board and use a small flat-blade screwdriver to gently seat the cable in the connector. Install the two set screws and the two white inner knobs.

2. Carefully connect the ribbon cable to the CCD camera assembly and use a small flat-blade screwdriver to gently seat the cable in the connector.

3. Install the CCD camera board assembly and connect the cables to the boards.

4. Perform the optical adjustment procedures in Section 6.3 to adjust the alignment of the CCD-POD board.

5.17.12 Upper CCD-POD Board - IS520 Only



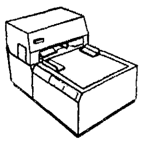
The upper CCD-POD board is located behind the left cover of the upper unit.

ADJUSTMENT NOTE: Optical adjustment is required after the CCD-POD board is replaced.

1. Remove the upper CCD board assembly according to steps 1 through 5 in Section 5.17.10.

2. Perform steps 3 and 4 in Section 5.17.11 to replace the CCD-POD board.

5.18 Replacing the CPU Firmware



The CPU firmware consists of a EPROM that installs on the CPU board.

The same CPU firmware must be installed on the upper and lower CPU boards on IS520 scanners.

Observe the caution on page 5-1 when removing the covers to gain access to the CPU boards.

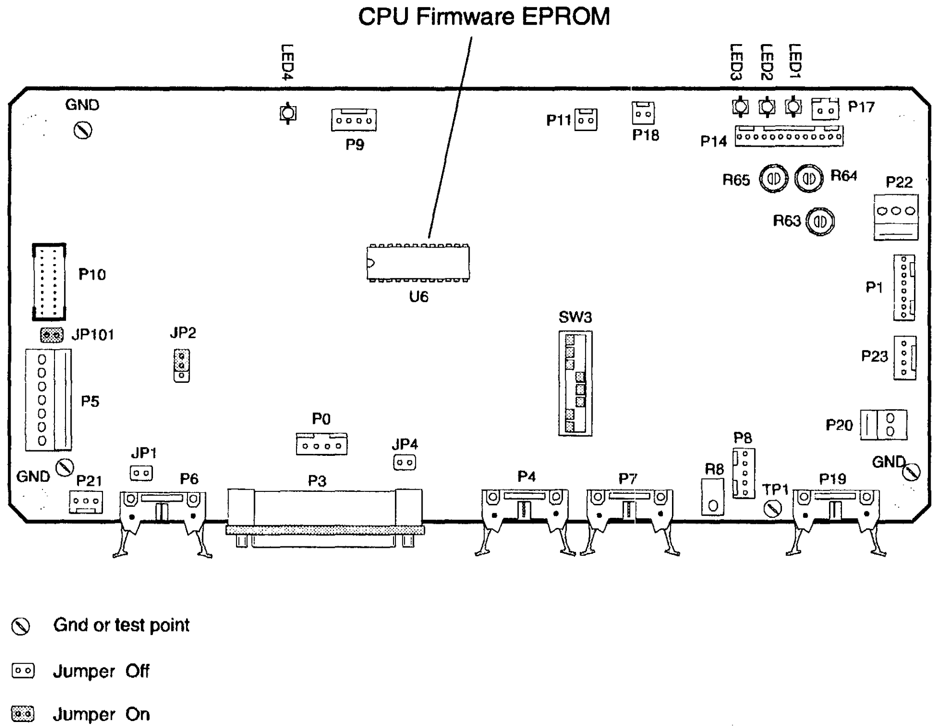


Figure 5-58. Replacing the CPU Firmware

5.18.1 Lower CPU Board

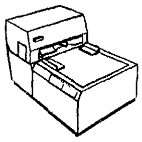
1. Remove the document table and top board. See Section 5.1 for the procedure. The lower electronics are now exposed showing the CPU board (PAGS-1000).

2. Locate the firmware EPROM at U6 on the CPU board and note its orientation in the socket.

3. Carefully remove the EPROM.

4. Insert the replacement EPROM in the socket in the same orientation as before, being careful not to bend any of the pins.

5.18.2 Upper CPU Board - IS520 Only



1. Remove all of the covers from the upper unit. See Section 5.2.8 for the procedure. The upper CPU board (PAGS-1001) is now exposed.
2. Locate the firmware EPROM at U6 on the CPU board and note its orientation in the socket.
3. Carefully remove the EPROM.
4. Insert the replacement EPROM in the socket in the same orientation as before, being careful not to bend any of the pins.

5.18.3 Testing the CPU Firmware Installation

1. Replace the covers and document table.
2. Plug the power cord into the scanner.
3. Make sure all doors are closed and that the upper unit is lowered and locked in position.
4. Turn the power switch ON.
5. Monitor the indicator panel for any error indicators.

   If an error is indicated, immediately turn the power switch OFF and contact your appropriate technical support representative for further assistance.

   If no errors are indicated, turn the power switch OFF and reconnect the scanner to the host computer and any other devices.

5.19 Replacing the SCSI Firmware

The SCSI firmware consists of a EPROM that installs on the SCSI board.

Observe the caution on page 5-1 when removing the covers to gain access to the SCSI board.

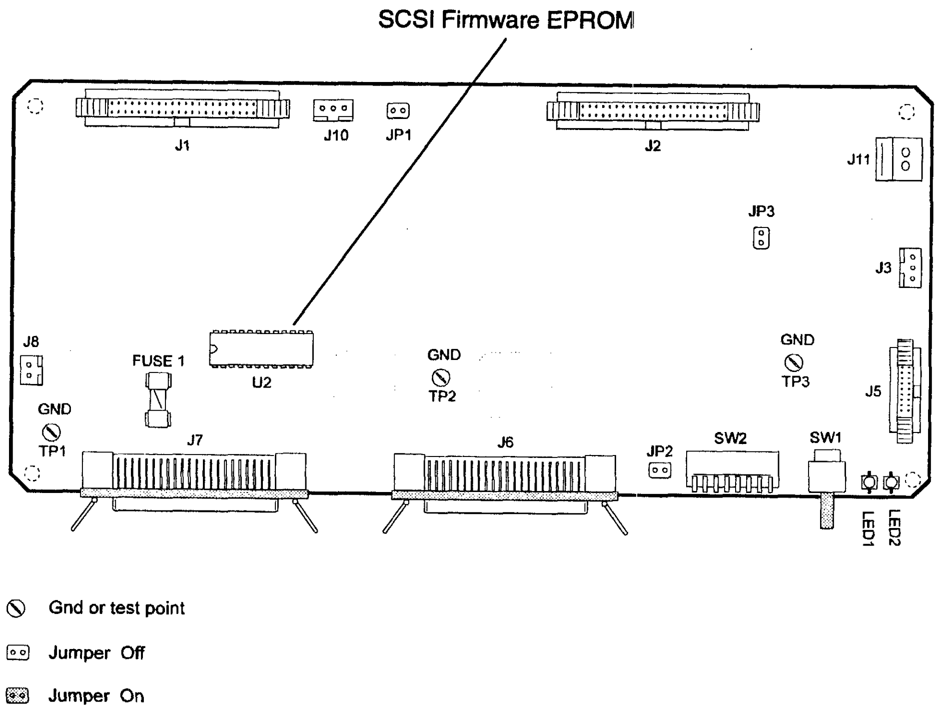


Figure 5-59. Replacing the SCSI Firmware

1. Remove the document table plates. See Section 5.1.1 for the procedure.
2. Remove the rear cover. See Section 5.2.4 for the procedure.
3. Remove the seven 3mm screws attaching the interface tray to the scanner's inner chassis wall. See Figure 5-51.
4. Hold the interface tray by the side tabs and slide it out of the scanner just far enough to gain access to the SCSI board. Guide the wiring harness through the opening so it doesn't bind.
5. Locate the firmware EPROM at U2 on the SCSI board and note its orientation in the socket.
6. Carefully remove the EPROM.

7. Insert the replacement EPROM in the socket in the same orientation as before, being careful not to bend any of the pins.

8. Carefully slide the interface tray back into the scanner, guiding the wiring harness so it doesn't bind on the chassis.

9. Secure the interface tray with the screws.

If no other adjustments are to be made:

1. Replace the lamp A assembly, upper unit covers, rear cover and document table plates.

2. Plug the power cord into the scanner.

3. Make sure all doors are closed and that the upper unit is lowered and locked in position,

4. Turn the power switch ON.

5. Monitor the indicator panel for any error indicators.

   If an error is indicated, immediately turn the power switch OFF and contact your appropriate technical support representative for further assistance.

   If no errors are indicated, turn the power switch OFF and reconnect the scanner to the host computer and any other devices.

CHAPTER 6

Adjustment Procedures

Inside this chapter:

This chapter describes adjustment procedures that should be performed when parts are replaced or out of adjustment. It covers the basic IS510 and IS520 scanners. If options are installed in the scanner, refer to Chapter 7 for information on adjustments for the installed options and special considerations when performing the optical adjustments.

6.1 Separation Cartridge Position

The separation cartridge blade makes contact with the upside of the page and feeds one page at a time into the scanner. This adjustment should be performed when double-feeds or jamming occur and when the feed unit or idler unit is replaced.

Tools Required

- metric Philips-head screwdriver

1. Open the upper unit and remove the separation cartridge.
2. Loosen the two screws (A) ¼ to ½ turn to shift the positioning plate (B) as illustrated in Figure 6-1.

6

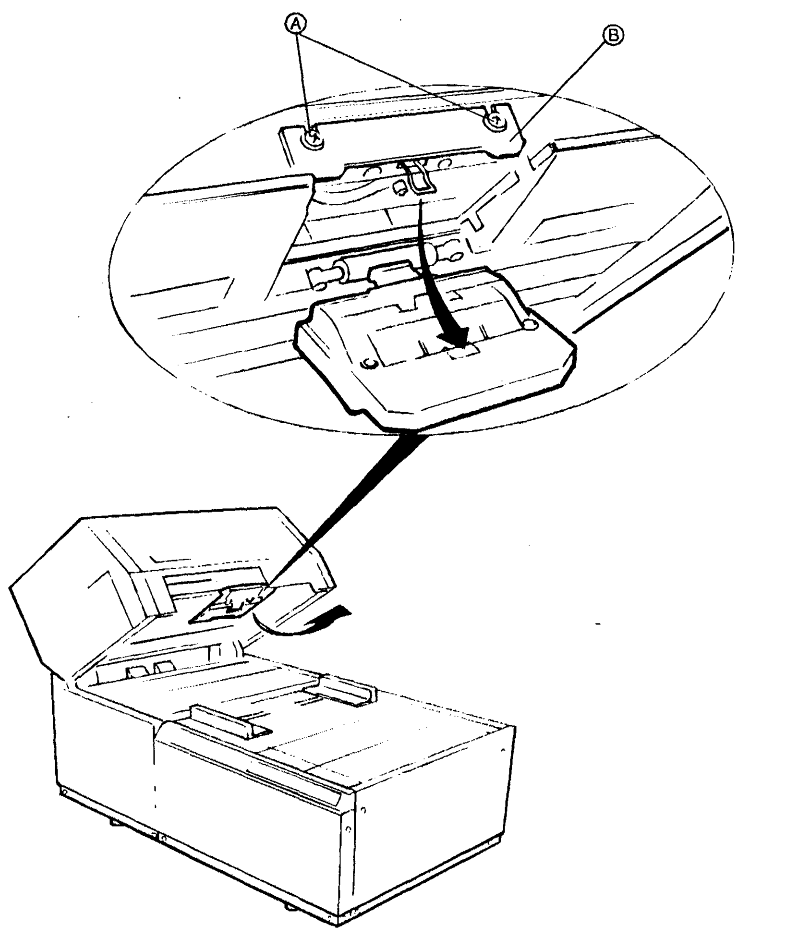


Figure 6-1. Loosening Positioning Plate

3. Tap the positioning plate:

   - up a little if it is double feeding
   - down a little if the pages aren't feeding

   A little = The thickness of a credit card (.030 in.).

   The plate should be parallel with the frame (no tilt).

4. Test the scanner and repeat step 3 until it feeds properly.

The adjustment can be tested using a PC connected to the monitor port or by using the host system to initiate scanning.

To use the monitor port, connect the PC as described in Section 4.5 and type a **7t** command to test feeding.

NOTE . . . A cartridge that is too far down may seem to operate OK, but will make a sound like sandpaper rubbing.

6.2 ADF Pickup Roller Position

The ADF pickup roller makes contact with the downside of the page and feeds it into the scanner. This adjustment should be performed when misfeeds or no feeding occur and when the feed unit solenoid is replaced.

Tools Required

- Hexagon-head screwdriver

1. Remove the document table and top board cover. See Section 5.1 for the procedure.

2. Open the ADF roller cover plate (A). See Figure 6-2.

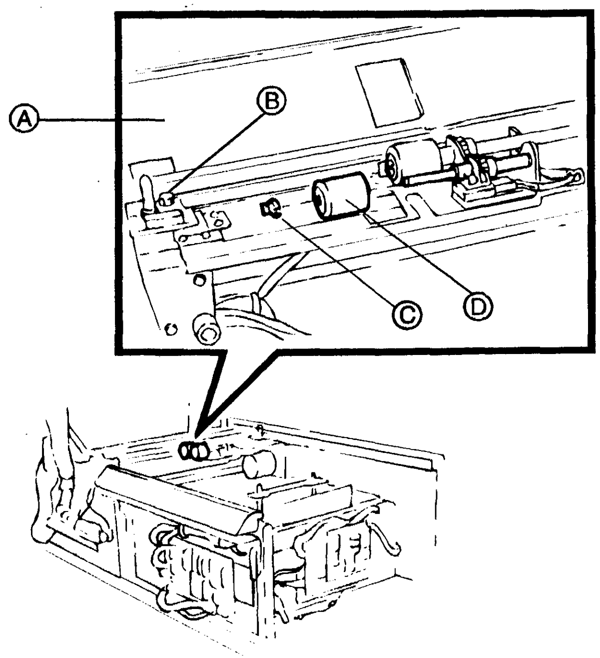


Figure 6-2. Removing the ADF Pickup Roller

3. Loosen the nut (B) and remove the snap ring (C) and the ADF pickup roller (D).

4. Set a hexagon-head screwdriver on the hexagon-head screw in the nut (B) through the round hole on the ADF roller cover plate. See Figure 6-3. Turn the screwdriver approximately ¼ turn clockwise to raise the pickup roller.

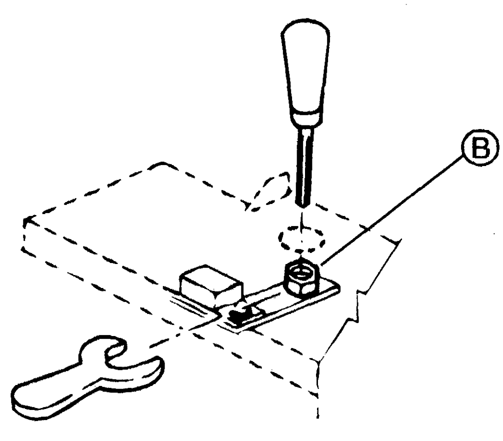


Figure 6-3. Inserting the Solenoid Positioning Tool

6

When you hold down the pickup solenoid, the ADF roller will rise and engage the spring-loaded gate of the separation cartridge. The gate should move up approximately 1 mm (0.04"). If this does not occur, adjust the solenoid's stroke.

5. Tighten the nut (B), holding the hexagon-head screwdriver on the hexagon-head screw in the nut to prevent the screw from turning.

6. Loosen the three screws (F) fixing the solenoid to the solenoid stud. See Figure 6-4.

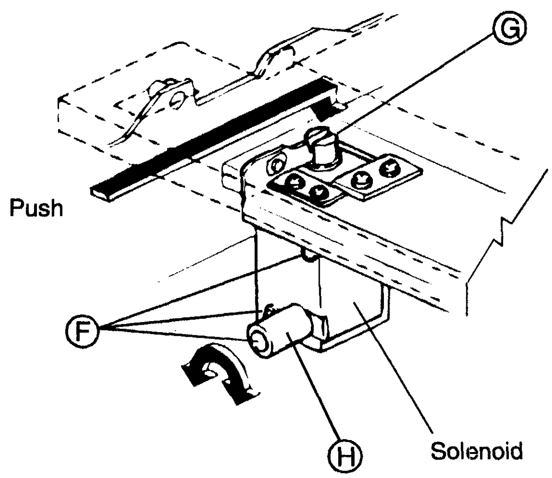


Figure 6-4. Adjusting the ADF Pickup Roller Position

7. While holding the plunger (G) fully down with your fingers, turn the solenoid positioning knob (H) approximately 1/8 to 1/2 turn counter-clockwise. See Figure 6-4.

   When you hold down the pickup solenoid, the ADF roller will rise and engage the spring-loaded gate of the separation cartridge. The gate should move up approximately 1 mm (0.04"). If this does not occur, adjust the solenoid's stroke.

8. Tighten the three screws (F). Tighten the solenoid positioning knob (H) after tightening the other screws to prevent the solenoid from moving.

9. Test the adjustment and repeat the adjustment, if needed.

The adjustment can be tested using a PC connected to the monitor port or by using the host system to initiate scanning.

To use the monitor port, connect the PC as described in Section 4.5 and type a **7t** command to test feeding.

6.3 Optical Adjustments

The IS510 and IS520 optical adjustment procedures are described below in their recommended order of execution. The following are typical conditions that require optical adjustment.

Condition	Required Adjustments
CCD-POD board replaced.	Perform all of the optical adjustments in the order given.
Fluorescent lamp replaced with a different color lamp (light source option).	Adjust the CCD Camera Dynamic Range only.
Image Processor option added or replaced.	Perform all of the optical adjustments in the order given.
Poor image quality.	Perform all of the optical adjustments in the order given.
Feed Unit replaced or removed to access other parts.	Perform all of the optical adjustments in the order given.
EQ/DITHER or 5KCCD board replaced.	Perform all of the optical adjustments except Lens Focusing.

NOTE . . . *If options are installed in the scanner, refer to Chapter 7 to see if there are any special considerations when performing the optical adjustments.*

Tools Required

- metric Philips-head screwdriver
- small flat blade screwdriver
- dual channel Oscilloscope
- Tiny bubbles, Graytone, Halftone test sheet (available from Ricoh and Improvision)
- PC connected to the Monitor port (see Section 4.5)

6.3.1 Preparation

Follow the steps below to prepare the IS510 and IS520 scanners for the optical adjustments.

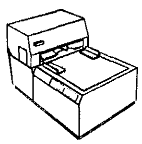
NOTE . . . *The fluorescent lamps must be turned on for 7 minutes or more to stabilize their condition before starting any of the optical adjustments.*

IS510 Scanners

1. Turn the scanner OFF and remove the power cord.

2. Remove the document table, top board cover, front-right and right covers from the lower unit to expose the camera assembly and the EQ/DITHER board. See Sections 5.1, 5.2.1 and 5.2.2 for the procedures.

3. Connect the power cord and turn the scanner ON.



IS520 Scanners

The optical adjustments must be performed for both the lower and upper camera assemblies. Follow the procedure below to access both camera assemblies.

1. Turn the scanner OFF and remove the power cord.

2. Remove the document table, top board cover, front-right and right covers from the lower unit to expose the camera assembly and the EQ/DITHER board. See Sections 5.1, 5.2.1 and 5.2.2 for the procedures.

3. Verify that the jumpers on JP1 and JP2 on the OP-CON board (located behind the front right cover) are both open.

4. Remove all of the covers from the upper unit. See Section 5.2.8 for the procedures.

5. Remove the cover from the CCD camera assembly on the left side of the upper unit. See Figure 6-5. The camera assembly is exposed.

6. To adjust the upper camera assembly, remove the six screws (B) from the metal tray that holds the upper CPU (PAGS-1000) board. Carefully raise the board and tray with cables attached by lifing one side, then the other and angle it so you can get to the lens. Temporarily secure the tray with a couple of screws. See Figure 6-5.

7. Remove the screw (C) and pull out the harness clamp (D) so the adjusting screw of the shading plate can be turned.

8. Place a tie wrap over the SW3 interlock switch on the upper unit so the scanner can be tested with the covers removed. See Figure 6-6.

9. Connect the power cord and turn the scanner ON.

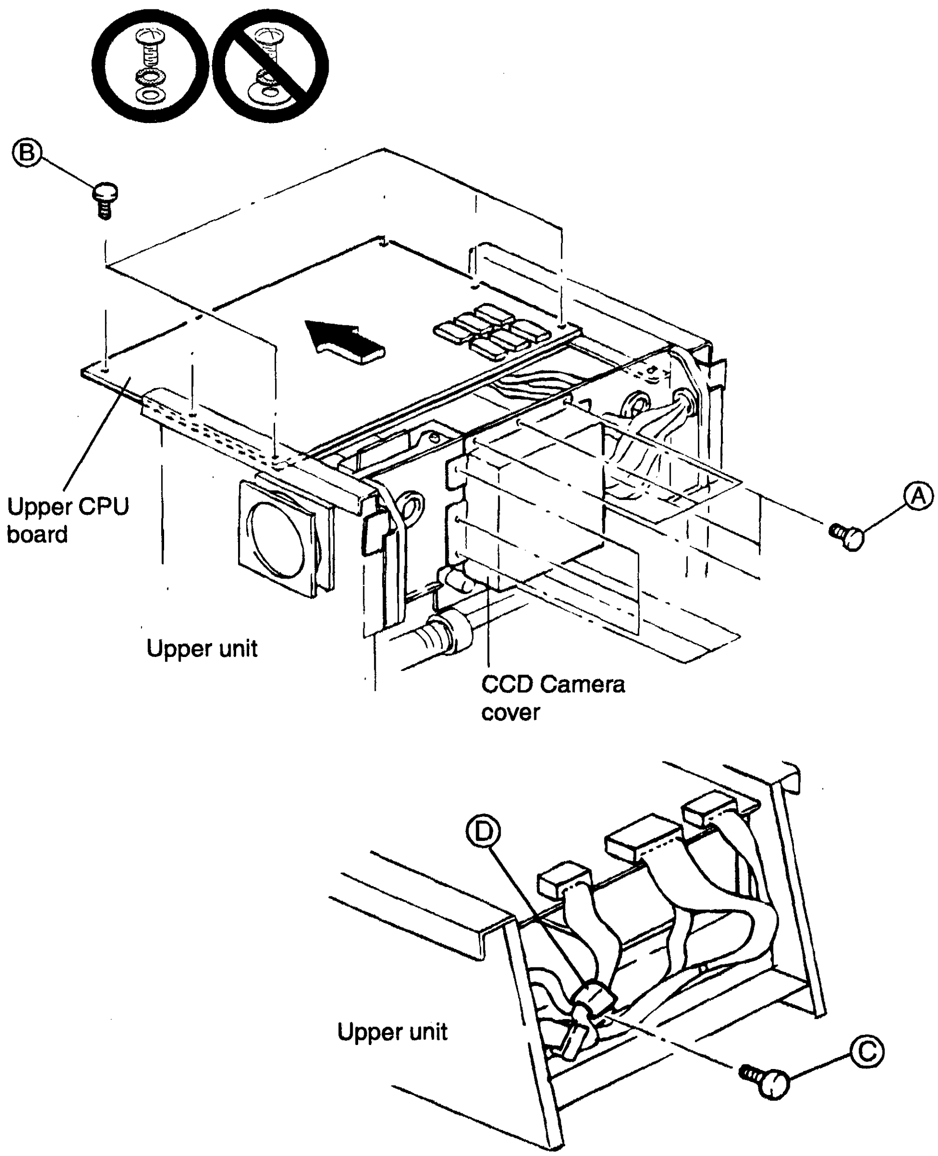


Figure 6-5. Upper Unit Access

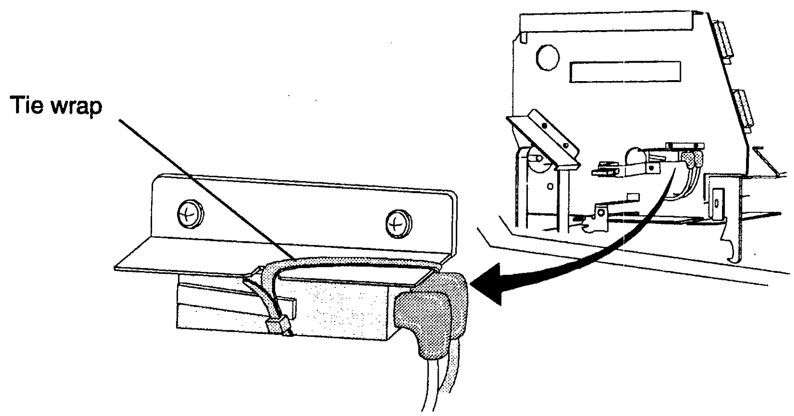


Figure 6-6. Disabling the SW3 Interlock Switch

IMPORTANT: After completing the optical adjustments, be sure to remove the tie wrap from the interlock switch before replacing the cover.

6.3.2 White Reference and CCD Alignment

This procedure is mandatory when replacing the CCD-POD board, or when poor image quality is observed. The purpose is to align the scanner's opto-mechanical axis, and maximize the CCD light envelope. Steps 9 through 13 are not required when the EQ/DITHER or 5KCCD boards are replaced.

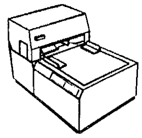
The monitor port and the Graytone test document are used in this procedure.

NOTE . . . *The scanner's upper unit must be closed with no document present for this procedure.*

1. Before making any adjustments, clean both contact glasses and make sure the white reference plate is clean. Also clean the mirrors and lens.

2. Connect a PC to the monitor port and set the PC for terminal emulation. See Section 4.5 for details.

3. Sync a scope to the camera "CLAMP" signal (J2 on the bottom edge of the EQ/DITHER board). Observe one of the CCD analog channels by connecting probes to the interconnect pins between the EQ/DITHER board and the CCD Control board (5KCCD) on the left edge of the boards AIN or BIN. See Figure 6-7.



IS520 upper unit only: Remove the four screws that attach the CCD camera board bracket to the scanner. See (A) in Figure 5-54. The

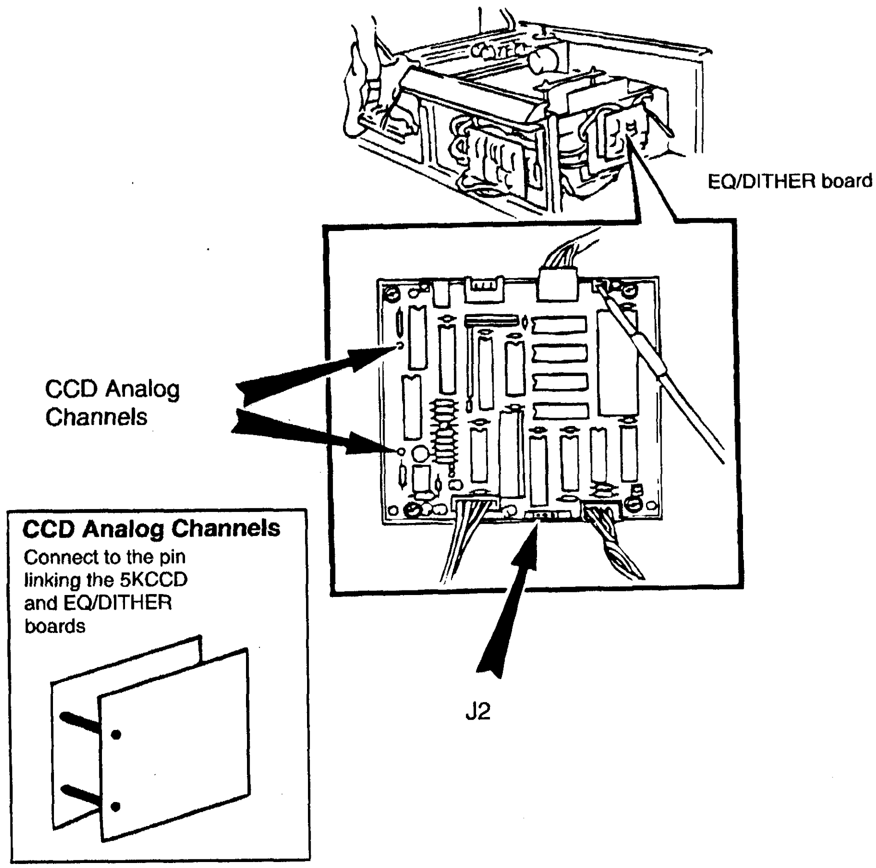


Figure 6-7. Probe Connections for White Reference Adjustment

CCD camera board connectors and ribbon cable should remain connected.

4. Type an **8t** command on the PC connected to the monitor port to turn the lamp(s) on.

5. Loosen the two set screws (A) on the CCD-POD board (B), then loosen the two white inner knobs attaching the CCD-POD board to the lens block assembly ½ to ¾ turn. See Figure 6-8.

6. Turn the white knobs (C) to articulate the CCD-POD board while observing the analog CCD output. The observed analog signal is the "CCD white reference."

6

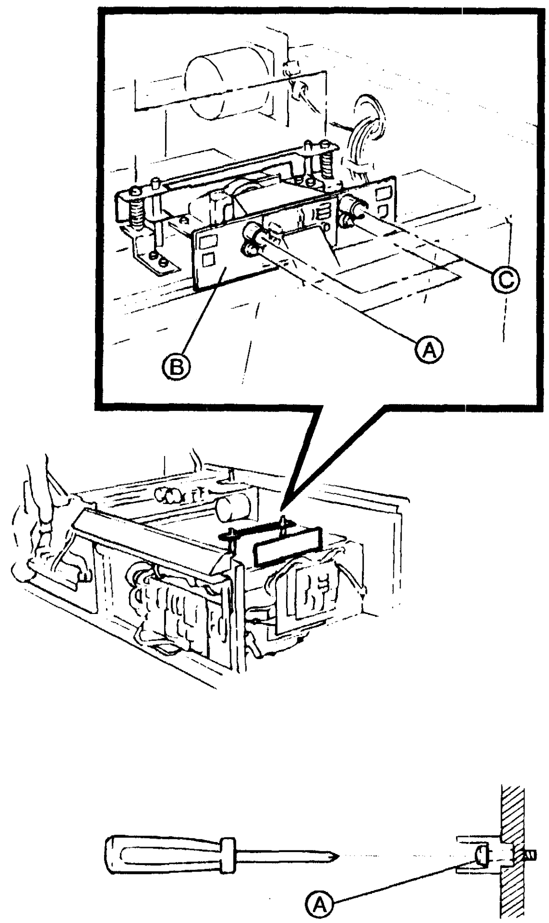


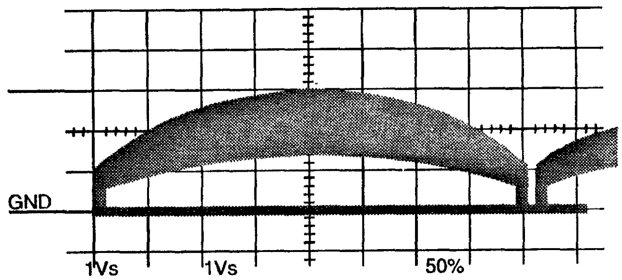
Figure 6-8. Adjusting the CCD Alignment

7. Bring the white reference to a point where it's amplitude is maximal and the envelope shape is symmetrical as shown in Figure 6-9. Slightly tighten the white knobs to insure that the envelope shape is maintained.

8. Observe that the white reference envelope is centered between the CLAMP negative going pulses. If this is not the case, move the CCD-POD sideways to correct for centering.

9. Remove the rear cover to gain access to the stepper motor. See Section 5.2.4 for the procedure.

10. Move the feed lever to the Manual position.



IS520	Lower	Upper
Green	2.5-3.5V	2-3V
Blue	2.5-3.5V	2-3V
Red	1.5-2.5V	1-2V

Figure 6-9. White Reference Envelope Centered

11. Insert the Graytone test sheet into the scanner and secure it against the R1 roller (to establish parallel mechanical feed).

12. Manually turn the stepper motor's shaft advancing the test sheet toward the scan window until changes are noticed in the CCD white reference. Two clicks of the motor is good and the signal should be flat.

If the CCD chip is not parallel to the mechanical axis of the scanner, the white reference amplitude will not decline uniformly across the CCD device.

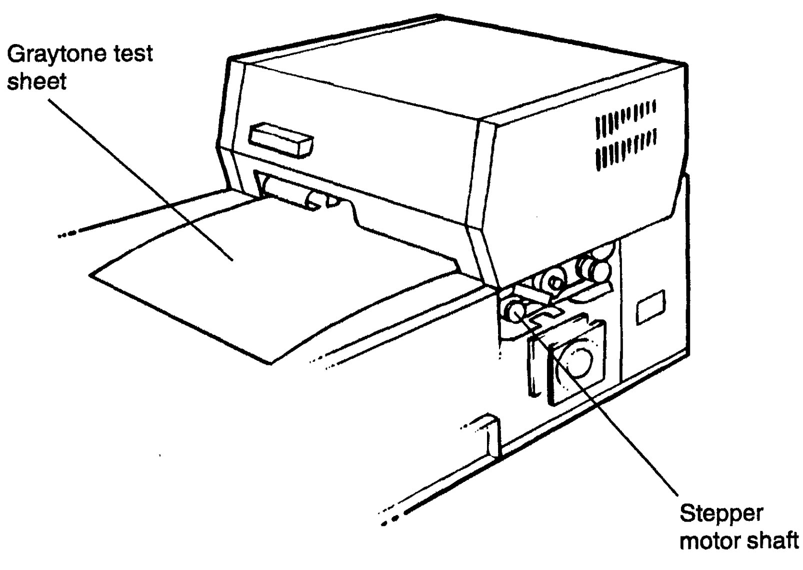
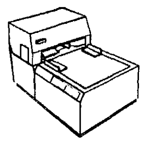


Figure 6-10. Advancing Page Manually

13. Correct the CCD axis by gently adjusting one of the white knobs, and repeating steps 10-12 until the amplitude declines uniformly across the CCD chip as the leading edge of the page is advanced.

14. Tighten the four screws (A) and (C) holding the CCD-POD to the lens block.

15. Install the CCD camera board assembly using the four screws removed in step 2.



16. For IS520 scanners, repeat the above steps to adjust the upper camera assembly. The upper camera assembly is exactly the same as the lower camera assembly and the same test points apply.

6.3.3 CCD Camera Dynamic Range Adjustment

This test verifies that the camera calibration is done at an optimal dynamic range of the flash ADC's.

NOTE . . . *If an Image Processor option is installed, this adjustment insures that the NPS/IP boards are operating at the full input range and are not saturated.*

The monitor port is used for this procedure.

1. Set the scanner as in steps 1 and 2 of the White Reference and CCD Alignment, Section 6.3.2.

2. Reset the scanner and CPU board by pressing the ESC key on the PC connected to the monitor port. Type an **8t** command to turn the lamp(s) on.

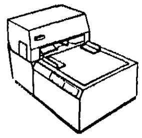
3. Measure the peak value of the CCD analog channel and observe the DC voltage at TP1 on the EQ/DITHER board. See Figure 6-11.

4. Adjust R9 on the EQ/DITHER board so that TP1 is approx. 0.8V above the peak value of the analog channel. See Figures 6-11 and 6-12.

   When using a Green or Blue lamp a higher adjustment is acceptable to soften the scanner's high frequency response.

   NOTE . . . *In all cases, the voltage of TP1 must not exceed 5.5V. This condition is especially critical in scanners equipped with the 8-Bit Grayscale option. If the 8-Bit Grayscale option is configured with disabled normalization (P4.6 to P4.7 jumpered), set R9 so TP1 is nominally 1.25V above the peak value of the analog channel.*

5. Press the ESC key on the PC to exit the test phase. The signal on TP1 should form a replica of the analog channel envelope observed in step 4. If the signal is distorted, verify step 4, or check the EQ/DITHER board for possible failures.



6. For IS520 scanners, repeat the above steps to adjust the upper camera assembly. The upper camera assembly is exactly the same as the lower camera assembly and the same test points apply.

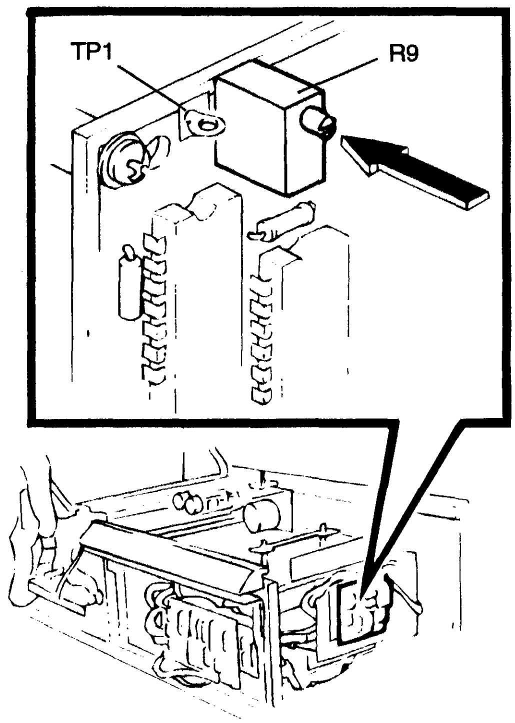


Figure 6-11. Adjusting R9 on the EQ/DITHER Board

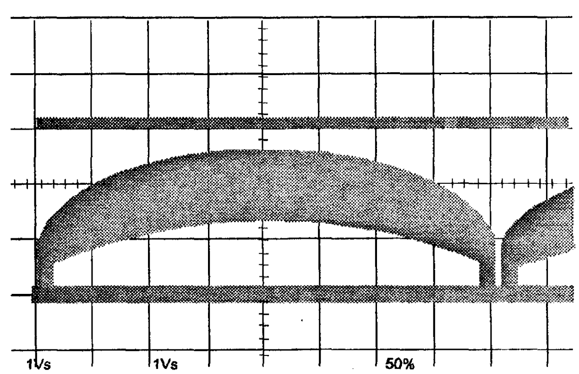


Figure 6-12. DC Voltage at TP1

6.3.4 Lens Focusing Procedure

This procedure is mandatory after the CCD-POD is replaced. It is also recommended after shipping the scanner if poor edge definition or high frequency response are noticed in scanned images.

The monitor port and the Tiny Bubbles test page are used in this procedure.

1. Set the scanner as in steps 1 and 2 of the White Reference and CCD Alignment, Section 6.3.2.

2. Sync the oscilloscope to CLAMP. Observe the CCD analog channel and type an **8t** command on the PC connected to the monitor port to turn the lamp(s) on.

3. Use the Tiny Bubbles test page or a monotonous test page with a fine grid or small circles pattern. Slide the page manually into the scanner with a skew of 10-20 degrees and turn the stepper motor shaft to advance the sheet. The skew will generate alias low frequencies which simplify the observation.

4. Free the lens in it's barrel by means of loosening the screw in the lens locking tab 3 to 5 turns.

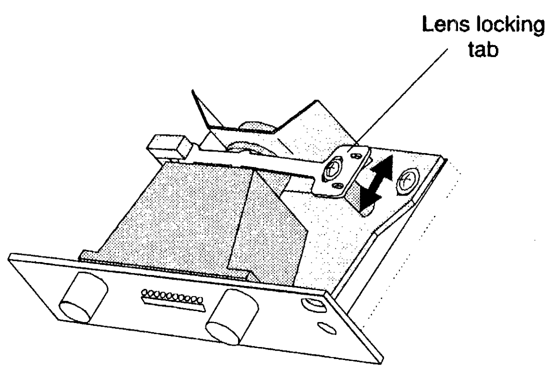


Figure 6-13. Lens Locking Tab

5. Manually move the lens locking tab (which moves the lens in the barrel) to maximize the peak-to-peak swing of the high frequency modulation seen on the analog signal pattern.

6. Tighten the locking tab screw to get the maximum swing along the CCD chip. Vibratite can be used to secure the screw. DO NOT use Lock-Tight.

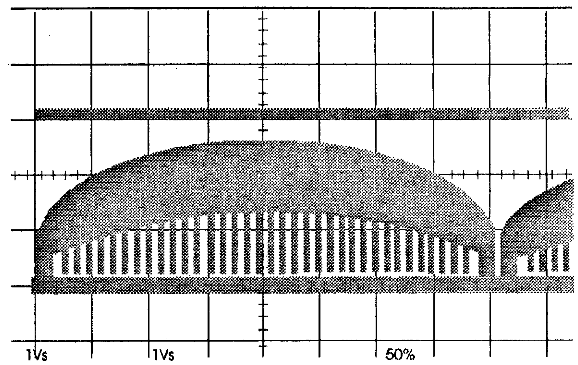
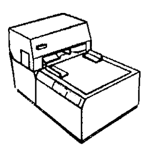


Figure 6-14. Adjusting Lens Focus

NOTE. . . If the scanner is configured with an Image Processor option, the same modulation may be observed on the "Gamma Video" test point of the NPS/IP board. See Figure 7.2.



7. For IS520 scanners, repeat the above steps to adjust the upper camera assembly. The upper camera assembly is exactly the same as the lower camera assembly and the same test points apply.

8. Verify the focusing on images with large even areas of fine halftones printed on good quality paper. Such image details contain high spatial frequencies which do not reproduce well unless the optics are focused.

   The halftone images should be scanned under various IP matrix selections. Typically a 30% 133 screen should reproduce well with a 0 matrix. A matrix of 2 will reduce the halftone fidelity, and a matrix of 4 will enhance it.

   In all matrix cases, the observed patterns should appear even across the image width. If density patches or smearing are observed, repeat steps 5 and 6 to optimize the focusing.

6.3.5 Contrast Modifier Range Adjustment

This adjustment allows the CPU board to modify the contrast of the CCD camera. In an IS520 scanner, this test must be performed on both CPU boards.

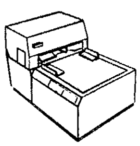
The monitor port is used for this procedure.

1. Type a **2t** command on the PC connected to the monitor port. The scanner will print a short test menu on the PC's monitor.

2. Connect the oscilloscope probe to the test point on the CPU board.

   R8 and the test point are located along the long edge of the CPU board toward the rear wall of the scanner. See Figure 6-15.

4. Adjust R8 on the CPU board so the swing of the waveform at the test point is 5.05V.



5. For IS520 scanners, repeat the above steps to adjust the upper CPU board. The upper CPU board is exactly the same as the lower CPU board and the same test points apply.

CPU board (PAGS-1000)

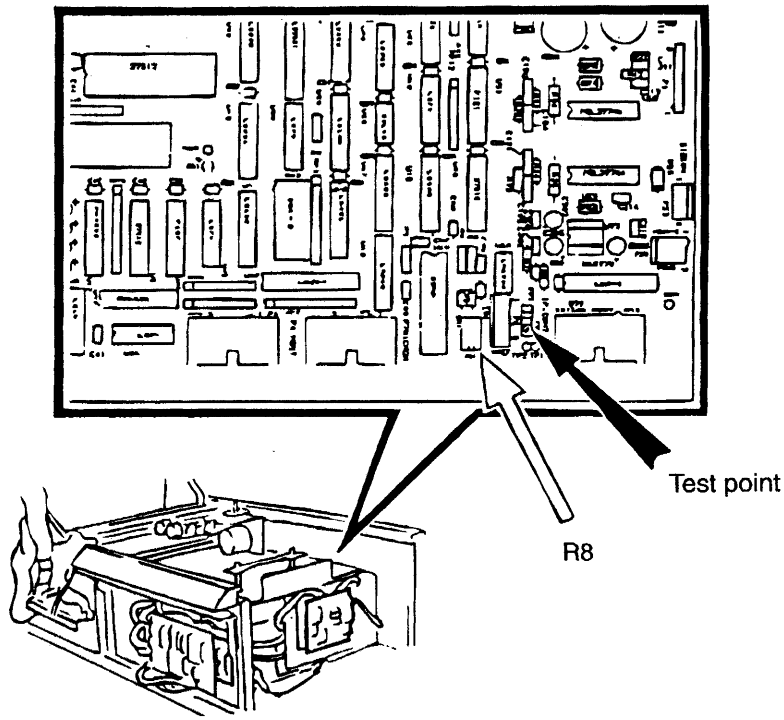


Figure 6-15. Adjusting Contrast Modifier Range

6

6.3.6 Resolution Accuracy Verification

This procedure is used to verify and adjust the optical resolution of the scanner. The vernier test sheet includes ruler patterns along its edges with line spacing of 0.050 in. and a cumulative dimensional error of less than 0.050 in. across the full sheet.

