Figure 5-1 is a functional block diagram of the printer showing the basic paths for signal, control, and media.
Power Distribution System

The AC and DC power supply circuits are contained in the Low Voltage Power Supply (LVPS). The high voltages required for image formation are generated by the High Voltage Power Supply (HVPS). The LVPS and Distribution System is illustrated in figure 5-2. See the Reference Diagrams at the end of Chapter 7 for more details.

Figure 5-2   Low Voltage Power Distribution System
AC Power Distribution

The AC power circuitry supplies AC voltage whenever the power cord is connected, and the power switch is on. A toner cartridge must be installed and the top access door must be closed before AC voltage is supplied to the DC power circuits or the Fusing Assembly.

Overcurrent/Overvoltage Protection

There are two overcurrent/overvoltage devices in this printer:

- The resettable circuit breaker (CB101) shuts off AC input power to the LVPS in case of an AC overcurrent condition. To reset, remove the LVPS and press in the circuit breaker button (figure 5-3, callout 1).
- Fuse 101 interrupts AC input power to the +24V DC and +5V DC power circuits.

![Figure 5-3 Low Voltage Power Supply](image-url)
High Voltage Power Distribution

The High Voltage Power Supply (HVPS, see figure 5-4) applies a DC-biased AC voltage to the primary charging roller and the developing roller, and a programmed DC voltage (depending upon the phase of the printing process) to the Transfer Roller. See the General Timing Diagram (figure 5-29 on page 183) for HVPS timing information.

Toner Cartridge Detection

A toner level detector inside the toner cartridge is connected to the HVPS when the toner cartridge is installed. If the toner level drops below a predefined level, the TONER LOW message will appear on the display panel. If the toner cartridge is missing, INSTALL TONER CARTRIDGE will be displayed.

Print Density Adjustment

The high voltage power supply also controls the image density by varying the voltages applied to the developing cylinder in the toner cartridge. These voltages determine the amount of toner applied to the photosensitive drum. Print density is adjusted from the control panel (Print Quality Menu) or from the driver software.

Figure 5-4  High Voltage Power Supply Contacts
Formatter System

The Formatter PCA is responsible for the following:

- Controlling the PowerSave mode.
- Receiving and processing print data from the various printer interfaces.
- Monitoring Control Panel inputs and relaying printer status information (through the Control Panel and the bidirectional I/O).
- Developing and coordinating data placement and timing with the print engine.
- Storing font information.
- Communicating with the host computer through the bidirectional Interface.

The Formatter PCA receives a print job from the bidirectional parallel port (IEEE 1284) and separates it into image information and instructions which control the printing process. The DC Controller synchronizes the Image Formation System with the Paper Input and Output Systems, and then signals the Formatter to send the print image data. The Formatter sends the print image data (dots) in the form of a VIDEO signal to start the printing process.

The Formatter PCA also provides the electrical interface and mounting locations for three EIO cards, additional memory DIMMs, the Disk Accessory, the 8-bin Mailbox/5-bin Mailbox with Stapler, the 7-bin Tabletop Mailbox, and the 2 x 500-sheet Input Tray (Trays 4 and 5).

PowerSave

This user-adjustable feature (Configuration Menu) conserves power by shutting down the fuser and exhaust fans after the printer has been idle for 15 minutes; 30 minutes; 1, 2, or 3 hours. The printer retains all printer settings, downloaded fonts, and macros while in PowerSave mode. The default setting is PowerSave on, with a 1-hour idle time. (PowerSave can also be turned off from the control panel.)

The printer exits PowerSave mode and enters the warm-up cycle when any of the following occurs:

- A print job, valid data, or a PML or PJL command is received at the parallel port or an EIO card.
- A Control Panel key is pressed.
- Any printer door (except the front access door) is opened and then closed.
- A paper tray is opened and then closed.
- The Engine Test microswitch is pressed.

**Note**

Printer error messages override the PowerSave message. The printer will enter PowerSave mode at the appropriate time, but the error message will continue to be displayed.

**Resolution Enhancement (REt)**

The Formatter PCA contains circuitry for Resolution Enhancement technology (REt), which modifies the standard video dot data on its way to the DC Controller to produce “smoothed” black-to-white boundaries. REt is user-controllable (on or off) from the control panel, or from some software applications. The default setting is on.

**Note**

REt settings sent from software applications or printer drivers override the control panel settings.
EconoMode

The EconoMode setting uses less toner than the normal printing mode by reducing the dot density. EconoMode, which is a draft-quality printing mode, is user selectable via the control panel (Print Quality Menu) and some software applications. The default setting is off.

**Note**

EconoMode does not affect print speed, memory usage, nor extend toner cartridge life.

![Normal Mode vs EconoMode](image)

**Figure 5-5** Normal Mode vs EconoMode
The following systems and functions are controlled by the DC Controller PCA:

- DC Power Distribution (+3.3V DC, +5V DC, +24V DC)
- Laser and Scanner Drive
- Paper Motion Monitoring and Control (photosensors and flags)
- Clutches (registration, tray pickup, and Tray 1 feed)
- Engine Test
- Motors (Main Drive, Scanner, and Fans)

Figure 5-2 on page 131 shows the Low Voltage Power Supply and Distribution System. See the wiring diagrams at the end of Chapter 7 for detailed listings of the DC Controller inputs and outputs.

**Laser and Scanner Drive**

Based on information received from the Formatter, the DC Controller sends signals to the Laser/Scanner Assembly to modulate the laser diode on and off and to drive the Laser/Scanner motor. See “Image Formation System” later in this chapter for more information.

**Paper Motion Monitoring and Control**

The DC Controller PCA controls paper motion by continuously monitoring the various paper sensors and coordinating paper movement with the other print processes.