1. Connect a PC to the monitor port and set the PC for terminal emulation.

2. Sync scope to the "CLAMP" signal, observe the CCD analog channel and the formatted pixel clock (PAGS-1K board U47.7 or J4.1).

3. Type an **8,<n>t** command on the PC connected to the monitor port where <n> is a resolution dependent parameter as follows:

600 dpi optics	<n>=1	marker every 30 pixel
500 dpi optics	<n>=2	marker every 25 pixel
400 dpi optics	<n>=3	marker every 20 pixel

   This will generate periodic single pulses on the formatted pixel clock as listed above. The spacing between pulses corresponds to 0.050 in. physical distance at the document plane at the specified resolution.

4. Move the ADF lever to the manual position. Insert the vernier test sheet into the ADF and advance it by manually rotating the stepper motor's shaft (see Figure 6-10) until the ruler's image is observed on the CCD Analog channel.

   The ruler will appear as a series of notches or valleys in the analog signal. Using the scope's magnified time delay, align the first pixel clock marker with a notch (lowest video level seen). If the scope does not permit alignment, note the timing relation between the two signals.

5. Use the delay dial to traverse the full scan line. If the video notches and pixel clock markers alignment is maintained, the optical resolution is accurate.

   - If notches lag behind their markers, the optical resolution is below specifications.
   - If markers lag behind notches the resolution is above specifications.

6. If required, correct the resolution by loosening the lens block adjustment screws and making slight movements of the lens block. See Figure 6-16. On scanners equipped with the 500/600 dpi option, correct the resolution by adjusting the CCD-POD board as in Section 6.3.2.

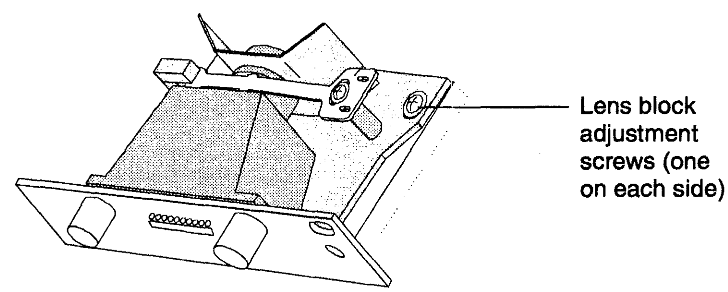


Figure 6-16. Lens Block Adjustment

NOTE . . . Moving the block or assembly toward the CCD camera unit REDUCES the resolution.

7. When correcting the optical resolution, repeat steps 4 through 6 until the notches and markers maintain alignment across a full scanline.

CHAPTER 7

Options

Inside this chapter:

This chapter provides detailed information on how each option operates, changes that are made to the scanner configuration when the options are installed, any special adjustment procedures, replacement procedures, and specifications.

7.1 Image Processor (NPS/IP)

An image processor can be used to operate on digital grayscale image data generated by the camera system. This module can provide background tracking, gamma correction, edge enhancement, edge smoothing, noise reduction, etc.

The NPS/IP board accepts digital grayscale image data from the CCD and converts it to binary image data. The NPS/IP board operates on 6 bit per pixel data at pixel rates up to 12 MHz with no limit on the number of pixels per line. The input grayscale data is translated with a selectable gamma curve correction circuit prior to its use by the NPS/IP. This feature is used to fit the overall response from the media, illuminator, and CCD.

The NPS/IP tracks the incoming image data for localized maximum and minimum points (high peaks and low valleys in the grayscale data along a scan line). The minimum and maximum data are used in determining a threshold value against which the incoming image data is evaluated and converted to binary data.

Several algorithms are provided for the usage of the maximum/minimum data permitting the control module (PAGS-1K) to adjust the resulting sensitivity to the image background.

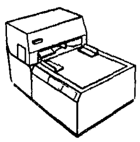
An edge detector circuit can be set to alter the binarization process as determined by evaluating the incoming data change rates against a selectable rule set. This circuit helps in removing some of the undeterministic pixels ("fuzziness") often seen on small text and is considered a high frequency operator.

The single pixel patch and removal (SPP) circuit operates on a 3 by 3 pixel matrix and assists in removing "orphans" of either color, as well as vertical and horizontal "holes/sticking pixels." This function improves the final image appearance and compression ratio. The SPP has a pass-through mode and three patch algorithms selectable by an external device such as the PAGS-1K module.

Refer to Part III, *Programmer's Reference,* for the Image Processor software commands.

7.1.1 Changes to the Scanner Configuration

The Image Processor option consists of an NPS/IP board that installs below the CPU (PAGS-1000) board in the lower unit as shown in Figure 8-1.



In IS520 scanners a second NPS/IP board is installed below the CPU (PAGS-1001) board in the upper unit as shown in Figure 8-3.

The NPS/IP is controlled by the external port of the CPU board(s).

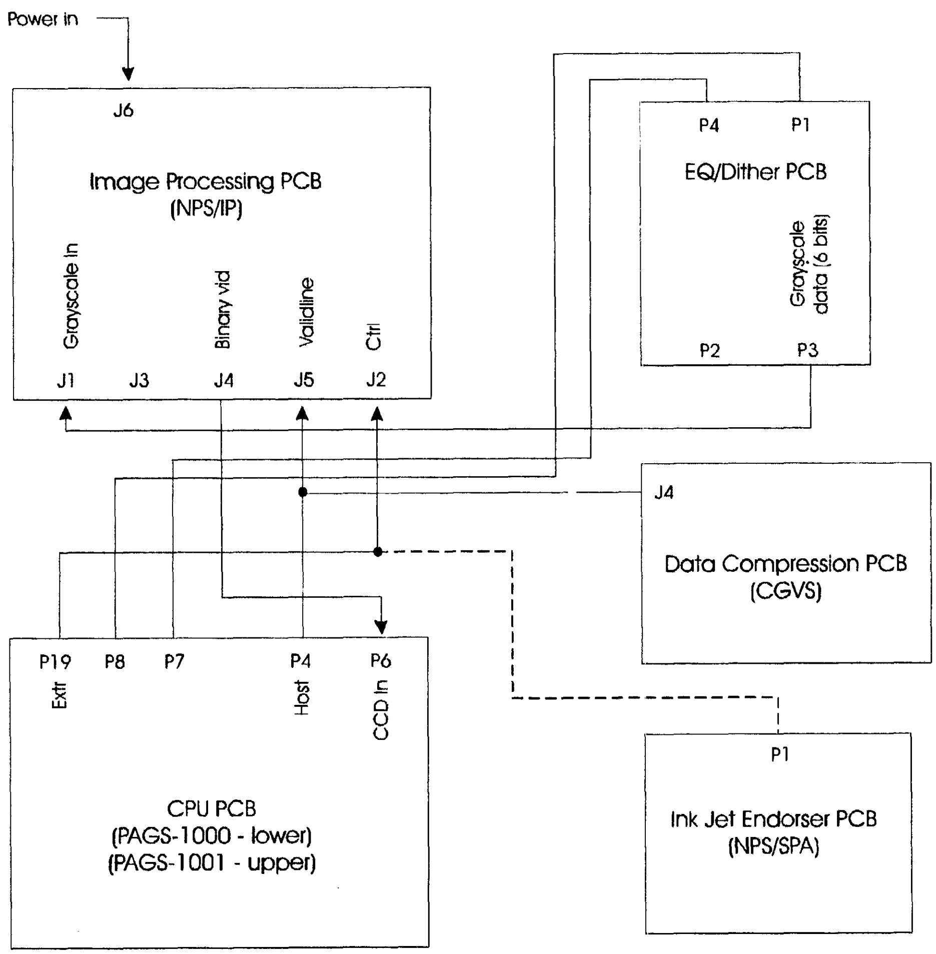


Figure 7-1. Lower and Upper NPS/IP Board Cable Diagram

The shading plate adjustment screws should be loosened to the maximum amount. This raises the shading plate so it doesn't interfere with the optical path.

DO NOT tighten the adjustment screws on the shading plate.

7.1.2 Video Signal Flow

With respect to the video signal flow discussed in Section 1.2.3, when the Image Processor option is installed, the video signal goes to the NPS/IP board for enhancement before going to the CPU board. In IS520 scanners, the signal goes to the respective NPS/IP board in each unit before going to the CPU board.

7.1.3 Replacing the NPS/IP Board

The following sections describe how to replace and test the lower NPS/IP board in IS510 scanners and the upper and lower NPS/IP boards in IS520 scanners.

ADJUSTMENT NOTE: The optical adjustments must be performed after the NPS/IP board has been removed or replaced. See Section 7.1.4 for details.

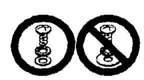
7.1.3.1 Lower NPS/IP Board

1. Remove the lower CPU board according to Section 5.17.1. The NPS/IP board is located below the CPU board.

2. Disconnect the cables from the NPS/IP board and remove the four screws from the corners of the board. See Figure 8-1.

3. Remove the NPS/IP board. Install the new board and secure it with the screws.

4. Reinstall the CPU board. Verify all connections. Check to be sure the black wire on all of the connectors is toward the front of the scanner.



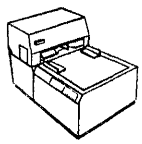
CAUTION: DO NOT use the screws with a large flat washer to install the CPU board. The washers on these screws can cause the board to short out.

5. Connect the cables to the CPU and NPS/IP boards. Check to be sure the black wire on all of the connectors is toward the front of the scanner. See Figure 7-1 for a cable diagram.

6. Carefully connect the ribbon cable to the CCD camera board and use a small flatblade screwdriver to gently seat the cable in the connector. Install the CCD camera assembly bracket and connect the cables to the EQ/Dither and CCD camera boards.

7. For IS510 scanners, go to section 7.1.3.3 to test the installation.

7.1.3.2 Upper NPS/IP Board - IS520 Only



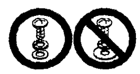
1. Remove the upper CPU board according to Section 5.17.2. The NPS/IP board is located below the CPU board.

2. Disconnect the connectors from the NPS/IP board and remove the four screws from the corners of the board. See Figure 8-3.

3. Remove the NPS/IP board. Install the new board and secure it with the screws. Connect the cables to the NPS/IP board. See Figure 7-1 for a cable diagram.

4. Reinstall the CPU board and connect the cables.

5. Verify all connections. Check to be sure the black wire on all of the connectors is toward the front of the scanner.



CAUTION: DO NOT use the screws with a large flat washer to install the CPU board. The washers on these screws can cause the board to short out.

6. Place a tie-wrap over the SW3 interlock switch on the upper unit so the scanner can be tested with the covers removed. See Figure 8-5.

7. Go to Section 7.1.3.3 to test the installation.

7.1.3.3 Testing the Image Processor Installation

The following test should be performed while the covers are removed from the scanner.

1. Connect the power cord and turn the scanner ON.

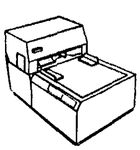
2. Check to be sure the Power light on the Indicator Panel is lit and that the scanner powers on properly.

3. Insert a sheet of paper into the scanner to verify that the lamp(s) turn on.

4. Perform the optical adjustments according to Section 7.1.4.

5. After completing the optical adjustments, replace the covers.

   In IS520 scanners, be sure to remove the tie wrap from the interlock switch before replacing the upper unit covers.



7.1.4 Adjustment Procedures

To insure optimal operation of the scanner when the Image Processor option is replaced, follow the optical adjustment procedures in Section 6.3. Check for the following when making the adjustments:

- Insure that the shading plate is out of the CCD optical path and has no effect on the analog video when performing the adjustment procedures.
- When performing the CCD Camera Dynamic Range Adjustment, set R9 to the peak video on "A" or "B" plus 0.3 to 0.5 volt.
- Verify the Odd/Even channel by measuring the signal at the NPS/IP Gamma Video test point. This is best done with a Ricoh R1 chart or other continuous-density gray bar chart.

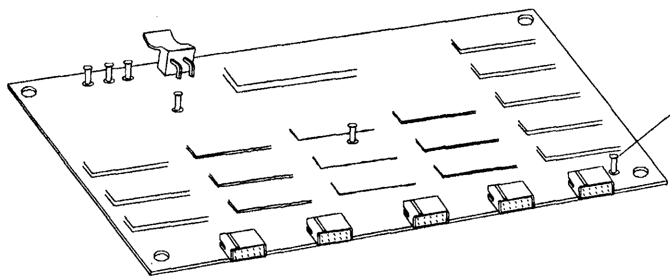


Figure 7-2. Image Processor Board (NPS/IP) - Gamma Video Test Point

Further adjustments to the image quality can be made using software commands on the host system. Since the Image Processor affects the image quality, a host system with a high-resolution monitor is required. A super VGA 1024 x 768 monochrome monitor is the minimum monitor that should be used.

7.1.5 Image Processor Specifications

Image input	Six bit per pixel normalized data Line clock, Pixel clock Valid scan line	single ended TTL single ended TTL single ended TTL
Data rate	10 Mpix/sec. typical 14 Mpix/sec. max recommended	
Pixels/line	Unlimited for non dithered output 5036 max. for dithered output	
Image output	Binary data, Pixel and Line clock Gamma corrected Grayscale data	differential TTL single ended TTL
Control input	EXT port from PAGS-1K/R3 32 bit wide data port	

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Selections	A. Gamma curve correction B. Background sensitivity C. Change rate sensitivity D. Change rate usage algorithm E. Combiner matrix mix F. Dither matrix select G. Single pixel algorithm H. Colored media override	(32 curves) (16 steps) (2 types) (2 types) (4 choices) (8 choices) (4 types) (on/off)
Physical	4 layer PCB, 140 by 170mm outside dimension	
Electrical	5V @2.5Amp	
Environmental	10 to 40C ambient 90% RH non-condensing	

7.1.6 I/O Pin Assignment Specifications

The I/O pin assignments and connector types for the NPS/IP board are listed below.

J4: Binary data (Output)
Amphenol 821-A010P-AFC00

3	+Pixel clock
1	–Pixel clock
7	+Line clock
5	–Line clock
9	+Binary video
10	–Binary video
2	GND
4	GND

J1: Grayscale data (Input)
Amphenol 821-A010P-AFC00

1	VID0 (LSB)
2	VID1
3	VID2
4	VID3
5	VID4
6	VID5 (MSB)
9	Pixel clock
10	Line clock/
7	GND

J2: Ext. Control (Input)
Amphenol 821-A010P-AFC00

1	Ctrl Data
2	Ctrl AX1
3	Ctrl AX2
4	Ctrl AX3
5	Ctrl AX4
6	Ctrl AX5
7	Ctrl clk
8	Ctrl port enb/
9	Port reset/

J5: Valid Line (Input)
Amphenol 821-A010P-AFC00

1	+FMTCK
2	–FMTCK

J3: Gamma Mod Gray (Output)
Amphenol 821-A010P-AFC00

1	Vid0 (LSB)
2	Vid1
3	Vid2
4	Vid3
5	Vid4
6	Vid5 (MSB)
9	Pixel clock
10	Line clock/
7	GND

P5: PSU (Input)
Molex 5274 (09-75-2024)

1	+5
2	GND

NOTE . . . *J3 is not used for Binary scanners. It is optional for grayscale.*

7.2 DR11 Interface

The DR11 Interface option permits the scanner to be attached to any host equipped with either a DR11 or DRV11 16-bit parallel DMA channel. Such configurations are presently available on the PC/AT, SUN SPARC, SUN VME, DECStation and VAX platforms. The supported DR11 host adapters are listed below:

PC/AT:	IKON 10094 (IBM, PS/2 Model 30, APOLLO, 386i)
VME:	IKON 10089 (SUN, ISI, CHARLES RIVER)
UNIBUS:	DEC DR11W (VAX)
QBUS:	DEC DRV11-WA (MICROVAX, 3500 etc.)
MCA:	IKON 10101 (IBM PS/2 Model 50 and beyond)
SBus:	EDT S11W (SPARC, all models)
TURBOch:	LOGICAL DCT-1000 (DECstation 5000/120 etc.)

Scanner software support in all DR11 environments is presently available from Improvision and several third-party VARs.

7.2.1 Changes to the Scanner Configuration

The SCSI (NPS/NSA) board along with its connectors and DIP switch are removed from the scanner when the DR11 interface is installed.

The DR11 electronics are built into the CGVS board so a separate board is not required. The DR11 interface connectors consist of two 40-pin DR11 connectors and a 9-pin DP connector.

7.2.2 RS232 Connection

The scanner's internal RS232 connection is shown below (only Rxd, Txd and GND are wired):

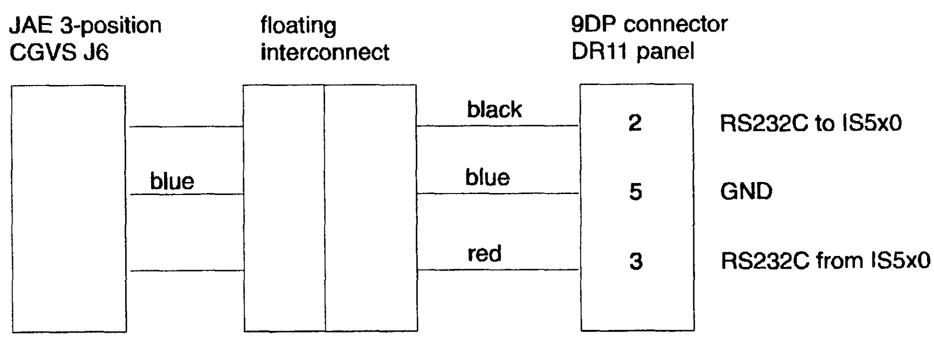

Figure 7-3. RS232 Connection

7.2.3 DR11 Physical Cable Pin Assignment

Improvision uses the numerical pin counting method for all flat cable pin assignments. Two rows of cable header pins are given odd and even numbers, so the wire numbers are sequential within the physical flat cable.
Pin #1 is marked on all cable headers with an indented triangle. Some cables may also use a coloring stripe to signify physical wire #1.

The relationship between the numeric method and DEC's notation of the DR11 cables is as follows:

pin#	DEC
1	VV
2	UU
3	TT
4	SS
5	RR
6	PP
7	NN
8	MM
9	LL
10	KK
11	JJ
12	HH
13	FF
14	EE
15	DD
16	CC
17	BB
18	AA
19	Z
20	Y

pin#	DEC
21	X
22	W
23	V
24	U
25	T
26	S
27	R
28	P
29	N
30	M
31	L
32	K
33	J
34	H
35	F
36	E
37	D
38	C
39	B
40	A

NOTE . . . *The DR11 is used in a user device mode (as opposed to link mode), and the host-to-CGVS cabling is a straight connect (J1 to J1 and J2 to J2). The wrong configuration will result in DR11 time out error messages.*

DR11 Cabling note:

If a wire mesh drain is provided on the DR11 cables, the user MUST insure that such drain is connected to pin 40 as opposed to pin 1 of the DR/LRP, GVS, or CGVS. In most cases this is insured by matching pin1 with the indented triangular marks on the connector bodies - AND NOT by the striped end of the ribbon cables.

7.2.4 CGVS Control by a DR11

The DR11 product has three output lines to the user device labeled FUNCthru.3. The CGVS makes special use of these lines as explained below:

name	pin	CGVS name
FUNC1	J2.23	data*_command
FUNC2	J2.27	reg0*_reg1
FUNC3	J2.31	to*_from VAX

FUNC1: The CGVS will route transfer cycle data to its control registers if this line is high. Otherwise, the data will be considered image data.

FUNC2: CGVS control register select. When low, the external data register is addressed. Otherwise, the control register is selected. The control register bit description is given below.

FUNC3: DMA transfer direction select. When low, the CGVS will pass data to the host. When high, the CGVS will expect data from the host. This line is explicitly defined to provide compatibility with Improvision's DR/LRP product.

The CGVS has two registers for control of various hardware functions. A 16 bit data register is used to pass data to on- and off-board hardware functions, such as the VCEP and the Vidar or IS400 adapter cards. This register is identified as 'reg0' and is selected with a low on FUNC2.

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The CGVS control register is 16 bit wide identified as 'reg1'. The bit position definitions of this register are as follows:

D0: XCNT0. External control line which is used by other boards as follows:

On the Vidar-Link:

A transition from low to high will latch the data present at 'reg0' into the line per image counter of the Vidar-Link board.

On the GVS-13/GVS-14 board:

A positive transition of this line will latch the data present in 'reg0' to the offset registers of the GVS-13 and the GVS-14 boards. Note that the values are expressed in 2's complement BYTES for the GVS-13, and 2's complement PIXELS for the GVS-14.

D1: EXCNT1. External control line which is used by other boards as follows:

On the Vidar-Link:

This line is used to reset the byte and line counters when low.

On the GVS-14 card:

This line is the scale control (*1/2X_1/4X) during scans. The line is also used as the 'gray translation table' write control (when BOTH D0 and D7 are held high).

D2: Init FIFO. A transition from low to high level on this bit will cause the 'read' and 'fill' pointers to reset and will also initialize the FIFO control state machine. This cycle must take place prior to a scan procedure.

D3-D4: Test pattern select. When testing the CGVS for RAM data integrity and DMA transfers, these lines select a test pattern that will be written into the CGVS FIFO buffer. The images are organized as 4K pixel/line, and have the following choices:

D4 D3 = 00 : clear image (0000)
D4 D3 = 01 : set image (ffff)
D4 D3 = 10 : 3 pixel wide cross hatch. (16 by 16 cell).
D4 D3 = 11 : 3 pixel wide diagonal lines.

D5: Enable pattern data. This bit enables the generation of test patterns when high. The low to high transition of the bit synchronizes the pattern to “line 0”.

D6: Enable ATTN generation. A low level on this line provides a software override of the ATTN signal. This condition also sets STATUS1 and clears STATUS0. When using ATTN or STATUS sense, this line must be brought to a high level prior to the start of scan.

D7: EXCNT2. External control line which is used by other boards as follows:

On the Vidar-Link:

A low to high transition on this line will latch the data present at 'reg0' into the byte per line counter of the Vidar-Link card.

On the GVS-13/GVS-14 card:

A low-to-high transition on this line will latch the data present at 'reg0' into the line size counters of the GVS-13 and the GVS-14 boards. Note that the values are expressed in 2's complement BYTES for the GVS-13, and 2's complement PIXELS for the GVS-14.

D8-D10: VCEP address lines. These lines are connected directly to three VCEP address lines with D8 connected as A0.

D11: VMR. This line is the VCEP reset. The line also reset the VCEP output arbiter state machine.

D12: VCEP Write Command. A low to high transition on this line will cause the data presently latched in 'reg0' to be written into a VCEP register as selected by D8-D10 above.

D13: not used

D14: unassigned line for external hardware control.

D15: unassigned line for external hardware control.

7.2.5 DR11 Interface Specifications

The CGVS board connects image scanners to host systems via control and data paths. In all of its configurations, the control path is an RS232 communication channel from the host system to the subject scanner. For a complete control protocol description, the reader is referred to Improvision's *PAGS_1000/2* and *RFS-216* specification documents or to the *SCANLIB User's Manual.*

The native CGVS data path is fully compatible with the DR11-W and DRV11-WA DMA channels. Full reference to these devices can be found in the following DEC documents:

DR11-W:	EK-DR11W-UG-002
DRV11-WA:	EK-DRVWA-UG-002

When using the CGVS with a DEC computer as a host, care must be taken to comply with the following operating parameters.

1. The CGVS has a jumper labeled "DRV". This jumper selects between the two DMA channel products. When umpeded, the DRV11-WA device operation is assumed. The differences between the two operating modes are the treatment of the EOC (end-of-cycle) signal, the CYREQB (cycle request B) signal, and the detailed handshake protocol.

2. The CGVS supports word transfers. Using DEC terminology, the image data transfer cycle is a "DATO". Command data to the CGVS and the CCITT_G4 compressor is passed from the host using a "DATI" transfer cycle.

3. The CGVS is configured for single-cycle operation. This avoids dedicating the internal host bus to the scanner, as done in burst mode operation.

The above statements imply that some interface signals are asserted to known levels as to select the DMA channel operating mode. The following table lists all of the CGVS signal line assertions.

name	pin	st	implied condition
A00	J2.35	GND	word transfers only
C0	J2.29	GND	word transfers only
ATTN	J2.37	JP3	continuous / interruptable DMA
BA_INC_ENB	J2.33	+5	DR bus address counter enabled
WC_INC_ENB	J1.33	+5	DR word counter enabled
SINGL_CYCL	J1.32	+5	burst mode disabled

7.3 Fujitsu Interface (GVS-12)

The Fujitsu (GVS-12) interface option allows the scanner to be plug compatible with any M309x scanner. This option permits connectivity to any third-party environment where the Fujitsu scanners are used. Part III, *Programmer's Reference*, lists several ISVs that offer Application Programming Interfaces (APIs) that support the standard PAGS-1000 command language combined with the Fujitsu interface data path.

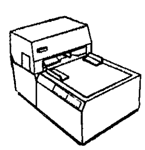
The Fujitsu interface generates an image data path compatible with Fujitsu scanners. It performs the following functions:

- M309X hardware compatibility
- Duplex buffered operation via GVS-01
- Multi media scanner engines support
- Adaptable data port timing

The Fujitsu interface accepts serial binary image data in Improvision's VSI format and converts it to the Fujitsu Corp. proprietary byte-oriented interface used in M309X scanners.

Refer to Part III, *Programmer's Reference,* for the Fujitsu Interface software commands.

7.3.1 Changes to the Scanner Configuration



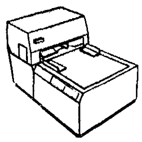
The SCSI (NPS/NSA) board, along with its connectors and DIP switch, and the CGVS board are removed from the scanner when the Fujitsu interface is installed.

On IS520 scanners, the GVS-09 data control board is also removed.

NOTE . . . *Data compression is performed on the host system when this interface is installed.*

The Fujitsu interface consists of a GVS-12 board, a 24-pin video connector and a 9-pin DP connector.

In IS510 scanners, the GVS-12 board installs on the interface tray after the SCSI and CGVS boards are removed.



In IS520 scanners, the GVS-12 board installs piggyback on the GVS-01 memory board.

As done in Fujitsu scanners, the complete interface is comprised of data and control paths. The control port is RS232 compatible. The command protocol used over the control path depends on the firmware implemented according to the scanner type.

The data port timing protocols for the Fujitsu interface can be modified in the field. All of the critical interface phase delays are adjustable by means of a jumper and two potentiometers to accommodate extra long cabling or other host interface requirements.

7.3.2 Video Signal Flow

The following illustrates the video signal flow when the Fujitsu interface is installed in an IS510 and IS520 scanner.

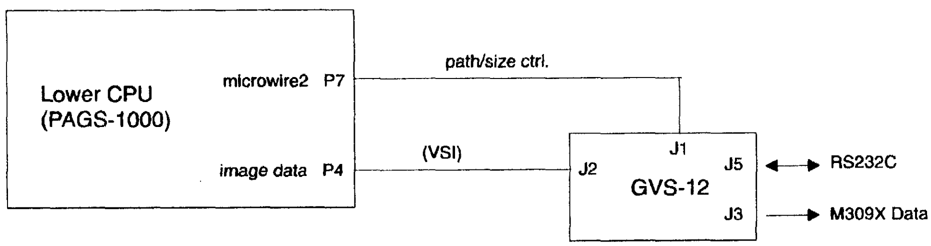
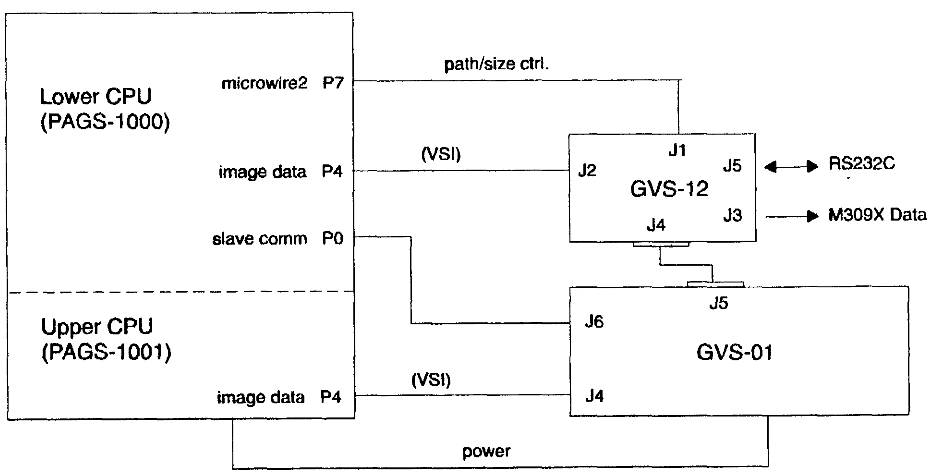


Figure 7-4. Fujitsu Interface Signal Flow for IS510 Scanners



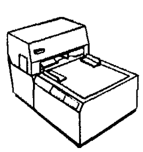


Figure 7-5. Fujitsu Interface Signal Flow for IS520 Scanners

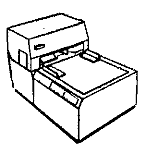
7.3.3 Replacing the GVS-12 Board

The following sections describe how to replace the GVS-12 board in IS510 and IS520 scanners.

7.3.3.1 GVS-12 Replacement - IS510 Scanners

1. Remove the document table and top board cover. See Section 5.1 for the procedure.
2. Remove the rear cover. See Section 5.2.4 for the procedure.
3. Remove the seven 3mm screws attaching the interface tray to the scanner's inner chassis wall. See Figure 5-51. Hold the interface tray by the side tabs and slide it out approximately 6 inches. Guide the wire harness through the opening so it doesn't bind.
4. Disconnect the cables from the GVS-12 board. See Figure 8-7.
5. Remove the four screws from the corners of the GVS-12 board and lift it out of the scanner.
6. Install the new GVS-12 board and secure it with the four screws.
7. Connect the cables to the GVS-12 board.
8. Slide the interface tray to it's backmost position. Secure the interface panel to the scanner's inner rear chassis wall, using the seven 3mm screws.
9. Test the installation according to Section 7.3.3.3. After completing the test, reinstall the rear cover, top board cover and document table.

7.3.3.2 GVS-12 Replacement - IS520 Scanners



1. Remove the document table and top board cover. See Section 5.1 for the procedure.
2. Disconnect the cables from the GVS-12 board that is piggyback connected to the GVS-10 memory board. See Figure 8-9.
3. Remove the four screws attaching the GVS-12 board to the GVS-01 posts (a 90 degree screwdriver is recommended). Gently pull the GVS-12 board out of the connector and remove it from the scanner.
4. Install the new GVS-12 board onto the GVS-01 board by mating the J4 connector on the bottom of the GVS-12 board with J5 on the GVS-01 board. When mating the two boards, use the GVS-12 mounting holes registration with the posts to insure proper unskewed mating of the piggyback connectors.

5. Secure the two boards together with the four screws removed in step 3.

6. Connect the cables to the GVS-12 board.

7. Test the installation according to Section 7.3.3.3. After completing the test, reinstall the top board cover and document table.

7.3.3.3 Testing the GVS-12 Installation

1. Install the document table and attach the scanner to the host system.

2. Connect the power cord and turn the scanner ON. Check to be sure the Power light on the Indicator Panel is lit and that the scanner powers on properly.

3. Insert a sheet of paper into the scanner to verify that the lamp(s) turn on.

4. Test the Fujitsu interface with the host system.

If the Fujitsu interface does not operate properly, follow the procedure in Section 8.3.2 to test the electrical operation of the scanner.

7.3.4 Adjustment Procedures

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If horizontal image tearing is observed, adjustment can be made by

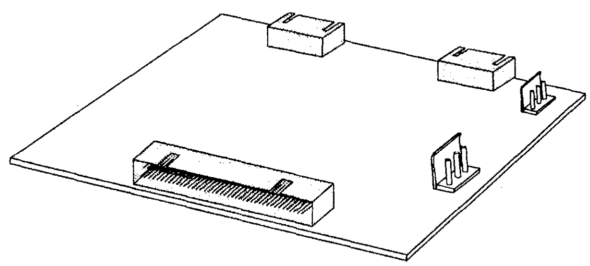

Figure 7-6. GVS-12 Board Jumper

changing the jumper position.

NOTE . . . The potentiometers are set at the factory and should not be adjusted in the field.

7.3.5 Fujitsu Interface Specifications

Image input	VSI serial binary video 16 bit parallel video, GVS-01	differential TTL single ended TTL
Data rate	10 Mpix/sec. typical 16 Mpix/sec. max recommended	
Pixels/line	Unlimited for non dithered output 5036 max. for dithered output	
Image format	up to 64K pixel per line up to 64K lines per frame	(in 16 pixels increments) (in 4 lines increments)
Image output	8 data bits VCL /HGATE, /VGATE	single ended TTL single ended TTL single ended TTL
Control input	Microwire port from PAGS-1K module (16 bit wide data port)	
Selections	A. Image format definition B. Image data path selection (in duplex mode) C. GVS-01 FIFO control	
Settings	A. VCL to data phase timing B. last VCL to /HGATE==F time C. duplex /HGATE==F min width	jumper selected potentiometer adj. potentiometer adj.
Physical	4 layer PCB, 126 by 140mm outside dimension	
Electrical	5V @0.8 Amp	
Environmental	10 to 40C ambient 90% RH non-condensing	

7.3.6 I/O Pin Assignment Specifications

The I/O pin assignments and connector types for the GVS-12 board are listed below:

J2: Binary data (Output)
Amphenol 821-A010P-AFC00

3	+Pixel clock
1	–Pixel clock
7	+Line clock
5	–Line clock
9	+Binary video
10	–Binary video
2	GND
4	GND

J1: Microwire port (Input)
Amphenol 821-A010P-AFC00

4	Microwire data
3	Microwire enable/
5	Microwire clock/
1	N.C (Normalize/)
9	N.C (M. wire CH2)
8	N.C (M. wire CH2)
10	N.C (M. wire CH2)
2	GND
7	GND

J3: M309x Data (Output) [*]
Amphenol 821-A026P-AFC00

1	/V0	[1] (rightmost pixel)
2	/V1	[3]
3	/V2	[5]
4	/V3	[7]
5	/V4	[9]
6	/V5	[11]
7	/V6	[13]
8	/V7	[15] (leftmost pixel)
9	/VGATE	[17]
10	/HGATE	[19]
11	VCL	[21]
12	/FAIL	[23]
13	GND	[2]
14	GND	[4]
15	GND	[6]
16	GND	[8]
17	GND	[10]
18	GND	[12]
19	GND	[14]
20	GND	[16]
21	GND	[18]
22	GND	[20]
23	GND	[22]
24	GND	[24]

Jx: Primary Scanner COMM
Adamtech LH3-

1	Rxd, PAGS-1K
2	Txd, PAGS-1K
3	GND

J6: Power in
Molex 5274 (09-75-2024)

1	+5
2	GND

[*] Numbers indicate pins on a 57F-24S external connector.

J4: GVS-01 Piggyback interface (**)
Samtec SSW-115-01-T-D

2	Data_in 0
4	Data_in 1
6	Data_in 2
8	Data_in 3
10	Data_in 4
12	Data_in 5
14	Data_in 6
16	Data_in 7
15	Data_in 8
13	Data_in 9
11	Data_in 10
9	Data_in 11
7	Data_in 12
5	Data_in 13
3	Data_in 14
1	Data_in 15
17	/GVS_WRDY
18	/GVS_WUSED
22	/GVS_INIT
19	GND
20	GND
21	GND
24	+5
25	+5
26	+5

(**) All unlisted pins on J4 are not used.

7.4 Ink Jet Endorser (NPS/SPA)

The ink jet endorser device is placed over the paper path of the IS510 and IS520 scanners. It is used to imprint (endorse) scanned media as it passes through the scanner. It uses industry standard HP "ThinkJet" cartridges . Black ink is recommended because other ink colors take longer to dry and may smear.

The ink jet printhead is stationary. The media motion produced by the scanner provides the means of the "printer carriage." As the paper moves under the jets column, the nozzles are fired to form dot matrix patterns corresponding to a character string. This printing method improves the scanner throughput since scan and print activities occur at the same time without stopping the media.

The NPS/SPA is fully software programmable by the CPU (PAGS-1000). Since the character font is not based on hardware, any user-defined symbol can be implemented in firmware. The standard character set implemented for IS510 and IS520 scanners is the printable USASCII.

Several of the PAGS-1K commands are aimed at simplifying typical scan/endorse applications. An auto incrementer lets the host define any numeric field within the print string which will increment without host intervention on a scanned page count basis.

The print string starting point and character density are programmable allowing adaptation to document layout requirements and fine PICA control. Print strings up to 512 characters in length are possible with the NPS/SPA.

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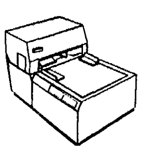
Refer to Part III, *Programmer's Reference,* for the Ink Jet Endorser software commands.

Follow the instructions in Appendix C of Part II, *Setup and Operation,* to change the ink jet cartridge, clean the printhead, and disable and enable the ink jet endorser.

7.4.1 Changes to the Scanner Configuration

The Ink Jet Endorser option consists of an NPS/SPA board and a printhead assembly. The NPS/SPA board installs in the upper unit.



In IS520 scanners the NPS/SPA installs below the CPU board in the upper unit. The printhead installs on the slide just behind the separation cartridge. The printhead assembly is connected to the NPS/SPA board.

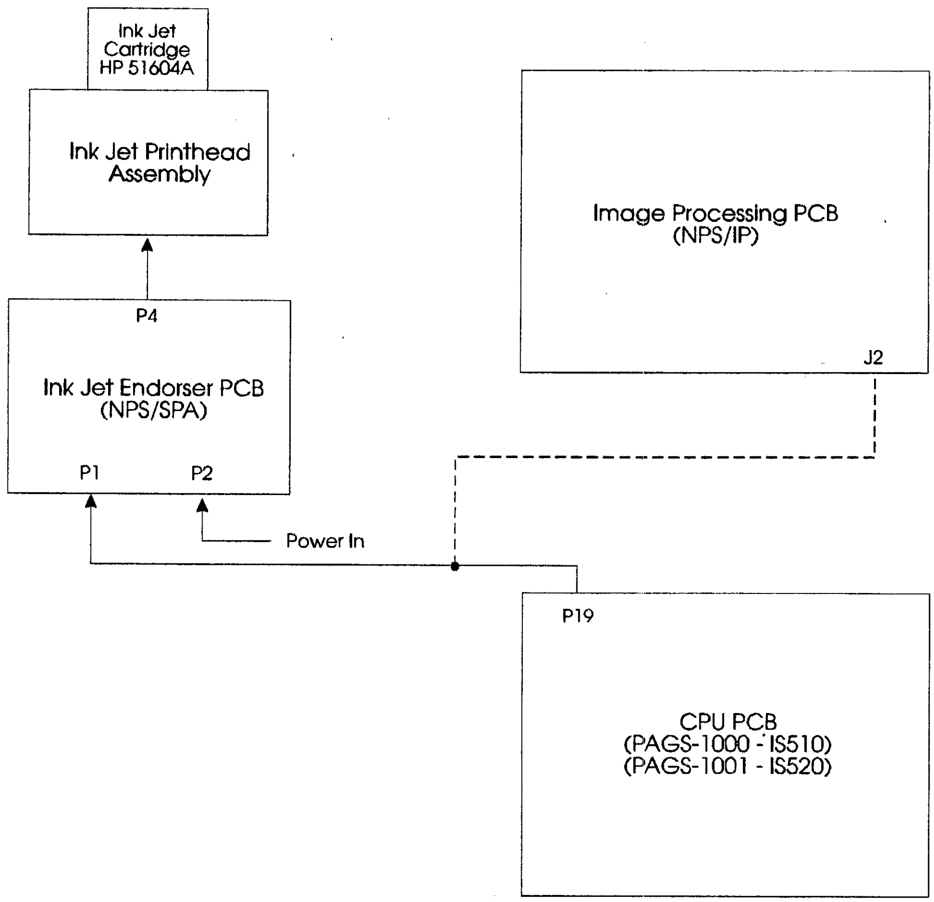


Figure 7-7. Ink Jet Endorser Cable Diagram

7.4.2 Ink Jet Endorser Problems

Poor print quality (fuzzy and uneven characters) is normally due to clogged ink jets. This may occur when the ink jet endorser has not been used for a while. To correct the problem, prime the cartridge and clean the faceplate and pins as described in the "Replacing Ink Jet Cartridge" procedure in Part II, *Setup and Operation*, Appendix C. If you continue to have print problems, check to be sure the cartridge is installed properly.

Marginal print quality may also be caused by bad cartridge contacts, cartridge faceplate orientation relative to the document surface and non-absorbing document types.

Symptom	Cause	Remedy
Poor print quality from the ink jet endorser.	The ink jet cartridge needs to be primed.	Prime the cartridge (as shown in Figure 8-16).
	The printhead and cartridge may need to be cleaned.	Use a lint-free cloth dampened with alcohol to wipe any excess ink off the printhead faceplate and cartridge pins.
	The print characters are smearing because of a non-absorbing paper.	Avoid endorsing non-absorbing papers and using colored ink cartridges.
	The jets plate is not parallel to the document plane.	Check the printhead orientation by looking through the output tray opening while the ADF cover is closed. The printhead should be vertical to ensure that the jets plate is parallel to the document plane.

NOTE . . . The ink may smear when scanning non-absorbing materials. To avoid this problem, disable the ink jet endorser before scanning documents that cannot absorb the ink.

CAUTION: Replacing the ink jet cartridge while the scanner is turned ON can damage the ink jets and cause white horizontal voids in the print characters.

Always prime the cartridge after using alcohol to clean the faceplate and pins.

7.4.3 Replacing the Ink Jet Endorser

The following sections describe how to replace the NPS/SPA board and ink jet printhead.

7.4.3.1 NPS/SPA Board Replacement - IS510 Scanners

1. Remove all of the covers from the upper unit. See Section 5.2.7 for the procedure.

2. Open the connector at P4 on the NPS/SPA board by pulling up on its locking plate ends. See Figure 8-15. Carefully remove the Mylar ribbon cable from the connector.

3. Disconnect the other cables from the NPS/SPA board.

4. Remove the four screws from the corners of the NSP/SPA board and lift it out of the scanner.

5. Install the new NPS/SPA board and secure it with the four screws.

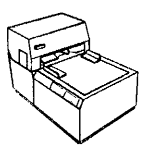
6. Carefully insert the Mylar ribbon cable into the connector on the NPS/SPA board. Make sure that the contacts side of the cable is oriented toward the power FET devices as indicated on the PCB assembly silkscreen. Push the locking bar down firmly to lock the Mylar ribbon cable in place.

7. Connect the other cables to the NPS/SPA board.

8. Replace the upper unit covers.

9. Follow the instructions in Section 8.5.2 to test the ink jet endorser.

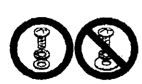
7.4.3.2 NPS/SPA Board Replacement - IS520 Scanners



1. Remove the upper CPU board according to Section 5.17.2. The NPS/SPA board is located below the CPU board.

2. Follow steps 2 through 7 in Section 7.4.3.1 to replace the NPS/SPA board.

3. Reinstall the upper CPU board and connect the cables. Verify all of the board connections and check to be sure the black ground wire on all of the cables is toward the front of the scanner.

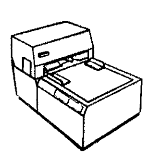


CAUTION: DO NOT use the screws with a large flat washer to install the CPU board. The washers on these screws can cause the board to short out.

4. Replace the upper unit covers.

5. Follow the instructions in Section 8.5.2 to test the ink jet endorser.

7.4.3.3 Replacing the Ink Jet Endorser Printhead

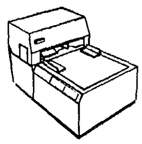


1. Remove all of the covers from the upper unit. See Section 5.2.7 for the procedure for IS510 scanners.

   For IS520 scanners, see Section 5.2.8 to remove the covers from the upper unit, then remove the upper CPU board according to Section 5.17.2.

2. Open the connector at P4 on the NPS/SPA board by pulling up on its locking plate ends. See (E) in Figure 8-11. Carefully remove the Mylar ribbon cable from the connector.

3. Lift the upper unit and carefully pull the Mylar ribbon cable that is connected to the printhead out of the scanner.



4. On IS520 scanners, remove the 45 degree harness guide (A) mounted on the front side of the upper unit (two 3mm screws) to gain access to the two 3mm screws holding the rear slide. See Figure 8-12.

5. Remove the lower screw (B) that secures the rear slide from the front side of the upper unit and loosen the top screw (C). Do the same thing on the rear side. See Figure 8-12.

6. Lift the upper unit and remove the five screws (A) from the rear slide. See Figure 8-13.

7. Push the rear slide back and remove the ink jet printhead assembly's four flanges from the front and rear slides. See Figure 8-14.

8. Insert the new ink jet printhead assembly into the slide. The printhead should be positioned as shown in Figure 8-14.

9. Insert one of the screws into the rear slide to secure it.

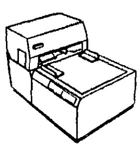
10. Carefully route the Mylar ribbon cable to the NPS/SPA board as illustrated in Figure 8-14. To avoid damage, orient the cable so it is not twisted around itself.

11. Insert the Mylar ribbon cable into connector P4 on the NPS/SPA board as shown in Figure 8-11. Make sure that the contacts side of the cable is oriented toward the power FET devices as indicated on the PCB assembly silkscreen. Push the locking bar down firmly to lock the Mylar ribbon cable in place.

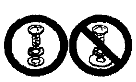
12. Attach the remaining four screws to secure the rear slide.

13. With the upper unit raised, slide the printhead to the desired position. No severe friction should be felt when sliding the printhead.

14. Attach the two lower screws removed in step 5 and tighten the two upper screws. On IS520 scanners, attach the harness guide removed in step 4.



15. On IS520 scanners, reinstall the upper CPU board and connect the cables. Verify all of the board connections and check to be sure the black ground wire on all of the cables is toward the front of the scanner.



CAUTION: DO NOT use the screws with a large flat washer to install the CPU board. The washers on these screws can cause the board to short out.

16. Replace the upper unit covers.

17. Follow the instructions in Sections 8.5.1.3 and 8.5.2 to install the ink jet cartridge and test the ink jet endorser.

7.4.3.4 Replacing the White Deflector

The white deflector attached to the side of the printhead can be removed if there are overspray or splatter problems. The anti-static brush serves the same purpose and is usually all that is needed.

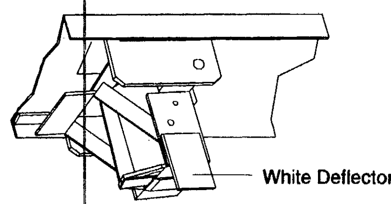


Figure 7-8. White Deflector on Ink Jet Endorser Printhead

To replace a worn white deflector, cut a section of V-channel insulation (commonly used to insulate doors or windows) to the same size as the original and attach to the printhead.

7.4.3.5 Replacing the Anti-static Brush

Replace the anti-static brush with P/N 5470-1225.

1. Remove the output tray.

2. Remove the two screws from the anti-static brush and discard the old anti-static brush.

3. Insert the new anti-static brush into the opening and align with the screw holes. Secure with the two screws.

4. Replace the output tray.

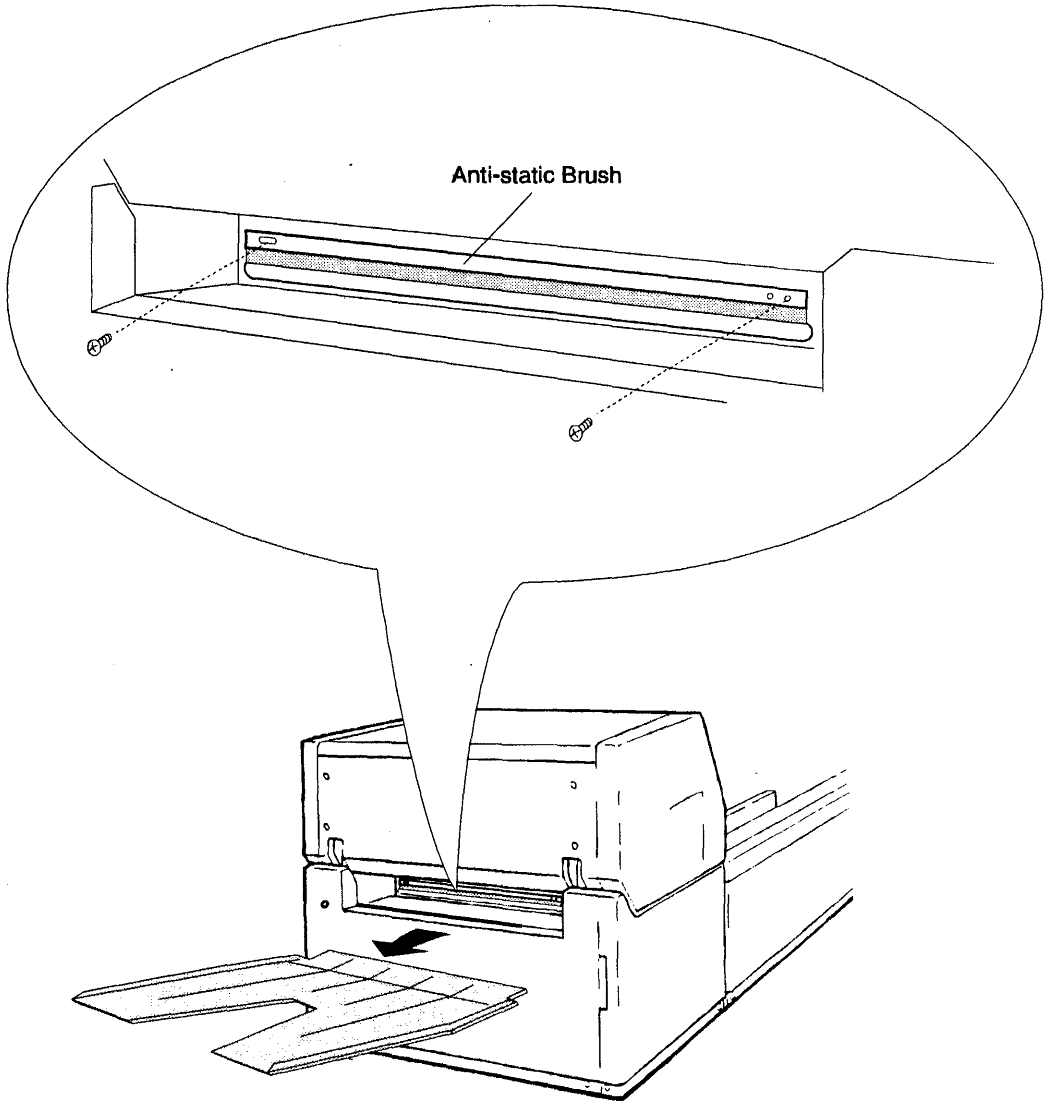


Figure 7-9. Anti-static Brush Replacement

7

7.4.4 Ink Jet Endorser Specifications

NPS/SPA buffer	1K (Std.) or 4K columns FIFO
Character font	7 by 9 cell format
String length	128 characters std. 512 max.
Character set	92 USASCII std. Others by request.
Host interface	PAGS-1K Expansion CRU port
Host controls	A. load print string B. read print string C. set start of print point D. set character aspect ratio E. define numeric auto incrementing field
String Position	Manual across scanner's neck Software along print string
Print timing	concurrent with scan
Auto increment	50 Millisec. per page
Nozzle timing	4.5 µSec ON time, single nozzle fire sequence programmable column cycle time
Cartridge type	HP 51604A, plain paper, black
Cartridge Life	0.5 million characters (average)
Physical	140mm by 64mm PCB (four layer, 10-10 rules)
Power cons	5V @300 mA 24V @100 mA (while printing)

7.4.5 I/O Pin Assignment Specifications

The I/O pin assignments and connector types for the NPS/SPA board are listed below:

J1: Ext. Control (Input)
Amphenol 821-A010P-AFC00

1	Ctrl Data
2	Ctrl AX1
3	Ctrl AX2
4	Ctrl AX3
5	Ctrl AX4
6	Ctrl AX5
7	Ctrl clk
8	Ctrl port enb/
9	Port reset/

J4: Ink jet connector (Output)
AMP 1-4879250

1	Jet #3
2	Jet #4
3	Jet #5
4	Jet #2
5	NC (or jet #1)
6	+24
7	NC
8	NC (or jet #11)
9	Jet #10
10	Jet #9
11	Jet #6
12	Jet #7
13	Jet #8

J2: PSU (Input)
Molex 5274 (09-75-2024)

1	+5
2	GND
3	+24

7.5 Light Source (Color Dropout) Option

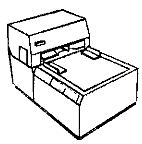
The Light Source option allows document scanning with dropout of selected colors. This is especially beneficial in OCR and form removal applications, such as medical forms, where controlled media is used. The standard green phosphor lamp can be replaced with a red or blue lamp. Other RGB phosphor mixes may be developed in the future to match specific customer requirements.

Any time the color of the light source is changed, the response characteristics are changed. Red lamps are meant to drop out certain shades of red, but they may also change the way other colors respond.

ADJUSTMENT NOTE: Installation of a different color lamp requires optical adjustments to the scanner. The image quality will be degraded if these adjustments are not made.

7.5.1 Changes to the Scanner Configuration

The only thing that is changed in the scanner is the lamp assembly.



In IS520 scanners both lamps must be the same color.

7.5.2 Adjustment Procedures

Follow the procedures in Section 6.3 to adjust the CCD Camera Dynamic Range when a different color lamp is installed.

7.5.3 Color Dropout Specifications

OCR dropout inks from Flint Ink (formerly Sinclair & Valentine) are recommended for printing forms to insure the best possible dropout under the broadest possible conditions. Flint Ink uses pure pigments with no carbon carrier in their inks. An ink with a carbon carrier will contain black as part of its color base and will not be dropped as effectively as a non-carbon based carrier ink. The following Flint Inks have been tested to dropout when using different colored lamps.

Green lamp (F1/G54)	J-24554, J-24649, J-27975, J-27976, J-24185, J-27974, J-24182, J-22052, J-24555, J24186, J-24662, 041328, J-30494
Red lamp (F1/R37)	J-6983, J-19410, J-24882, J-24893, J-25083, J-30495.
Blue lamp (F1/BA)	J-27975, J-27976, J-24186, J-27972, J-27973, J-31858, J-30494, J-18710, J-31861, J-31862

7.6 Video (VSI) Interface

The Video interface connects to a host system via a single ten-wire flat ribbon cable. This interface consists of a serial ASCII communication channel for control and differential image transfer lines. Conversion to other interfaces is facilitated by Improvision's GVS boards.

This section covers several video configurations. Be sure to identify and use the information that is relevant to your scanner configuration.

7.6.1 Changes to the Scanner Configuration

The connectors on the interface panel are changed when the video interface is installed. The single channel (Kafax) interface has one connector and the dual channel (Xionics) interface has two connectors.

When the Single Channel Video Interface is installed, the SCSI board and CGVS boards are removed.

The Dual Channel Video Interface can only be installed in IS520 scanners. When it is installed, the SCSI, CGVS, GVS-01 and GVS-09 boards are removed.

7.6.2 Video (VSI) Hardware Interface

Scanners equipped with a Video interface have a Video interface host serial port in addition to the monitor port. Both the host and monitor serial ports have the following specifications:

data bits:	8
stop bits:	1
parity:	none
baud rate:	9600 or 2400 (DIP switch selected)

The electrical interfacing to the different signals is recommended as follows:

diff. pairs:	AM26LS32
RS-232 in:	MAX232 (or 1489 equiv.)
RS-232 out:	MAX232 (or 1488 equiv.)

The VSI connector is labeled as "P4 HOST" on the scanner's CPU card. The physical VSI interface pin assignments are shown below.

The numbers shown are for the physical flat ribbon wires. If the host is connected to the VSI via a 15 pin DF connector, a sequential to odd/even conversion derives the DF pin numbers.

"HOST"
3M-3491

1	framed pixel clock+	(to host)
2	framed pixel clock–	(to host)
4	binary pixel+	(to host)
5	binary pixel–	(to host)
8	framed line clock+	(to host)
6	framed line clock–	(to host)
7	RS-232	(from host)
9	RS-232	(to host)
3,10	GND	

"MONITOR"
25DS

2	RS-232	(to scanner)
3	RS-232	(from scanner)
7	GND	

7.6.3 Video Interface Signal Definitions

The image transfer lines of the Video interface are active ONLY during the active scan time. These lines may be terminated with pull up/down network on the receiving end to improve signal shaping and noise immunity.

When in active scan, the pixel clock and line clock are active according to the scanner and image format used. In PAGSX or RFSX, the following times are held:

Pixel Clock:	12.82 MHz (for skip factor of 9999)
Line Clock:	394 microsec. cycle time
Line Clock inactive (porch):	2.18 microsec.

Note that IS510 and IS520 scanners provide a "6t" command that enables Video interface signal observation regardless of the scan window (number of lines per frame). Host compatibility with the Video interface is provided as follows:

- The host shall collect image data by latching pixel data on the rising edges of pixel clock. While the scanners can increment the line size in single pixel increments, it is recommended to keep the line size to a module 16 value for CGVS and SCSI compatibility.
- The line clock porch separates between image lines. The line clock porch precedes the first image line, and follows the last.
- The pixel clock and the line clock porch shall never overlap regardless of image format or scale.
- Users requiring a 'frame active' signal may derive it with a retriggerable one shot timer. The input to such circuit shall be the line clock (negative going edge) and the time constant shall be larger that one line clock cycle.

7.6.4 Grayscale Data from the EQ/DIT and 8EQ/DIT Boards

The EQ/DIT board is normally used in all scanner configurations. It performs light normalization, dithering, and simple gray-to-binary conversion using 6 bits per pixel. The 8EQ/DIT board is an option extending the same operation to 8 bits per pixel.

Both EQ/DIT and 8EQ/DIT boards provide the normalized digital grayscale video on a 10-pin header. The header pinout is compatible with NPS/IP Image Processor board (note that the Image Processor may also provide gamma mapping of the grayscale video).

The Grayscale data connector is labeled P3 on the silk screen of both boards with pin #1 marked as a square pad.

1	video0 (LSB)
2	video1
3	video2
4	video3
5	video4
6	video5 (MSB)
7	GND
8	+5 Volt
9	pixel clk+
10	line clk–

EQ/DIT pinout

1	video2
2	video3
3	video4
4	video5
5	video6
6	video7 (MSB)
7	video0 (LSB)
8	video1
9	pixel clk+
10	line clk–

8EQ/DIT pinout

7

The internal phase of "pixel clk+" is selected by the placement of JP1 on the respective EQ/DIT board. The video data lines are latched on the EQ/DIT board on the rising edge of this signal.

An image capture device may latch data on either edge of "pixel clock+" but the use of the rising edge is generally recommended.

"Line clk-" is high during the active line time, and low between lines (porch time). Either edge of this signal can be used as a valid line separator.

No damping resistors are provided on any of the lines. All signals are TTL levels driven by 74FXXX devices.

7.6.5 Grayscale Capture Timing

Grayscale image capture is accomplished by using the EQ/DIT data (6 or 8 bit per pixel) combined with the framed pixel clock and line clock of the binary VSI cable.

The grayscale VSI timing might differ from the binary timing given above. Timing changes are typically made to slow down the scanner and enable the host system to keep up with the data rate.

VSI timing changes are generally provided by factory selection of a clock and two PLDs on the 5KCCD camera board.

The typical grayscale timing for use with a SCSI configured scanner is:

Pixel Clock:	9.00 Mhz (for skip factor of 9999)
Line Clock:	911 MicroSec. cycle time.
Line Clock inactive (porch):	2.42 MicroSec.

Please note that other timing sets are available per client specifications.

7.6.6 Grayscale VSI Connection

A faster alternative to the SCSI interface is parallel video. When using this option, the signal timing and data rates are identical to the binary VSI specifications listed above.

The Grayscale VSI is available on a 36-pin Amphenol type connector 57FE-40360-20 or equivalent. IS520 scanners will have two connectors for separate data streams.

GND	1	19	GND	
Rxd	2	20	Txd	(*)
n.u	3	21	GND	(*)
n.u	4	22	n.u	
GND	5	23	GND	
/VID0+	6	24	/VID0–	
/VID1+	7	25	/VID1–	
/VID2+	8	26	/VID2–	
/VID3+	9	27	/VID3–	
/VID4+	10	28	/VID4–	
/VID5+	11	29	/VID5–	
/VID6+	12	30	/VID6–	
/VID7+	13	31	/VID7–	
VCL+	14	32	VCL–	
/HGATE+	15	33	/HGATE–	
/VGATE	16	34	GND	
pup	17	35	GND	(*)
GND	18	36	GND	

(*) Pin 17 (pup) is pulled up with 4.7K to VCC. This is for compatibility with the 2020 board.

(*) Unused pins should be connect to GND.

(*) When using a duplex scanner with two data channels, pins 2 and 20 are not connected.

Signal Definitions:

VIDn: are the grayscale data lines with VID0 as LSB. These lines are always active, but are only valid when /VGATE and /HGATE are asserted.

/HGATE: is a line separator clock. It is always active regardless of the scanner's operational phase.

/VGATE: is a frame clock. It is asserted during the valid portion of the image.

VCL: is a grayscale pixel clock. The receiving interface shall use the falling edge of VCL to latch the VIDn data. Note that the phase of VCL can be adjusted in the scanner to match the requirements of long or capacitive interface cables.

VCL is active during the valid portion of the image.

7.7 Electronic Endorser (BMW)

The BMW (bitmap writer) electronic endorser option enables IS510 and IS520 scanners to superimpose alphanumeric and graphic characters with the scanned raster data providing the means to electronically endorse an image.

The BMW modifies the raster data generated by an image scanner in real time. It uses a hardware character generator to create a high resolution graphic marking any place on the scanned frame.

The BMW mark characters modify the original image to "black" providing the effect of a rubber stamp, or by inverting the original image bits. The latter mode preserves any image detail that may coincide with a mark character position.

A font cell of 32 by 32 pixels is used to define the mark characters with extended 256 character per font. Two font selections are available for possible inclusion of user specified symbols.

The font cell data can be mapped directly to image pixels resulting in an approximation of 10 point typeface for 300 dpi images. Also available are binary zoom factors of 2X, 4X, and 8X.

Up to eight lines of mark characters can be loaded to the BMW with maximum of 256 characters per line. The actual number of characters and lines used may be further limited by the scanned image format, the marking zoom factor, and the starting point of the marking area relative to the image frame.

The BMW functions are programmed from its host control port. Several PAGS-1K commands are presently defined to load marking data, select marking type, zoom factor, and image frame placement.

Refer to Part III, *Programmer's Reference,* for the BMW Electronic Endorser software commands.

7.7.1 Changes to the Scanner Configuration

The OP-CON board is removed when the Electronic Endorser is installed.

7.7.1.1 Indicator Panel Response

The Feed Unit Lamp and Busy indicators respond as follows when this option is installed.

- The Lamp indicator(s) respond immediately (not after 5 minutes) to *all* errors (high-low lamp, lamp out).
- The Busy indicator lights during scanning only.
- The Feed Unit indicator is disconnected.

7.7.2 Electronic Endorser (BMW) Signal Flow

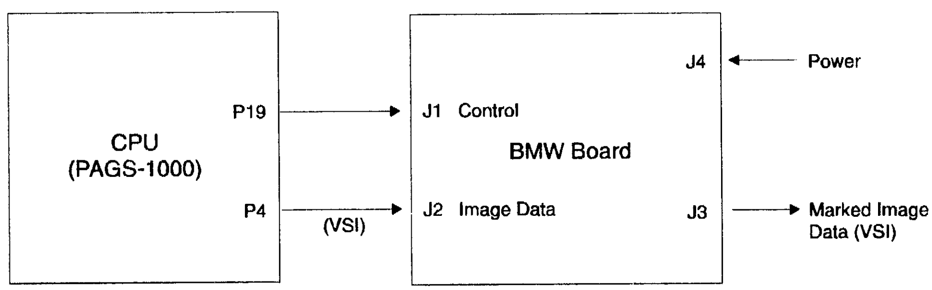


Figure 7-10. Electronic Endorser (BMW) Signal Flow

7.7.3 Replacing the Electronic Endorser (BMW) Board

(TBD)

7.7.4 Electronic Endorser Specifications

Marking buffer	up to 8 marking lines 256 (max) symbols per line
Mark font cell	32 by 32 pixels
Mark modes	"stamp" marks black in image "preserve" inverts image under mark symbol
Mark position	by number of scanlines from top of image frame by blank font cells from 1st pixel per line
Zoom factors	1X, 2X, 4X, 8X selectable by software command
Host interface	PAGS-1K Expansion CRU port - control
Host controls	A - select vertical mark placement B - set font zoom factor C - set "stamping" or "preserving" mark modes D - select font (std. or custom) E - enable/disable operation
Mark timing	concurrent with scan
Physical	110mm by 210mm PCB (four layer, 10-10 rules) (shared physical PCB area with the IBCR module)
Power cons	5V @800 mA

7.7.5 I/O Pin Assignment Specifications

The I/O pin assignments and connector types for the BMW board are listed below:

J2: Ext. Control (Input)
Amphenol 821-A010P-AFC00

1	Ctrl Data
2	Ctrl AX1
3	Ctrl AX2
4	Ctrl AX3
5	Ctrl AX4
6	Ctrl AX5
7	Ctrl clk
8	Ctrl port enb/
9	Port reset/

J1: Image data (Input)
Amphenol 821-A010P-AFC00

1	+Pixel clock
2	–Pixel clock
8	+Line clock
6	–Line clock
4	+Binary video
5	–Binary video
7	PAGS-1K Txd
9	PAGS-1K Rxd
3	GND
10	GND

J3: Image Data (Output)
Amphenol 821-A010P-AFC00

1	+Pixel clock
2	–Pixel clock
8	+Line clock
6	–Line clock
4	+Binary video
5	–Binary video
7	PAGS-1K Txd
9	PAGS-1K Rxd
3	GND
10	GND

J12: External port (I/O)
Amphenol 821-A010P-AFC00

1	input #0
2	input #1
3	input #2
4	input #3
5	output #0
6	output #1
7	output #2
8	output #3
9	+5Volt
10	GND

J10: PSU (Input)
Molex 5274 (09-75-2024)

1	+24
2	+5
3	GND

J4: Host Comm (I/O)
AdamTech LHS4A

4	RTS (from ICBR)
2	Rxd (to ICBR)
3	Txd (from ICBD)
1	GND

J7: CPU lines (I/O)
Molex 5274 (09-75-2024)

1	+24
2	+5
3	GND

J8: OP Panel (Output)
JAE

4	RTS (from ICBR)
2	Rxd (to ICBR)
3	Txd (from ICBD)
1	GND

7.8 Bar Code Recognition (IBCR)

The IBCR option enables IS510 and IS520 scanners to sense and recognize bar code labels in scanned images. Both vertical and horizontal bar code labels can be found by this option in real time. Seven major bar code standards, including all of the ANSI and JAN specified types, are supported. When operating on horizontal bar codes, the option will sample the data several times and try to find valid data.

The IBCR uses raster data generated by an image scanner to emulate a handheld laser bar code scanner. The data is collected in a local FIFO buffer and is processed during the scan time by a dedicated bar code processor.

Bar code label recognition is based on examination of one or more data streams intersecting the label across all its bars. The IBCR supports vertical and horizontal label orientations placed anywhere within the image.

The label orientation is relative to image scan lines and is considered "horizontal" when a single image scan line intersects all the label bars. It is considered "vertical" when the label bars are parallel to the image scan lines.

When operating on horizontal labels, the IBCR can be set to examine several scan lines which intersect the label. This mode of operation improves the recognition immunity to poor label quality or other noise in the image.

The IBCR functions are programmed from the host control port. Several PAGS-1K commands are presently defined to select coding type, label position and orientation, auto retry modes, etc.

The IBCR adjusts itself dynamically to the bar code elements width without host intervention. Jumper selection on the board is provided to qualify elements as narrow as two or four pixels as the "thin" bars or gaps in a bar code label.

Refer to Part III, *Programmer's Reference,* for the Bar Code Recognition software commands.

7.8.1 Changes to the Scanner Configuration

The OP-CON board is removed and the IBCR board is installed in its place when the Bar Code Recognition option is installed.

7.8.1.1 Indicator Panel Response

The Feed Unit Lamp and Busy indicators respond as follows when this option is installed.

- The Lamp indicator(s) respond immediately (not after 5 minutes) to *all* errors (high-low lamp, lamp out).
- The Busy indicator lights during scanning only.
- The Feed Unit indicator is disconnected.

7.8.2 Bar Code Recognition Signal Flow

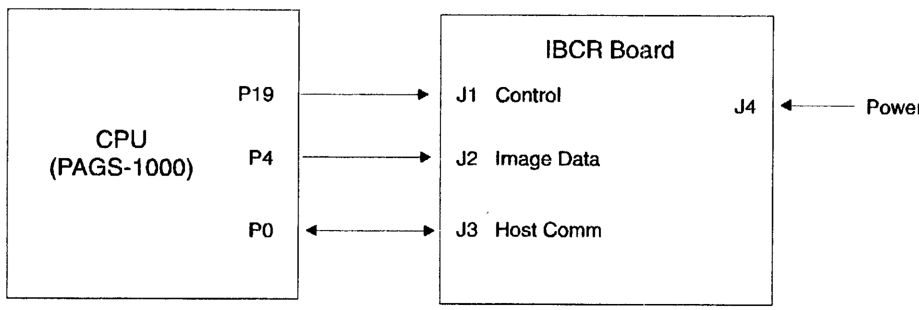


Figure 7-11. Bar Code Recognition Signal Flow

7.8.3 Replacing the IBCR Board

(TBD)

7.8.4 Operational Notes

The following sections provide usage tips and bar code label attributes to consider when using Bar Code Recognition.

7.8.4.1 Label Offset Parameters

The X/Y point specified by the parameters must be in the label 'quite zone' regardless of the orientation. The offsets are specified in pixels and lines within the current image frame.

A software utility that displays a scanned image together with cross-hair markers of the offsets is very useful to fine tune these offsets.

NOTE . . . *The pixel offset will be rounded off to a 16 bit boundary by the scanner. The line offset will be used as issued by the host.*

7.8.4.2 Horizontal vs. Vertical Labels

Vertical labels are analyzed by the scanner only once. This implies that the wrong offset parameters or poor label quality may cause the IBCR to mis-read the label.

Horizontal labels permit the IBCR to 'try again' once per 16 to 64 scan-lines. This relaxes the required accuracy of the lines offset parameter somewhat. It also helps the IBCR to overcome poor label image quality.

Some Bar Code Recognition guidelines regarding label placement in scanned documents are given below.

- Either Horizontal or vertical labels should be placed close to the top of the page. This improves the IBCR's ability to recognize the label within the image scan time, eliminating overhead time.
- Large quite zones on both of the label's ends improve the bar code recognition accuracy and relax the required accuracy of an offset argument (pixel offset for horizontal, line offset for vertical).
- Horizontal labels are best placed close to the right side of the page. This helps the IBCR to retry the label analysis every 16 scanlines. When the label is placed closer to the left document side, the retry rate may fall to once per 64 scanlines.

7.8.4.3 Label Size Considerations

The thinnest element (bar or space) must be 3 pixels for horizontal and 2 pixels for vertical labels. Larger element sizes are preferred as they reduce Bar Code Recognition uncertainties caused by image noise.

Larger element (bar) length is preferred. In vertical labels it relaxes the accuracy requirement of the pixel offset argument. In horizontal labels it permits a larger number of retry attempts when the label image quality is poor.

Thick and long elements are also preferred since they are more immune to IBCR mis-reads due to label skew as explained below.

7.8.4.4 Label Skew Tolerance

The bar code label skew should be kept to a minimum. When a horizontal label cannot be fully intersected by a single scanline, or when a vertical label is shifted out of a specified pixel position, no recognition is possible.

Using thick and long label elements allows greater skew angles before causing mis-read conditions. In all cases the maximal skew angle possible is the arctangent of the label height-to-length ratio.

The IBCR performs both horizontal and digital filtering on the image data. This helps recovery from poor image quality (stray speckles and voids are cleaned out) but may cause problems on skewed labels which do not meet the minimum element width requirements.

7.8.4.5 Label Print Quality

The IBCR operates on scanned image data. Poor print quality will result in a noisy image of the barcode elements and may cause mis-reads. Proper barcodes should not have voids in the black elements or dark areas in the spaces. The space-to-bar reflection contrast ratio should be as large as possible (50% min is suggested).

7.8.5 Bar Code Recognition Specifications

IBCR data FIFO	4KB (Std), 8KB (Optional)
Bar code types	Code 39 Standard and Extended (ANSI MH10.8M) Codabar (ANSI MH10.8M) Interleaved 2 of 5 (ANSI MH10.8M) code 128 UPC A, E MSI code Code 11 EAN/JAN 8, 13
Min element	3 or 5 pixels (jumper select), horizontal labels 2 pixel (scanline), vertical labels
Element filter	Black preserving, 7 pixel horizontal and vertical
Code length	to 32 characters or as limited by code type
Auto retry	Examine every 16th scanline - horizontal Inactive for vertical labels
Host interface	PAGS-1K Expansion CRU port - control RS232 port - code group select and label data
Host controls	A - select vertical or horizontal label B - set bar code offsets C - select bar code type, label length (optional)
Label Position	16 pixel increments - vertical label center line or horizontal label quite zone Number of scanlines from top of page - vertical label quite zone or horizontal label center line
Label decoding	concurrent with scan
Physical	110mm by 210mm PCB (four layer, 10-10 rules)
Power cons	5V @XXX mA 24V @2.2 Amp (when used in IS520)

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7.8.6 I/O Pin Assignment Specifications

The I/O pin assignments and connector types for the IBCR card are listed below:

J2: Ext. Control (Input)
Amphenol 821-A010P-AFC00

1	Ctrl Data
2	Ctrl AX1
3	Ctrl AX2
4	Ctrl AX3
5	Ctrl AX4
6	Ctrl AX5
7	Ctrl clk
8	Ctrl port enb/
9	Port reset/

J1: Image data (Input)
Amphenol 821-A010P-AFC00

1	+Pixel clock
2	–Pixel clock
8	+Line clock
6	–Line clock
4	+Binary video
5	–Binary video
7	PAGS-1K Txd
9	PAGS-1K Rxd
3	GND
10	GND

J4: PSU (Input)
Molex 5274 (09-75-2024)

1	+5
2	GND

J3: Host Comm (I/O)
AdamTech LHS4A

4	RTS (from ICBR)
2	Rxd (to ICBR)
3	Txd (from ICBD)
1	GND

7.9 500/600 DPI (HIRES)

This option sets the optical stage of the IS510 scanner for true 500 or 600 dpi resolutions. A scanning rate of 20 A-size pages per minute at 600 dpi is typical. This option targets the print-on-demand systems for publishing applications, and the ICR/OCR needs of special systems such as phone books and certain foreign language documents.

NOTE . . . *This option cannot be installed in the field.*

7.9.1 500/600 DPI Specifications

Scanning velocity	5.09 ips @500 dpi, 12.8715 MHz clock 4.24 ips @600 dpi, 12.8715 MHz clock

7.10 Grayscale Output, 8-Bit Processing (8EQ/DIT)

This option improves the internal image processing capability for binary scanners, and allows fast grayscale image capture.

The grayscale data is useful for systems where special ICR or post-scan image processing requirements exist. When combined with the 500 dpi option, the Grayscale option is ideal for fast fingerprint (IAFIS) system applications. Fingerprint card data capture below 5 seconds at 500 dpi is typical.

The grayscale option is only available for IS510 scanners. The information in the following sections assumes that the scanner is also configured with the 500 dpi option.

NOTE . . . *This option cannot be installed in the field.*

7.10.1 Changes to Scanner Configuration

The Grayscale Output, 8-Bit Processing option consists of the following physical changes to the scanner's configuration:

- The standard EQ/DIT board is replaced with an NEQ8/DIT board. The board is the outermost member of the CCD camera unit. All the connectors, test points, and adjustments on this board are identical to the EQ/DITHER board.
- The two PLD devices in the 5KCCD board are different than the binary set. The user does not need to access these devices, but should know that the CCD camera clock phases are different than in binary models.
- The clock oscillator on the 5KCCD board is of a different value than in standard models. Typically a 36MHZ clock is used, but this value may be changed to accommodate host system aggregate data rates.

- A piggyback board marked GSIA is installed over the CGVS board. This is the grayscale data path into the CGVS FIFO.

  The GSIA board mates with sockets U8 and U9 on the CGVS board.

  The GSIA board has three external connections as follows:

J1: Parallel Data Input from	This is the 8 bit per pixel data from the NEQ8 board (J1). If the scanner is equipped with an Image Processor (NPS/IP) option, this cable also feeds the video input (J1) of the NPS/IP.
J2: VSI data	This is the binary data output from the PAGS-1K boards (P4). This cable is connected to the CGVS input (J4) in binary systems.
J5: Host Communications.	This cable connects to the NPS/NSA board (J3). The cable is connected to the CGVS (J6) in binary systems.

- Three of the jumpers on the CGVS board are configured for parallel data capture as follows:

  JP9: jumper on the 3-2 position (marked "P")
  JP8: jumper on the 3-2 position (marked "P")
  JP4: jumper on the 1-2 position ("data dir")

7.10.2 Timing Considerations

The PLDs of the 5KCCD board extend the CCD integration time beyond the 5000 pixels of the sensor. This slows down the scanner and allows the CGVS and host to keep up with the data rate.

The timing changes affect the lines offset, stepper velocity, and video adjustments relative to binary systems. Default values are shown below for a 5KCCD clock of 36MHz.

Stepper Velocity	148
Lines offset	590
Skip factor	9999
Scanline time	911 Micro Sec.
Analog Video peak	3.5 Volt

Note that changes to the clock rate will require the user to recalibrate the scanner and derive new parameters.

7.10.3 Jumper Relations to Data Quality

The following jumpers interact in determining the pixel timing of grayscale data. The jumper positions shown are the factory default settings.

NEQ8/DIT JP1: pixel clock latch phase	short on 3-2
GSIA "CLK POL": clock phase to line FIFO	short on 1-2
PAGS-1K JP2: IP input pixel clock phase	short on 2-3

The above jumper positions do not require any field changes as long as the 5KCCD PROMs are not changed. The positions above reflect the level of "t02" PROM.

If the above jumper positions are modified, compression error messages may result at the SCSI level since an incorrect number of bytes per scan-line will be generated. See Section 7.10.5, SCSI Driver Development Pointers, regarding this condition.

7.10.4 Normalized vs. Raw Video Operation

The scanners ship with normalization ON. This means that the NEQ8/DIT board will use the light envelope measured before each scan to calibrate itself when generating grayscale data.

If the user prefers to use 'raw' video (in which the light envelope changes are reflected) the cable connected to P4 on the NEQ8/DIT board must be disconnected.

7

In order to set raw video, pins 6 and 7 of P4 must be shorted. This may also be accomplished by a special header marked "raw/P4" supplied with the scanner (it will be in a small plastic box inside the unit near the CCD camera assembly).

7.10.5 SCSI Driver Development Pointers

The SCSI notes in Part III, *Programmer's Reference*, and in Improvision's *SCNOTE document are a good template for writing code for grayscale scanners. As the notes are written for binary data capture, please note the following:*

- The only changes required are in the "set_window" definition. When collecting grayscale data, make sure that compression is 0 (no compression), and that the length field is 8 times the actual page length in scanlines (as used in the SEND91 U).
- Always start with image sizes below 6MB. This insures that the CGVS FIFO will not overflow, regardless of the host system data rate.

- If data problems are suspected, the GSIA may need to get a hard reset command. This is done by power up or by a momentary grounding pin 1 of U11 on the GSIA.

  The scanner may ship with a "reset wire" in place. Open the right cover per Section 5.2.2 and look for an EZ hook jumper wire. If one is in place, use it to touch the chassis of the scanner for GSIA reset.

- It is best to develop code while having a terminal device on the monitor port. This allows you to observe the commands that are being sent to the scanner.

  If the host system is Windows-based and has an available TTY port (COM port if a PC), use it to attach to the Monitor port connector on the scanner under any terminal emulation program available.

The Monitor port is set to 9600 baud, 8 data bits, 1 stop, No parity.

7.10.6 Replacing the CGVS and/or GSIA Boards

The CGVS board in grayscale IS510 scanners uses a different clock oscillator than the one used in binary models. When changing the CGVS in the field please follow these steps:

1. Turn the scanner power off and disconnect the interface and power cables from the scanner.

2. Remove document table and top board cover per Section 5.1. This exposes the optical block and the CPU, CGVS and GSIA boards.

3. Remove the rear cover per Section 5.2.4. The interface tray (where the interface connectors are located) is now exposed.

4. Remove the seven screws from the interface tray and slide it out per Section 5.17.3.

   The interface tray is populated by two PCBs (CGVS and NSA). The GSIA board is mounted on top of the CGVS board.

5. Remove the GSIA board from the CGVS by holding the board near its U8/U9 sockets and pulling up. Avoid excessive slant when pulling the board to prevent damage to the mating connectors on the bottom of the board.

6. Remove the CGVS board according to Section 5.17.3.

7. To replace the GSIA and CGVS boards, perform the above steps in the reverse order.

   When replacing the CGVS board, be sure to align the board so the mounting studs are centered within their respective CGVS ground areas.

When inserting the GSIA board into the CGVS sockets, insure that the boards are lined up. Verify this by observing the alignment of the edges of the GSIA and CGVS boards (GSIA J1 J2 side) as well as the two round holes near the GSIA opposite edge.

When done, please refer to the wiring diagram in Section 7.10.7 for verification of the correct connection.

7.10.7 Grayscale IS510 Internal Harnessing

Verify the correct internal connection of the CGVS and GSIA boards by tracing the following harnesses:

from	to	conn type	name
NEQ8.J1	GSIA.J1	10pin ribbon	Parallel_data
PAGS1K.P4	GSIA.J2	10pin ribbon	VSI_data
GSIA.J5	NSA.J3	3pin JAE	Host_Comm
CGVS.J1	NSA.J1	40pin IDC	DR11_J1
CGVS.J2	NSA.J2	40pin IDC	DR11_J2
GSIA.U8	CGVS.U91	20pin socket	par_data_low
GSIA.U9	CGVS.U92	20pin socket	par_data_high

7.10.8 Grayscale Output, 8-Bit Processing Specifications

Optional resolution	400 dpi, 500 dpi (IAFIS applications) and 600 dpi
Output format	8-bit per pixel
Data type selection	Grayscale only (8, 4, 2-bit or binary)
Data orientation	MSB-D7, LSB-D0
Scan rate	11.25 Mpix/sec. or 12.8175 Mpix/sec. (selected for grayscale uniformity specs)
Host interface	PVSI (differential TTL, 8-bit)

CHAPTER 8

Installing Options

Inside this chapter:

This chapter describes how to install the IS510 and IS520 scanner options.

IMPORTANT: After installing an option, please enter the change on the Configuration Form in the customer's manual. The Configuration Form is inserted into the binder front pocket when shipped. There is a blank form in Part II, *Setup and Operation.*

8.1 Image Processor (NPS/IP)

This section describes how to install and test the Image Processor (NPS/IP) option. The Image Processor provides full-feature programmable image processing (enhancement) beyond the standard features of the IS510 and IS520 scanners.

Contents of Option Package:

IS510 Scanners:

1 ea NPS/IP PCB assembly
_ ea IDC header for ribbon cable
Mounting hardware

IS520 Scanners:

2 ea NPS/IP PCB assembly
_ ea IDC header for ribbon cable
Mounting hardware

Tools Needed:

- long-handled metric Philips screwdriver (magnetic tip preferred)
- wire cutters
- small metal file
- tie wraps (approx 10 for IS510 and 20 for IS520)
- vice grips or a ribbon crimper

8.1.1 Installation Procedure

In this installation procedure one Image Processor (NPS/IP) board is installed in the lower unit of IS510 scanners and two NPS/IP boards are installed in IS520 scanners (one in the lower unit and one in the upper unit).

☞ **ADJUSTMENT NOTE:** All optical adjustments listed in Section 6.3 must be performed after the image processor option is installed.

1. Unpack the Image Processor (NPS/IP) kit.
2. Turn the scanner OFF and remove the power cord.
3. Remove the document table plates and top board cover. See Section 5.1 for the procedure.

   The lower electronics are now exposed showing the CPU (PAGS-1000) and optical unit.
4. Remove the rear cover. See Section 5.2.4 for the procedure.

8.1.1.1 Installing the Lower Image Processor Board

Perform the following steps to install the NPS/IP board in the lower unit of IS510 and IS520 scanners.

1. Remove the lower CPU (PAGS-1000) board. See Section 5.17.1 for the procedure.

   The NPS/IP mounting posts are located below the CPU board.
2. Install the NPS/IP board on the mounting posts using the four 3mm screws (A) provided in the kit.