**Clutches**

The DC Controller PCA provides drive signals for the Registration Assembly Clutch (CL1), Paper Input Unit Clutch (CL2), and the Tray 1 Feed Clutch. The External Paper Handling PCA mounted on the Formatter Assembly provides the control signals for the clutches in the 2000-sheet Input Tray, 8-bin Mailbox/5-bin Mailbox with Stapler, 2 x 500-sheet Input Tray, and 7-bin Tabletop Mailbox.

**Note** Refer to figure 5-2 for details.
Engine Test Microswitch

The Engine Test Microswitch, located on the top side of the DC Controller PCA, is activated manually through the square access hole at the top right side of the printer (Figure 6-6). This switch causes the print engine to perform an internal self test diagnostic which bypasses the Formatter PCA and then prints a full page of black parallel lines. This test is useful for troubleshooting printer problems because it isolates the print engine from the Formatter PCA. The engine test printout prints from Tray 3 only and can be activated with the Formatter PCA removed. A continuous test is performed indefinitely if the test button is held in. For more information, see Engine Test in Figure 7-10.

Motors

See the General Timing Diagram (figure 5-29 on page 183) for specific timing details for the printer motors.

The Main Motor, MT1, is controlled by the DC Controller PCA. The Main Motor drives the Main Gear Assembly and rotates during the Initial Rotation period (following power-on), the Print period, the Last Rotation Period, or whenever the printer front door is opened and closed.

The Scanner Motor is controlled and monitored by the DC Controller. It rotates the laser/scanner mirror during the Initial Rotation period and the Print period.

The Fan Motors are controlled and monitored by the DC Controller PCA. All five fans operate at full speed during the printing modes. All five fans turn off in the PowerSave mode after the Fuser cools down.

The drive signal for the Tray 2 and 3 Paper Pickup Motor, SMT1, is provided by the DC Controller PCA through the Paper Input Unit (PIU) PCA mounted on the right side of the PIU. When the job instructions call for paper to be supplied by Tray 2, SMT1 rotates in a forward direction and drives the Pickup roller for Tray 2. When paper is supplied by Tray 3, SMT1 rotates in the reverse direction and drives the Pickup roller for Tray 3.
Image Formation System

Laser printing requires the interaction of several different technologies (such as electronics, optics, and electrophotographics) to provide a printed page. Each process functions independently and must be coordinated with the other printer processes. The image formation process consists of six steps:

1. Drum Cleaning
2. Drum Conditioning
3. Image Writing
4. Image Developing
5. Image Transferring and Media Separation
6. Image Fusing

Figure 5-6  Image Formation Block Diagram
Toner Cartridge

The toner cartridge is the “heart” of the Image Formation System. It houses the cleaning, conditioning, and developing steps of the process. The toner cartridge contains the photosensitive drum, primary charging roller, developing station, toner cavity, and cleaning station. Including the components that wear, degrade, or are consumed in a customer-replaceable toner cartridge eliminates the need for a service call when replacement is required.

Toner Cartridge/High Voltage Power Supply Contacts

The toner cartridge has three contacts that route voltage from the HVPS PCA. They are:

- Upper: Primary Charge
- Middle: Developing Bias
- Lower: Toner Sensing/Toner Recognition
The Photosensitive Drum

The image from the Laser/Scanner Assembly is written on the drum surface, developed, and transferred to the media. The drum is an aluminum cylinder. The aluminum base of the photosensitive drum is electrically connected to ground potential. The outside of the cylinder is coated with a layer of non-toxic organic-photoconductive (OPC) material. The OPC material becomes electrically conductive when exposed to light. The drum surface is first cleaned of excess toner, then conditioned with a uniform negative charge. When an area on the drum surface is exposed to the laser light beam, the negative charge in that area is conducted to the ground potential of the drum base and thus becomes more positive. Areas not exposed to light remain non-conductive and maintain their negative charge.

![Figure 5-7 Photosensitive Drum]
Drum Cleaning

The cleaning blade inside the toner cartridge is in contact with the surface of the drum at all times. As the drum rotates during printing, excess toner is removed from the drum surface and stored in the waste toner receptacle inside the toner cartridge.

Figure 5-8 Drum Cleaning
Drum Conditioning

After the drum is physically cleaned, it is conditioned by applying a uniform negative charge across the surface of the drum with the primary charging roller, located in the toner cartridge. The primary charging roller is coated with conductive rubber, charged with an AC current that erases any residual charges, and produces a uniform drum surface potential. The AC current is centered around a negative DC bias which changes according to the Print Density setting.

Figure 5-9 Primary Charging Roller
Image Writing

During the writing process, a modulated laser diode projects a beam onto a rotating six-sided scanning mirror. As the scanning mirror rotates, the beam is directed through a set of focusing lenses to another mirror that reflects it through a slot on the top of the toner cartridge and onto the photosensitive drum. The beam sweeps across the drum and discharges the negative potential wherever it strikes the surface. This creates a latent (invisible) electrostatic image, which is developed into a visible image as the drum rotates (see figure 5-10).

Because the beam is sweeping the entire length of the drum and the drum is rotating, the entire surface area of the drum can be covered. The speed of the laser/scanner motor (which turns the scanning mirror) and the speed of the main motor (which turns the drum) are synchronized, and each successive sweep of the beam is offset 1/600th of an inch. The beam can be turned on and off to place a dot of light every 1/600th of an inch. This is how the printer achieves its 600 x 600 dpi resolution. After the writing process, the drum surface has a latent (invisible) electrostatic image.

At the end of each sweep, the beam strikes the beam detect lens, generating the Beam Detect (BD) signal. The BD signal is sent to the DC Controller, where it is converted to an electrical signal used to synchronize the output of data (VDO) for one sweep (scan line) and to diagnose problems with the laser diode or laser/scanner motor.
**FastRes 1200**

FastRes 1200 (PCL 6 only) is an HP developed technology that can represent each dot space as one of four different levels of black. However, FastRes 1200 uses only 2 data bits to store information for the same dot space. This means that only half as much RAM is needed to print an image.

FastRes 1200 takes advantage of HP’s new smaller toner particle (less than 5 microns) to provide superb test and image quality.
Image Developing

The developing process changes the latent electrostatic image into a visible image by depositing negatively charged toner particles on the exposed areas of the drum. The developing station is located inside the toner cartridge and consists of a metallic cylinder that rotates around a fixed magnetic core.

The developing cylinder is charged with an AC current that is centered around a negative DC bias. The AC current improves density and contrast by decreasing the attraction between the toner particles and the magnetic core of the cylinder. This increases the repelling action of the toner against the areas of the drum not exposed to laser light. The negative DC bias applied to the developing cylinder is also changed according to the Print Density setting. Both the primary charging roller and developing cylinder DC bias voltages are changed in response to the density setting. These changes in DC bias cause either more or less toner to be attracted to the drum, thus increasing or decreasing print density.

The toner is a powdery substance made of black plastic resin bound to iron particles. The toner particles are attracted to the magnetic core of the developing cylinder. A rubber blade "brushes" the toner on the developing cylinder to a uniform thickness.
The toner particles obtain a negative static charge by rubbing against the developing cylinder, which is charged with a negative DC bias. The negatively charged toner is attracted to the discharged (exposed, more positive) areas of the drum and repelled from the negatively charged (non-exposed) areas.

![Image Development](image.png)
Image Transferring and Media Separation

During the image transferring process, the toner image on the drum surface is transferred to the media. A positive charge applied to the back of the media by the transfer roller causes the negatively charged toner particles on the drum surface to be attracted to the media.

The small diameter of the drum, combined with the stiffness of the media, causes the media to separate easily from the drum. The static eliminator teeth also help separate the paper from the drum. The static eliminator teeth weaken the attractive forces between the negatively charged drum surface and the positively charged paper. This action keeps thin media from wrapping around the drum. After separation, the drum is cleaned and conditioned for the next image.

![Image Transferring and Media Separation](image_url)
Image Fusing

The Fusing Assembly bonds the toner particles into the media with a heated fusing roller and a soft pressure roller. There are two levers on the Fusing Assembly that adjust roller pressure for single sheets (down position) or envelopes (up position). Both levers must be set to the same position.

The fusing roller contains two quartz-halogen lamps that provide heat for the fusing process. Fusing temperature is monitored by the DC Controller PCA via thermistor TH1. The DC Controller maintains a temperature of about 190° C during print mode. If the fusing system overheats (about 230° C), TH1 opens, interrupting power to the fusing heater, causing a 50.x FUSER ERROR. If the fusing system exceeds 230° C, the thermal fuse opens, moving power away from the fuser.

Figure 5-13 Image Fusing
Paper Paths and Components

Printer, Duplexer, and Envelope Feeder

The components of the printer paper path are illustrated in figure 5-14. Figure 5-15 and table 5-1 illustrate and describe all of the printer sensors, solenoids, clutches, motors, and fans.

Figure 5-14  Printer Paper Paths
Table 5-1. Printer Sensors, Solenoids, Clutches, Motors, and Fans