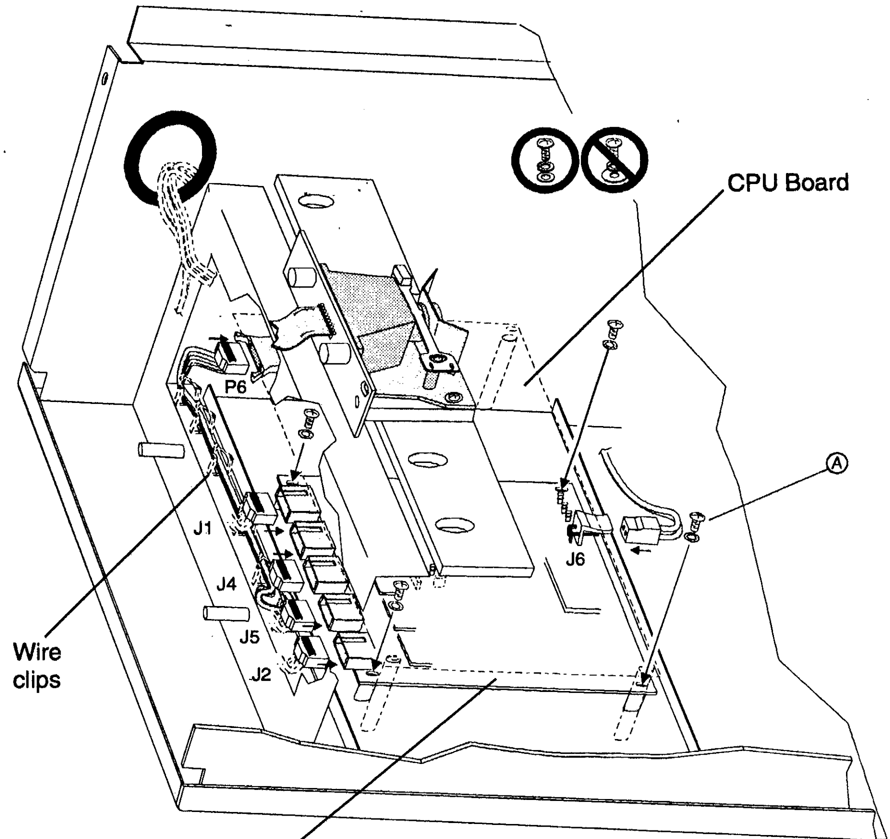
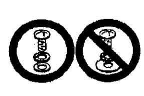


Figure 8-1. Installing the NPS/IP Board

3. The power cable to the NPS/IP is folded and secured to the inner front chassis wall above the harness access hole. Release the cable and connect it to J6 on the NPS/IP board.

   Use a tie wrap to tie the power cable to the PAGS-1000 mounting post to prevent blockage of the optical path.

4. Reinstall the CPU board (PAGS-1000).



CAUTION: DO NOT use the screws with a large flat washer to install the CPU board. The washers on these screws can cause the board to short out.

Connect all of the cables to the CPU board except for the one between P6 on the CPU board and P2 on the EQ/Dither board. This cable can be discarded.

DO NOT install the CCD camera assembly.

5. Release the wire harness by opening the wire clips and cutting the tie wraps.

> **CAUTION:** Carefully cut the head off the tie wraps to remove them. Cutting the tie wraps anywhere else may cut and damage the cables.

An extra cable is included in the harness. This cable will be used later in this procedure.

6. The connectors on the cables have a key tab on the top that must be removed so they will fit into the sockets on the NPS/IP board. Use wire cutters to snip the tap off the connectors (flathead wire cutters make this job easier), then use a metal file to smooth the surface.

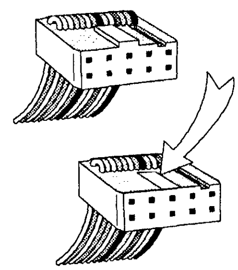


Figure 8-2. Removing the Key Tab

> **CAUTION:** Exercise caution when clipping the key tab to be sure that you do not cut the cable.

7. Connect the cables to J5 and J2 on the NPS/IP board matching the markings on the cables to the connectors on the board. See Figure 8-1.

NOTE . . . In IS510 scanners with an ink jet endorser (NPS/SPA), the control cable connected to J2 on the NPS/IP board and P19 on the PAGS-1000 board is daisy chained to J1 on the NPS/SPA board.

8. Connect the cable that was loose in the wiring harness to J1 on the NPS/IP board. Cut the cable by 3 inches and crimp an IDC header to the end. The other end of this cable connects to P3 on the EQ/Dither board when it is installed.

   NOTE . . . *Excess cable length can have an adverse effect on image quality.*

9. Make a new 8 inch cable and crimp IDC headers on each end. Connect the cable to P6 on the PAGS-1000 board and route to J4 on the NPS/IP board.

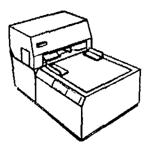
10. Verify all of the board connections and check to be sure the black ground wire on all of the cables is toward the front of the scanner.

11. Route the wire harness through the wire clips and dress the harness with tie wraps.

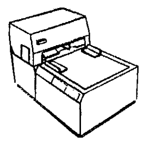
12. Carefully connect the ribbon cable to the CCD camera board and use a small flat-blade screwdriver to gently seat the cable in the connector. Install the CCD camera assembly bracket and connect the cables to the EQ/Dither and CCD camera boards.

13. For IS510 scanners, go to Section 8.1.2, "Testing Image Processor," to test the installation.

    For IS520 scanners, continue on to Section 8.1.1.2 to install the upper Image Processor board.



8.1.1.2 Installing the Upper Image Processor Board - IS520 Only



1. Remove all of the covers from the upper unit. See Section 5.2.8 for the procedure.

   The upper CPU board (PAGS-1001) is exposed.

2. Disconnect the cables from the CPU board, remove the four screws (A) from the corners of the board, and remove the CPU board. See Section 5.17.2 for the procedure. Set the screws aside. The NPS/IP mounting posts are exposed below.

3. Install the NPS/IP board on the mounting posts using the four 3mm screws (B) provided in the kit.

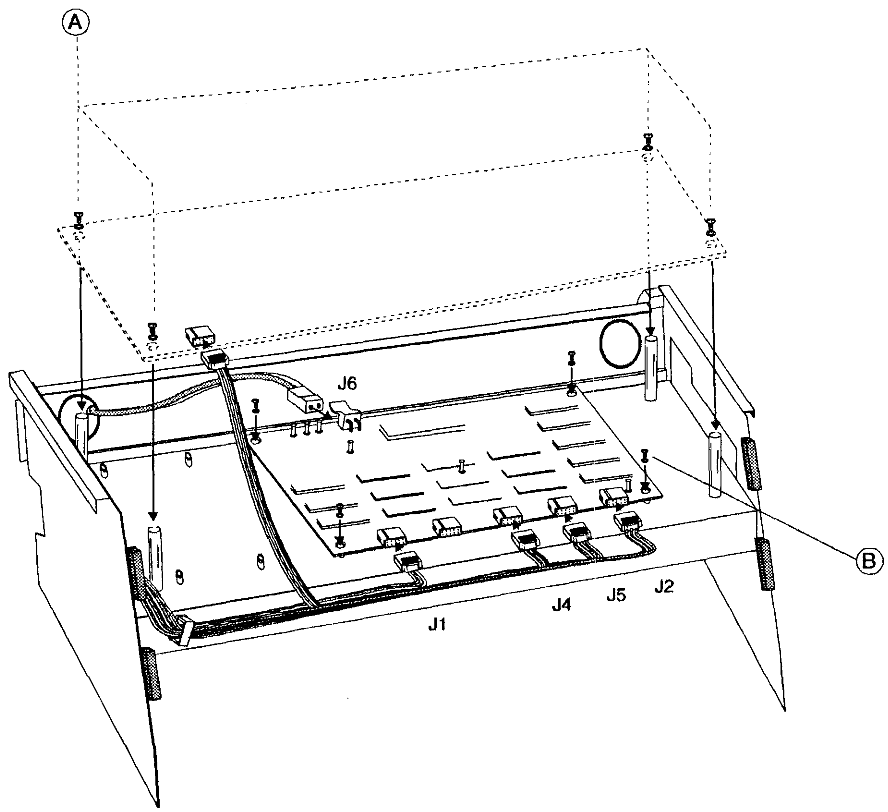


Figure 8-3. Installing the Upper NPS/IP Board - IS520 Only

4. Remove the cover from the CCD camera (A) (12 screws) on the left side of the upper unit.

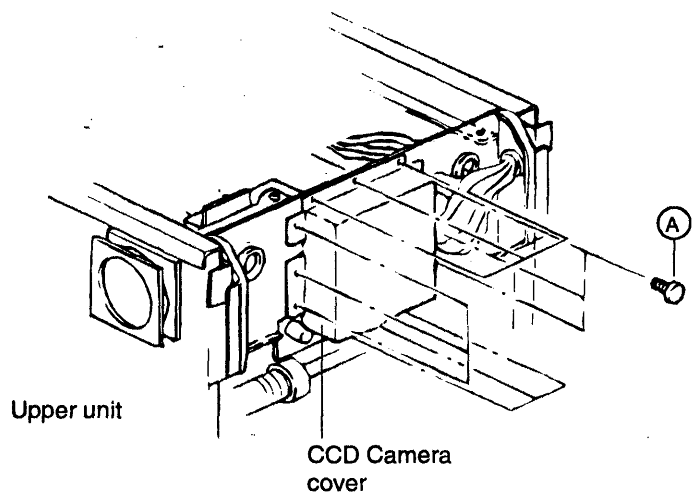


Figure 8-4. Removing Cover from the CCD Camera Assembly

5. Release the wire harness by opening the wire clips and cutting the tie wraps.

> **CAUTION:** Carefully cut the head off the tie wraps to remove them. Cutting the tie wraps anywhere else may cut and damage the cables.

An extra cable is included in the harness. This cable will be used later in this procedure.

6. The connectors on the cables have a key tab on the top that must be removed so they will fit into the sockets on the NPS/IP board. Use wire cutters to snip the tap off the connectors (flathead wire cutters make this job easier), then use a metal file to smooth the surface (see Figure 8-2).

> **CAUTION:** Exercise caution when clipping the key tab to be sure that you do not cut the cable.

7. Connect the cables to J2 and J5 on the NPS/IP board. See Figure 7-1 for the cable diagram.

NOTE . . . In scanners with an ink jet endorser (NPS/SPA), the control cable connected to J2 on the NPS/IP board and P19 on the PAGS-1000 board is daisy chained to J1 on the NPS/SPA board.

8

8. Disconnect the cable connected to P2 on the EQ/Dither board and remove the ferrite torroid bracket. Pull out about 2 in. of the cable through the torroid so it is long enough to connect to P3 on the EQ/Dither board. Install the ferrite torroid bracket.

   Release the NPS/IP grayscale input cable (J1 connector end) and give it about 1 inch slack on the CCD camera side (loop it twice in the ferrite torroid). Route this cable straight from the torroid alongside the inner front chassis wall to J1 on the NPS/IP board. Cut off about 6 in. of the excess cable length and crimp an IDC header on the end. Connect the cable to J1 on the NPS/IP board.

   NOTE . . . *Excess cable length can have an adverse effect on image quality.*

9. Pull out about 1 in. of the power cable and connect it to J6 on the NPS/IP board. Route the NPS/IP power cable parallel to the Fl lamp inverter cable.

   NOTE . . . *Check the power cable connector to be sure the black ground wire matches the silkscreening on the board. Some scanners may have this cable's polarity reversed. If this is the case, you can plug the connector in upside down or lift the tab on the connector and reverse the wires.*

10. Tie the harness on the right side and attach the wire clip.

11. Reinstall the CPU (PAGS-1001) board and connect the cables.

CAUTION: DO NOT use the screws with a large flat washer to install the CPU board. The washers on these screws can cause the board to short out.

12. Connect the cable that was loose in the wiring harness to P6 on the PAGS-1000 board and route to J4 on the NPS/IP board. Cut off the excess cable and crimp an IDC header on the end.

    NOTE . . . *Excess cable length can have an adverse effect on image quality.*

13. Verify all of the board connections and check to be sure the black ground wire on all of the cables is toward the front of the scanner.

14. Route the wiring harness through the wire clips and dress the harness with tie wraps.

15. Install the cover over the CCD camera assembly.

16. Place a tie wrap over the SW3 interlock switch on the upper unit so the scanner can be tested with the covers removed.

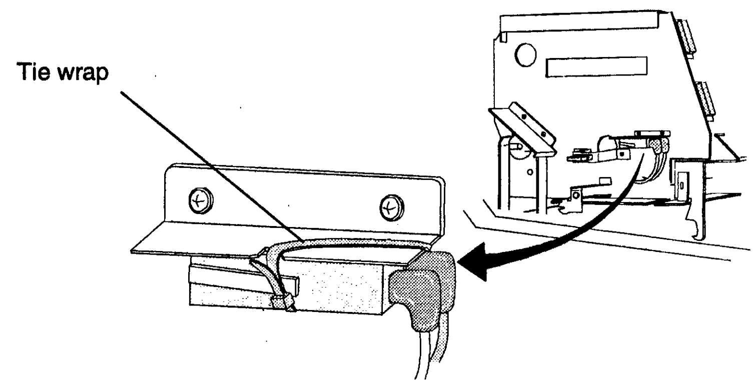


Figure 8-5. Disabling the SW3 Interlock Switch

17. Test the installation as described in Section 8.1.2.

8.1.2 Testing the Image Processor

The following test should be performed while the covers are removed from the scanner.

1. Connect the power cord and turn the scanner ON.
2. Check to be sure the Power light on the Indicator Panel is lit and that the scanner powers on properly.
3. Insert a sheet of paper into the scanner to verify that the lamp(s) turn on.

8

8.1.3 Optical Adjustments

To insure optimal operation of the scanner when the Image Processor option is installed, follow the optical adjustment procedures in Section 6.3. Check for the following when making the adjustments.:

- Insure that the shading plate is out of the CCD optical path and has no effect on the analog video when performing the adjustment procedures.
- When performing the CCD Camera Dynamic Range Adjustment, set R9 to the peak video on "A" or "B" plus 0.3 to 0.5 volt.
- Verify the Odd/Even channel by measuring the signal at the NPS/IP Gamma Video test point. This is best done with a Ricoh R1 chart or other continuous-density gray bar chart. See Figure 7-2.

After completing the optical adjustments, replace the covers. In IS520 scanners, be sure to remove the tie wrap from the interlock switch before replacing the upper unit covers.

Further adjustments to the image quality can be made using software commands on the host system. Since the Image Processor affects the image quality, a host system with a high-resolution monitor is required. A super VGA 1024 x 768 monochrome monitor is the minimum monitor that should be used.

8.2 DR11 Interface

This section describes how to install and test the DR11 interface option. The DR11 interface is a 16-bit bi-directional parallel interface. The DR11 electronics are included in the scanner design. Therefore, a separate DR11 PCB is not required.

Contents of Option Package:

1 ea DR11 interface panel with 2 ribbon cables
1 ea 9 pin DP connector
Mounting hardware

Tools Needed:

- metric Philips screwdriver (magnetic tip preferred)
- small needle-nose pliers
- tie wraps
- sticky back holders

Host Interface Cables Required:

2 ea 40-pin DR11 data cables
1 ea RS232 null modem cable with no handshaking

8.2.1 Installation Procedure

This installation procedure assumes that the scanner is currently configured with a SCSI interface. If any other optional interface is installed in the scanner, contact Ricoh Technical Support for assistance.

1. Unpack the DR11 Interface option kit.

2. Turn the scanner OFF, and remove the power cord.

3. Remove the document table plates and the rear cover. See Sections 5.1.1 and 5.2.4 for the procedures.

4. Remove the seven 3mm screws attaching the interface tray to the scanner's inner chassis wall. See Figure 5-51. Hold the interface tray by the side tabs and slide it out approximately 6 inches.

NOTE . . . *When the interface tray is viewed from above, the SCSI (NSA) board is close to the scanner's rear and the data compression (CGVS) board is installed behind.*

8

8.2.2 Temporary Changeover

The following procedure is optional. It allows you to test the DR11 interface before making a permanent changeover.

1. Disconnect the two 40-pin ribbon cables from DR11 J1 and DR11 J2 on the CGVS board. This disconnects the SCSI board from the CGVS board.

2. Disconnect the 3-wire JAE connector from J3 on the SCSI board. Note that the now open connector is marked NPS.

3. Attach the two 40-pin ribbon cables from the DR11 interface panel to DR11 J1 and DR11 J2 on the CGVS board. Be sure to match pin 1 to pin 1.

4. Connect the three-pin male connector from the DR11 interface panel to the floating JAE connector removed from the SCSI board. Match the blue wire on both connectors.

5. Install the magnetically latched document table covers and attach the scanner to the host system using two 40-pin DR11 data cables and a 9-pin RS232 cable.

6. Attach the power cord and turn the scanner ON. Check to be sure the Power light on the Indicator Panel is lit and that the scanner powers on properly. Insert a sheet of paper into the scanner to verify that the lamp(s) turn on.

7. Test the scanner with a DR11-equipped host.

8.2.3 Permanent Changeover

In this procedure the SCSI (NPS/NSA) board along with the SCSI interface connectors, rotary switch and SCSI DIP switch are removed from the scanner and replaced by the DR11 interface panel and 9-pin DP connector. Steps 1 and 2 are the same as the temporary changeover.

1. Disconnect the two 40-pin ribbon cables from DR11 J1 and DR11 J2 on the CGVS board. This disconnects the SCSI board from the CGVS board.

2. Disconnect the 3-wire JAE connector from J3 on the SCSI board. Note that the now open connector is marked NPS.

3. Disconnect all of the cables from the SCSI board. See Figure 5-51.

4. Remove the four 3mm screws attaching the SCSI connectors to the interface tray.

5. Remove the two screws that attach the SCSI DIP switch cover plate to the interface tray.

6. Use a pair of small needle-nose pliers to squeeze the four plastic standoff posts on the SCSI board. Lift the SCSI board away from the interface tray.

7. Install the DR11 interface panel onto the inner side of the interface tray's panel and secure it with the four No. 4-40 screws provided in the kit. Start with the two places where pem nuts are placed on the DR11 panel.

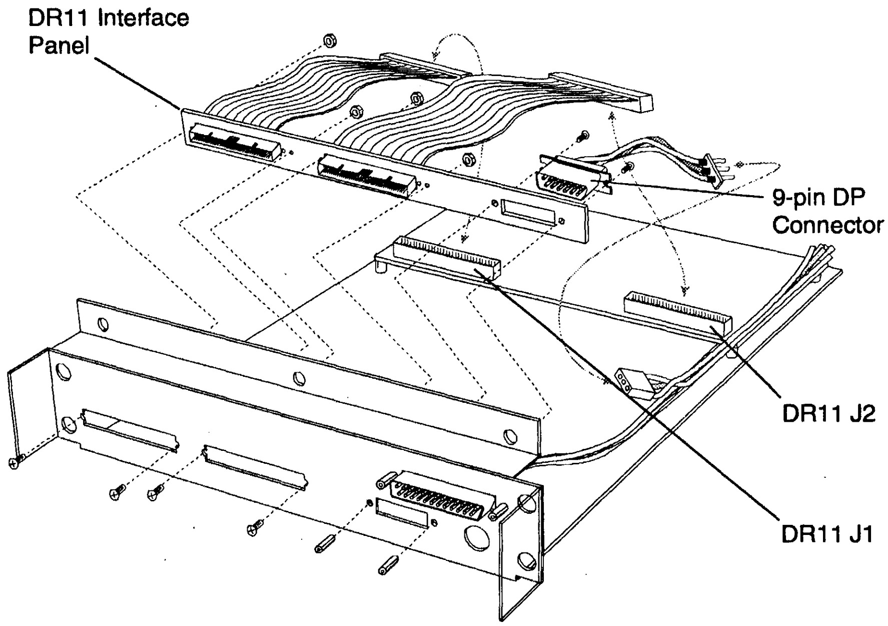


Figure 8-6. Installing the DR11 Interface

8. Install the 9-pin DP connector onto the inner side of the DR11 panel and secure the DP connector's flange with the two long No. 4-40 screws with washers provided in the kit.

9. Connect the two ribbon cables on the DR11 interface panel to DR11 J1 and DR11 J2 on the CGVS board.

10. Connect the 3-wire cable from the 9-pin DP connector into the floating JAE connector removed from the SCSI board. Match the blue wire in both connectors.

8

11. Use a tie wraps and a sticky back holders to secure the 3-wire cable and SCSI harness to the interface tray.

12. Slide the interface tray to its backmost position. Secure the interface tray to the scanner's inner rear chassis wall using the seven 3mm screws. See Figure 5-51.

13. Install the magnetically latched document table covers and attach the scanner to the host system using two 40-pin DR11 data cables and a
9-pin RS232 cable.

14. Attach the power cord and turn the scanner ON. Check to be sure the Power light on the Indicator Panel is lit and that the scanner powers on properly. Insert a sheet of paper into the scanner to verify that the lamp(s) turn on.

15. Test the scanner with a DR11-equipped host. Use Scandisp or a similar program to scan and view an image.

    If the DR11 verification is done with Improvision's Sunscan, Scandisp or Scanmenu, be sure to use COM1 on all PC/AT products and TTYB on all SparcStation products. Refer to the "Scandisp Installation Hints" document included with the Scandisp software to test the DR11 interface. These hints were written with a PC/AT and Scandisp in mind. Users of this environment should use the Improvision demo diskette for the procedures.

    Sparc users will also have a demo diskette containing mostly the same files (with the exception of "testdrv"). Sparc users should look at the "READ1ST" and "READ2ND" files for driver installation procedures.

16. Install the rear cover and document table covers.

8.3 Fujitsu Interface (GVS-12)

This section describes how to install and test the Fujitsu interface option.

The Fujitsu interface is plug compatible with any Fujitsu M309x scanner.

Contents of Option Package:

IS510 scanner kit:

1 ea GVS-12 PCB assembly
1 ea M309x connector carrier panel assembly with 6 in. data cable
1 ea mounting subplate
Mounting hardware

IS520 scanner kit:

1 ea GVS-12 PCB assembly with a connector on the back side
1 ea M309x connector carrier panel assembly with 24 in. data cable
Mounting hardware

Tools Needed:

- metric Philips screwdriver (magnetic tip preferred)
- small needle-nose pliers
- wire cutters
- small metal files

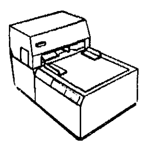
Host Interface Cables Required:

1 ea 24-pin M309 Data cable
1 ea RS232 cable

8.3.1 Installation Procedure

This installation procedure assumes that the scanner is currently configured with a SCSI interface. If any other optional interface is installed in the scanner, contact Ricoh Technical Support for assistance.

During installation the SCSI (NPS/NSA) board and the CGVS board are removed from the scanner and replaced by the GVS-12 board and M309x connector panel.



In IS520 scanners the GVS-09 data control board is also removed.

NOTE . . . *Data compression is performed on the host system when this interface is installed.*

1. Unpack the Fujitsu Interface (GVS-12) kit.

2. Turn the scanner OFF, and remove the power cord.

3. Remove the document table and top board cover. See Section 5.1 for the procedure.

   The main unit electronics are now exposed showing the lower CPU board (PAGS-1000) and optical unit. In IS520 scanners the memory board (GVS-01) and data control board (GVS-09) are exposed on the left, next to the CPU.

4. Remove the rear cover. See Section 5.2.4 for the procedure.

5. Remove the seven 3mm screws attaching the interface tray to the scanner's inner chassis wall. See Figure 5-51. Hold the chassis by the side tabs and slide it out approximately 6 inches. Guide the wire harness through the opening so it doesn't bind.

   NOTE . . . *When the interface tray is viewed from above, the SCSI (NSA) board is close to the scanner's rear and the data compression (CGVS) board is installed behind.*

6. Remove all of the cables from the SCSI and CGVS boards. See Figures 5-48 and 5-51.

7. Remove the four 3mm screws attaching the SCSI connectors to the interface tray. See Figure 5-51.

8. Use a pair of small needle nose pliers to squeeze the four plastic standoff posts on the SCSI board. Lift the SCSI board away from the interface tray.

9. Remove the six screws from the CGVS board and lift it away from the interface tray.

8.3.1.1 IS510 Procedure

In the IS510 scanner the GVS-12 board is installed on the mounting subplate in the location previously used for the SCSI board. Follow the steps below to complete the installation of the Fujitsu Interface in IS510 scanners.

1. Attach the M309x connector carrier panel onto the inner side of the interface tray and secure it with the four No. 4-40 screws provided in the kit. Use the provided 3mm shoulder screw in the right side (when viewed from the rear) of the connector. See Figure 8-7.
2. Remove the four plastic standoffs that were used for the SCSI board from the interface tray.
3. Place the GVS-12 subplate on the interface tray. Attach it to the tray with four No. 4-40 screws inserted from the tray's bottom side.
4. Attach the GVS-12 board to the subplate studs using four No. 4-40 screws.
5. Connect the ribbon cable from the connector panel to J3 on the GVS-12 board.
6. Connect the 3-wire cable from the connector panel to J5 on the GVS-12 board.

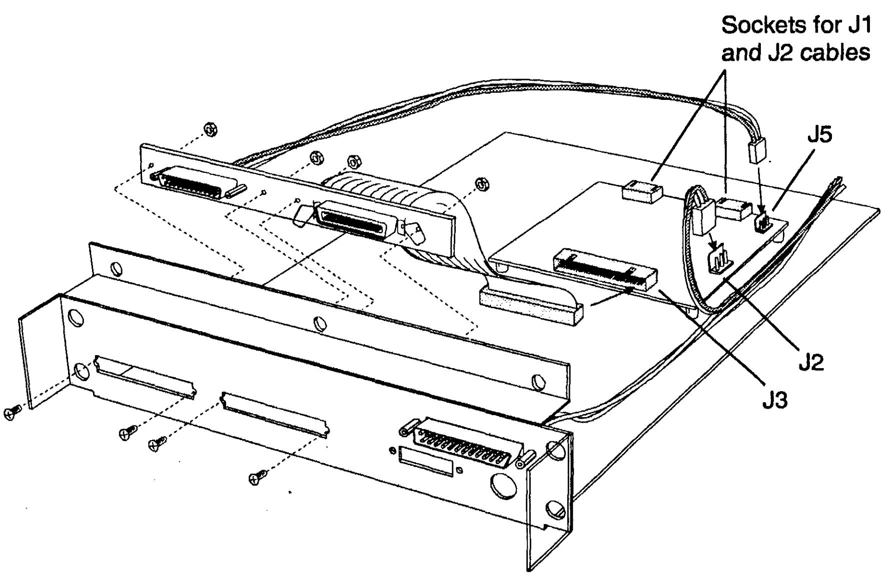


Figure 8-7. Installing the GVS-12 Board in an IS510 Scanner

7. Slide the interface tray partially in so you can connect the remaining cables. Guide the wiring harness so it doesn't bind on the chassis.

8. Release the microwire power cable from its harness, starting at Px on the CPU board (PAGS-1000), and route it to J2 on the GVS-12 board. The routing path is underneath the PAGS-1000 mounting bracket.

9. Locate the J1 and J2 cables that were removed from the SCSI board. Before these cables can be connected to the sockets on the GVS-12 board, the key tab on the top of the connector must be removed. Use wire cutters to snip the tab off the connectors (flathead wire cutters make this job easier), then use a metal file to smooth the surface.

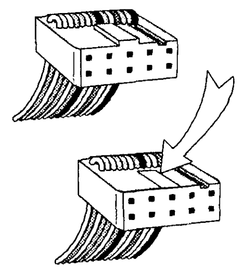


Figure 8-8. Removing the Key Tab

CAUTION: Exercise caution when clipping the key tab to be sure that you do not cut the cable.

10. Connect the J1 and J2 cables to the sockets on the GVS-12 board. Note pin 1 is marked by a triangular mark with an optional red stripe in the ribbons on all ribbon cable headers.

11. Use tie wraps and sticky-back holders to secure the loose SCSI harness and cables to the interface tray floor.

12. Slide the interface tray to it's backmost position. Secure the interface panel to the scanner's inner rear chassis wall, using the seven 3mm screws.

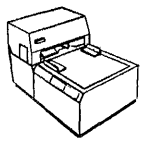
13. Install the document table covers and attach the scanner to the host system using a video cable and a RS232 cable.

14. Connect the power cord and turn the scanner ON. Check to be sure the Power light on the Indicator Panel is lit and that the scanner powers on properly. Insert a sheet of paper into the scanner to verify that the lamp(s) turn on.

15. Test the Fujitsu interface with the host system that has a RIP card or Scandisp plus internal GVSII and CAVS.

16. Install the rear cover, top board and document table covers.

8.3.1.2 IS520 Procedure



In IS520 scanners, the GVS-12 board installs piggyback on the GVS-01 board. Follow the steps below to complete the installation of the Fujitsu Interface in IS520 scanners.

1. Attach the M309x connector carrier panel onto the inner side of the interface tray and secure it with the four No. 4-40 screws provided in the kit. Use the provided 3mm shoulder screw in the right side (when viewed from the rear) of the connector. See Figure 8-7.

2. Slide the interface tray partially in so you can connect the cables. Guide the wiring harness so it doesn't bind on the chassis.

3. Disconnect all cables from the GVS-09 data control board positioned over and piggyback connected to the GVS-01 memory board. See Figure 5-50. Note the labeling of J1 and J2 since these will be connected to the GVS-12 board.

4. Remove the four 3mm screws attaching the GVS-09 board to the GVS-01 posts (a 90 degree screwdriver is recommended). Gently pull the GVS-09 board out.

5. Install the GVS-12 board onto the GVS-01 memory board by mating the J4 connector on the bottom of the GVS-12 board with J5 on the GVS-01 board. When mating the two boards, use the GVS-12 mounting holes registration with the posts to insure proper unskewed mating of the piggyback connectors.

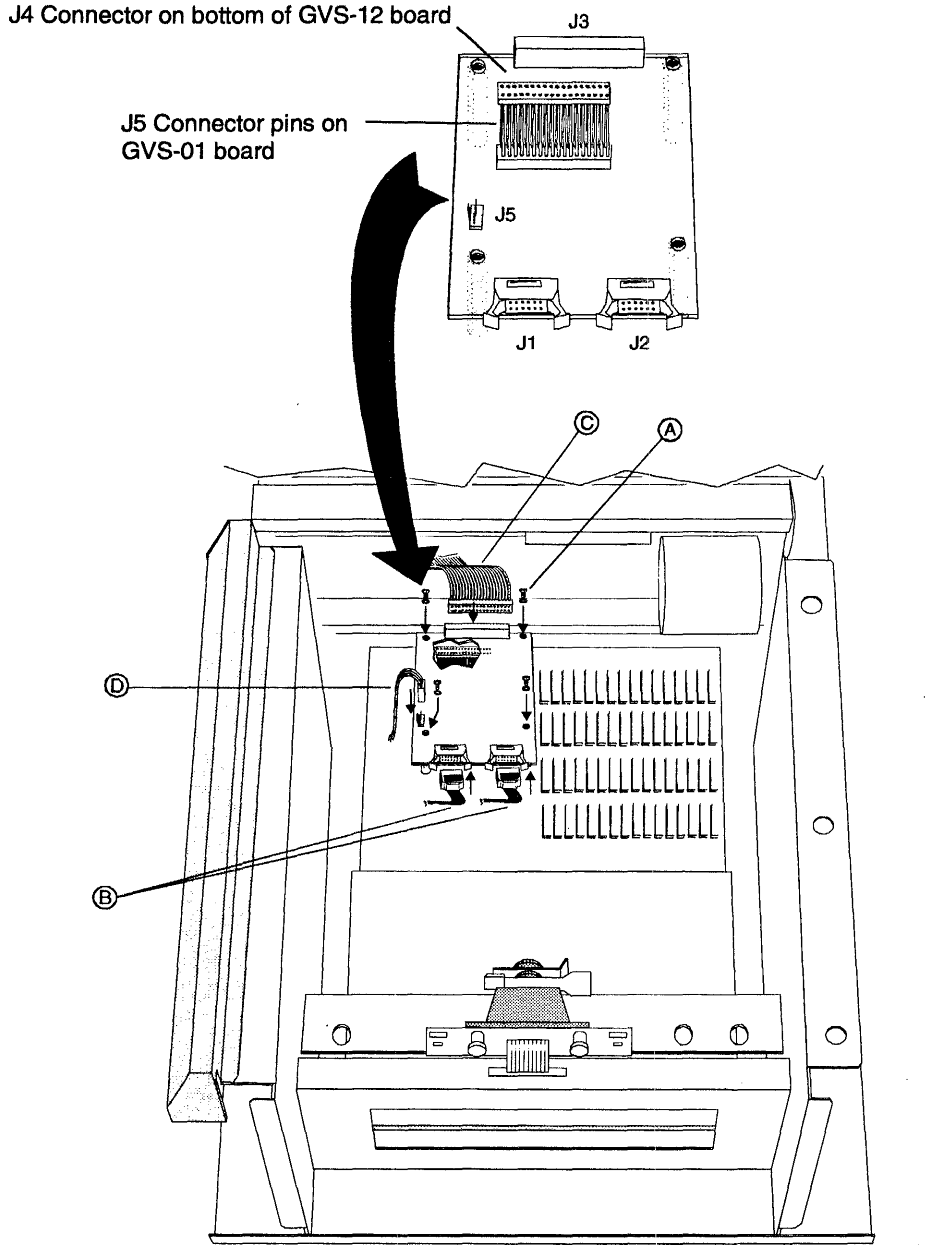


Figure 8-9. Installing the GVS-12 Board in an IS520 Scanner

6. Secure the two boards together with the four 3mm screws (A) removed in step 4.

7. Locate the J1 and J2 cables that were removed from the GVS-09 board. Before these cables can be connected to the sockets on the GVS-12 board, the key tab on the top of the connector must be removed. Use wire cutters to snip the tab off the connectors (flat-head wire cutters make this job easier), then use a metal file to smooth the surface. See Figure 8-8.

CAUTION: Exercise caution when clipping the key tab to be sure that you do not cut the cable.

8. Connect the J1 and J2 cables (B) to the sockets on the GVS-12 board. Note pin 1 is marked by a triangular mark with an optional red stripe in the ribbons on all ribbon cable headers.

9. Route the ribbon data cable from the connector panel (C) to J3 on the GVS-12 board. Route the 3-wire cable from the connector panel (D) to J5 on the GVS-12 board.

10. Use tie wraps and sticky-back holders to secure the loose SCSI harness and cables to the interface tray floor.

11. Slide the interface tray to it's backmost position. Secure the interface panel to the scanner's inner rear chassis wall using the seven 3mm screws.

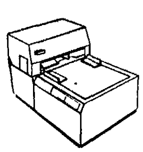
12. Place the document table plates on the scanner. Attach the scanner to the host system using a video cable and a RS232 cable.

13. Connect the power cord and turn the scanner ON. Check to be sure the Power light on the Indicator Panel is lit and that the scanner powers on properly. Insert a sheet of paper into the scanner to verify that the lamp(s) turn on.

14. Test the Fujitsu interface with the host system.

15. Install the rear cover, top board cover and document table plates.

8.3.2 Test Procedures for IS520



The GVS-12 boards are tested prior to shipment and the following steps are only required when the Fujitsu interface does not operate properly. Completion of the following tests assures the electrical operation of the scanner as configured.

A multi-channel oscilloscope is required for the test procedure.

1. Attach the power cord and turn the scanner ON.

2. Connect a PC or other monitor device to the scanner's monitor port (9600 baud, 8 data bits, 1 stop, No parity). See Section 4.5.

3. To verify the correct connection of the internal ribbon cables, issue a **C** (calibrate) command to the scanner.

   For IS520 scanners: If the upper unit lamp stays off, or a message regarding "slave time out" is printed on the monitor port—the slave communication is not connected.

4. Select a primary image path on the GVS-12. This is done on power up or by an **ESC** command issued from either the host or monitor port.

5. Verify the correct connection of the microwire control port by observing U6.6 on the GVS-12 board when an ESC command is issued (best done with repeat key on the monitor port). Two 10 µsec low TTL pulses should be observed. The pulses are spaced 36 µsec from each other.

6. Sync a scope to the scanner's line clock, located at J2 on the 5K EQ board. The signal is a low-going TTL pulse with a period of 504 µsec, and a low duration of 2.5 µsec. The same signal may be observed with positive sense on the center pin of J2 on the CCD control board (5K CCD) (top edge).

7. Issue a scan command to the scanner (L from the host or monitor port) and observe a negative-going group of pulses on JP2.1 on the GVS-12 board. Note that JP2.3 displays the inverse image of these pulses.

8. Check for a positive-going group of pulses on U13.18 on the GVS-12 board. Note that U13.11 displays the same pulse group, but does not return to low after the end of that group. The signal returns to low level only when the line clock becomes low.

9. Observe the J3.21 of the GVS-12 during the scan for a positive group of pulses. Also observe J3.19 for a TTL signal with a low period that overlaps and contains the pulses on J3.21. The pulse groups are VCL, and the TTL waveform is /HGATE.

10. Adjust R7 so the time from the last VCL pulse to /HGATE going high is 12 µsec. If you are using an AIP/MM board, this is the time used by the TI34010 to transfer an image line from the VRAM to main memory. A minimal safe time is 6 µsec. If the interface is MM/VIP, increase this time to 20 µsec.

11. Select a secondary data path with a GVS FIFO reset. This is done by a **20,1,2F** command issued to the scanner from the host or monitor port.

12. Issue a scan command to the scanner (L), and adjust R8 so the width of /HGATE high portion as seen on J3.19 is 12 µsec.

8.4 Light Source (Color Dropout) Option

The Light Source option changes the color of the scanner lamp so specific colors can be dropped out when scanning forms and similar documents. The lamps currently available are:

Green, wide spectrum (standard)
Red, narrow spectrum
Blue, wide spectrum

There is a big difference in the light output level of narrow and wide spectrum lamps. The scanner is calibrated at the factory for the color of lamp that is shipped with the scanner. When changing between wide and narrow spectrum lamps, it is very important to recalibrate the scanner. The image quality will degrade if these adjustments are not made.

Contents of Option Package:

IS510 scanner kit:

1 ea Lamp assembly in the specified color

IS520 scanner kit:

2 ea Lamp assembly in the specified color

Tools Needed:

- metric Philips screwdriver
- multi-channel oscilloscope
- sample documents with drop out colors (optional)

8

8.4.1 Installation Procedure

☞ **ADJUSTMENT NOTE:** The CCD Camera Dynamic Range adjustment must be performed when a different color lamp is installed. See Section 6.3.3 for the procedure.

1. Unpack the Lamp Source kit.

2. Turn the scanner OFF and remove the power cord.

8.4.1.1 Lamp B (lower)

Follow the procedure below to change the lower lamp in IS510 and IS520 scanners and expose the lower EQ/DITHER board so adjustments can be made.

1. Replace lamp B with the new lamp in the option kit. See Section 5.5.1 for the procedure.

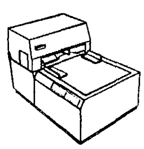
> ⚠ **CAUTION:** Avoid touching the lamp body as it may be hot from normal operation.

2. Remove the right cover from the lower unit. See section 5.2.2 for the procedure. The lower EQ/DITHER board is exposed.

3. For IS510 scanners go to section 8.4.2 to adjust the contrast and test the lamp.

   For IS520 scanners, go to section 8.4.1.2.

8.4.1.2 Lamp A (upper) - IS520 Only



Follow the procedure below to change the upper lamp in IS520 scanners and expose the upper EQ/DITHER board so adjustments can be made.

1. Remove lamp A from the scanner. See Section 5.5.2 for the procedure.

2. Remove all of the covers from the upper unit. See Section 5.2.8 for the procedures.

3. Remove the cover from the CCD camera assembly on the left side of the upper unit. See Figure 8-4. The EQ/DITHER board is exposed.

4. Install the new lamp from the option kit. See Section 5.5.2 for the procedure.

5. Place a tie wrap over the SW3 interlock switch on the upper unit so the scanner can be tested with the covers removed.

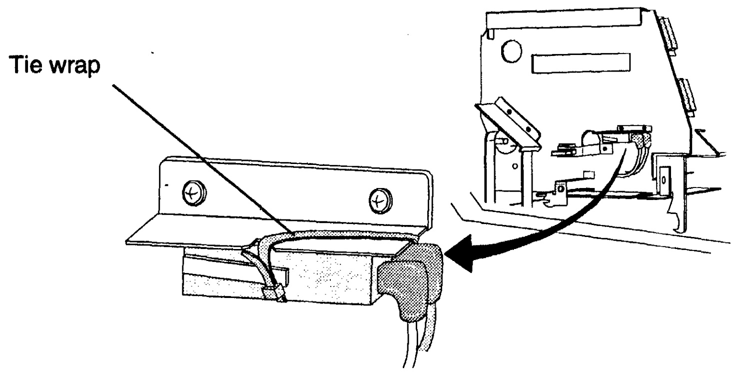


Figure 8-10. Tie Wrap Interlock Switch

6. Continue to Section 8.4.2 to test the lamp(s).

8.4.2 Testing the Installation

An oscilloscope is required for this procedure.

1. Attach the power cord and turn the scanner ON. Check to be sure the Power light on the Indicator Panel is lit and that the scanner powers on properly. Insert a sheet of paper into the scanner to verify that the lamp(s) turn on.

2. Follow the procedures in Section 6.3.3, "CCD Camera Dynamic Range Adjustment," to adjust the scanner for the lamp color change. For IS520 scanners be sure to adjust the upper and lower settings.

3. Install the scanner covers. On IS520 scanners install the cover on the CCD camera assembly and remove the tie wrap from the interlock switch before replacing the covers on the upper unit.

4. A host system is needed to verify that the desired colors are dropped. Scan sample documents that are printed in the dropout color and
adjust the software until the color is completely dropped.

NOTE . . . *Any time the light source is changed on the scanner, response characteristics are changed. Red lamps are meant to drop out certain shades of red, but they may change the way other colors respond and test documents should be run.*

8.5 Ink Jet Endorser (NPS/SPA)

This section describes how to install the Ink Jet Endorser option in IS510 and IS520 scanners.

Contents of Option Package:

1 ea NPS/SPA PCB assembly
1 ea Printhead assembly
1 ea HP 51604A Ink jet cartridge
Mounting hardware

NOTE . . . *The ink jet cartridge is not included in the Ricoh Option package. The HP 51604A ink jet cartridge is available at stores that carry HP ink jet supplies.*

In addition to the Ink Jet Endorser option you will also need an anti-static brush. P/N 5470-1225

Tools Needed:

- metric Philips screwdriver
- wire cutters
- small metal file

8.5.1 Installation Procedure

The NPS/SPA board installs in the upper unit of the IS510 and IS520 scanners. The printhead assembly installs near the separation cartridge.

1. Install the anti-static brush per Section 7.4.3.5.

2. Unpack the Ink Jet Endorser (NPS/SPA) kit.

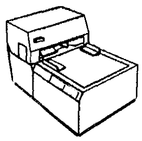
3. Turn the scanner OFF and remove the power cord.

4. Remove all of the covers from the upper unit.

If the scanner is an IS510, see Section 5.2.7 for the procedures.

If the scanner is an IS520, see Section 5.2.8 for the procedures.

8.5.1.1 Installing the NPS/SPA Board



1. Install the NPS/SPA board as follows:

   IS510 Scanners

   Install the NPS/SPA board (A) onto the mounting posts using the four 3mm screws provided in the kit. See Figure 8-11.

   IS520 Scanners

   In IS520 scanners the CPU board must be removed to gain access to the mounting posts for the NPS/SPA board.

   A. Disconnect the cables from the upper CPU board (PAGS 1001) and remove it. See Section 5.17.2 for the procedure. Set the screws aside.

   B. Install the NPS/SPA board (A) onto the mounting posts using the four 3mm screws provided in the kit. See Figure 8-11.

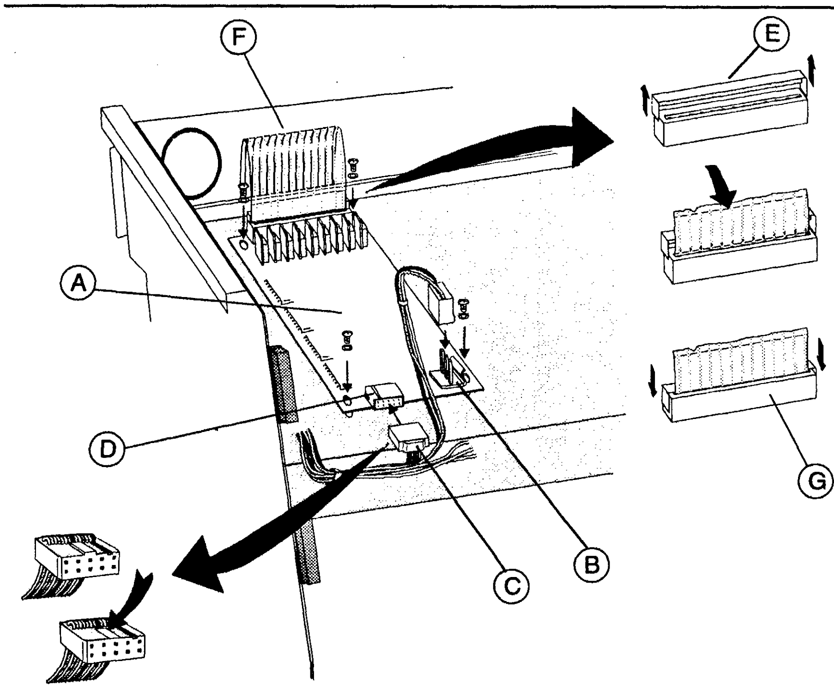


Figure 8-11. Installing the NPS/SPA Board

2. Connect the power cable into the 3-prong power connector (B) on the NPS/SPA board.

3. Use wire cutters to snip the tab off the control cable connector (C) (flathead wire cutters make this job easier), then use a metal file to smooth the surface. See Figure 8-11.

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CAUTION: Exercise caution when clipping the key tab to be sure that you do not cut the cable.

Connect the control cable to P1 (D) on the NPS/SPA board, matching the cable connector markings to the board connector. See Figure 7-5 for the cable diagram. The black ground wire on the cable should be toward the front of the scanner.

NOTE... In scanners with an Image Processor option installed, the control cable connected to J2 on the NPS/IP board and P19 on the CPU board is daisy chained to P1 on the NPS/SPA board.

8.5.1.2 Installing the Ink Jet Printhead

1. On IS520 scanners, remove the 45 degree harness guide (A) mounted on the front side of the upper unit (two 3mm screws) to gain access to the two 3mm screws holding the rear slide. See Figure 8-12.

2. Remove the lower screw (B) that secures the rear slide from the front side of the upper unit and loosen the top screw (C). Do the same thing on the rear side.

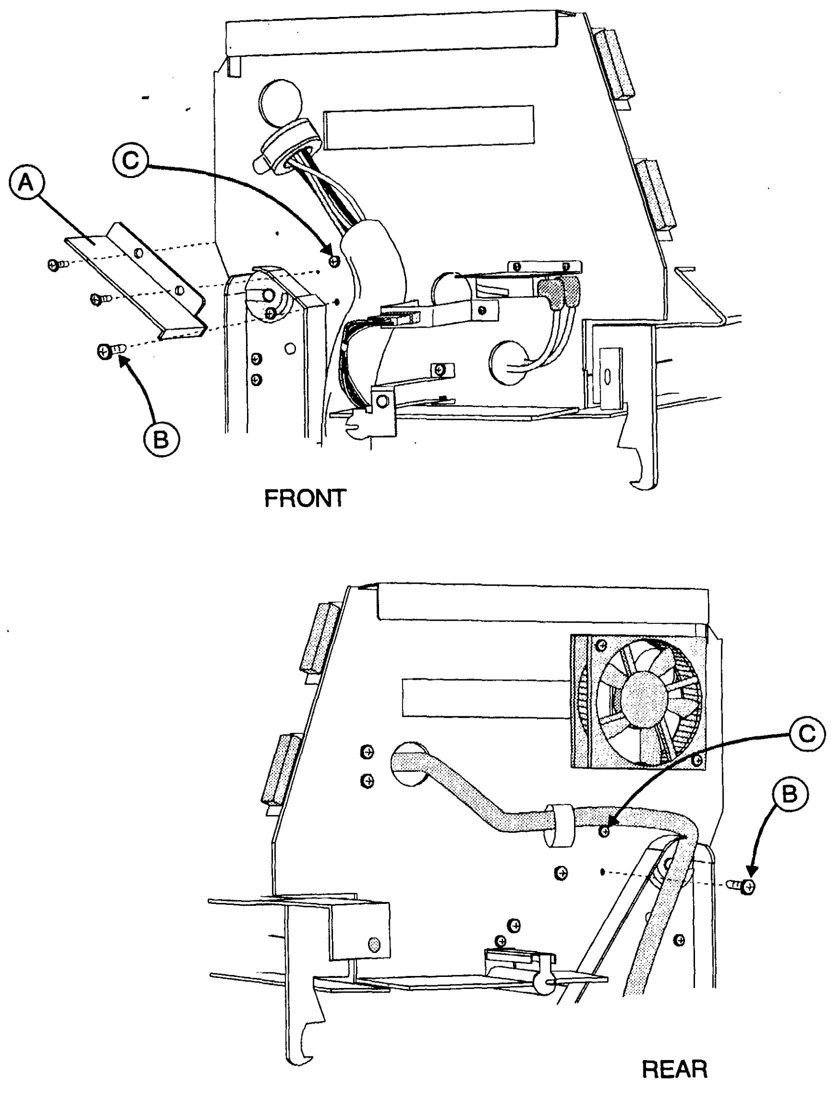


Figure 8-12. Unfastening the Rear Slide

3. Lift the upper unit and remove the five screws (A) from the rear slide. See Figure 8-13.

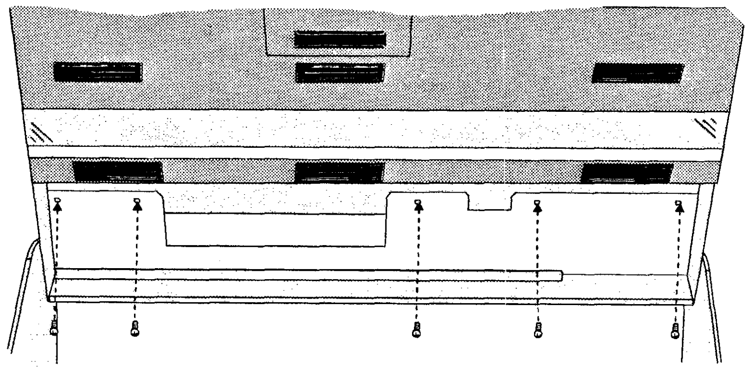


Figure 8-13. Removing Screws from the Rear Slide

4. With the printhead oriented as shown in Figure 8-14, carefully insert the printhead's Mylar ribbon cable (A) into the opening in the rear slide as illustrated. Slide the cable up between the rear support panel and the PCB board shelf.

5. Push the rear track (B) back and insert the ink jet printhead assembly's four flanges into the front and rear tracks (C).

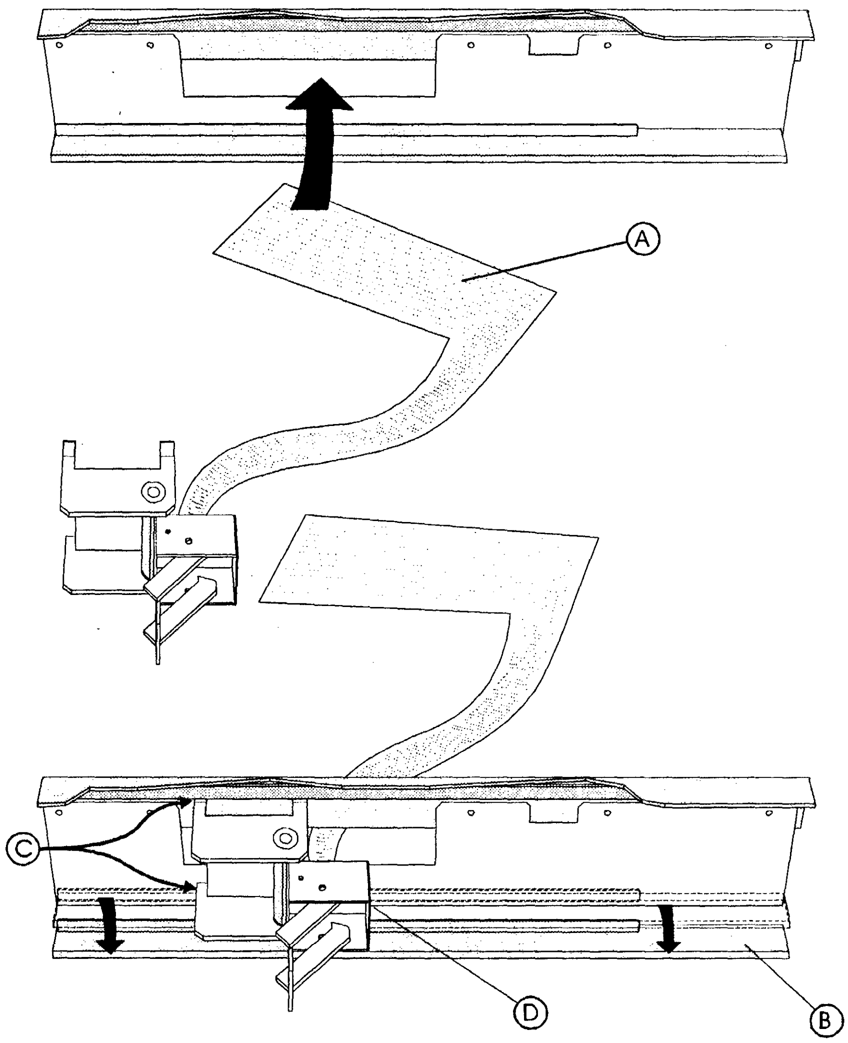


Figure 8-14. Installing the Ink Jet Printhead

When viewed from the document table end with the upper unit raised, the ink jet printhead (D) must point toward the scanner's rear side as shown in Figure 8-14.

6. Insert one of the screws removed in step 3 to secure the rear slide.

7. Connect the printhead's Mylar ribbon cable (F) to the NPS/SPA board as illustrated in Figure 8-11.

   A. Carefully route the Mylar ribbon cable to the NPS/SPA board. To avoid damage, orient the cable so it is not twisted around itself.

B. Open the connector (E) at P4 on the NPS/SPA board by pulling up on its locking plate ends. Insert the Mylar ribbon cable (F) into the connector. Make sure that the contacts side of the cable is oriented toward the power FET devices as indicated on the PCB assembly silkscreen.

C. Push the locking bar on the connector down firmly to lock the Mylar ribbon cable in place (G).

8. Attach the remaining four screws to secure the rear slide.

ADJUSTMENT NOTE: With the upper unit raised, check the printhead for freedom of movement by sliding it in the track. It must move smoothly.

9. Slide the printhead to the desired position being careful not to put a strain on the ribbon cable.

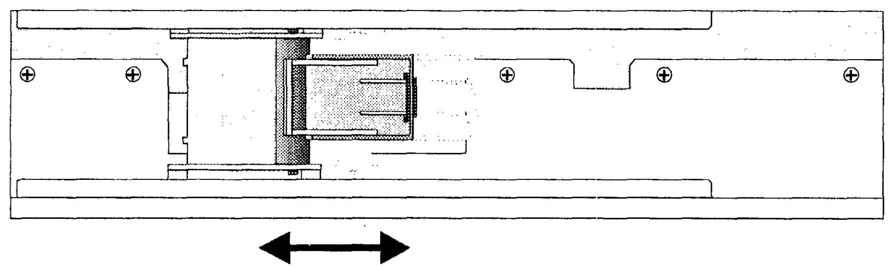
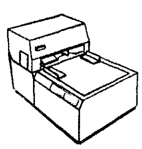


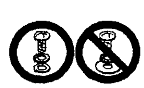
Figure 8-15. Positioning the Printhead

10. Attach the two lower screws removed in step 2 and tighten the two upper screws.



On IS520 scanners, attach the harness guide removed in step 1.

11. On the IS520 scanner, reinstall the upper CPU board (PAGS 1001) and connect the cables. See Section 5.17.2 for the procedure. Verify all of the board connections and check to be sure the black ground wire on all of the cables is toward the front of the scanner.



CAUTION: DO NOT use the screws with a large flat washer to install the CPU board. The washers on these screws can cause the board to short out.

12. Attach the power cord and turn the scanner ON. Check to be sure the POWER light on the Indicator Panel is lit and that the scanner powers on properly. Insert a sheet of paper into the scanner to verify that the lamp(s) turn on.

8.5.1.3 Installing the Ink Jet Cartridge

Follow the procedure below to install an HP 51604A ink jet cartridge in the printhead.

1. Turn the scanner OFF.

2. Lift the upper unit and swivel the printhead counter clockwise (to the rear of the scanner). See Figure 8-17.

3. Prime the cartridge by using any pointed dull object such as a ball point pen to apply pressure on the ink bladder through the hole in the top of the cartridge. When the nozzle area is covered with ink, use a damp lint-free cloth to wipe it clean.

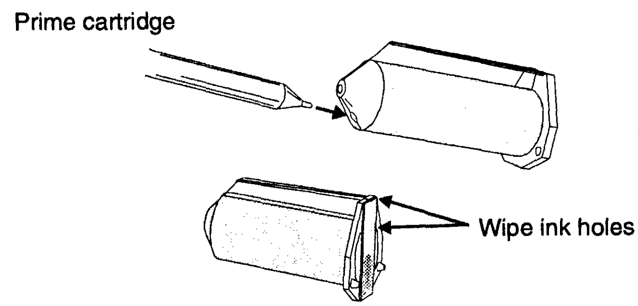


Figure 8-16. Priming the Cartridge

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4. Push the locking lever (A) up and insert the cartridge (B) so its two plastic pins fit into the holes in the printhead assembly (C).

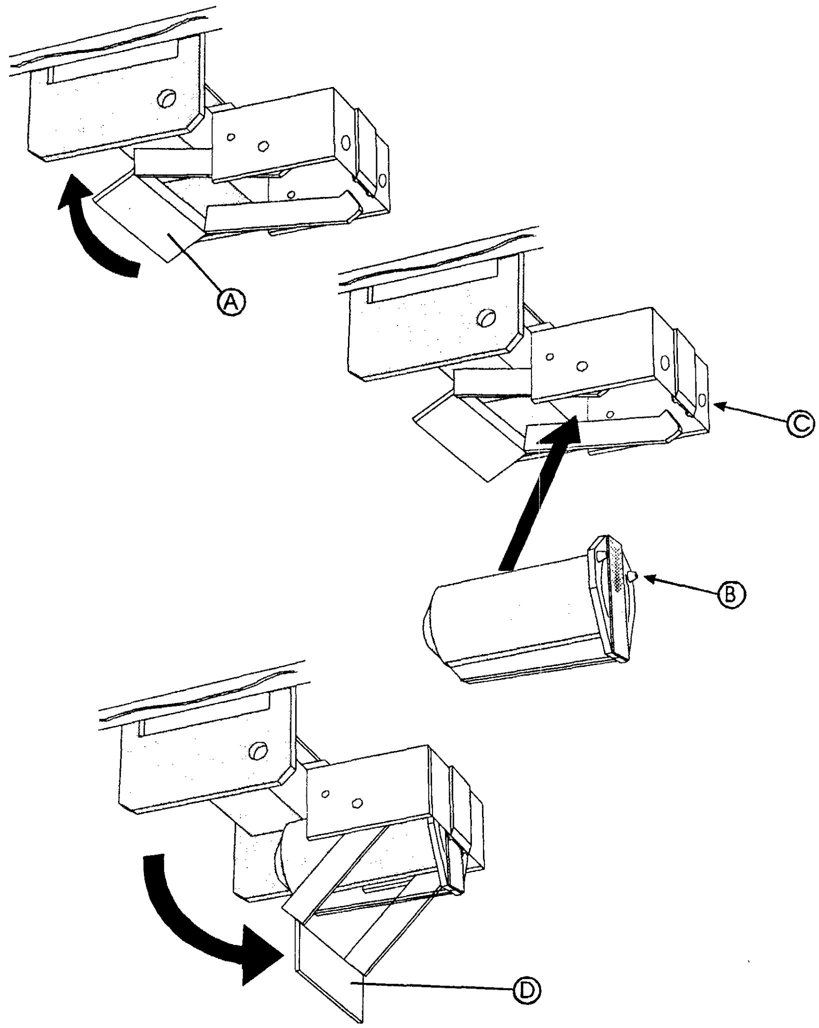

Figure 8-17. Inserting the Cartridge

5. Pull the lever down (D) to lock the cartridge in place.

6. Swivel the printhead clockwise (down) until it snaps into its operating vertical orientation.

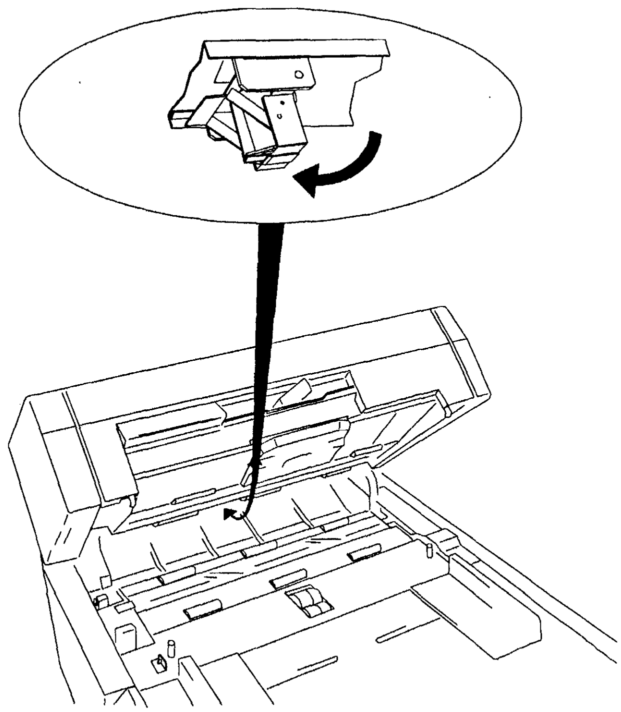

Figure 8-18. Swiveling the Printhead

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8.5.2 Testing the Ink Jet Endorser

The Ink Jet Endorser can be fully tested under software control from the monitor port. The upper unit covers should be removed during the test procedure.

1. Turn the scanner ON.
2. Connect a PC to the monitor port. See Section 4.5 for details.
3. Place a sheet of paper under the ink jet cartridge. The test will activate the ink jet and cause ink spray.
4. Type the following commands. The response to each command is shown on the PC monitor.

Type	To
B1234567890 and press the **Enter** key	Define the print string as "1234567890"
11t	Send the print string to the endorser and scan the sheets. The ink jet sprays ink immediately.

The monitor port will display information for places to track with an oscilloscope.

If the circuit board, head assembly and cartridge are functional, A blot of ink will build up on the paper placed under the cartridge.

NOTE . . . *Running this test for a few seconds can be used to prime a cartridge and clean partially clogged ink jet nozzles.*

5. Use an oscilloscope to trace the ink jet control signals. The 9 jets are fired in a predetermined sequence where each jet is turned on for 4-5 Microsecond at a time to print a dot.

NOTE . . . *The TTL level signals listed on the monitor port can be observed without a cartridge. The high level signals require a cartridge or a simulated jet to operate.*

To simulate a jet, install a pull-up resistor from the –24V to the proper pin of the head connector (J4). The +24V can be hooked from J2.3 or J4.6.

If all J4 lines show proper high voltage signal with a pull-up resistor, but partial printing was observed in operation, check the head cable contacts. All 13 gold-plated contacts should have a small "nick" caused by locking J4. If the nicks are not parallel to the cables end, or not centered in the gold areas, the head cable was not properly installed.

WARNING: NEVER connect or disconnect the cartridge or the head assembly cable while in a test phase. Doing so will automatically damage the cartridge!

To test the print quality:

1. Load several sheets of paper and repeat step 4 above.
2. Check the print quality on the sample sheets. See Section 7.4.2 if there are problems with the print quality.

NOTE . . . *A Windows-based Ricoh Test Program is currently being developed that will allow you to define the print string and perform additional tests to verify the function of the ink jet endorser.*

Under normal operation the print string and other parameters are defined from the host system. See the Part III, *Programmer's Reference,* for a complete set of the ink jet endorser commands.

8.6 Bar Code Recognition (IBCR)

This section describes how to install the Bar Code Recognition (IBCR) option.

Contents of Option Package:

1 ea IBCR PCB assembly
1 ea Operator panel decal
Cables
Mounting hardware

Tools Needed:

- A metric Philips screwdriver (magnetic tip preferred) is the only required tool for this procedure.

8.6.1 Installation Procedure

The OP-CON board is removed from the scanner and replaced by the IBCR board in this procedure.

1. Unpack the Bar Code Recognition (IBCR) kit.

2. Turn the scanner OFF and remove the power cord.

3. Remove the front-right cover. See Section 5.2.1 for the procedure. The inner wall with the indicator control board (OP-CON) is exposed.

4. Note and identify the placement of the LED cable, lamp cable (two in IS520), monitor port, power and CPU OP-PORT cables (CN1, CN2, CN3, CNx, CN4 and CN6, respectively) on the OP-CON board.

5. Disconnect the cables from the OP-CON board and remove it together with the EEPROM module (eight 3mm screws). See Section 5.17.8 for the procedure.

6. Install the IBCR board onto the OP-CON mounting posts (using four 3mm screws). Connect the cables to the IBCR board. The placement on the IBCR matches that of the OP-CON board.

(TBD)

Figure 8-19. Installing the IBCR Board

7. Identify the ribbon cables coming from P4 and P19 on the CPU board (PAGS-1000) in the lower unit. If these have floating headers, plug the ribbon from P4 on the CPU board to Jx on the IBCR board. The ribbon from P19 on the CPU board plugs to Jx on the IBCR board.

8. If the scanner cables do not have floating headers and the kit contains two headers, crimp these onto the present scanner ribbons to make the same connections listed above.

9. If the scanner is an IS510, connect the IBCR J4 to the CPU P0.

   In IS520 scanners this connection is made to P0 on the upper CPU (requires special routing by hand).

8.7 Video (VSI) Interface

This section describes how to install the single and dual channel Video interface option.

Contents of Option Package:

1 ea Single Channel or Dual Channel Video interface panel with ribbon cable(s)
Mounting hardware

Tools Needed:

- metric Philips screwdriver (magnetic tip preferred)
- small needle-nose pliers
- tie wraps
- sticky back holders

Host Interface Cables Required:

Single Channel:
1 ea 15-pin D straight through video cable
Dual Channel:
2 ea 15-pin D straight through video cables

8.7.1 Installation Procedure

This installation procedure assumes that the scanner is currently configured with a SCSI interface. If any other optional interface is installed in the scanner, contact Ricoh Technical Support for assistance.

1. Unpack the Video Interface option kit.

2. Turn the scanner OFF, and remove the power cord.

3. Remove the document table and top board cover. See Section 5.1 for the procedure.

   The main unit electronics are now exposed showing the lower CPU board (PAGS-1000) and optical unit. In IS520 scanners the memory board (GVS-01) and data control board (GVS-09) are exposed on the left, next to the CPU.

4. Remove the rear cover. See Section 5.2.4 for the procedure.

5. Remove the seven 3mm screws attaching the interface tray to the scanner's inner chassis wall. See Figure 5-51. Hold the chassis by the side tabs and slide it out approximately 6 inches. Guide the wire harness through the opening so it doesn't bind.

NOTE . . . When the interface tray is viewed from above, the SCSI (NSA) board is close to the scanner's rear and the data compression (CGVS) board is installed behind.

8.7.1.1 Single Channel Video Interface

The Single Channel Video interface can be installed in IS510 or IS520 scanners.

In this procedure the SCSI (NPS/NSA) board (along with the SCSI interface connectors, rotary switch and SCSI DIP switch) and the CGVS board are removed from the scanner and replaced by the Single Channel Video interface panel.

1. Remove the CGVS and SCSI boards per Sections 5.17.3 and 5.17.6.

2. Install the Single Channel Video interface panel onto the inner side of the interface tray's panel and secure it with the four No. 4-40 screws and nuts provided in the kit.

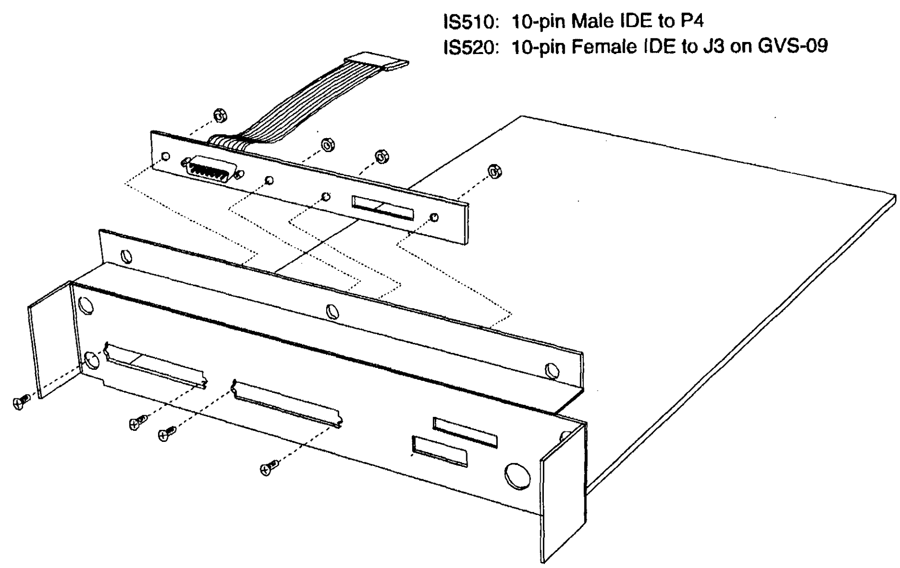
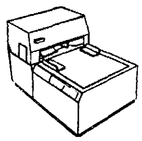


Figure 8-20. Installing the Single Channel Video Interface

3. Connect the ribbon cable as follows:

   IS510 Scanners: Connect the 10-pin Male IDE to the 10-pin Female P4 plug that normally connects to J4 on the CGVS board. This harness is the primary video from the CCD.



IS520 Scanners: Slide the interface tray partially in so you can connect the cable. Guide the wiring harness so it doesn't bind on the chassis.

Connect the 10-pin Female IDE to J3 on the GVS-09 board. The IS520 is designed to be a dual-side single video channel. The data path PCB (GVS-09) and secondary side buffer (GVS-01) are still used.

4. Use tie wraps and sticky-back holders to secure the loose SCSI harness and cables to the interface tray floor.

5. Slide the interface tray to it's backmost position. Secure the interface panel to the scanner's inner rear chassis wall, using the seven 3mm screws.

6. Install the document table covers and attach the scanner to the host system using a video cable a illustrated in Figure 8-21.

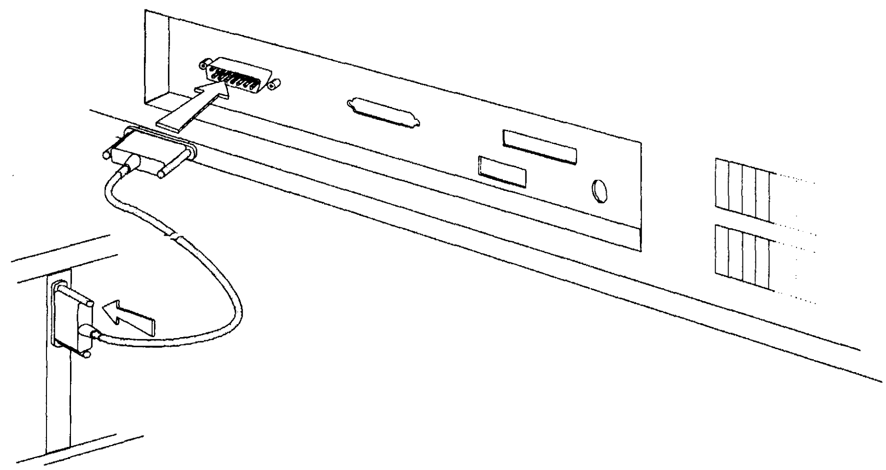
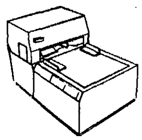


Figure 8-21. Connecting the Single Channel Video Interface

7. Connect the power cord and turn the scanner ON. Check to be sure the Power light on the Indicator Panel is lit and that the scanner powers on properly. Insert a sheet of paper into the scanner to verify that the lamp(s) turn on.

8. Install the rear cover, top board and document table covers.

8.7.1.21 Dual Channel Video Interface (IS520 Only)



The Dual Channel Video interface can only be installed in IS520 scanners.

In this procedure the SCSI (NPS/NSA) board (along with the SCSI interface connectors, rotary switch and SCSI DIP switch) and the CGVS, GVS-01 and GVS-09 boards are removed from the scanner and replaced by the Dual Channel Video interface panel.

1. Remove the CGVS and SCSI boards per Sections 5.17.3 and 5.17.6.
2. Remove the GVS-01 and GVS-09 boards per Sections 5.17.4 and 5.17.5.
3. Install the Dual Channel Video interface panel onto the inner side of the interface tray's panel and secure it with the four No. 4-40 screws and nuts provided in the kit.

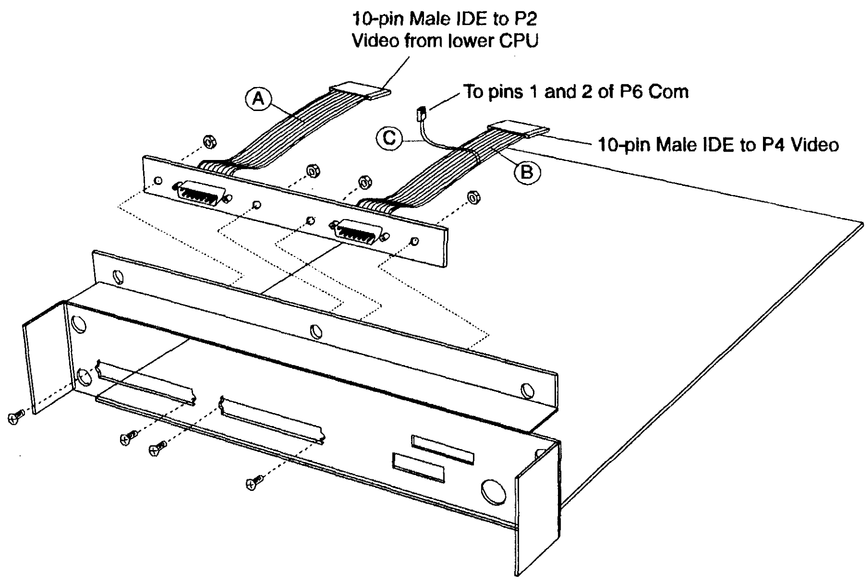


Figure 8-22. Installing the Dual Channel Video Interface

4. Slide the interface tray partially in so you can connect the cables. Guide the wiring harness so it doesn't bind on the chassis.
5. Connect the 10-pin Male IDE on cable (A) to P2. This is the primary video from the lower CPU that normally connects to J2 on the GVS-09 board.
6. Connect the 10-pin Male IDE on cable (B) to the 10-pin Female P4 plug that normally connects to J4 on the GVS-01 board. This harness is the secondary video from the upper CCD.

8

7. Connect the 2-pin RS232 cable offshoot (C) to the 3-pin connector P6. This connection is red in color and has three wires. The black, or ground, wire is not used. Only the red and blue, pins 1 and 2, are used.

8. Use tie wraps and sticky-back holders to secure the loose SCSI harness and cables to the interface tray floor.

9. Slide the interface tray to it's backmost position. Secure the interface panel to the scanner's inner rear chassis wall, using the seven 3mm screws.

10. Install the document table covers and attach the scanner to the host system using two video cables as illustrated in Figure 8-23.

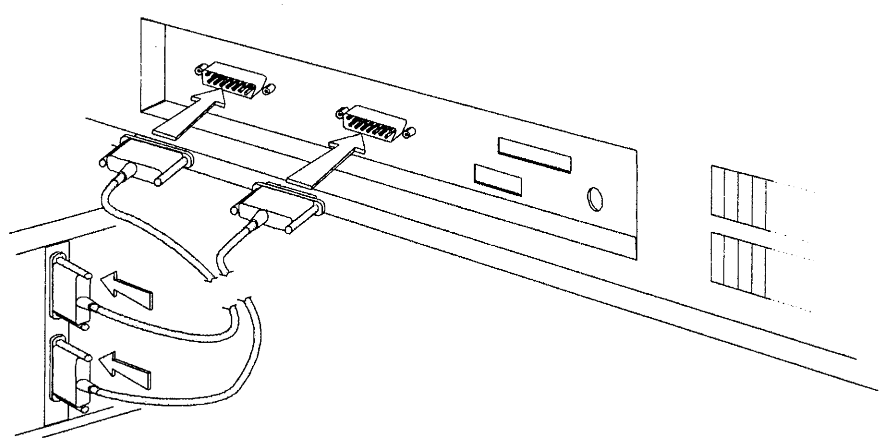


Figure 8-23. Connecting the Dual Channel Video Interface

11. Connect the power cord and turn the scanner ON. Check to be sure the Power light on the Indicator Panel is lit and that the scanner powers on properly. Insert a sheet of paper into the scanner to verify that both lamps turn on.

12. Install the rear cover, top board and document table covers.

CHAPTER 9

Electric Data

Inside this chapter:

9.1 Signal Table

9.1.1 Lower CPU Board (PAGS-1000)

Connector No.	Pin No.	Name	IN/OUT	Description
P0	1	STXD	OUT	Command output to upper CPU board
	2	GND	–	GND
	3	SRXD	IN	Status input from upper CPU board
	4	NC	–	Not used
P1	1	/PHB	OUT	Motor phase signal
	2	PHB	OUT	Motor phase signal
	3	NC	–	Not used
	4	/PHA	OUT	Motor phase signal
	5	PHA	OUT	Motor phase signal
	6	NC	–	Not used
	7	/CLCH	OUT	Paper feed clutch ON/OFF signal
	8	+24V–2	OUT	+24V
P3	1	GND	–	Grounding electric potential
	2	NC	–	Not used
	3	MRXD	IN	Input signal from monitor
	4	NC	–	Not used
	5	MTXD	OUT	Output signal to monitor
	6	NC	–	Not used
	7	NC	–	Not used
	8	NC	–	Not used
	9	NC	–	Not used
	10	NC	–	Not used
	11	NC	–	Not used
	12	NC	–	Not used
	13	GND	–	Grounding electric potential
	14	NC	–	Not used
	15	NC	–	Not used
	16	NC	–	Not used
	17	NC	–	Not used
	18	NC	–	Not used
	19	NC	–	Not used
	20	NC	–	Not used
	21	NC	–	Not used
	22	NC	–	Not used
	23	NC	–	Not used
	24	NC	–	Not used
	25	NC	–	Not used

9

Connector No.	Pin No.	Name	IN/OUT	Description
P4	1	BCLK+	OUT	Pixel clock signal
	2	BCLK–	OUT	Pixel clock signal
	3	GND	–	Grounding electric potential
	4	BDAT+	OUT	Pixel data signal
	5	BDAT–	OUT	Pixel data signal
	6	LINCLK–	OUT	Line clock signal
	7	HRXD	IN	Input signal from host
	8	LINCLK+	OUT	Line clock signal
	9	HTXD	OUT	Output signal from host
	10	GND	–	Grounding electric potential
P5	1	+12V	IN	Power (from power supply unit)
	2	–12V	IN	Power (from power supply unit)
	3	GND	–	Grounding electric potential
	4	+24V–2	IN	Power (from power supply unit)
	5	+24V–2	IN	Power (from power supply unit)
	6	GND	–	Grounding electric potential
	7	+5V	IN	Power (from power supply unit)
P6	1	PIXCLK–	IN	Pixel clock
	2	GND	–	Grounding electric potential
	3	PIXCLK+	IN	Pixel clock
	4	GND	–	Grounding electric potential
	5	CLMP–	IN	Line clock
	6	NC	–	Not used
	7	CLMP+	IN	Line clock
	8	NC	–	Not used
	9	BV+	IN	Pixel data
	10	BV–	IN	Pixel data
P7	1	/CALIB	OUT	Calibration ON/OFF signal
	2	GND	–	Grounding electric potential
	3	CRUCLK	OUT	Serial input/output periodic clock
	4	AX0	OUT	Serial input/output data
	5	µWEN1	OUT	µW1 enable signal
	6	/CALIB	OUT	Calibration ON/OFF signal
	7	GND	–	Grounding electric potential
	8	CRUCLK	OUT	Serial input/output periodic clock
	9	AX0	OUT	Serial input/output data
	10	µWEN0	OUT	µW0 enable signal
P8	1	GND	–	Grounding electric potential
	2	FMTCLK	OUT	Pixel clock
	3	GND	–	Grounding electric potential
	4	CONT	OUT	Contrast setting

Connector No.	Pin No.	Name	IN/OUT	Description
P8	5	GND	–	Grounding electric potential
P9	1	PGND	–	Power ground (grounding electric potential)
	2	NC	–	Not used
	3	/LIGHT	OUT	Fluorescent ON/OFF signal
	4	+24V–2	OUT	Power
P10	1A	NC	–	Not used
	2A	NC	–	Not used
	3A	NC	–	Not used
	4A	NC	–	Not used
	5A	GND	–	Grounding electric potential
	6A	/TOTAL	OUT	Counter ON/OFF periodic signal
	7A	/ERR	OUT	Error signal
	8A	NC	–	Not used
	9A	NC	–	Not used
	10A	GND	–	Grounding electric potential
	1B	NC	–	Not used
	2B	NC	–	Not used
	3B	NC	–	Not used
	4B	SYNCI	IN	Calibration end signal
	5B	GND	–	Grounding electric potential
	6B	/LAMP	OUT	Fluorescent lamp ON/OFF periodic signal
	7B	/DSET	OUT	ADF sensor ON/OFF periodic signal
	8B	NC	–	Not used
	9B	SYNCO	OUT	PIB sensor ON/OFF periodic signal
	10B	GND	–	Grounding electric potential
P11	1	/TCNT	OUT	Counter ON/OFF signal
	2	+24V–2	OUT	Power
P14	1	Vcc	OUT	
	2	GND	–	Grounding electric potential
	3	SIBSN	IN	SIB sensor signal input
	4	Vcc	OUT	
	5	GND	–	Grounding electric potential
	6	PIBSN	IN	PIB sensor signal input
	7	Vcc	OUT	
	8	GND	–	Grounding electric potential
	9	ADFSN	IN	ADF sensor signal input
	10	Vcc	OUT	Power (+5V)
	11	–	–	Not used
	12	–	–	Not used
	13	–	–	Not used

9

Connector No.	Pin No.	Name	IN/OUT	Description
P17	1	GND	–	Grounding electric potential
	2	ADFSW	IN	ADFSW sensor signal input
P18	1	GND	–	Not used
	2	DORSW	IN	Not used
P19	–	–		Not used
P20	1	–	–	Not used
P21	1	+24V–2	OUT	Power
	2	NC	–	Not used
	3	/STSOL	OUT	Solenoid ON/OFF signal
P22	1	+24V–1	IN	Power
	2	+24V–2	IN	Power
	3	GND	–	Grounding electric potential

9.1.2 Upper CPU Board (PAGS-1001) - IS520 Only

Connector No.	Pin No.	Name	IN/OUT	Description
P0	–	–	–	Not used
P1	–	–	–	Not used
P3	–	–	–	Not used
P4	1	BCLK+	OUT	Pixel clock
	2	BCLK–	OUT	Pixel clock
	3	GND	–	Grounding electric potential
	4	BDAT+	OUT	Pixel data signal
	5	BDAT–	OUT	Pixel data signal
	6	LINCLK–	OUT	Line clock signal
	7	HRXD	IN	Input signal from host
	8	LINCLK	OUT	Line clock signal
	9	HTXD	OUT	Output signal from host
	10	GND	–	
P5	1	+12V	IN	Power (from power supply unit)
	2	–12V	IN	Power (from power supply unit)
	3	GND	–	Grounding electric potential
	4	+24V–2	IN	Power (from power supply unit)
	5	+24V–2	IN	Power (from power supply unit)
	6	GND	–	Grounding electric potential
	7	+5V	IN	Power (from power supply unit)
P6	1	PIXCLK–	IN	Pixel clock
	2	GND	–	Grounding electric potential
	3	PIXCLK+	IN	Pixel clock
	4	GND	–	Grounding electric potential
	5	CLMP–	IN	Line clock
	6	NC	–	Not used
	7	CLMP+	IN	Line clock
	8	NC	–	Not used
	9	BV+	IN	Pixel data
	10	BV–	IN	Pixel data
P7	1	/CALIB	OUT	Calibration ON/OFF signal
	2	GND	–	Grounding electric potential
	3	CRUCLK	OUT	Serial input/output periodic clock
	4	AX0	OUT	Serial input/output data
	5	µWEN1	OUT	µW1 enable signal
	6	/CALIB	OUT	Calibration ON/OFF signal
	7	GND	–	Grounding electric potential
	8	CRUCLK	OUT	Serial input/output periodic clock
	9	AX0	OUT	Serial input/output data

9

Connector No.	Pin No.	Name	IN/OUT	Description
P7	10	µWEN0	OUT	µW0 enable signal
P8	1	GND	–	Grounding electric potential
	2	FMTCLK	OUT	Pixel clock
	3	GND	–	Grounding electric potential
	4	CONT	OUT	Contrast setting
	5	GND	–	Grounding electric potential
P9	1	PGND	OUT	Power ground (grounding electric potential)
	2	NC	–	Not used
	3	/LIGHT	OUT	Fluorescent lamp ON/OFF signal
	4	+24V–2	OUT	Power supply
P10	1A	NC	–	Not used
	2A	NC	–	Not used
	3A	NC	–	Not used
	4A	NC	–	Not used
	5A	GND	–	Grounding electric potential
	6A	/TOTAL	OUT	Counter ON/OFF periodic signal
	7A	/ERR	OUT	Error signal
	8A	NC	–	Not used
	9A	NC	–	Not used
	10A	GND	–	Grounding electric potential
	1B	NC	–	Not used
	2B	NC	–	Not used
	3B	NC	–	Not used
	4B	SYNCI	IN	PIB sensor ON/OFF periodic signal
	5B	GND	–	Grounding electric potential
	6B	/LAMP	OUT	Fluorescent lamp ON/OFF periodic signal
	7B	/DSET	OUT	ADF sensor ON/OFF periodic signal
	8B	NC	–	Not used
	9B	SYNCO	OUT	Calibration end signal
	10B	GND	–	Grounding electric potential
P11	–	–	–	Not used
P14	–	–	–	Not used
P17	–	–	–	Not used
P19	–	–	–	Not used
P20	1	+24V–2	OUT	Fan
	2	PGND	–	Ground
P21	–	–	–	Not used
P22	–	–	–	Not used