<table>
<thead>
<tr>
<th>Control Device</th>
<th>Title</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL1</td>
<td>Registration Clutch</td>
<td>PIU (right side)</td>
</tr>
<tr>
<td>CL2</td>
<td>Paper Input Unit Feed Clutch</td>
<td>PIU (right side)</td>
</tr>
<tr>
<td>CL3</td>
<td>Tray 1 Feed Clutch</td>
<td>Tray 1 Drive Unit</td>
</tr>
<tr>
<td>Fan 1</td>
<td>Laser/Scanner Fan</td>
<td>Under Top Cover</td>
</tr>
<tr>
<td>Fan 2</td>
<td>Low Voltage Power Supply</td>
<td>LVPS</td>
</tr>
<tr>
<td>Fan 3</td>
<td>Formatter Fan</td>
<td>Below Formatter</td>
</tr>
<tr>
<td>Fan 4</td>
<td>Face-down Delivery Unit Fan</td>
<td>Under Top Cover</td>
</tr>
<tr>
<td>Fan 5</td>
<td>Tray 1 Fan</td>
<td>Tray 1 Drive Unit</td>
</tr>
<tr>
<td>MT1</td>
<td>Main Motor</td>
<td>Behind HVPS</td>
</tr>
<tr>
<td>PS1</td>
<td>Registration Paper Sensor</td>
<td>Registration Assembly (center)</td>
</tr>
<tr>
<td>PS2</td>
<td>Paper Input Unit Paper Sensor</td>
<td>Paper Input Unit (top, center)</td>
</tr>
<tr>
<td>PS1201</td>
<td>Tray 3 Paper Present Sensor</td>
<td>Paper Input Unit PCA</td>
</tr>
<tr>
<td>PS1202</td>
<td>Tray 2 Paper Present Sensor</td>
<td>Paper Input Unit PCA</td>
</tr>
<tr>
<td>PS1203</td>
<td>Tray 3 Paper Level Sensor 1</td>
<td>Paper Input Unit PCA</td>
</tr>
<tr>
<td>PS1204</td>
<td>Tray 3 Paper Level Sensor 2</td>
<td>Paper Input Unit PCA</td>
</tr>
<tr>
<td>PS1205</td>
<td>Tray 2 Paper Level Sensor 1</td>
<td>Paper Input Unit PCA</td>
</tr>
<tr>
<td>PS1206</td>
<td>Tray 2 Paper Level Sensor 2</td>
<td>Paper Input Unit PCA</td>
</tr>
<tr>
<td>PS1207</td>
<td>Tray 3 Paper Out Sensor</td>
<td>Paper Input Unit PCA</td>
</tr>
<tr>
<td>PS1208</td>
<td>Tray 2 Paper Out Sensor</td>
<td>Paper Input Unit PCA</td>
</tr>
<tr>
<td>PS1301</td>
<td>Tray 1 Paper Present Sensor</td>
<td>Tray 1 Drive Unit PCA</td>
</tr>
<tr>
<td>PS1302</td>
<td>Tray 1 Lifting Plate Position Sensor</td>
<td>Tray 1 Drive Unit PCA</td>
</tr>
<tr>
<td>PS1401</td>
<td>Face-down Bin Full Sensor</td>
<td>Switch/Sensor PCA</td>
</tr>
<tr>
<td>PS1402</td>
<td>Face-down Bin Delivery Sensor</td>
<td>Switch/Sensor PCA</td>
</tr>
<tr>
<td>PS1403</td>
<td>Fuser Delivery Sensor</td>
<td>Switch/Sensor PCA</td>
</tr>
<tr>
<td>SL1</td>
<td>Tray 2 and 3 Paper Pickup Solenoid</td>
<td>PIU (right side)</td>
</tr>
<tr>
<td>SL2</td>
<td>Tray 1 Lifting Plate Solenoid</td>
<td>Tray 1 Drive Unit</td>
</tr>
<tr>
<td>SL3</td>
<td>Face-up Bin Delivery Solenoid</td>
<td>Left Rear Corner of Chassis (behind diverter door)</td>
</tr>
<tr>
<td>SMT1</td>
<td>Tray 2 and 3 Paper Pickup Motor</td>
<td>PIU (right side)</td>
</tr>
<tr>
<td>SW1401</td>
<td>Doors Open Switch</td>
<td>Switch/Sensor PCA</td>
</tr>
<tr>
<td>Tray 2, SW1601</td>
<td>Tray 2 Paper Size Sensing Switch</td>
<td>Behind LVPS</td>
</tr>
<tr>
<td>Tray 2, SW1602</td>
<td>Tray 2 Paper Size Sensing Switch</td>
<td>Behind LVPS</td>
</tr>
</tbody>
</table>
Table 5-1. Printer Sensors, Solenoids, Clutches, Motors, and Fans (continued)

<table>
<thead>
<tr>
<th>Control Device</th>
<th>Title</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tray 2, SW1603</td>
<td>Tray 2 Paper Size Sensing Switch</td>
<td>Behind LVPS</td>
</tr>
<tr>
<td>Tray 2, SW1604</td>
<td>Tray 2 Paper Size Sensing Switch</td>
<td>Behind LVPS</td>
</tr>
<tr>
<td>Tray 3, SW1601</td>
<td>Tray 3 Paper Size Sensing Switch</td>
<td>Behind LVPS</td>
</tr>
<tr>
<td>Tray 3, SW1602</td>
<td>Tray 3 Paper Size Sensing Switch</td>
<td>Behind LVPS</td>
</tr>
<tr>
<td>Tray 3, SW1603</td>
<td>Tray 3 Paper Size Sensing Switch</td>
<td>Behind LVPS</td>
</tr>
<tr>
<td>Tray 3, SW1604</td>
<td>Tray 3 Paper Size Sensing Switch</td>
<td>Behind LVPS</td>
</tr>
</tbody>
</table>

**Note**  
See figure 5-15 for the locations of sensors, solenoids, clutches, motors and fans in table 5-1.

**Figure 5-15**  
Printer Sensors, Solenoids, Clutches, Motors, and Fans
Paper Size Switches (Trays 2 and 3)

The paper guides in Trays 2 and 3 operate four levers at the back of the trays that activate the size sensing switches (SW1601 through SW1604) mounted in the printer chassis. Paper sizes are compared to switch conditions in table 5-2.

Table 5-2. Paper Size Switches

<table>
<thead>
<tr>
<th>Paper Size</th>
<th>SW1601</th>
<th>SW1602</th>
<th>SW1603</th>
<th>SW1604</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ledger (portrait)</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>A3 (portrait)</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>B4 (portrait)</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Legal (portrait)</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Letter (landscape)</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>A4 (landscape)</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

Printing from Tray 1

The presence of paper in Tray 1 is detected by the Tray 1 Paper Present Sensor (PS1301). The lifting plate pressurization solenoid (SL2) is then activated, releasing the plate that applies upward pressure on the paper and causing it to contact the Tray 1 pickup roller. The Tray 1 Feed Clutch (CL3) turns on at this time and feeds the paper from Tray 1 to the registration position.

The remainder of the Tray 1 print process is identical to the Tray 2 and 3 process, described in “Printing from Tray 1” on page 153.

Printing from Trays 2 and 3

The Pickup, Feed, and Separation rollers start rotating when the DC Controller receives the /PRNT signal from the Formatter PCA. Then, the DC Controller activates the Pickup Solenoid (SL1) and starts feeding paper through the Paper Input Unit (PIU), triggering photosensors PS2 and then PS1. These sensors inform the DC Controller that paper has passed through the PIU and is present at the Registration Assembly.

When the Laser/Scanner and Fuser are ready, the DC Controller sends the /VSREQ signal to the Formatter. When the Formatter has processed the print data, it sends the /VSYNC and /VDO signals to the DC Controller. The paper is then released from the Registration Assembly (by CL1) and fed to the photosensitive drum, starting the
image transfer and fusing processes. After the paper passes through the Fuser, it triggers PS1403 and PS1402 to the specified type, size, and destination of the paper being fed through the printer.