9.1.3 Data Compression Board (CGVS)

Connector No.	Pin No.	Name	IN/OUT	Description
J1	1	OUT15	IN	Command input
	2	OUT0	IN	
	3	OUT14	IN	
	4	OUT1	IN	
	5	OUT13	IN	
	6	OUT2	IN	
	7	OUT12	IN	
	8	OUT3	IN	
	9	OUT11	IN	
	10	OUT4	IN	
	11	OUT10	IN	
	12	OUT5	IN	
	13	OUT9	IN	
	14	OUT6	IN	
	15	OUT8	IN	
	16	OUT7	IN	
	17	NC	–	Not used
	18	NC	–	Not used
	19	NC	–	Not used
	20	NC	–	Not used
	21	NC	–	Not used
	22	NC	–	Not used
	23	NC	–	Not used
	24	NC	–	Not used
	25	NC	–	Not used
	26	NC	–	Not used
	27	STATUS1	OUT	Status signal
	28	NC	–	Not used
	29	INIT	IN	Initial signal
	30	NC	–	Not used
	31	STATUS0	OUT	Status signal
	32	NC	–	Not used
	33	NC	–	Not used
	34	NC	–	Not used
	35	/RDY	IN	Ready signal
	36	NC	–	Not used
	37	NC	–	Not used
	38	NC	–	Not used
	39	CYREQA	OUT	Data request signal

9

Connector No.	Pin No.	Name	IN/OUT	Description
J1	40	NC	–	Not used
J2	1	DH15	OUT	Pixel data output
	2	DH0	OUT	
	3	DH14	OUT	
	4	DH1	OUT	
	5	DH13	OUT	
	6	DH2	OUT	
	7	DH12	OUT	
	8	DH3	OUT	
	9	DH11	OUT	
	10	DH4	OUT	
	11	DH10	OUT	
	12	DH5	OUT	
	13	DH9	OUT	
	14	DH6	OUT	
	15	DH8	OUT	
	16	DH7	OUT	
	17	NC	–	Not used
	18	NC	–	Not used
	19	NC	–	Not used
	20	NC	–	Not used
	21	NC	–	Not used
	22	NC	–	Not used
	23	FUNC1	IN	Function signal
	24	NC	–	Not used
	25	C1 si	OUT	Bus cycle selection
	26	NC	–	Not used
	27	FUNC2	IN	Function signal
	28	NC	–	Not used
	29	NC	–	Not used
	30	NC	–	Not used
	31	FUNC3	IN	Function signal
	32	NC	–	Not used
	33	NC	–	Not used
	34	NC	–	Not used
	35	NC	–	Not used
	36	NC	–	Not used
	37	ATTN	OUT	Error signal
	38	NC	–	Not used
	39	BUSY	IN	Busy signal
	40	NC	–	Not used

Connector No.	Pin No.	Name	IN/OUT	Description
J3	–	–	–	Not used
J4	1	VCLK+	IN	Pixel clock
	2	VCLK–	IN	Pixel clock
	3	GND	–	Grounding electric potential
	4	PIX+	IN	Pixel clock
	5	PIX–	IN	Pixel clock
	6	LCLK+	IN	Line clock
	7	HRXD	OUT	Command input from host
	8	LCLK–	IN	Line clock
	9	HTXD	IN	Command output from host
	10	GND	–	Grounding electric potential
J5	1	GND	–	Grounding electric potential
	2	+5V	IN	Power
J6	1	GND	–	Grounding electric potential
	2	HTXD	OUT	Status output to host
	3	HRXD	IN	Command input from host
J7	–	–	–	Not used
J8	–	–	–	Not used
J9	1	GND	–	Grounding electric potential
	2	+5V	IN	Power

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9.1.4 Memory Board (GVS-01) - IS520 Only

Connector No.	Pin No.	Name	IN/OUT	Description
J1	–	–	–	Not used
J2	–	–	–	Not used
J3	–	–	–	Not used
J4	1	VCLK+	IN	Pixel data signal
	2	VCLK–	IN	Pixel data signal
	3	GND	–	Grounding electric potential
	4	PIX+	IN	Pixel clock signal
	5	PIX–	IN	Pixel clock signal
	6	LCLK+	IN	Line clock signal
	7	STxD	OUT	Data input from CPU board (PAGS-1001)
	8	LCLK–	IN	Line clock signal
	9	SRxD	IN	Output to CPU board (PAGS-1001)
	10	GND	–	Grounding electric potential
J5	1	DIN15	OUT	Pixel data output signal
	2	DIN0	OUT	
	3	DIN14	OUT	
	4	DIN1	OUT	
	5	DIN13	OUT	
	6	DIN2	OUT	
	7	DIN12	OUT	
	8	DIN3	OUT	
	9	DIN11	OUT	
	10	DIN4	OUT	
	11	DIN10	OUT	
	12	DIN5	OUT	
	13	DIN9	OUT	
	14	DIN6	OUT	
	15	DIN8	OUT	
	16	DIN7	OUT	
	17	/GSWRDY	OUT	Data output ready signal
	18	/GSNEXT	IN	Data request signal
	19	GND	–	Grounding electric potential
	20	GND	–	Grounding electric potential
	21	GND	–	Grounding electric potential
	22	GSINT	IN	Reset signal
	23	1/20M	OUT	Not used
	24	+5V	OUT	Power
	25	+5V	OUT	Power
	26	+5V	OUT	Power

Connector No.	Pin No.	Name	IN/OUT	Description
J5	27	ATTN	OUT	Not used
J6	1	STxD	IN	Data from PAGS-1000
	2	SRxD	OUT	Data to PAGS-1000
	3	–	–	Not used
J7	1	GND	–	Grounding electric potential
	2	+5V	IN	Power
J8	1	GND	–	Grounding electric potential
	2	+5V	IN	Power

9.1.5 Data Control Board (GVS-09) - IS520 Only

Connector No.	Pin No.	Name	IN/OUT	Description
J1	1	NC	–	–
	2	GND	–	Grounding electric potential
	3	CRUCLK	IN	Serial communciation clock
	4	AX0	IN	Control data
	5	/ENB	IN	Serial data enable signal
	6	NC	–	
	7	GND	–	Grounding electric potential
	8	NC	–	–
	9	NC	–	–
	10	NC	–	–
J2	1	BCLK+	IN	Pixel data clock (upper)
	2	BCLK–	IN	Pixel data clock (upper)
	3	GND	–	Grounding electric potential
	4	BDAT+	IN	Pixel data signal (upper)
	5	BDAT–	IN	Pixel data signal (upper)
	6	LINCLK–	IN	Line clock (upper)
	7	HRXD	OUT	Serial output to PAGS-1000 (upper)
	8	LINCLK+	IN	Line clock (upper)
	9	HTXD	IN	Serial input from PAGS-1000 (upper)
	10	GND	–	Grounding electric potential
J3	1	VCLK+	OUT	Pixel data
	2	VCLK–	OUT	Pixel data
	3	GND	–	Grounding electric potential
	4	PIX+	OUT	Pixel data clock
	5	PIX–	OUT	Pixel data clock
	6	CLMP–	OUT	Line clock
	7	HRxD	IN	Serial input from CGVS
	8	CLMP+	OUT	Line clock
	9	HTxD	OUT	Serial output to CGVS
	10	GND	–	Grounding electric potential
J4	1	PIN15	IN	Pixel data (lower)
	2	DIN0	IN	
	3	PIN14	IN	
	4	DIN1	IN	
	5	PIN13	IN	
	6	DIN2	IN	
	7	PIN12	IN	
	8	DIN3	IN	
	9	PIN11	IN	

Connector No.	Pin No.	Name	IN/OUT	Description
J4	10	DIN4	IN	Pixel data (lower)
	11	PIN10	IN	
	12	DIN5	IN	
	13	PIN9	IN	
	14	DIN6	IN	
	15	PIN8	IN	
	16	DIN7	IN	
	17	/GVSWRDY	IN	Data ready signal
	18	/WUSED	OUT	Data request signal
	19	GND	–	Grounding electric potential
	20	GND	–	Grounding electric potential
	21	GND	–	Grounding electric potential
	22	/GSINT	OUT	Reset signal
	23	NC	–	–
	24	+5V	IN	Power
	25	+5V	IN	Power
	26	+5V	IN	Power

9

9.1.6 CCD-POD Board (CCD Carrier)

Connector No.	Pin No.	Name	IN/OUT	Description
P1	1	SS	OUT	Grounding electric potential
	2	OS	IN	Open
	3	OS1	OUT	Signal output 1 at separate output (analog)
	4	¢2B	IN	Grounding electric potential
	5	RS1	IN	Reset gate 1 at separate output
	6	¢2C	IN	Separate phase-2 clock (transfer pulse)
	7	IS	IN	Input source voltage (+12V)
	8	SS	IN	Grounding electric potential
	9	¢20	IN	Separate phase-2 clock (transfer pulse)
	10	¢10	IN	Separate phase-1 clock (transfer pulse)
	11	–	–	NC
	12	SH	IN	Shift gate
	13	¢1E	IN	Separate phase-1 clock (transfer pulse)
	14	¢2E	IN	Separate phase-2 clock (transfer pulse)
	15	SS	IN	Grounding electric potential
	16	IG	IN	Input gate voltage (GND)
	17	¢1C	IN	Separate phase-1 clock (transfer pulse)
	18	RS2	IN	Reset gate 2 at separate output
	19	OD	IN	+12V power
	20	OS2	OUT	Signal output 2 at separate output (analog)
	21	¢1B	IN	Grounding electric potential
	22	RS	IN	Grounding electric potential

9.1.7 CCD Control Board (5KCCD)

Connector No.	Pin No.	Name	IN/OUT	Description
P1	1	PIX CLK	OUT	Pixel clock (10 MHz)
	2	¢CONV	OUT	2-phase separate clock (5 MHz)
	3	/CLMP	OUT	Clamp pulse
P2	1	AIN	OUT	Analog signal output 1
P3	1	BIN	OUT	Analog signal output 2
P4	1	GND	–	Grounding electric potential
	2	+5V	IN	+5V power
	3	+12V	IN	+12V power
	4	–12V	IN	–12V power
P5	1	SS	OUT	Grounding electric potential
	2	OS	OUT	Open
	3	OS1	IN	Signal output 1 at separate output (analog)
	4	¢2B	OUT	Grounding electric potential
	5	RS1	OUT	Reset gate 1 at separate output
	6	¢2C	OUT	Separate phase-2 clock (transfer pulse)
	7	IS	OUT	Input source voltage (+12V)
	8	SS	OUT	Grounding electric potential
	9	¢20	OUT	Separate phase-2 clock (transfer pulse)
	10	¢10	OUT	Separate phase-1 clock (transfer pulse)
	11	–	–	Not used
	12	/SH	OUT	Shift gate
	13	¢1E	OUT	Separate phase-1 clock (transfer pulse)
	14	¢2E	OUT	Separate phase-2 clock (transfer pulse)
	15	SS	OUT	Grounding electric potential
	16	IG	OUT	Input gate voltage (GND)
	17	¢1C	OUT	Separate phase-1 clock (transfer pulse)
	18	RS2	OUT	Reset gate 2 at separate output
	19	OD	OUT	Power input (+12V)
	20	OS2	IN	Signal output 2 at separate output (analog)
	21	¢1B	OUT	Grounding electric potential
	22	RS	OUT	Grounding electric potential

9

9.1.8 Equalizer Board (EQ/DITHER)

Connector No.	Pin No.	Name	IN/OUT	Description
P1	1	CONTRST	IN	Contrast value
	2	GND	–	Grounding electric potential
P2	1A	PIXCLK–	OUT	Pixel clock (invert)
	1B	GND	–	Grounding electric potential
	2A	PIXCLK+	OUT	Pixel clock
	2B	GND	–	Grounding electric potential
	3A	/CLMP–	OUT	Clamp pulse (invert)
	3B	–	–	Open
	4A	/CLMP+	OUT	Clamp pulse
	4B	–	–	Open
	5A	BINDAT+	OUT	Digital binary image data
	5B	BINDAT–	OUT	Digital binary image data (invert)
P3	–	–	–	Not used
P4	1A	–	–	Open
	1B	GND	IN	Grounding electric potential
	2A	–	–	Open
	2B	–	–	Open
	3A	–	–	Open
	3B	CALIB	IN	Shading signal
	4A	GND	–	Grounding electric potential
	4B	/CLK	IN	Serial communication clock
	5A	DATA	IN	Dither # signal
	5B	/µEN	IN	Serial communication strobe
P5	1	/CLMP	IN	Clamp pulse (invert)
	2	¢CONV	IN	2-phase separation clock (5 MHz)
	3	PIX CLK	IN	Pixel clock (10 MHz)
P6	1	AIN	IN	Analog signal input 1
P7	1	BIN	IN	Analog signal input 2
P8	1	GND	–	Grounding electric potential
	2	+5V	IN	+5V power
	3	+12V	IN	+12V power
	4	–12V	IN	–12V power
P9	1	GND	–	Grounding electric potential
	2	+5V	OUT	+5V power
	3	+12V	OUT	+12V power
	4	–12V	OUT	–12V power

9.1.9 Indicator Control Board (OP-CON)

Connector No.	Pin No.	Name	IN/OUT	Description
CN1	1	+5V	OUT	+5V power supplied to indicator board
	2	GND	–	Grounding electric potential
	3	/BSY	OUT	BUSY LED (on indicator panel) light-on signal
	4	/DSET	OUT	Original Set LED (on indicator panel) light-on signal
	5	/ERR	OUT	Error LED (on indicator panel) light-on signal
	6	/LCHG0	OUT	Lamp (IS510) or lamp B (IS520) (on indicator panel) light-on signal
	7	/LCHG1	OUT	Lamp A LED (on indicator panel) light-on signal
	8	/TUCHG	OUT	Feed unit LED (on indicator panel) light-on signal
	9	GND	–	Grounding electric potential
CN2	1	+24V	OUT	+24V power
	2	/HEAT0	OUT	Fluorescent lamp heater ON/OFF signal
	3	+5V	OUT	+5V power
	4	TEMP0	IN	Fluorescent lamp thermistor signal
	5	GND	–	Grounding electric potential
	6	/FUSE0	IN	New fluorescent lamp sense fuse signal (0V = new lamp)
	7	GND	–	Grounding electric potential
	8	/TUCSW	IN	Transport unit replace reset switch signal
CN3	1	+24V	OUT	+24V power
	2	/HEAT1	OUT	Duplex unit fluorescent lamp heater ON/OFF signal
	3	+5V	OUT	+5V power
	4	TEMP1	IN	Duplex unit fluorescent lamp thermistor signal
	5	GND	–	Grounding electric potential
	6	/FUSE1	IN	Duplex unit new fluorescent lamp sense fuse signal (0V = new lamp)
CN4	1	+24V	IN	+24V power input
	2	+5V	IN	+5V power
	3	GND	–	Grounding electric potential
CN5	1	SCSI0	IN	Indicates a command from the SCSI I/F board
	2	SCSI1	IN	Indicates a command from the SCSI I/F board
	3	SCSI2	IN	Indicates a command from the SCSI I/F board

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Connector No.	Pin No.	Name	IN/OUT	Description
CN5	4	SCSI3	IN	Indicates a command from the SCSI I/F board
	5	SCSI4	OUT	Indicates the status of the indicator board
	6	SCSI5	OUT	Indicates the status of the indicator board
	7	SCSI6	OUT	Indicates the status of the indicator board
	8	SCSI7	OUT	Indicates the status of the indicator board
	9	GND	–	Grounding electric potential
	10	GND	–	Grounding electric potential
CN6	1	/DSET	IN	Document set sense signal (0V = A document is set. 5V = No document.)
	2	/ERR	IN	Error sense signal
	3	/LAMP	IN	Fluorescent lamp light-on signal (0V = ON, 5V = OFF)
	4	/TOTAL	IN	Read document count signal (5V —) 0V = 1 page)
	5	AIN	IN	Not used
	6	GND	–	Grounding electric potential
	7	GND	–	Grounding electric potential
	8	MON TXD	OUT	Dummy command output in test mode
	9	MON RXD	IN	Not used
	10	GND	–	Grounding electric potential
CN7	a1	+5V	OUT	+5V power
	a2	GND	–	Grounding electric potential
	a3	CSO	OUT	Chip selection for EEPROM1
	a4	SK	OUT	Clock output to EEPROM
	a5	DI	OUT	EEPROM data output
	b1	+5V	OUT	+5V power
	b2	GND	–	Grounding electric potential
	b3	ORG	–	Not used
	b4	CS1	OUT	Chip selection for EEPROM2
	b5	DO	IN	EEPROM data input
CN8	1	MONRXD	IN	External monitor input
	2	MONTXD	OUT	External monitor output
	3	GND	–	Grounding electric potential

9.1.10 SCSI Interface Board (NPS/NSA)

Connector No.	Pin No.	Name	IN/OUT	Description
J1	1	D15	OUT	DR11 output data signal (pixel compression mode setting)
	2	D0	OUT	
	3	D14	OUT	
	4	D1	OUT	
	5	D13	OUT	
	6	D2	OUT	
	7	D12	OUT	
	8	D3	OUT	
	9	D11	OUT	
	10	D4	OUT	
	11	D10	OUT	
	12	D5	OUT	
	13	D9	OUT	
	14	D6	OUT	
	15	D8	OUT	
	16	D7	OUT	
	17	–	–	Not used
	18	–	–	Not used
	19	–	–	Not used
	20	–	–	Not used
	21	–	–	Not used
	22	–	–	Not used
	23	–	–	Not used
	24	–	–	Not used
	25	–	–	Not used
	26	–	–	Not used
	27	STATUS1	IN	DR11 status signal 1
	28	–	–	Not used
	29	INITH	OUT	DR11 initialize signal
	30	–	–	Not used
	31	STATUS0	IN	DR11 status signal 0
	32	–	–	Not used
	33	–	–	Not used
	34	–	–	Not used
	35	RDY	IN	DR11 ready signal
	36	–	–	Not used
	37	–	–	Not used
	38	–	–	Not used
	39	CYREQ	IN	DR11 cycle request signal

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Connector No.	Pin No.	Name	IN/OUT	Description
J1	40	–	–	Not used
J2	1	D15	IN	DR11 input data signal (pixel data)
	2	D0	IN	
	3	D14	IN	
	4	D1	IN	
	5	D13	IN	
	6	D2	IN	
	7	D12	IN	
	8	D3	IN	
	9	D11	IN	
	10	D4	IN	
	11	D10	IN	
	12	D5	IN	
	13	D9	IN	
	14	D6	IN	
	15	D8	IN	
	16	D7	IN	
	17	–	–	Not used
	18	–	–	Not used
	19	–	–	Not used
	20	–	–	Not used
	21	–	–	Not used
	22	–	–	Not used
	23	FUNC1	OUT	DR11 function signal 1
	24	–	–	Not used
	25	C1	IN	DR11 C1 signal
	26	–	–	Not used
	27	FUNC2	OUT	DR11 function signal 2
	28	–	–	Not used
	29	–	–	Not used
	30	–	–	Not used
	31	FUNC3	OUT	DR11 function signal 3
	32	–	–	Not used
	33	–	–	Not used
	34	–	–	Not used
	35	–	–	Not used
	36	–	–	Not used
	37	ATTNH	IN	DR11 attention signal
	38	–	–	Not used
	39	BSY	OUT	DR11 busy signal
	40	–	–	Not used

Connector No.	Pin No.	Name	IN/OUT	Description
J3	1	NPSRXD	IN	NPS serial communication-send data signal
	2	NPSTXD	OUT	NPS serial communication-send data signa
	3	GND	–	Grounding electric potential
J4	–	–	–	Not used
J5	1	SCSI0	OUT	Indicator control board I/F signal 0 (output)
	2	SCSI1	OUT	Indicator control board I/F signal 1 (output)
	3	SCSI2	OUT	Indicator control board I/F signal 2 (output)
	4	SCSI3	OUT	Indicator control board I/F signal 3 (output)
	5	SCSI7	IN	Indicator control board I/F signal 7 (input)
	6	SCSI6	IN	Indicator control board I/F signal 6 (input)
	7	SCSI5	IN	Indicator control board I/F signal 5 (input)
	8	SCSI4	IN	Indicator control board I/F signal 4 (input)
	9	GND	–	Grounding electric potential
	10	GND	–	Grounding electric potential
J6	1	–	–	Not used
	2	–	–	Not used
	3	–	–	Not used
	4	–	–	Not used
	5	–	–	Not used
	6	–	–	Not used
	7	–	–	Not used
	8	–	–	Not used
	9	–	–	Not used
	10	–	–	Not used
	11	–	–	Not used
	12	–	–	Not used
	13	–	–	Not used
	14	–	–	Not used
	15	–	–	Not used
	16	–	–	Not used
	17	–	–	Not used
	18	–	–	Not used
	19	–	–	Not used
	20	–	–	Not used

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Connector No.	Pin No.	Name	IN/OUT	Description
J6	21	–	–	Not used
	22	–	–	Not used
	23	–	–	Not used
	24	–	–	Not used
	25	–	–	Not used
	26	DB0	IN/OUT	Data bus 0 (LSB)
	27	DB1	IN/OUT	Data bus 1
	28	DB2	IN/OUT	Data bus 2
	29	DB3	IN/OUT	Data bus 3
	30	DB4	IN/OUT	Data bus 4
	31	DB5	IN/OUT	Data bus 5
	32	DB6	IN/OUT	Data bus 6
	33	DB7	IN/OUT	Data bus 7 (MSB)
	34	DBP	IN/OUT	Data bus parity
	35	GND	–	Grounding electric potential
	36	GND	–	Grounding electric potential
	37	RESERVED	–	Reserved (not used)
	38	TERMPWR	IN/OUT	Terminating resistor power supply line
	39	RESERVED	–	Reserved (not used)
	40	GND	–	Grounding electric potential
	41	ATTN	IN/OUT	Attention signal
	42	GND	–	Grounding electric potential
	43	BSY	IN/OUT	Busy signal
	44	ACK	IN/OUT	Acknowledge signal
	45	RST	IN/OUT	Reset signal
	46	MSG	IN/OUT	Message signal
	47	SEL	IN/OUT	Select signal
	48	C/D	IN/OUT	Control/data signal
	49	REQ	IN/OUT	Request signal
	50	I/O	IN/OUT	Input-output signal
J7	1	–	–	Not used
	2	–	–	Not used
	3	–	–	Not used
	4	–	–	Not used
	5	–	–	Not used
	6	–	–	Not used
	7	–	–	Not used
	8	–	–	Not used
	9	–	–	Not used
	10	–	–	Not used
	11	–	–	Not used

Connector No.	Pin No.	Name	IN/OUT	Description
J7	12	–	–	Not used
	13	–	–	Not used
	14	–	–	Not used
	15	–	–	Not used
	16	–	–	Not used
	17	–	–	Not used
	18	–	–	Not used
	19	–	–	Not used
	20	–	–	Not used
	21	–	–	Not used
	22	–	–	Not used
	23	–	–	Not used
	24	–	–	Not used
	25	–	–	Not used
	26	DB0	IN/OUT	Data bus 0 (LSB)
	27	DB1	IN/OUT	Data bus 1
	28	DB2	IN/OUT	Data bus 2
	29	DB3	IN/OUT	Data bus 3
	30	DB4	IN/OUT	Data bus 4
	31	DB5	IN/OUT	Data bus 5
	32	DB6	IN/OUT	Data bus 6
	33	DB7	IN/OUT	Data bus 7 (MSB)
	34	DBP	IN/OUT	Data bus parity
	35	GND	–	Grounding electric potential
	36	GND	–	Grounding electric potential
	37	RESERVED	–	Reserved (not used)
	38	TERMPWR	IN/OUT	Terminating resistor power supply line
	39	RESERVED	–	Reserved (not used)
	40	GND	–	Grounding electric potential
	41	ATTN	IN/OUT	Attention signal
	42	GND	–	Grounding electric potential
	43	BSY	IN/OUT	Busy signal
	44	ACK	IN/OUT	Acknowledge signal
	45	RST	IN/OUT	Reset signal
	46	MSG	IN/OUT	Message signal
	47	SEL	IN/OUT	Select signal
	48	C/D	IN/OUT	Control/data signal
	49	REQ	IN/OUT	Request signal
	50	I/O	IN/OUT	Input-output signal
J8	1	FUSE0	OUT	Terminating resistor power supply line fuse output

Connector No.	Pin No.	Name	IN/OUT	Description
J8	2		IN	Terminating resistor power supply line fuse input
J9	–	–	–	Not used
J10	–	–	–	Not used
J11	1	GND	–	Grounding electric potential
	2	+5V	IN	+5V power

9.1.11 Power Supply Unit (PSU)

Connector No.	Pin No.	Name	IN/OUT	Description
CN5	1	+5V	OUT	Power
	2	+12V	OUT	
	3	+5V	OUT	
	4	+24V	OUT	
	5	–12V	OUT	
	6	+5V	OUT	
	7	+24V	OUT	
	8	–	–	Not used
	9	+5V	OUT	Power
	10	+24V	OUT	
	11	GND	–	Grounding electric potential
	12	GND	–	
	13	GND	–	
	14	GND	–	
	15	GND	–	
CN6	1	+12V	OUT	Power
	2	–12V	OUT	
	3	GND	–	Grounding electric potential
	4	+24V	OUT	Power
	5	+24V	OUT	
	6	–12V	OUT	
	7	GND	–	Grounding electric potential
	8	GND	–	Grounding electric potential
	9	+5V	OUT	Power
	10	+5V	OUT	
	11	+12V	OUT	
	12	GND	–	Grounding electric potential
	13	GND		
	14	+5V	OUT	Power
	15	+5V	OUT	
CN7	1	GND	–	Grounding electric potential
	2	GND	–	
	3	GND	–	
	4	+5V	OUT	Power
	5	–	–	Not used
	6	GND	–	Grounding electric potential
	7	+12V	OUT	Power
	8	–12V	OUT	
	9	+24V	OUT	

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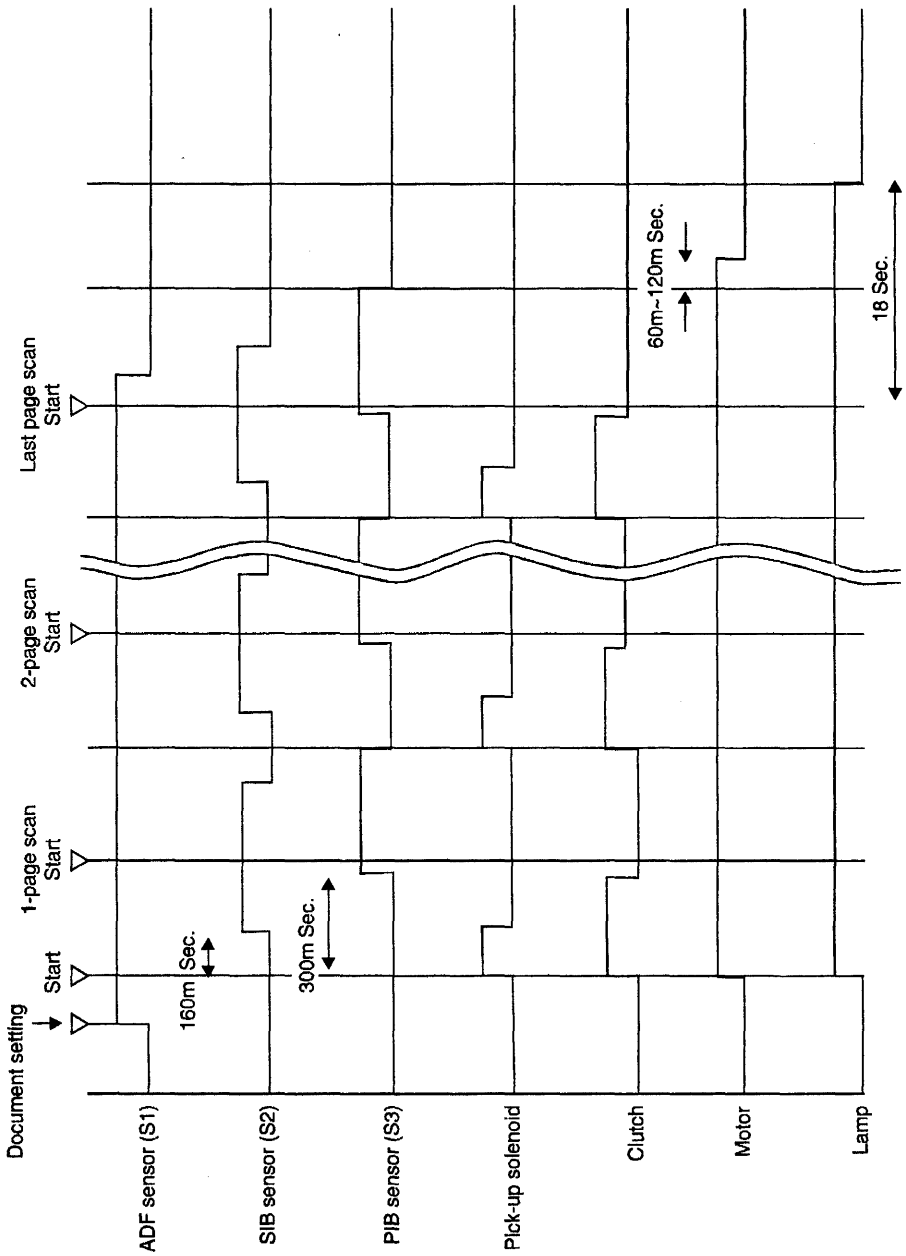
Connector No.	Pin No.	Name	IN/OUT	Description
CN7	10	+24V	IN	Power (from interlock switch)
	11	+24V	OUT	Power (to interlock switch)
	12	+24V	OUT	
	13	+24V	IN	Power (from interlock switch)
	14	+5V	OUT	Power
	15	+5V	OUT	

9.2 Timing Chart



CHAPTER 10

Specifications

Inside this chapter:

10.1 Basic Specifications

	IS510	IS520
Type	Desktop (simplex)	Desktop (duplex)
Document type	Sheets (paper), card, roll, opaque and transparent material (film of any translucency) The following materials will degrade or damage the ADF: wrinkled or torn (dog-eared) paper documents with tractor feed holes stacked together documents with loose objects (gum, glue, paper etc.) paper with foreign objects (staples, tape etc.) coated paper (wax, aluminum powder etc.) wet paper (water, ink, etc.) oil stained paper high carbon content paper (with grain perpendicular to motion) product of PPC with silicone oil fuser	
Document size	width: minimum: 0.5 in. maximum: 12 in. length: minimum: 2.75 in. maximum: unlimited (continuous scan mode) or 64K scan lines	
Document paper weight	auto feed: 8 lb. to 45 lb. paper stock manual feed: 4 lb. to 80 lb. paper stock	
Scanning speed	0.679 sec. at 200 dpi = 12.72 ips 1.006 sec. at 300 dpi = 8.48 ips 1.333 sec. at 400 dpi = 6.36 ips	
Throughput Data based on an A4 size (8.3 in. x 11.7 in.) document scanned in landscape format.	60 ppm at 200 dpi 45 ppm at 300 dpi	
Image type	Line art or dither halftone	
Resolution major (along scan lines) and minor (along document motion axis) resolution selection per:	400/300/200 dpi 500/600 dpi (optional) maj_res +=400 * skip/(skip+1) * mod min_res = (256 - stepper time) * 5.79 * mod (skip range: 1-999 mod = 1 or 1/2) (valid stepper time range = 140-230)	
Interface	SCSI-2 (CGVS and NSA) per Ricoh IS520 spec Options: DR11-W and DRV11-WA, per DEC specs (CGVS) Fujitsu MARS compatible (with GVS-12) Video - per Improvision's VSI specs PVSI (differential TTL, 8-bit)	
Dropout color	The following Flint Ink (formerly Sinclair & Valentine) green, yellow and blue shades have been tested to dropout when using the standard green (F1/G54) wide sprectrum lamp: J24554, J24649, J27975, J-27976, J-24185, J27974, J-24182, J-22052, J-24555, J-24186, J-24662, 041328, J-30494. See Chapter 7 for other lamp colors.	

	IS510	IS520
Power source	85 to 132 V 176 to 265 V AC 110/220 (85~264V 47~65Hz) universal input PSU	
Power consumption	standby: 150 W operating: 190 W	standby: 220 W operating: 250 W
Noise	Idle: TBD dBA Scan: TBD dBA	
Heat	800 BTU	
Dimensions (W x D x H)	25.9 x 17.9 x 12.3 in. (657 x 455 x 313 mm)	25.9 x 17.9 x 16.7 in. (657 x 455 x 424 mm)
Weight	approx. 88 lbs. (40 Kg)	approx. 99 lbs. (45 Kg)
User replaceable parts	separation cartridge, ADF feed and pickup rollers, fluorescent lamp assembly	
Scanning system	stationary, CCD	
Grayscale	6 bit/pixel or 8 bit/pixel (optional)	
Warm up time	approx 10 sec. for first scan	
Camera controls	white level calibration (equalization) contrast control (range: 0-255) single pixel delete/patch (on/off) binary output control to select from: binary, positive binary, negative Bayers dither matrix (positive) 5 dither matrices with "harsher" Bayer pattern	
Scan area selection	Relative to leading edge of document, and pixel No. 1 of the CCD by the following 7 parameters: Pixel offset (first valid pixel per line) pixels per line skip factor (horizontal scaling) Lines offset (page offset from edge sensing) number of scan lines per page stepper velocity (vertical scaling) 1/2X Scaler (50% 2D scaler) All parameters are defined to a pixel/line accuracy. The pixel and page offsets can be set uniquely for the secondary side of IS520 scanners. The number of scan lines per page is ignored when the AIF is enabled.	
Area select recall	8 sets of area selections may reside in EEPROM and recalled by reference to a format I.D. (range = 9-16)	
Data compression	Selectable by host commands to: Explicit bit map (no compression) CCITT-G3/1D (MH) CCITT-G3/2D (MR) CCITT-G4 (MMR) Jumper selection of Code reversal (16 bit words)	

	IS510	IS520
Compression speed	97 Mbit/sec max (white space) 6 Mbit/sec min (1 pixel checkerboard pattern) 0 overhead for images with positive compression ratio	
Compressor FIFO	2/4/6 Mbyte FIFO prior to compression size is jumper selectable.	
Monitor port	RS232C DTE, 9600 baud, No parity, 8 data bits, 1 stop	
ADF type	differential friction, center pick-up	
ADF capacity	8-10 mm stack (up to 50 sheets)	
ADF error ratio	Measured with clean high quality paper (64g/sq. m) no feed: 1/1000 double feed: 1/2000 jam: 1/1000	
Document guides	centered, uniform hand adjusted min opening: 100 mm (60mm with adapter) max opening: 304 mm	
ADF cleaning	Clean rubber rollers with a dry cloth or a cloth moistened with water.	
Temperature	10 to 40C	
Humidity	10 to 85% RH non condensing	
MTBF	2000 hour @80% continuous load	
MTTR	less than 30 min. for trained personnel	

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10.2 CCD Camera Module Specifications

Manufacturer	Toshiba
Model name	TCD106C/-2
No. of valid pixels	5,000
Pixel size	7 µm x 7 µm (7 µm pitch)
Photosensitive section	High sensitivity on photodiode
CCD device	TCD-106C 5000 element linear array (141 adapter option)
Data rate	10 Mpix/sec. typical 16 Mpix/sec. max recommended
Integration	504 µSec in free run mode (@10 Mpix/sec) or per user supplied positive edge in external sync
Clock spec	4X output pixel rate
Image output	Six bit per pixel normalized data - single ended TTL Binary video, Pixel clock, line clock - differential TTL Dithered binary video - diff. TTL
Other output	line done to other CCAM_5K - single ended TTL
Inputs	A. Normalization envelope multiplier - bipolar DC B. External line sync (optional) - single ended TTL C. Normalize command line - single ended TTL D. Dither matrix select command - TTL (microwire)
Operation	A. Free run mode - matches CCD integration time to the pixel shift time. ('sync' and 'done' loopback) B. External sync mode - extends integration time by an external clock NOTE: The integration time must be sufficient for complete shift out of CCD data.
Physical	two PC cards, 3.4" by 3.4" outside dimension 3.0" by 3.0" mounting holes (for #4-40 hardware) CCD axis: centered within the PCB both ways CCD attaches to cards directly or via 2.5" extended flexible cable
Electrical	5V @1.5Amp, +12V @0.5Amp, -12V @0.2Amp
Environment	10 to 40C ambient 80% RH non condensing

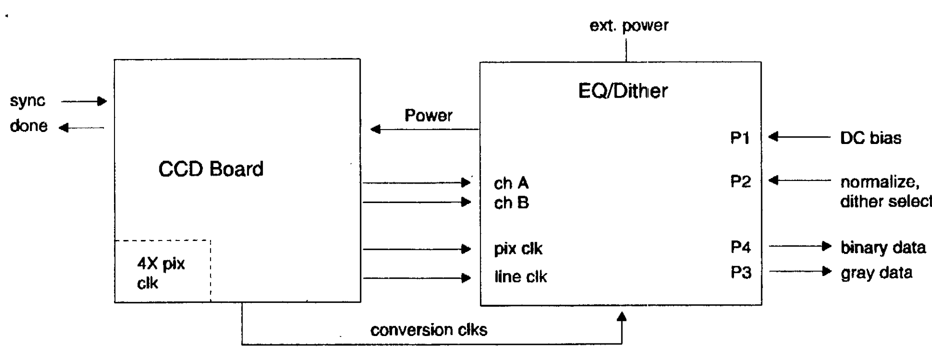

Figure 10-1. CCD Camera Module Signal Flow

10.2.1 Camera Module I/O Pin Assignment Specifications

The interface and power connectors to the CCD camera module are all made via the EQ/DIT card. The I/O pin assignments and connector types are listed below:

P2: Binary data (Output)
Amphenol 821-A010P-AFC00

3	+Pixel clock
1	–Pixel clock
7	+Line clock
5	–Line clock
9	+Binary video
10	–Binary video
2	GND
4	GND

P3: Grayscale data (Output)
Amphenol 821-A010P-AFC00

1	VID0 (LSB)
2	VID1
3	VID2
4	VID3
5	VID4
6	VID5 (MSB)
9	Pixel clock
10	Line clock/
7	GND

P4: Microwire (Input)
Amphenol 821-A010P-AFC00

9	Microwire data
8	Microwire clock/
10	Microwire enable/
6	Normalize/
2	GND
7	GND

P1: Contrast (Input)
AdamTech LHA-02TS

1	Contrast multiplier
2	GND

P5: PSU (Input)
Molex 5274 (09-75-2044)

1	GND
2	+5
3	+12
4	–12

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10.3 Data Compression Board (CGVS) Specifications

Buffer size	up to 6MB in 2MB increments (pre compression buffer)
Input format	Improvision VSI (PAGS_100X NPS_X0 compatible) or 16-bit parallel (with d0 as left pixel)
Input rate	up to 30Mpix/Sec for binary data (concurrent with host) up to 2.5MW/sec for parallel data
Output format	16 bit parallel on two 40 pin IDC headers (DR11 specs) and on a 50 pin .05 pitch connector -> Jumper selected DR11-W or DRV11-WA compatibility -> Jumper selected Bit ordering selection within words
Output rate	2 MW/sec average (or less as gated by host)
Data format	sequential words along lines, sequential lines within image (or as otherwise sent by scanner)
Host controls	A. setup CCITT compressor parameters B. init FIFO pointers and logic C. test pattern selection and timing D. external user device control (4 16 bit ports)
Output side	NSA DR11 to SCSI Adapter
Physical	6.8" by 11" PCB (four layer, 10-10 rules) (scanner resident or stand alone 3"x17.5"x13" enclosure)
Power cons	5 volt @ 2.7Amp. (20 Mpix/sec scanner and host active)

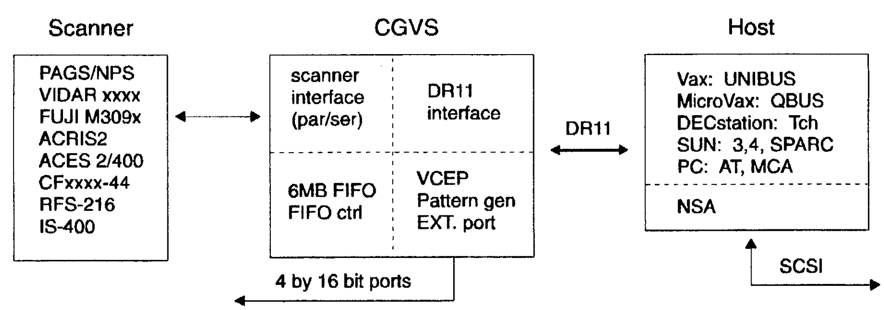


Figure 10-2. CGVS Board Signal Flow

10.3.1 CGVS I/O Pin Assignment Specifications

The I/O pin assignments and connector types for the CGVS board are listed below:

J1: DR11/DRV11 (*)
Fuji FCN-705Q040-AU/M

2	Data 0
4	Data 1
6	Data 2
8	Data 3
10	Data 4
12	Data 5
14	Data 6
16	Data 7
15	Data 8
13	Data 9
11	Data 10
9	Data 11
7	Data 12
5	Data 13
3	Data 14
1	Data 15 (to CGVS)
39	cycle request A
19	cycle request B
35	ready
29	initH
21	EOC
32	single cycle (==H)
33	WAinc (==H)
31	status0
27	status1
23	status2
37	attnH

J2: DR11/DRV11 (*)
Fuji FCN-705Q040-AU/M

2	Data 0
4	Data 1
6	Data 2
8	Data 3
10	Data 4
12	Data 5
14	Data 6
16	Data 7
15	Data 8
13	Data 9
11	Data 10
9	Data 11
7	Data 12
5	Data 13
3	Data 14
1	Data 15 (from CGVS)
39	busy
25	C1
29	C0 (==L)
35	A00 (==L)
33	BAinc (==H)
31	func3
27	func2
23	func1

J5A/B: Power input
Molex 2648-2025

1	+5
2	GND

J6: Host Comm (I/O)
AdamTech LHA-03TS

1	RS232C to Scanner
2	RS232C from Scanner
3	GND

(*) 1: All unlisted pins on J1 and J2 are GND connected.
2: CGVS pins marked (==L) are GND. (==H) are pulled up with 4.7K.

J4: VSI input
Amphenol 821-A010P-AFC

4	+Pixclk
5	–Pixclk
1	+Bin data
2	–Bin data
6	+Line_clk
8	–Line_clk
7	RS-232 to scanner
9	RS-232 from scanner
3	GND
10	GND

J7: Parallel input
Amphenol 821-A020P-AFC

1	GND	
2	Data	15
3	Data	0
4	Data	14
5	Data	1
6	Data	13
7	Data	2
8	Data	12
9	Data	3
10	Data	11
11	Data	4
12	Data	10
13	Data	5
14	Data	9
15	Data	6
16	Data	8
17	Data	7
18	GND	
19	Word_Clk	
20	GND	

10.4 SCSI Board (NPS/NSA) Specifications

Control CPU	Intel 80C196KB-12
SCSI device	NCR-53C94 ASC
ROM/RAM range	32K/30K or 60K/2K jumper selected
PROM device	Single socket, 27C512-125 or faster
EEPROM	1K/4K serial device (93Cx6 type)
SCSI I/O	single ended TTL, 2 daisy chained low density "SCSI A cable" connectors type: 57F-36S
Termination	Socketed 220/330 Ohm type (Beckman 1889-0010-1)
TERMPWR line	Available, fused
Image Input	DR11 port, CGVS compatible on two 40 pin headers
Special I/O	4 output lines (64 mA) 4 input lines (4.7K pull up) 2 RS232 ports (88C-681 DUART) 1 RS232 port (CPU port 2) 7 position DIP switch, general use 2 16-bit wide serial (Microwire) ports 1 general use LED indicator
SCSI Address	Rotary switch, 8 position
Physical	4 layer PCB, 110mm by 280mm outside dimension
Electrical	5V @0.7 Amp
Environmental	10 to 40C ambient 90% RH non-condensing

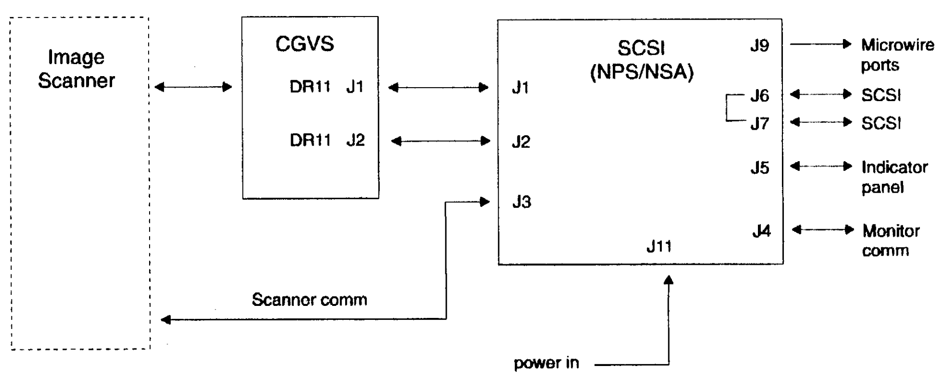


Figure 10-3. SCSI Board Signal Flow

10

10.4.1 SCSI I/O Pin Assignment Specifications

The I/O pin assignments and connector types for the NSA card are listed below:

J1: DR11 (*)
Fuji FCN-705Q040-AU/M

2	Data 0
4	Data 1
6	Data 2
8	Data 3
10	Data 4
12	Data 5
14	Data 6
16	Data 7
15	Data 8
13	Data 9
11	Data 10
9	Data 11
7	Data 12
5	Data 13
3	Data 14
1	Data 15 (from NSA)
39	cycle request A
35	ready
29	initH
31	status0
27	status1
37	attnH

J2: DR11 (*)
Fuji FCN-705Q040-AU/M

2	Data 0
4	Data 1
6	Data 2
8	Data 3
10	Data 4
12	Data 5
14	Data 6
16	Data 7
15	Data 8
13	Data 9
11	Data 10
9	Data 11
7	Data 12
5	Data 13
3	Data 14
1	Data 15 (to NSA)
39	busy
25	C1
31	func3
27	func2
23	func1

J3: Scanner Control port
JAE IL-G-3P

1	Rxd (from Scanner)
2	Txd (to Scanner)
3	GND

J4: NSA Monitor port
JAE IL-G-3P

2	Rxd (from Monitor)
2	Txd (to Monitor)
3	GND

J10: Spare Comm (In/Out)
JAE IL-G-3P

1	Rxd RS232
2	Txd RS232
3	GND

J11: PSU (Input)
Molex 5274 (09-75-2024)

1	+5
2	GND

(*) Unused DR11 functions are open. Other J1/J2 pins are GND.

J5: OP Panel port (In/Out)
Amphenol 821-A010P-AFC00

1	OP0	output
2	OP1	output
3	OP2	output
4	OP3	output
5	IP0	input
6	IP1	input
7	IP2	input
8	IP3	input
9	GND	
10	GND	

J9: Microwire port (Output)
Amphenol 821-A010P-AFC00

1	CL0 output
2	GND
3	/M.W CLK
4	M.W Data
5	/ENB port1
6	CL0 output
7	GND
8	/M.W CLK
9	M.W Data
10	/ENB port0

J6: SCSI (**)
DDK 57F-50S-LE

26	/DB0
27	/DB1
28	/DB2
29	/DB3
30	/DB4
31	/DB5
32	/DB6
33	/DB7
34	/DBP
38	TERMPWR
41	/ATN
43	/BSY
44	/ACK
45	/RST
46	/MSG
47	/SEL
48	/C_D
49	/REQ
50	/I_O
13	N.C

J7: SCSI (**)
DDK 57F-50S-LE

26	/DB0
27	/DB1
28	/DB2
29	/DB3
30	/DB4
31	/DB5
32	/DB6
33	/DB7
34	/DBP
38	TERMPWR
41	/ATN
43	/BSY
44	/ACK
45	/RST
46	/MSG
47	/SEL
48	/C_D
49	/REQ
50	/I_O
13	N.C

(**) All unlisted J6/J7 pins are GND connected.

CHAPTER 11

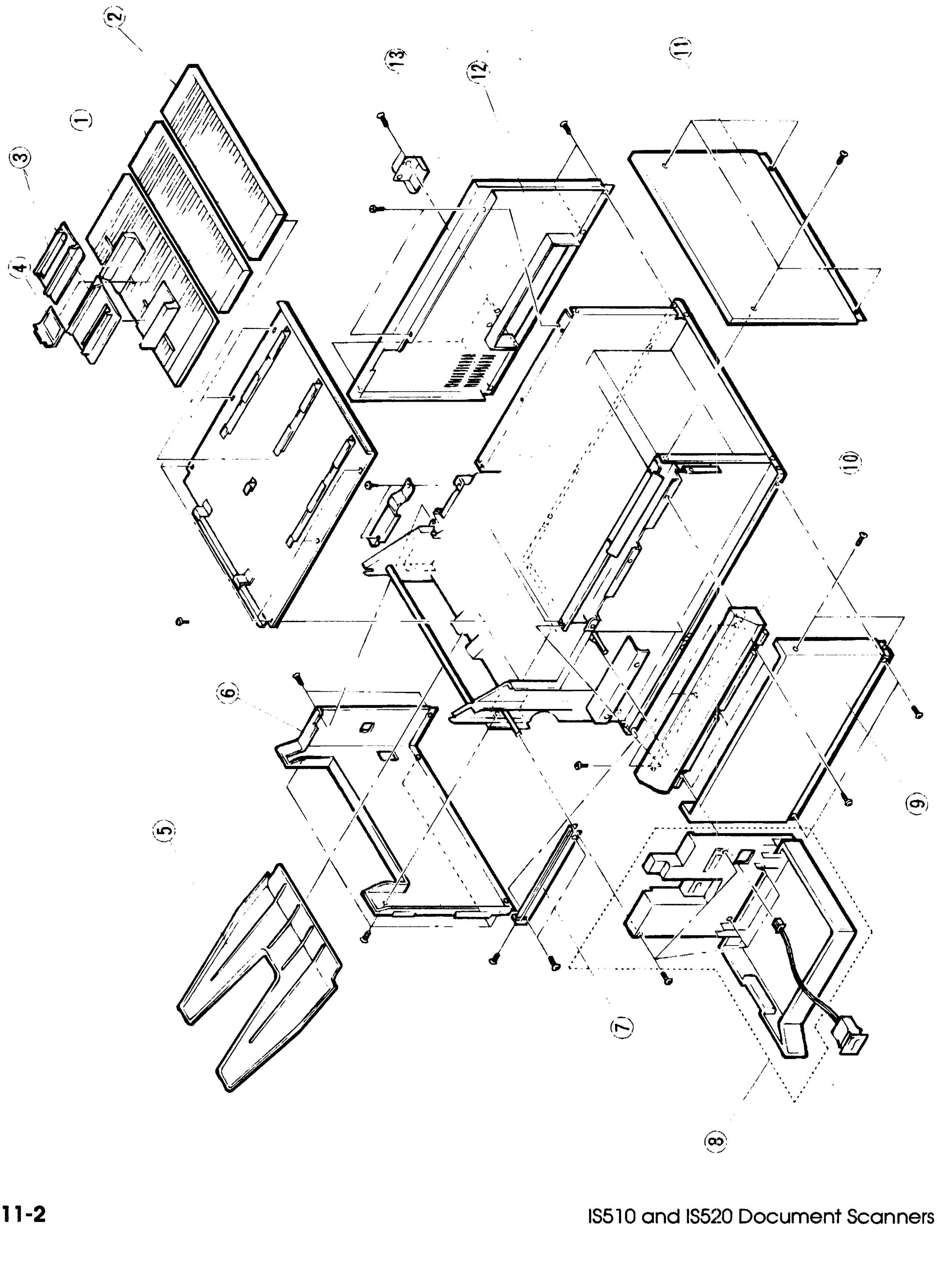
Parts Catalog

Inside this chapter:

This chapter provides an illustrated parts list of all of the IS510 and IS520 scanner parts.

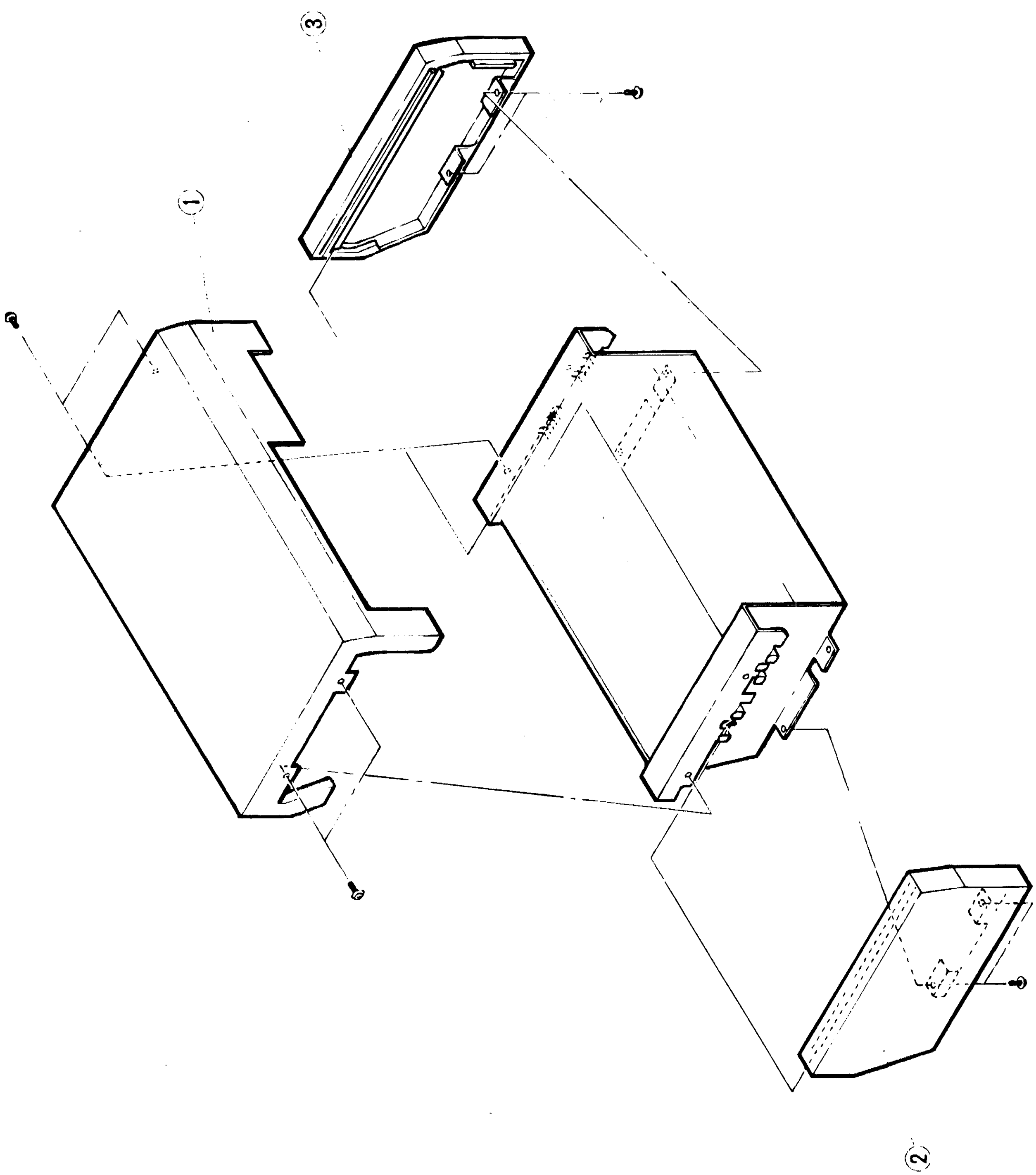
11.1 IS510 Parts Catalog

11.1.1 Exterior - Lower Unit



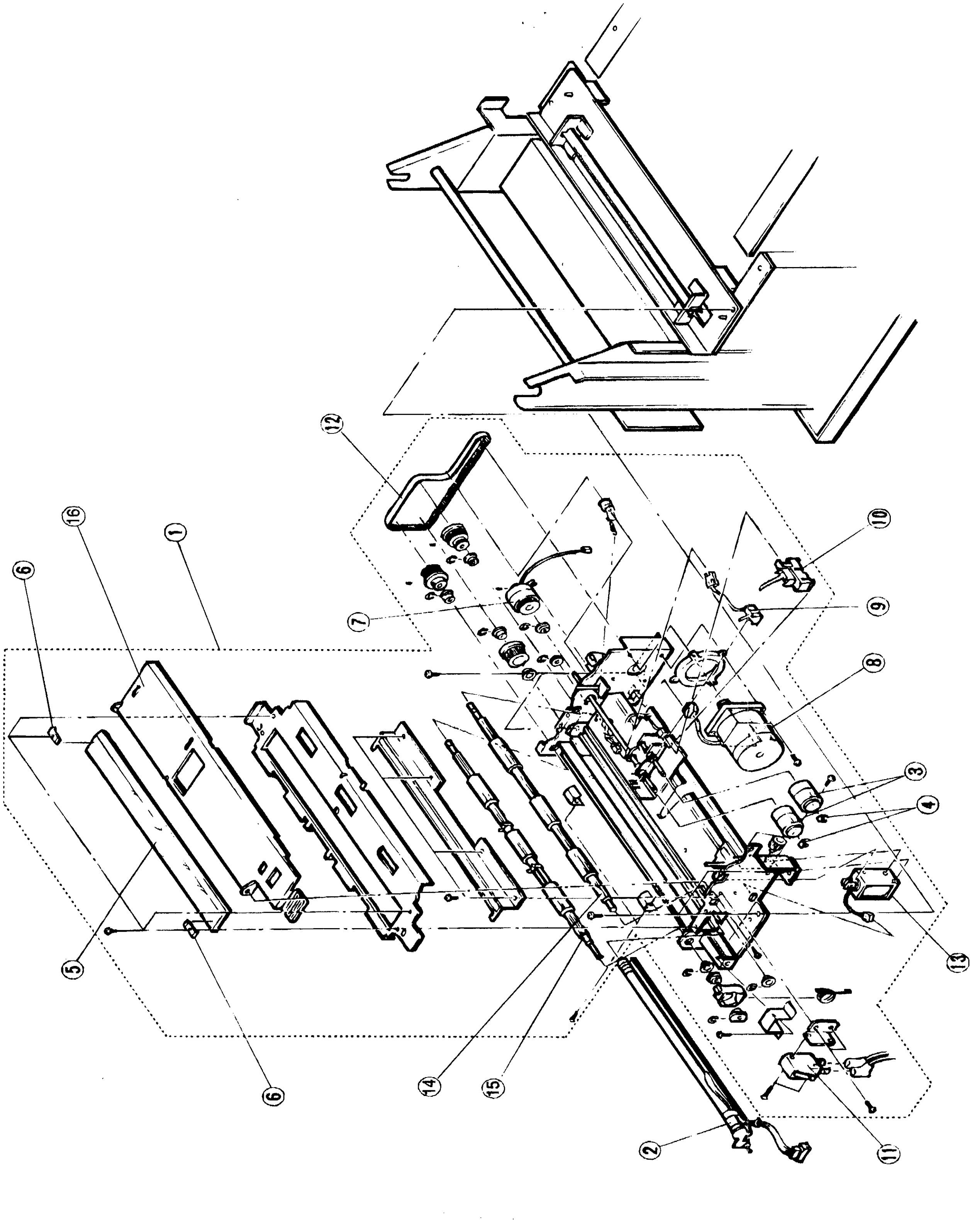
No.	Part Number	Description	Qty.
1	G4003531	Document Table	1
2	G4003541	Document Small Table	2
3	G4003610	Small Document Guides	2
4	G4003620	Small Document Backstop	1
5	G4003711	Output Tray	1
6	G4001592	Left Cover	1
7	G4001561	Front-Left Lower Cover	1
8	G4001531	Lamp B Door Assembly	1
9	G4001520	Front Right Cover	1
10	G4001510	Indicator Panel Cover	1
11	G4001571	Right Cover	1
12	G4001582	Rear Cover	1
13	G4001587	Switch Cover	1

11.1.2 Exterior - Upper Unit



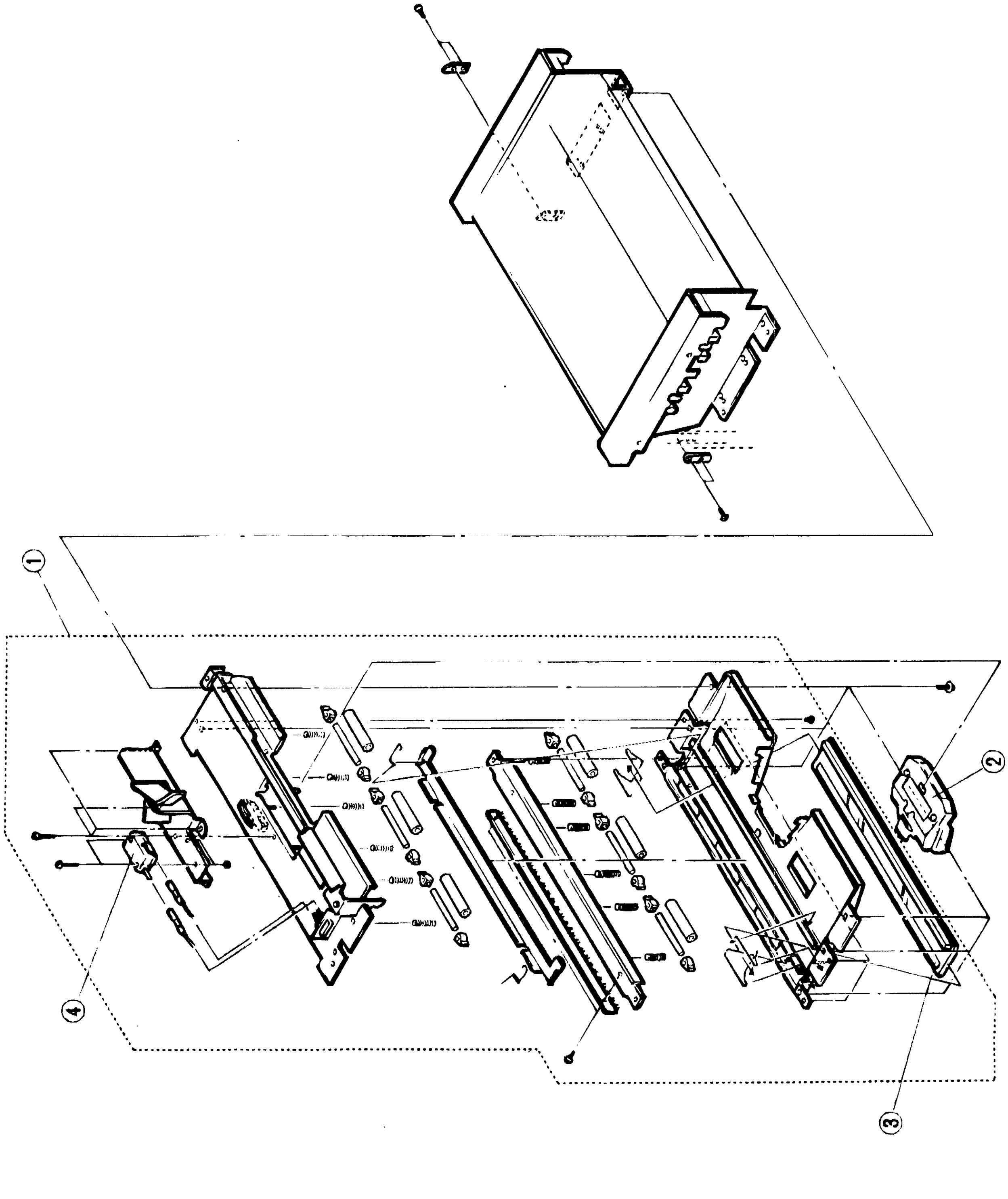
No.	Part Number	Description	Qty.
1	G4001611	Top Cover: IS510	1
2	G4001620	Top Front Cover: IS510	1
3	G4001630	Top Rear Cover: IS510	1

11.1.3 Mechanical - Lower Unit



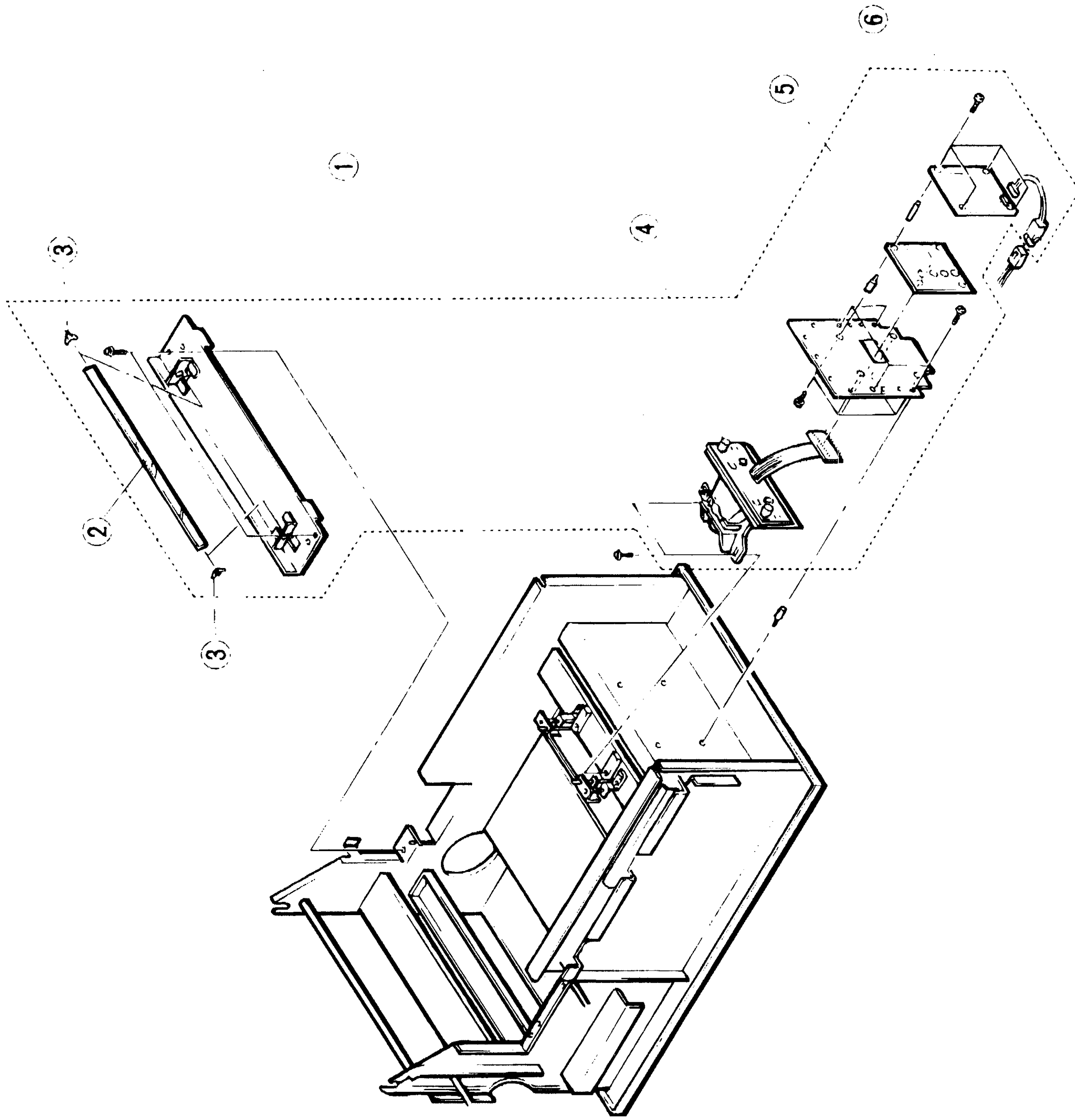
No.	Part Number	Description	Qty.
1	G4003210	Feed Unit	1
2	G4005021	Fluorescent Lamp Assembly	1
3	G4003451	ADF Pickup/Feed Rollers	2
4	54472681	Snap Ring	2
5	G4002751	Lower Contact Glass	1
6	G4002761	Fixing Boards	2
7	G4005030	Clutch	1
8	G4005000	Stepper Motor 9.6 W	1
9	G4005055	SIB Sensor	1
10	G4005049	ADF Sensor	1
11	12042188	Interlock Switch	1
12	G4001487	Motor Belt	1
13	G4005-41	Feed Unit Solenoid	1
14	G4003401	Exit Feed Roller - R1	1
15	G4003403	Exit Feed Roller - R2	1
16	G4003360	ADF Roller Cover Plate	1

11.1.4 Mechanical - Upper Unit



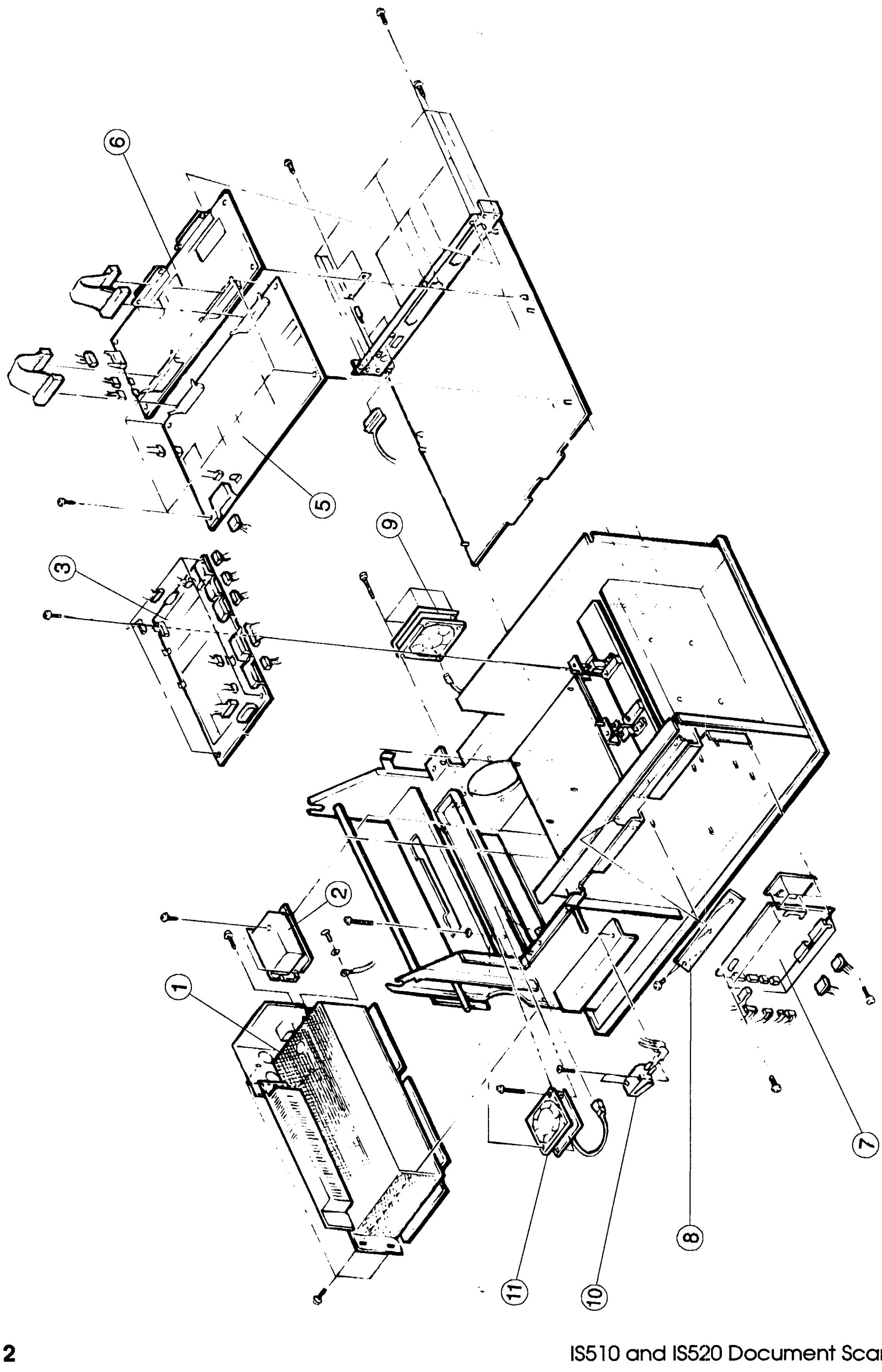
No.	Part Number	Description	Qty.
1	G4004100	Idler Unit	1
2	G4004500	Separation Cartridge	1
3	G4002735	Upper Contact Glass	1
4	G4005060	Microswitch	1

11.1.5 Optical - Lower Unit



No.	Part Number	Description	Qty.
1	G4002711	Lower Optical Unit	1
2	53612097	Lower Unit Mirror	1
3	53612098	Spring Clip, Lower Unit Mirror	2
4	G4002719	CCD/Lens Block Assembly: Lower	1
5	G4005220	CCD Control Board (5KCCD)	1
6	G4005250	Equalizer Board (EQ/DITHER)	1

11.1.6 Electrical - Lower Unit



No.	Part Number	Description	Qty.
1	G4005011	Power Supply Unit	1
2	H2035200	Lamp Drive Unit	1
3	G4005102	CPU Board (PAGS-1000) with firmware 4.8 + Kofax Timing	1
4	28456-001	SCSI Board firmware (not shown)	1
6	G4005130	Data Compression Board (CGVS)	1
7	G4005650	SCSI Board (NPS/NSA)	1
8	G4005310	Indicator Control Board (OP-CON)	1
9	G4005340	Indicator Board (OPLED)	1
10	GX640007	Fan	1
11	12042188	Interlock Switch	1
12	GX640014	PSU Fan	1
13	28457-001	CPU Board firmware - IS510 (not shown)	1

11.1.7 Roller Kit

No.	Part Number	Description	Qty.
N/A	G4009100	Roller Kit The Roller Kit consists of the following: G4004500 Separation Cartridge (1 pc.) G4003451 Pickup/Feed Roller (2 pcs.) 54472681 Snap Ring (2 pcs.)	1

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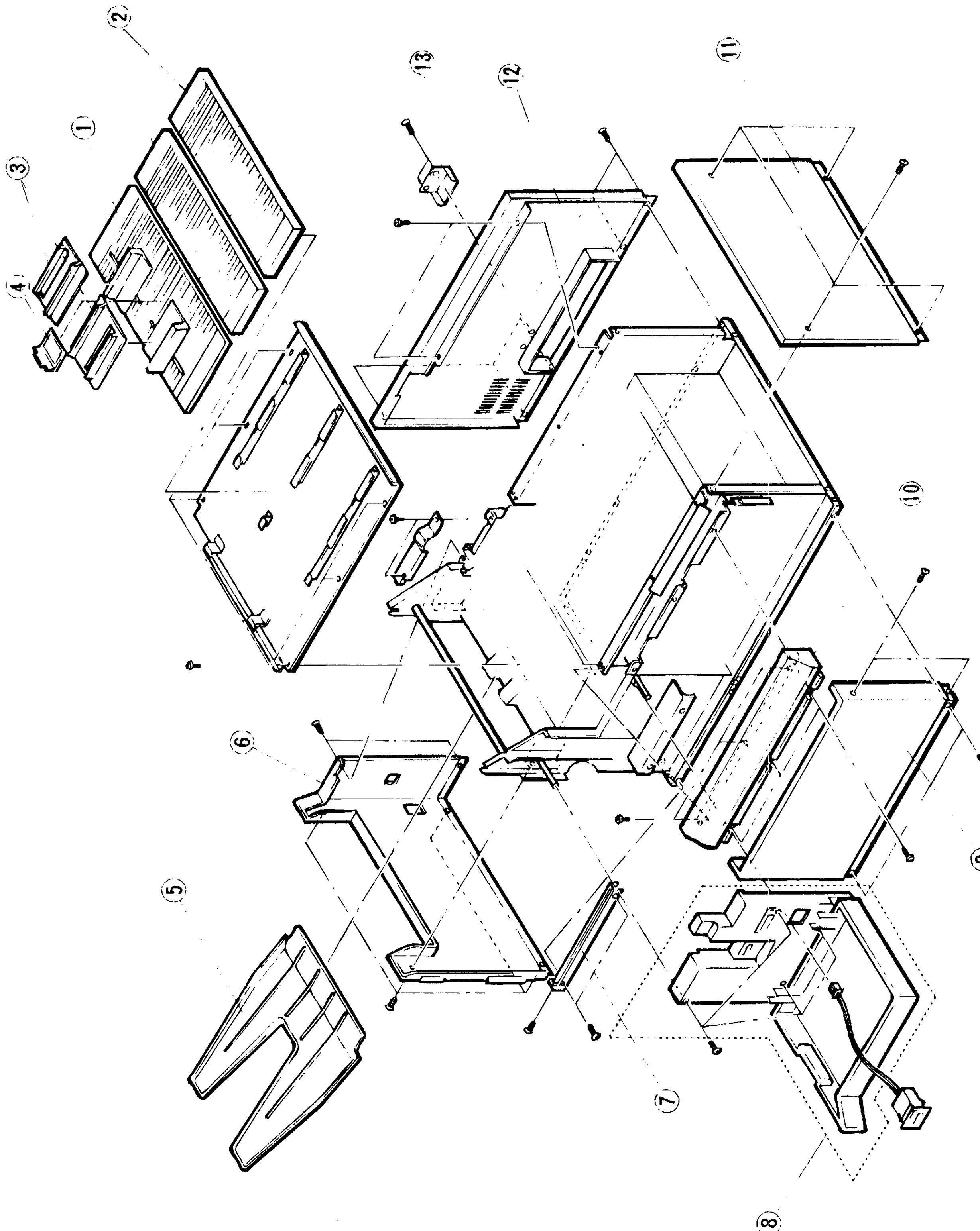
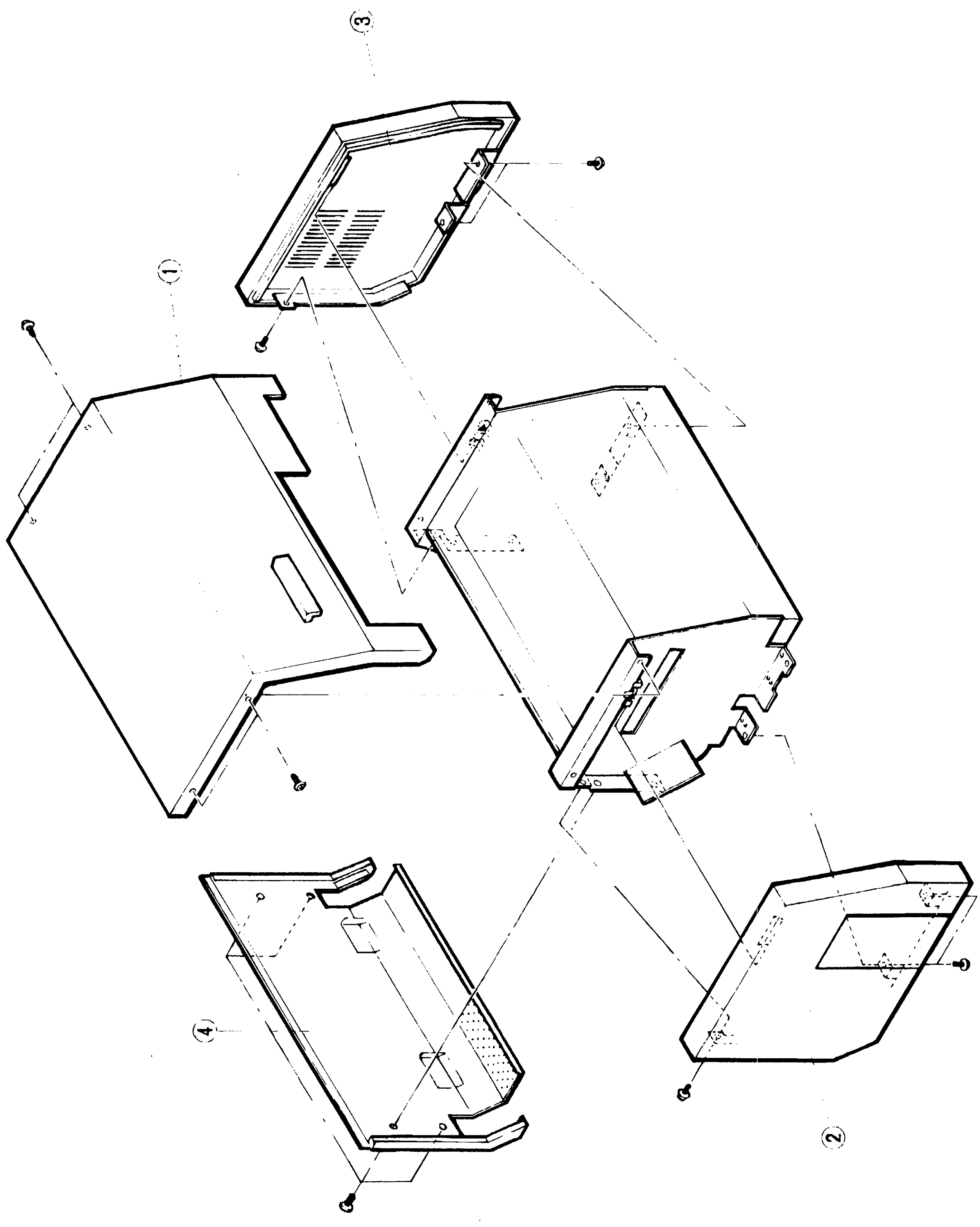
11.2 IS520 Parts Catalog

11.2.1 Exterior - Lower Unit



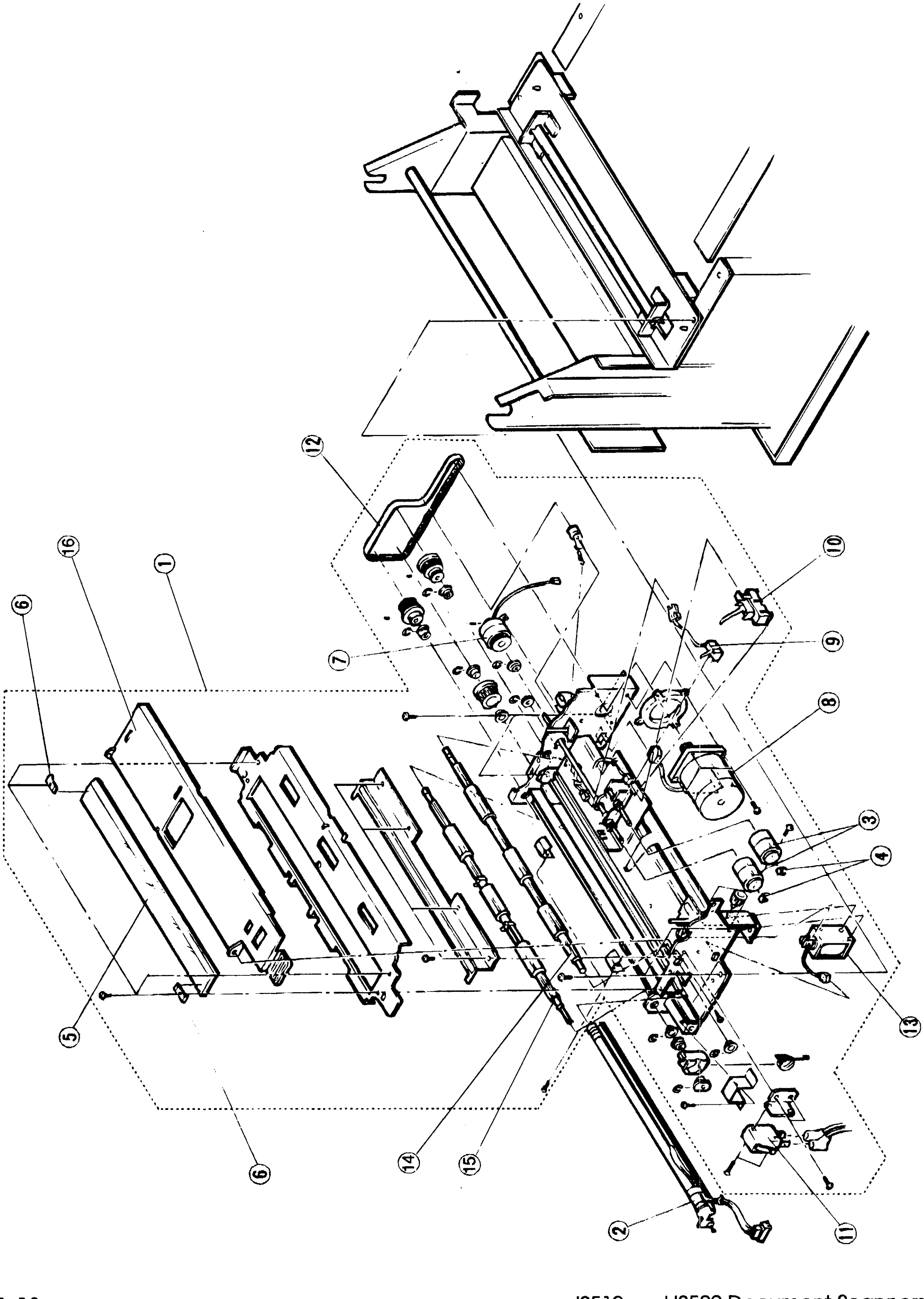
No.	Part Number	Description	Qty.
1	G4003531	Document Table	1
2	G4003541	Document Small Table	2
3	G4003610	Small Document Guides	2
4	G4003620	Small Document Backstop	1
5	G4003711	Output Tray	1
6	G4001592	Left Cover	1
7	G4001561	Front-Left Lower Cover	1
8	G4011531	Lamp B Door Assembly	1
9	G4001520	Front Right Cover	1
10	G4011510	Indicator Panel Cover: IS520	
11	G4001571	Right Cover	1
12	G4001582	Rear Cover	1
13	G4001587	Switch Cover	1