**Printing from the Envelope Feeder**

The Envelope Feeder mounts in slots above Tray 1. The printer can print from Tray 1 even during the installation of the Envelope Feeder. When the print job calls for an envelope, it is fed directly to the Registration Assembly. From there, the print process is identical to the Tray 2 and 3 process, described in “Printing from Tray 1” on page 153.

**Printing with the Duplexer**

The duplexer mounts inside the printer below the Fusing Assembly. The back side of the paper is printed first, the paper is turned over, and then fed back to the Registration Assembly for front side printing. When the print job calls for 2-sided printing, a solenoid in the duplexer operates the duplex flipper in the Diverter Assembly and routes the paper to the duplexer. The paper does not exit the printer when being turned over for 2-sided printing. It is routed through a slot in the back of the duplexer, down inside the left cover and under Tray 3. When the duplexer senses the trailing edge of the paper, it reverses direction and feeds the paper back through the duplexer to the Registration Assembly.
2000-sheet Input Tray (Tray 4) Components

The HP 2000-sheet Input Tray now supports variable engine input speeds, ranging from 6 to 32 ppm. The 2000-sheet Input Tray also automatically senses paper size. Figure 5-16 illustrates the paper path components in the 2000-sheet Input Tray. Table 5-3 and figure 5-17 describe and illustrate the sensors, switches, clutches, and motors on the 2000-sheet Input Tray.

![2000-sheet Input Tray Paper Path](image)

**Figure 5-16  2000-sheet Input Tray Paper Path**
Table 5-3. 2000-sheet Input Tray Sensors, Switches, Clutches and Motors

<table>
<thead>
<tr>
<th>Control Device</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL31</td>
<td>Vertical Transfer Unit (VTU) Clutch</td>
<td>Vertical Transfer Unit (VTU)</td>
</tr>
<tr>
<td>CL32</td>
<td>Main Drive Clutch</td>
<td>VTU</td>
</tr>
<tr>
<td>MT31</td>
<td>Main Motor</td>
<td>Paper Deck Drive Assembly</td>
</tr>
<tr>
<td>PS31</td>
<td>Paper Entry Sensor</td>
<td>VTU</td>
</tr>
<tr>
<td>PS32</td>
<td>Paper Exit Sensor</td>
<td>VTU</td>
</tr>
<tr>
<td>PS33</td>
<td>Paper Tray Empty Sensor</td>
<td>Paper Pickup Assembly</td>
</tr>
<tr>
<td>PS34</td>
<td>Paper Tray Raised Sensor</td>
<td>Paper Pickup Assembly</td>
</tr>
<tr>
<td>PS35</td>
<td>VTU Closed Sensor</td>
<td>Paper Pickup Assembly</td>
</tr>
<tr>
<td>SW601-SW602</td>
<td>Paper Quantity Switches</td>
<td>Lower Chassis</td>
</tr>
<tr>
<td>SW701-SW704</td>
<td>Paper Size Switches</td>
<td>Lower Chassis</td>
</tr>
<tr>
<td>Power Supply Switch</td>
<td>Normal/Diagnostic Mode Switch</td>
<td>Power Supply</td>
</tr>
<tr>
<td>VTU Motor</td>
<td>Vertical Transfer Unit Motor for entry and exit rollers</td>
<td>VTU</td>
</tr>
</tbody>
</table>
2000-Sheet Input Tray Operation

Pickup and Feed System

When the 2000-sheet Input Tray is loaded with paper and the paper tray is closed, the paper stack moves into position under the Pickup, Feed, and Separation Rollers. This operation is detected by the PS34 sensor in the 2000-sheet Input Tray’s Pickup Assembly. The presence of paper in the paper tray is detected by the PS33 sensor. The paper level is detected by switches SW601 and SW602 in the Paper Quantity Switch Assembly. The paper size is detected by switches SW701 through SW704 in the Paper Size Switch Assembly. Tables 5-4 and 5-5 show the paper quantity and paper size switches on the 2000-sheet Input Tray.
When the Paper Handling Controller on the printer sends an input command to the Controller PCA on the 2000-sheet Input Tray, the Paper Deck Driver runs the Pickup Motor to rotate the Pickup, Feed, and Separation Rollers. As the Pickup Roller turns, the paper feeds into the Vertical Transfer Unit (VTU) and passes through the PS31 and PS32 sensors.

If the paper fails to reach the PS31 and PS32 sensors in the VTU within the allotted time, the Controller PCA on the 2000-sheet Input Tray assumes that a paper jam has occurred. The 2000-sheet Input Tray stops the operation and reports the paper jam to the Paper Handling Controller on the printer. A paper jam message appears on the printer control panel display.

Hardware malfunctions are also displayed on the printer control panel.

Table 5-4. 2000-sheet Input Tray Paper Quantity Switches

<table>
<thead>
<tr>
<th>SW601</th>
<th>SW602</th>
<th>Remaining Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>100%</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>75%</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>50%</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>25%</td>
</tr>
</tbody>
</table>

Table 5-5. 2000-sheet Input Tray Paper Size Switches

<table>
<thead>
<tr>
<th>Paper Size (portrait)</th>
<th>SW701</th>
<th>SW702</th>
<th>SW703</th>
<th>SW704</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ledger</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>A3</td>
<td>On</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>B4</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>Legal</td>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>Letter</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>A4</td>
<td>On</td>
<td>On</td>
<td>Off</td>
<td>On</td>
</tr>
</tbody>
</table>

When the Paper Handling Controller on the printer sends an input command to the Controller PCA on the 2000-sheet Input Tray, the Paper Deck Driver runs the Pickup Motor to rotate the Pickup, Feed, and Separation Rollers. As the Pickup Roller turns, the paper feeds into the Vertical Transfer Unit (VTU) and passes through the PS31 and PS32 sensors.