11.2.2 Exterior - Upper Unit



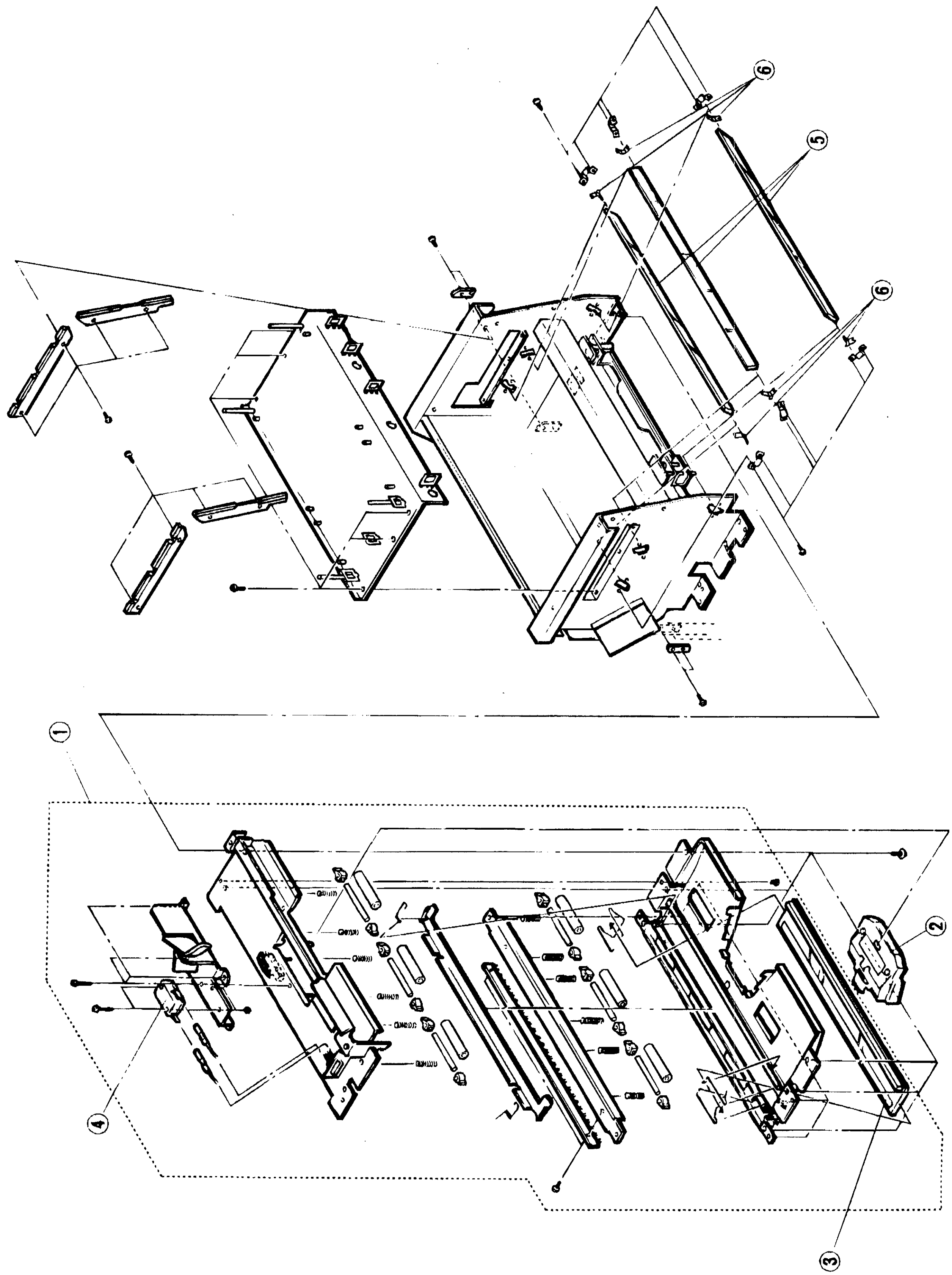
No.	Part Number	Description	Qty.
1	G4011611	Top Cover: IS520 Upper Unit	1
2	G4011620	Top Front Cover: IS520 Upper Unit	1
3	G4011651	Top Rear Cover: IS520 Upper Unit	1
4	G4011661	Top Left Cover: IS520 Upper Unit	1

11.2.3 Mechanical - Lower Unit



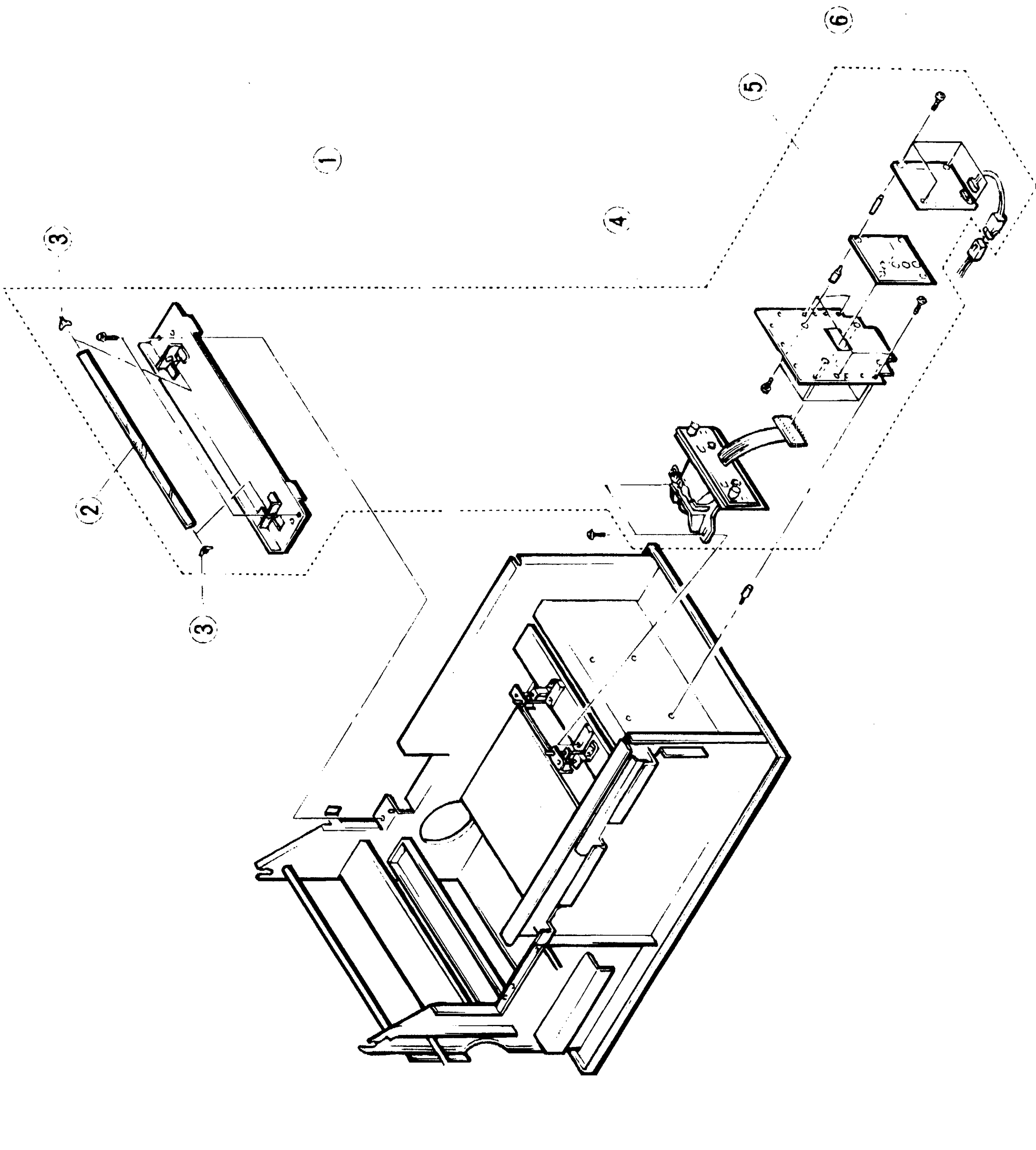
No.	Part Number	Description	Qty.
1	G4003210	Feed Unit	1
2	G4005021	Fluorescent Lamp Assembly	1
3	G4003451	ADF Pickup/Feed Rollers	2
4	54472681	Snap Ring	2
5	G4002751	Lower Contact Glass	1
6	G4002761	Fixing Boards	2
7	G4005030	Clutch	1
8	G4005000	Stepper Motor 9.6 W	1
9	G4005055	SIB Sensor	1
10	G4005049	ADF Sensor	1
11	12042188	Interlock Switch	1
12	G4001487	Motor Belt	1
13	G4005-41	Feed Unit Solenoid	1
14	G4003401	Exit Feed Roller - R1	1
15	G4003403	Exit Feed Roller - R2	1
16	G4003360	ADF Roller Cover Plate	1

11.2.4 Mechanical - Upper Unit



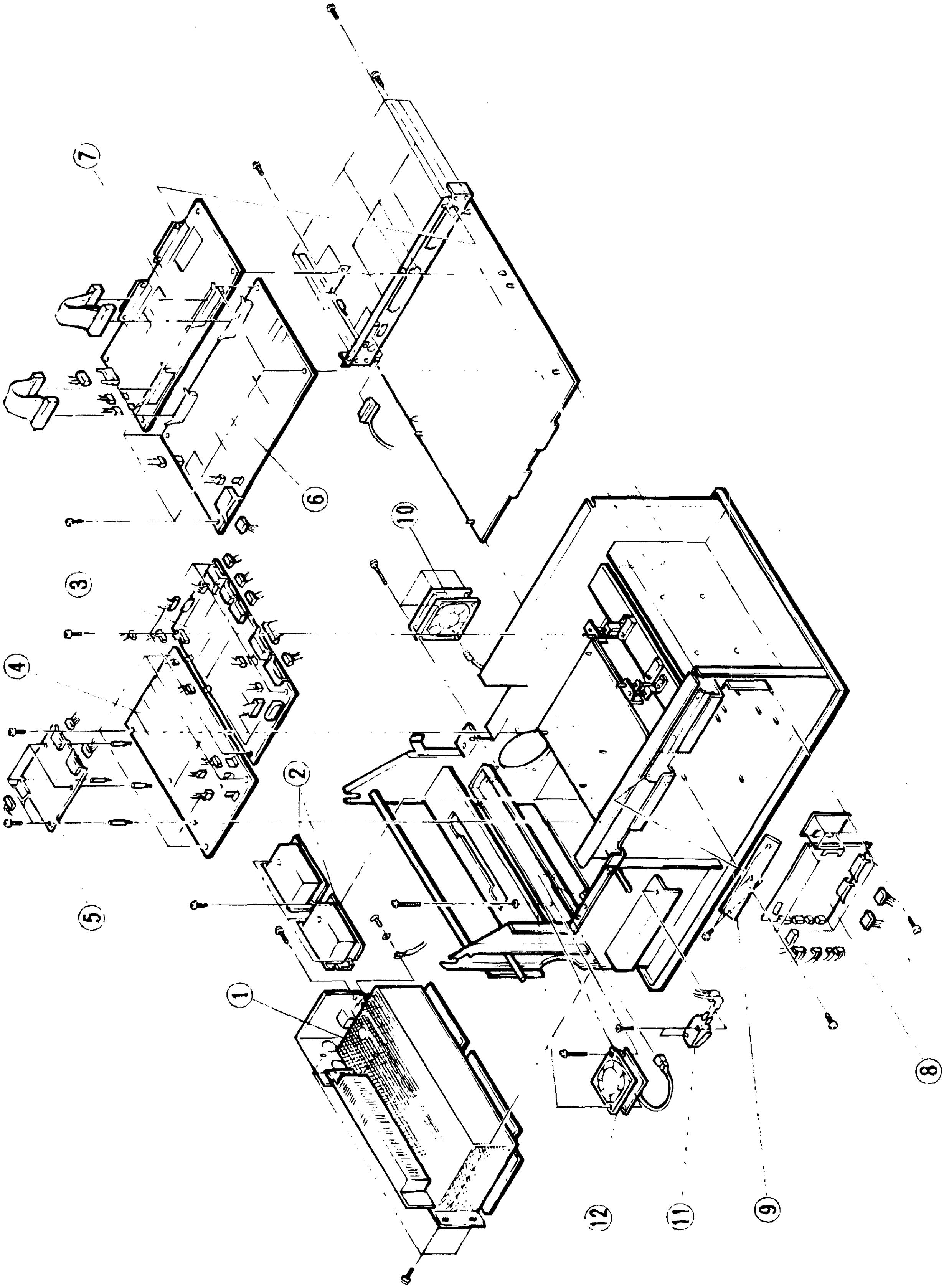
No.	Part Number	Description	Qty.
1	G4004100	Idler Unit	1
2	G4004500	Separation Cartridge	1
3	G4002735	Upper Contact Glass	1
4	G4005060	Microswitch	1
5	G4012711	Upper Unit Mirrors	3
6	53612113	Retaining Brackets, Upper Mirrors	6

11.2.5 Optical - Lower Unit



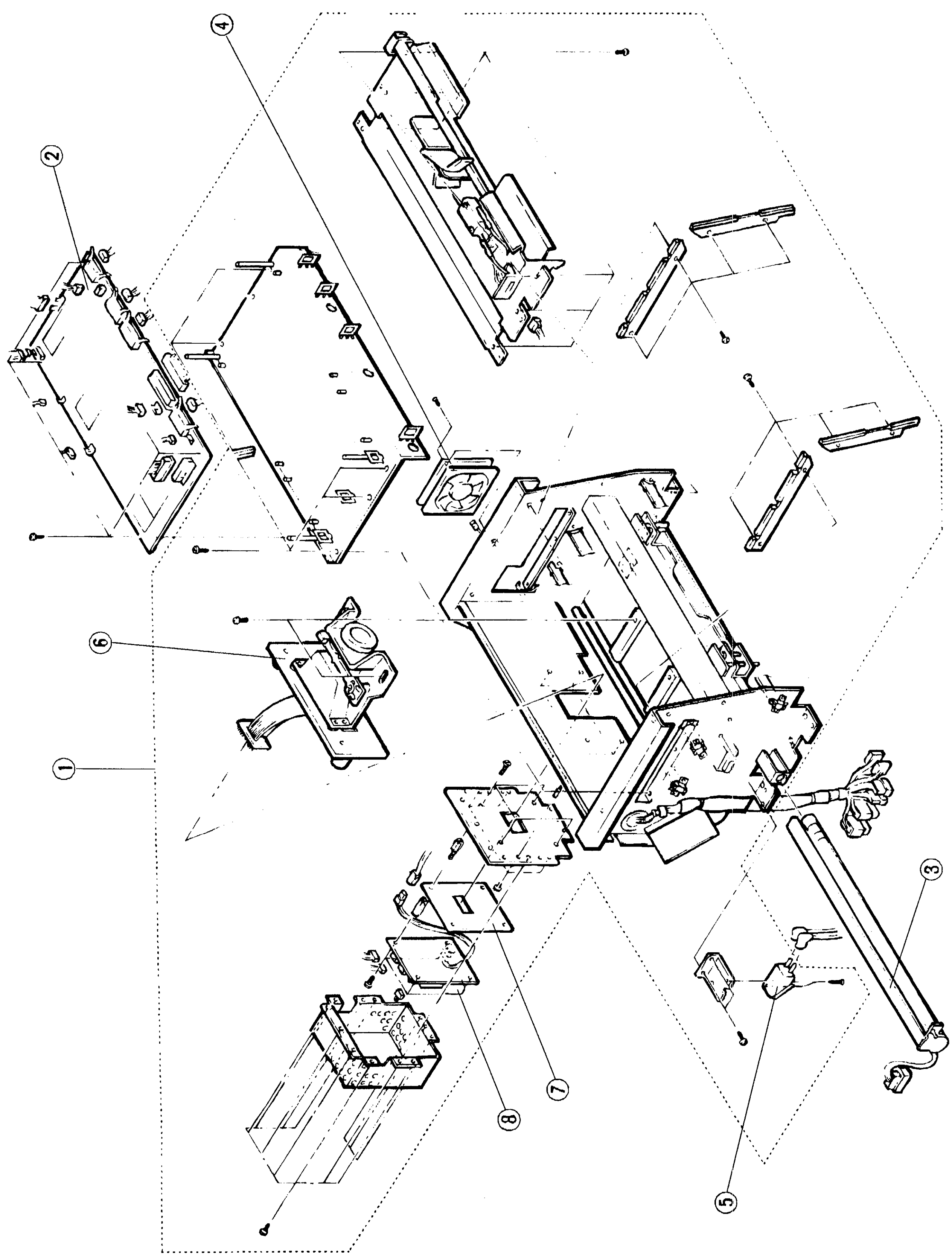
No.	Part Number	Description	Qty.
1	G4002711	Lower Optical Unit	1
2	53612097	Lower Unit Mirror	1
3	53612098	Spring Clip - Lower Unit Mirror	2
4	G4002719	CCD/Lens Block Assembly: Lower	1
5	G4005220	CCD Control Board (5KCCD)	1
6	G4005250	Equalizer Board (EQ/DITHER)	1

11.2.6 Electrical - Lower Unit



No.	Part Number	Description	Qty.
1	G4005011	Power Supply Unit	1
2	H2035200	Lamp Drive Unit	2
3	G4005100	CPU Board (PAGS-1000) with firmware 4.8 + Kofax Timing	1
4	G4005160	Memory Board (GVS-01)	1
5	G4005190	Data Control Board (GVS-09)	1
6	G4005130	Data Compression Board (CGVS)	1
7	G4005650	SCSI Board (NPS/NSA)	1
8	G4005310	Indicator Control Board (OP-CON)	1
9	G4005340	Indicator Board (OPLED)	1
10	GX640007	Fan	1
11	12042188	Interlock Switch	1
12	GX640014	PSU Fan	1
13	28458-001	CPU Board firmware - IS520 (not shown)	1
14	28456-001	SCSI Board firmware (not shown)	1

11.2.7 Electrical/Optical - Upper Unit



No.	Part Number	Description	Qty.
1	G4012701	Upper Optical Unit	1
2	G4005100	CPU Board (PAGS-1000) with firmware 4.8 + Kofax Timing	1
3	G4005021	Fluorescent Lamp Assembly	1
4	GX640007	Fan	1
5	12042188	Interlock Switch	1
6	G4002720	CCD/Lens Block Assembly: IS520: Upper	1
7	G4005220	CCD Control Board (5KCCD)	1
8	G4005250	Equalizer Board (EQ/DITHER)	1
9	28458-001	CPU Board firmware - IS520 (not shown)	1

11.2.8 Roller Kit

No.	Part Number	Description	Qty.
N/A	G4009100	Roller Kit The Roller Kit consists of the following: G4004500 Separation Cartridge (1 pc.) G4003451 Pickup/Feed Roller (2 pcs.) 54472681 Snap Ring (2 pcs.)	1

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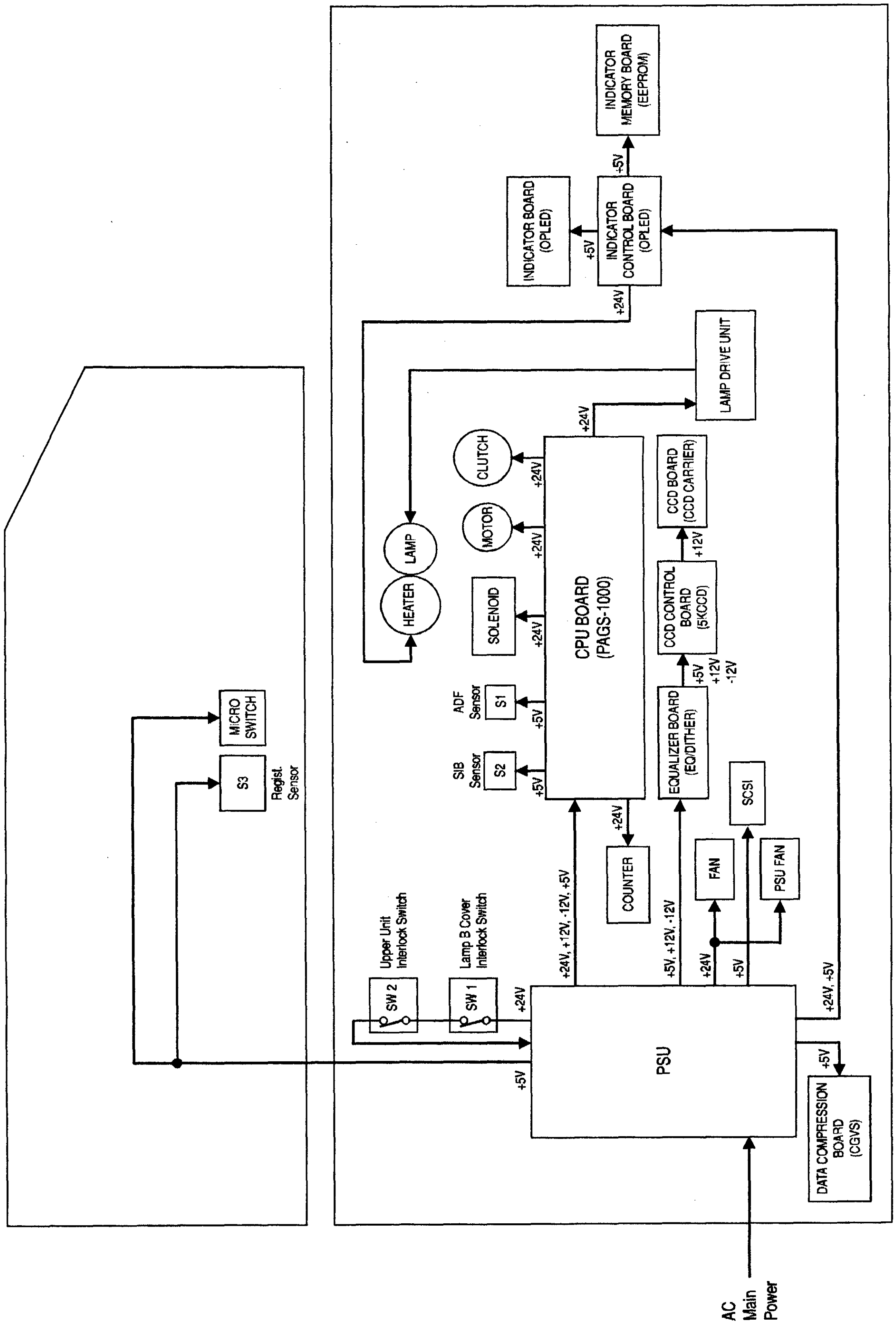
APPENDIX A

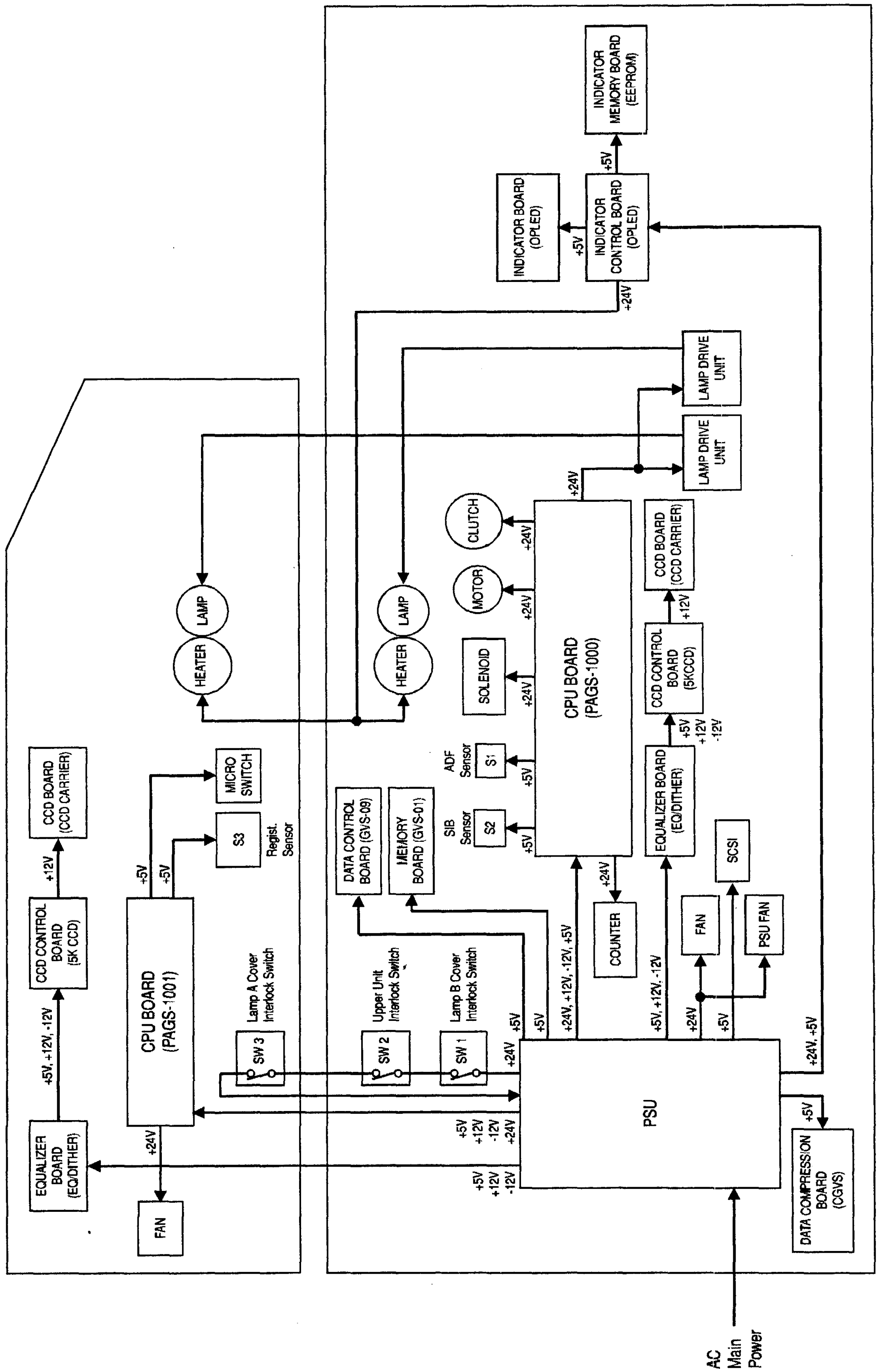
Power Distribution Diagrams

Inside this appendix:

A.1 IS510 Power Distribution Diagram



A.2 IS520 Power Distribution Diagram

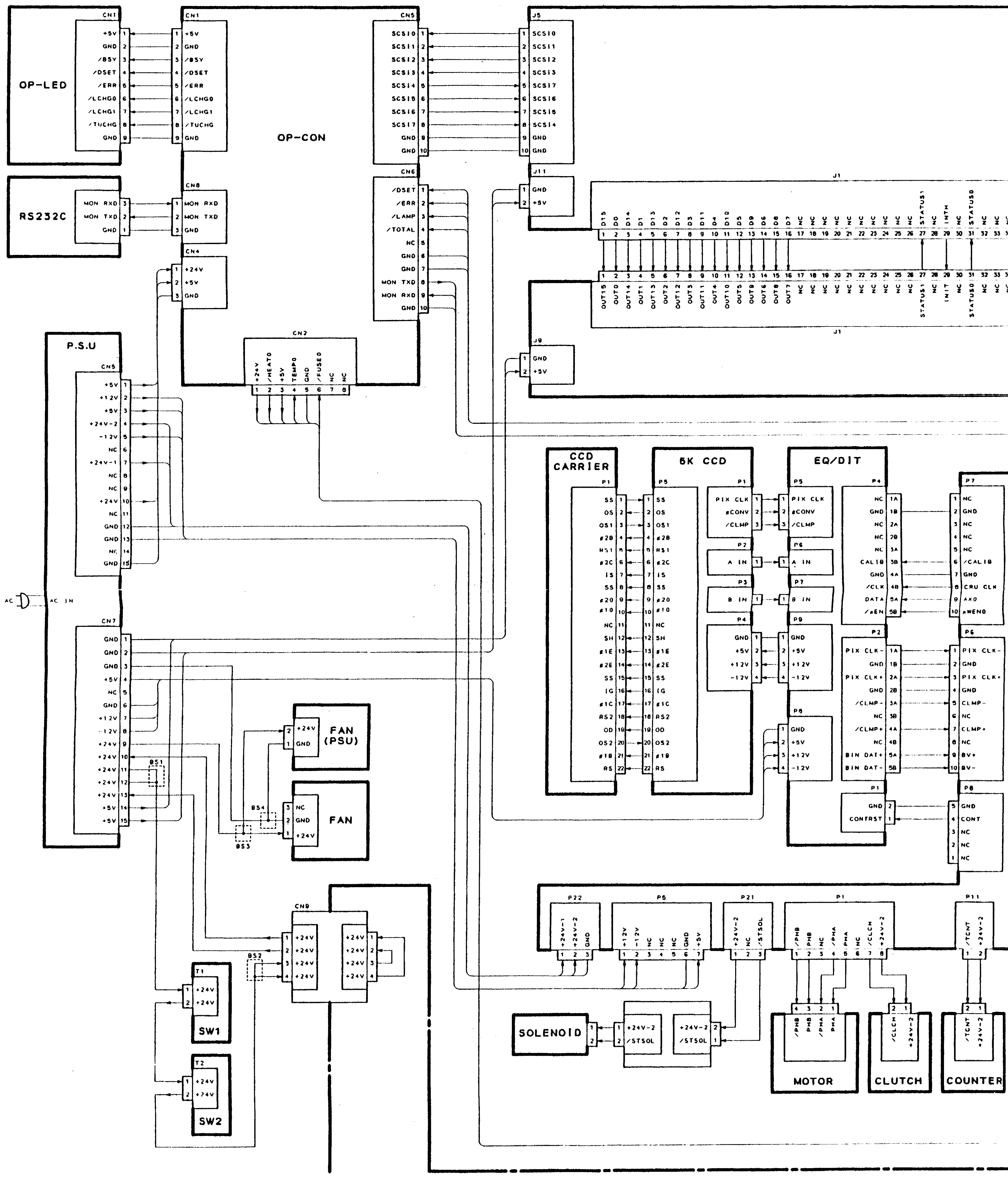


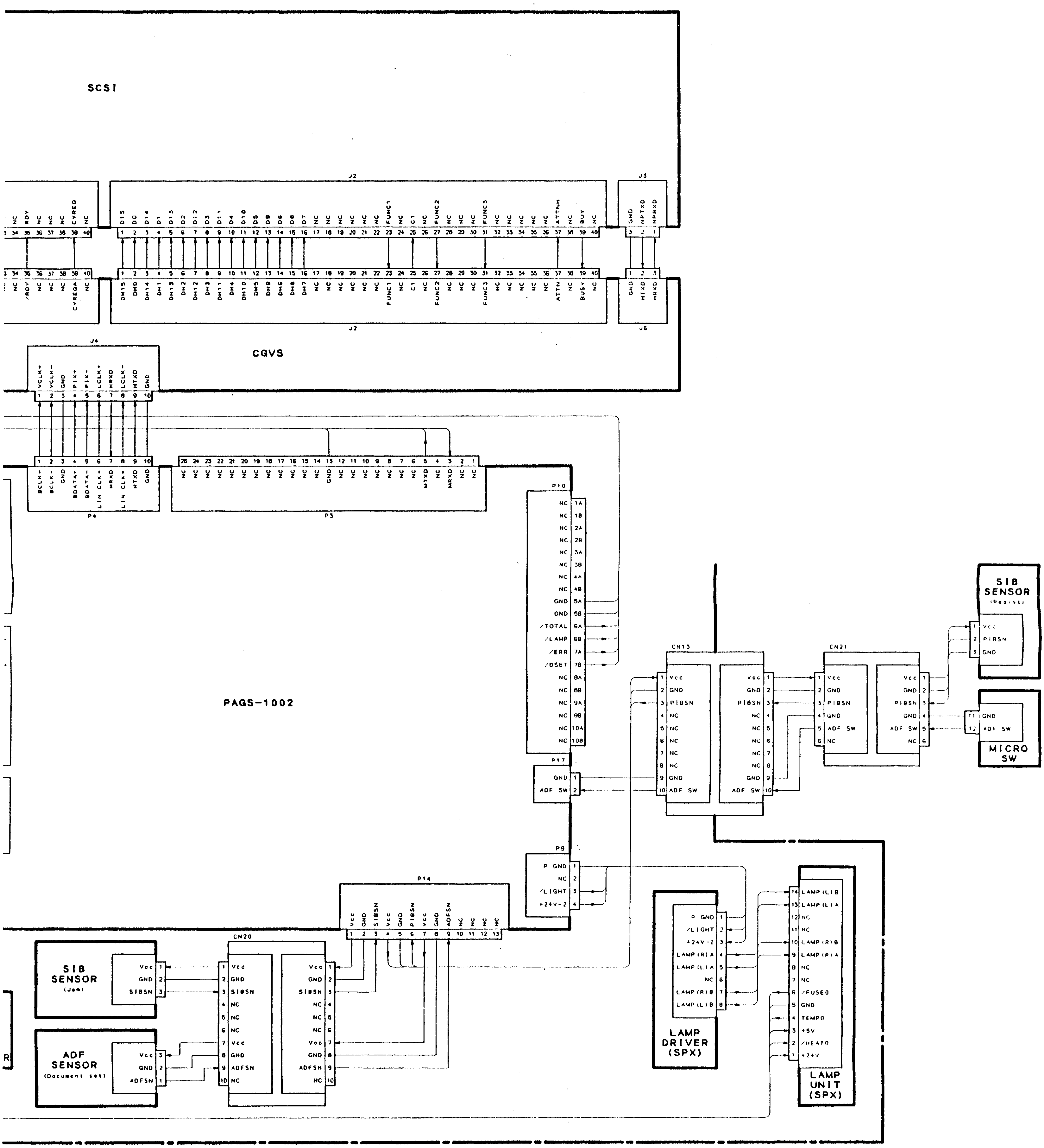
APPENDIX B

Point-to-Point Diagrams

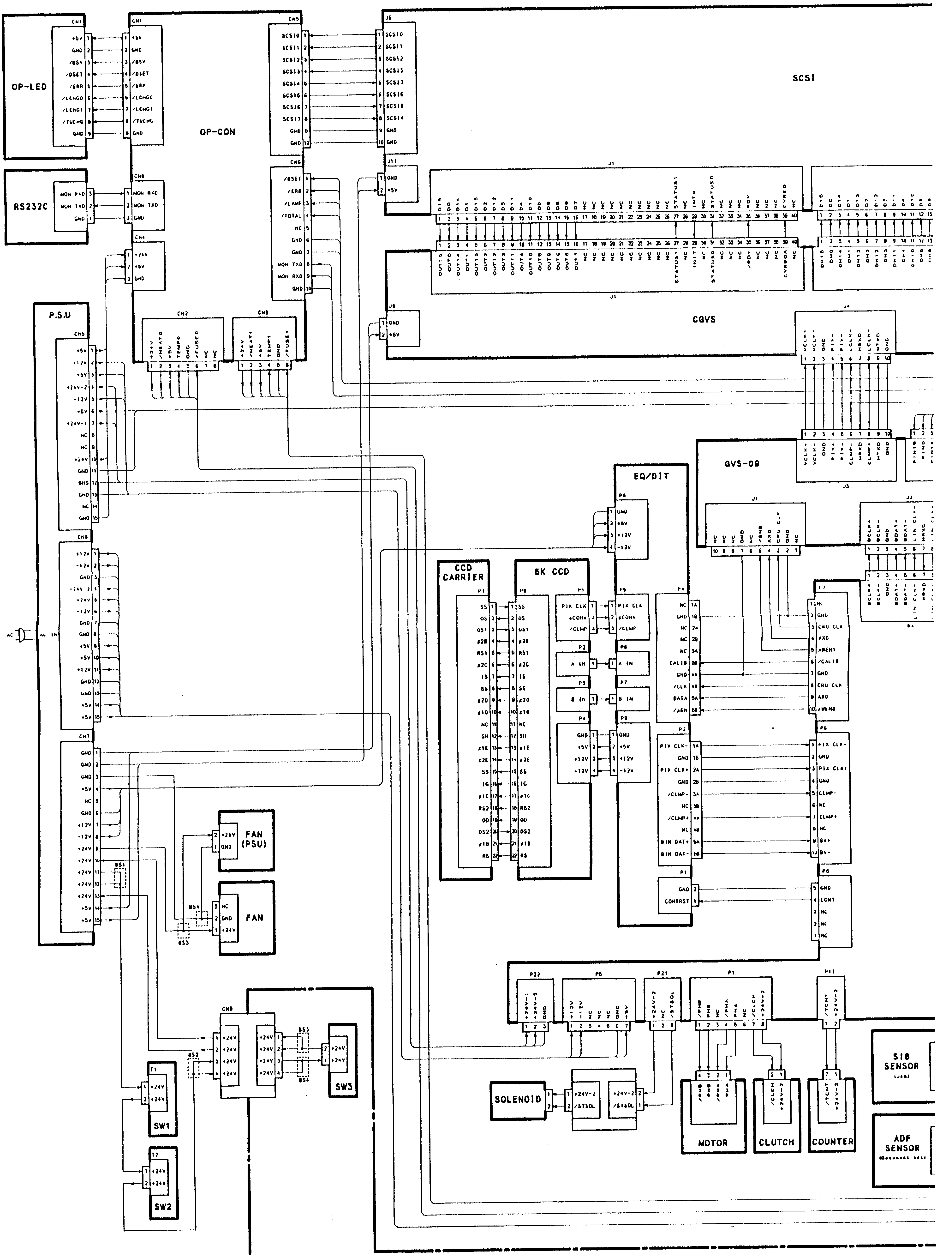
Inside this appendix:

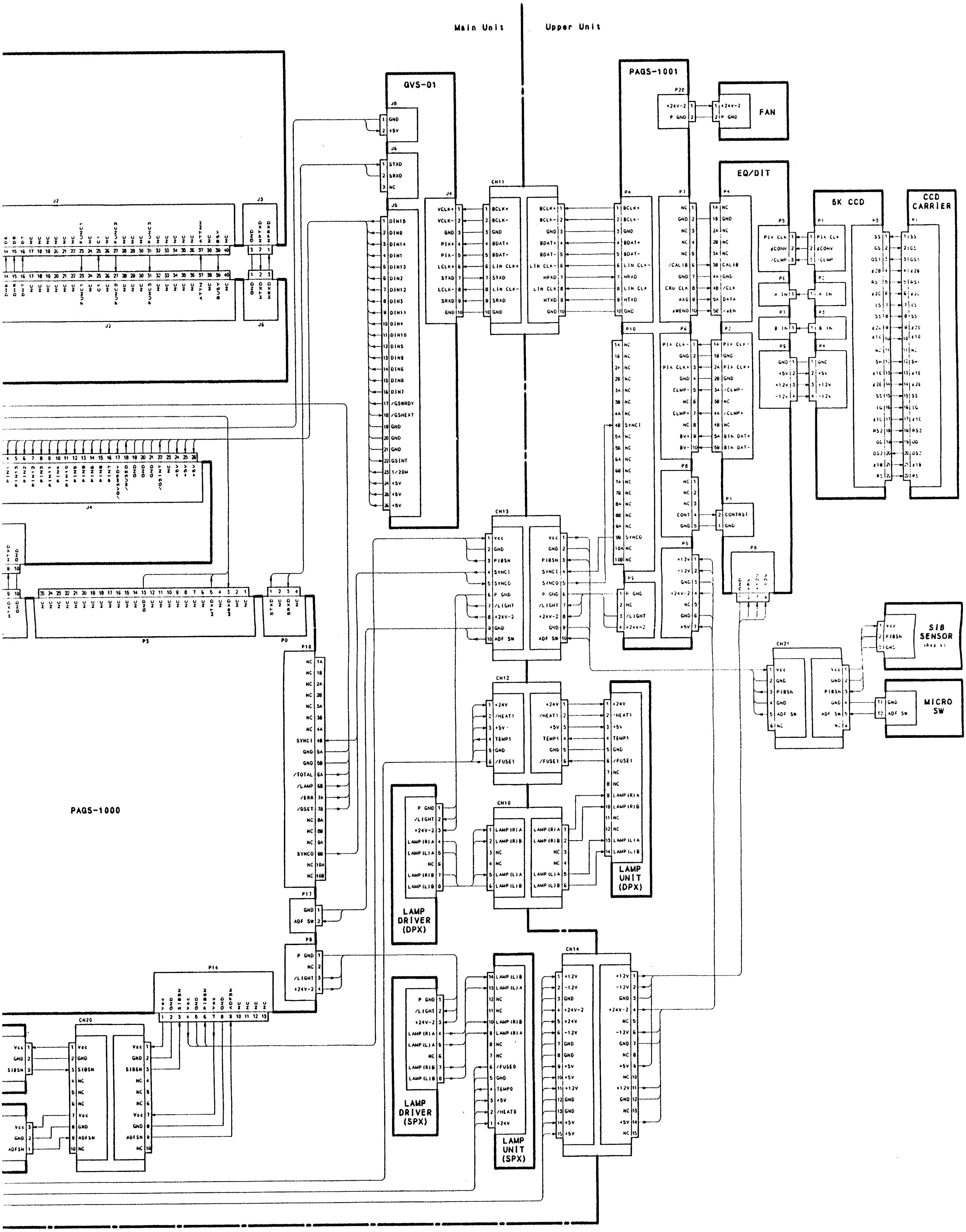
Appendix B-1 IS510 Point-to-Point




SCSI
J2
J3
D15 D0 D14 D1 D13 D2 D12 D3 D11 D4 D10 D5 D9 D6 D8 D7 NC NC NC NC NC NC FUNC1 NC C1 NC FUNC2 NC NC NC FUNC3 NC NC NC NC NC ATTNH NC BUY NC
GND NPTXD NPRXD
DH15 DH0 DH14 DH1 DH13 DH2 DH12 DH3 DH11 DH4 DH10 DH5 DH9 DH6 DH8 DH7 NC NC NC NC NC NC FUNC1 NC C1 NC FUNC2 NC NC NC FUNC3 NC NC NC NC NC ATTN NC BUSY NC
GND MTXD MRXD
J6
J4
CGVS
VCLK+ VCLK- GND PIX+ PIX- LCLK+ LCLK- MRXD MTXD GND
BCLK+ BCLK- GND BDATA+ BDATA- LIN CLK- MRXD LIN CLK+ MTXD GND
P4
P3
MTXD MRXD
P10
NC 1A
NC 1B
NC 2A
NC 2B
NC 3A
NC 3B
NC 4A
NC 4B
GND 5A
GND 5B
/TOTAL 6A
/LAMP 6B
/ERR 7A
/DSET 7B
NC 8A
NC 8B
NC 9A
NC 9B
NC 10A
NC 10B
PAGS-1002
P17
GND 1
ADF SW 2
P9
P GND 1
NC 2
/LIGHT 3
+24V-2 4
P14
Vcc GND SIBSN Vcc GND PIBSN Vcc GND ADFSN NC NC NC NC
CN20
Vcc GND SIBSN NC NC NC Vcc GND ADFSN NC
SIB SENSOR (Jam)
ADF SENSOR (Document set)
CN13
Vcc GND PIBSN NC NC NC NC NC GND ADF SW
CN21
Vcc GND PIBSN GND ADF SW NC
SIB SENSOR (Regist)
Vcc PIBSN GND
MICRO SW
GND ADF SW
P GND /LIGHT +24V-2 LAMP (R) A LAMP (L) A NC LAMP (R) B LAMP (L) B
LAMP DRIVER (SPX)
LAMP (L) B LAMP (L) A NC NC LAMP (R) B LAMP (R) A NC NC /FUSE0 GND TEMPO +5V /HEATO +24V
LAMP UNIT (SPX)

Appendix B-2 IS520 Point-to-Point




Main Unit
Upper Unit
GVS-01
PAGS-1001
FAN
EQ/DIT
5K CCD
CCD CARRIER
CN11
CN13
CN12
CN10
CN14
CN20
CN21
SIB SENSOR
MICRO SW
PAGS-1000
LAMP DRIVER (DPX)
LAMP UNIT (DPX)
LAMP DRIVER (SPX)
LAMP UNIT (SPX)
J2
J4
J5
J6
J8
P3
P0
P10
P17
P8
P14

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