If the paper fails to reach the PS31 and PS32 sensors in the VTU within the allotted time, the Controller PCA on the 2000-sheet Input Tray assumes that a paper jam has occurred. The 2000-sheet Input Tray stops the operation and reports the paper jam to the Paper Handling Controller on the printer. A paper jam message appears on the printer control panel display.

Hardware malfunctions are also displayed on the printer control panel.
Lifter Operation

The lifter plate in the 2000-sheet Input Tray’s paper tray is held by two wires that are wound on four pulleys by the Lifter Motor. When the paper tray is open, the pulley gears disengage from the motor gears, and the Lifter lowers by its own weight. The presence or absence of the tray is detected by switches SW701 through SW704 on the unit’s Paper/Tray Size Switch Assembly.

After the paper tray is closed, the Lifter Motor lifts the paper stack into position; this action is detected by the PS34 sensor. The PS34 sensor also maintains the height of the paper stack. As paper is picked up by the rollers, the number of sheets decreases. Once the paper stack decreases to a certain level, the PS34 sensor registers a low condition. Then the Paper Deck Driver turns on the Lifter Motor again and lifts the paper stack until the PS34 sensor registers sufficient paper in the tray.

Power Supply

The 2000-sheet Input Tray has an internal Power Supply that activates when the printer’s power switch is turned on. The Paper Handling Controller on the printer sends a power-on signal to the Power Supply on the 2000-sheet Input Tray through the Controller PCA on the 2000-sheet Input Tray. When the signal is high, the Power Supply provides both +24V and +5V to the Paper Deck Driver. The +24V drives the motors, clutches, and solenoids for the lifter, feed, and pickup systems. The +5V drives the sensors and PCA electronics.

Printing from the 2000-sheet Input Tray (Tray 4) or 2 x 500-sheet Input Tray (Trays 4 and 5)

Trays 4 and 5 feed the paper upward through a guide slot in the Lower Right Door Assembly to the Paper Input Unit. Once there, the operation is the same as printing from Trays 2 and 3, described in “Printing from Tray 1” on page 153.
2 x 500-sheet Input Tray

The 2 x 500-sheet Input Tray is an input paper handling device that provides two additional input trays that hold up to 500 sheets each. The device is designed to support different printer platforms with variable engine input speeds, from 6 to 32 pages per minute, and provide storage space for printer supplies or consumables. The device has automatic paper size sensing and enhanced network management capabilities.

The 2 x 500-sheet Input Tray paper path is shown in figure 5-18.
### Table 5-6. 2 x 500-sheet Input Tray Sensors, Switches, and Motors

<table>
<thead>
<tr>
<th>Control Device</th>
<th>Title</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS1203</td>
<td>Lower Cassette Paper Level Sensor 1</td>
<td>Pickup Assembly PCA</td>
</tr>
<tr>
<td>PS1204</td>
<td>Lower Cassette Paper Level Sensor 2</td>
<td>Pickup Assembly PCA</td>
</tr>
<tr>
<td>PS1201</td>
<td>Lower Cassette Sensor</td>
<td>Pickup Assembly PCA</td>
</tr>
<tr>
<td>PS 1208</td>
<td>Upper Cassette Paper Out Sensor</td>
<td>Pickup Assembly PCA</td>
</tr>
<tr>
<td>PS 1206</td>
<td>Upper Cassette Paper Level Sensor 2</td>
<td>Pickup Assembly PCA</td>
</tr>
<tr>
<td>PS 1205</td>
<td>Upper Cassette Paper Level Sensor 1</td>
<td>Pickup Assembly PCA</td>
</tr>
<tr>
<td>PS2</td>
<td>Paper Jam Sensor</td>
<td>Vertical Transfer Unit (VTU)</td>
</tr>
<tr>
<td>CL31</td>
<td>VTU Clutch</td>
<td>VTU</td>
</tr>
<tr>
<td>PS35</td>
<td>VTU Closed and Open Sensor</td>
<td>Pickup Assembly</td>
</tr>
<tr>
<td>SW1601-SW1604</td>
<td>Paper Size Switches</td>
<td>Back Lower Chassis</td>
</tr>
<tr>
<td>Power Supply</td>
<td>Normal/Diagnostic Mode Switch</td>
<td>Power Supply</td>
</tr>
<tr>
<td>VTU Motor</td>
<td>Vertical Transfer Unit for entry and exit rollers</td>
<td>VTU</td>
</tr>
</tbody>
</table>

---

**Figure 5-19**  
2 x 500-sheet input Tray Sensors and Switches
2 x 500-sheet Input Tray Operation

Communication and control of the input device are made through the Paper Handling Controller by a sequence of instructions controlled into the 2 x 500-sheet Input Tray controller PCA.

Pickup and Feed System

When each tray in the 2 x 500-sheet Input Tray is loaded with paper and the paper tray is closed, the paper stack moves into position under the Pickup, Feed, and Separation Rollers. The trays are detected by the PS1202 sensor in the upper tray and by the PS1201 sensor in the lower tray. The presence of paper is detected in the upper paper tray by the PS1208 sensor, and in the lower tray by sensor PS1207. The paper level is detected by switches SW1205 and SW1206 in the upper tray, and by switches SW1203 and SW1204 in the lower tray. The paper size is detected by switches SW1601 through SW1604 installed in each tray.

Table 5-7. 2 x 500-sheet Input Tray Switches

<table>
<thead>
<tr>
<th>Paper Size</th>
<th>SW1601</th>
<th>SW1602</th>
<th>SW1603</th>
<th>SW1604</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ledger (Portrait)</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>A3 (Portrait)</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>B4 (Portrait)</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Legal (Portrait)</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Letter (Landscape)</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>A4 (Landscape)</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

When the Paper Handling Controller in the printer sends an input command to the Controller PCA on the 2 x 500-sheet Input Tray, the 2 x 500-sheet Input Tray driver engages the Pickup Motor to rotate the Pickup, Feed, and Separation Rollers. The direction of rotation of the Pickup motor determines which set of rollers are activated. When the motor rotates clockwise, the paper is picked up from the upper tray, and when the motor rotates counterclockwise, the paper is picked up from the lower tray. The 2 x 500-sheet Input Tray driver also engages the 2 x 500-sheet Input Tray motor to activate the Pickup Solenoid, which lowers the rollers to the level of the paper. As the Pickup Roller turns, the paper feeds into the Vertical Transfer Unit (VTU) and passes through the PS1 and PS2 sensors.
If the paper fails to reach the PS1 and PS2 sensors in the VTU within the allotted time, the Controller PCA on the 2 x 500-sheet Input Tray assumes that a paper jam has occurred. The 2 x 500-sheet Input Tray stops the operation and reports the paper jam to the Paper Handling Controller on the printer. A paper jam message appears on the printer control panel display.

Hardware malfunctions are also displayed on the printer control panel.

**Lifter Operation**

The 2 x 500-sheet Input Tray drive motor lifts the paper when a tray is installed and when the pickup roller is lowered as a result of a partially filled tray.

When a tray is installed, the Paper Pickup Solenoid SL3 is turned on. The movements of the shaft drive arm and the lift-up release arm free the lift-up cam. This advances the lifter gear one tooth at a time, raising the lifting plate. When the paper on the lifting plate engages the pickup roller, the lift-up cam is stopped from rotating, and the lifting operation is completed.

When the paper falls below a set level, the actions are the same to lift the plate, except the position of the pickup roller (which is lowered as paper is used) triggers the lift-up release arm to free the lift-up cam, advancing the lifter gear. The lifting operation terminates the same way in both cases, triggered by contact between the paper in the tray and the pickup roller.

**Power Supply**

The 2 x 500-sheet Input Tray has an internal power supply activated when the printer power switch has been turned on. The Paper Handling Controller sends a power-on signal to the power supply through the 2 x 500-sheet Input Tray controller. When the signal is high, the power supply provides +24V and +5V to the paper deck driver. The +24V is used to drive the lifter, Feed, Pickup motors, clutches, and solenoids; +5V drives sensors and PCA electronics.
7-bin Tabletop Mailbox Components

Components of the 7-bin Tabletop Mailbox paper path, including mailbox sensors, switches and motors, are illustrated in figure 5-20 and figure 5-21 and described in table below.

Figure 5-20  7-bin Tabletop Mailbox Components (1 of 2)
<table>
<thead>
<tr>
<th>Control Device</th>
<th>Title</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Motor</td>
<td>Upper back side</td>
</tr>
<tr>
<td>S1</td>
<td>Face-up/down Diverter Solenoid</td>
<td>Upper front side</td>
</tr>
<tr>
<td>S2</td>
<td>Reversing mechanism solenoid</td>
<td>Right side of the motor</td>
</tr>
<tr>
<td>S3</td>
<td>Diverters solenoid (bins 1, 3, and 5)</td>
<td>Bottom back side</td>
</tr>
<tr>
<td>S4</td>
<td>Diverters solenoid (bins 2, 4, and 6)</td>
<td>Bottom back side</td>
</tr>
<tr>
<td>BES1 to 7</td>
<td>Bin empty sensors (1 to 7)</td>
<td>Surface of every Face-down Bin</td>
</tr>
<tr>
<td>BFS1 to 7</td>
<td>Bin full sensors (1 to 7)</td>
<td>Upper left side of every Face-down Bin entrance</td>
</tr>
<tr>
<td>FUBFS</td>
<td>Face-up Bin full sensor</td>
<td>Upper center of the Face-up Bin entrance</td>
</tr>
<tr>
<td>ES</td>
<td>Paper entry sensor</td>
<td>Paper entrance</td>
</tr>
<tr>
<td>FUDS</td>
<td>Face-up Delivery Sensor</td>
<td>Rev. assembly. (top cover)</td>
</tr>
<tr>
<td>PPS1</td>
<td>Paper path sensor 1</td>
<td>Inside the unit, down the entry rollers.</td>
</tr>
<tr>
<td>PPS2</td>
<td>Paper path sensor 2</td>
<td>Paper path (right cover)</td>
</tr>
<tr>
<td>ILSW</td>
<td>Interlock switch</td>
<td>Bottom right side</td>
</tr>
</tbody>
</table>

Table 5-8. 7-bin Tabletop Mailbox Sensors, Switches, and Motors

![Figure 5-21](image_url) 7-bin Tabletop Mailbox Components (2 of 2)
7-bin Tabletop Mailbox Operation

The 7-bin Tabletop Mailbox is a low cost output device designed to support different printer platforms at variable engine input speeds and to increase office productivity. The mailbox has a total capacity of 940 sheets distributed in 7x120 Face-down bins and a 1x100 Face-up Bin, and works with four intelligent and configurable operating modes.

An additional optional product, the Stand for the 7-bin Tabletop Mailbox, allows the customer to attach the mailbox in a floor stand configuration when an input device is attached to the printer.

Power-on Sequence

During the power-on sequence, the mailbox runs an initialization routine. The motor will perform a complete cycle and solenoid S2, S3, and S4 will be activated in that order. At the end of this routine, the front cover LED will display a fixed green light, but if there is a problem, the LED will flash red.

The information from the paper handling controller is carried by the C-link cables that connect the controller board for all of the C-link protocol-supported devices. The C-link protocol supports up to 5 devices connected to the paper handling controller in a Daisy Chain. Each device controller has an input and output port that provides them the flexibility of connection in different configurations. However, HP recommends using the configuration shown in figure 5-28 on page 181 to avoid rearrangements in the supported device numbering and confusion when evaluating the event log.

Receiving Paper

The engine delivers paper to the mailbox through the Face-up Delivery Slot (input paper guide) at 107 mm/sec. The entry sensor (ES) senses paper arrival, and then the Face-up/down Diverter Solenoid actuates only if the paper is going to the Face-up Bin. If the paper has to reach any Face-down Bin, this solenoid will not actuate and the paper will go into the reversing area.
Delivering Paper

If the paper is going to the Face-up Bin, the Face-up Delivery Sensor (FUDS) waits for the paper to reach the Face-up Bin. When the bin is full, the paper will actuate the Face-up Bin full sensor (FUBFS).

If the paper is sent to any of the Face-down bins, the reversing mechanism will be activated by the reversing mechanism solenoid (S2). The paper path sensor 1 (PPS1) will wait for paper, and the correct diverter solenoid will actuate to deliver the paper in the correct bin (S3 if the paper is going to bin numbers 1 through 3 or S4 for bin number 2).

If the paper has to reach other bins, then the paper path sensor 2 (PPS2) will be waiting for it. In the same way, S3 will be activated if the paper final destination is bin number 5, and if not, then S4 will be activated to reach bins 4 through 6. Finally, if the paper destination is bin number 7, none of the solenoids will be actuated. When a specific bin is full, then the paper will actuate the corresponding Face-down Bin full sensor (BFS1 to 7). The unit can report an empty bin condition to the engine based on the empty bin sensors (BES1 to 7).

Configuring the Operating Modes

The network administrator chooses the mode of operation through an HP network configuration utility, such as HP JetAdmin or HP LaserJet utility. You must set up your printer driver to reflect the mode chosen by the administrator.

Bidirectional environment: The printer automatically selects the mode established by the network administrator.

Unidirectional environment: The mode of operation can be changed in the driver. The method for changing the mode varies with the driver and type of operating system. For additional information, see the online help for the printer software.

Configurable Mailbox Mode (Default Configuration)

In this mode, each bin can be addressed individually as the output destination and can have a name assigned to it by the network or mopier administrator. All the jobs are placed in the Face-down bins. If the assigned bins are full, the printer halts or sends the next pages to the overflow bin, as defined by the MIS manager.
Job Separator Mode

- Print jobs are automatically sent one job per bin to the first empty bin beginning with the top bin. Non-empty bins are skipped. If all bins have paper, then the job will be sent to the first non-full bin starting at the top.
- If a bin fills during delivery, the system will stop. A control panel message indicates that paper needs to be removed before delivery to that bin can continue. Delivery of the job resumes in the same bin when paper is removed.
- To clear a device full condition, empty all bins.

Note
Use of an overflow bin can cause a job to be mixed in two bins.

Virtual Stacker Mode

In Virtual Stacker Mode, printed sheets are stacked face down in the bins from the lowest bin to the top bin, regardless of job boundaries. This mode of operation takes advantage of the total capacity of the mailbox bins. The software sees the mailbox as one logical bin. When the mailbox is full, the system will halt until all bins are emptied.

Collator Mode

- Mopies of a print job are automatically sent one mopy per bin beginning with the top bin.
- If there are more mopies than bins, the delivery resumes sequentially from the top bin until all mopies are delivered.
- If a bin fills during delivery, the system will stop. A control panel message indicates which bin is full, and will display a request to remove paper. Delivery of the mopy resumes in the same bin when paper is removed.
- To clear a device full condition, empty all bins.

Note
Use of an overflow bin can cause a job to be mixed in two bins.
Figure 5-22  7-bin Tabletop Mailbox Block Diagram
8-bin Mailbox Components

The 8-bin Mailbox is an output unit designed for variable speeds, ranging from 6 to 32 ppm. The 8-bin Mailbox holds up to 2,100 sheets distributed in eight 250-sheet Face-down bins and one 100-sheet Face-up Bin. The 8-bin Mailbox also features four intelligent and configurable operating modes. Table 5-9 and figure 5-24 illustrate and describe the 8-bin Mailbox sensors, switches, motors, and Controller PCA. Figure 5-23 illustrates the components of the 8-bin Mailbox paper path.

Figure 5-23  8-bin Mailbox Paper Path
Table 5-9. 8-bin Mailbox Sensors, Switches, Motors, and Controller PCA

<table>
<thead>
<tr>
<th>Control Device</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>Delivery Head Motor</td>
<td>Upper-back side</td>
</tr>
<tr>
<td>M2</td>
<td>Flipper Roller Motor with Encoder</td>
<td>Flipper Assembly (upper back)</td>
</tr>
<tr>
<td>M3</td>
<td>Delivery Head Roller Motor</td>
<td>Delivery Head Assembly (upper back)</td>
</tr>
<tr>
<td>M4</td>
<td>Ejector Motor</td>
<td>Under Delivery Head Assembly</td>
</tr>
<tr>
<td>M5</td>
<td>Transport Belt Motor</td>
<td>Lower-back side</td>
</tr>
<tr>
<td>PSBinEmpty</td>
<td>Paper Bin Empty Sensor</td>
<td>Delivery Head Assembly (upper back)</td>
</tr>
<tr>
<td>PSBinFull/Head Position</td>
<td>Paper Bin (below) Full Sensor</td>
<td>Delivery Head Assembly (upper back)</td>
</tr>
<tr>
<td>PSEject</td>
<td>Delivery Rollers Extended Sensor</td>
<td>Delivery Head Assembly (upper back)</td>
</tr>
<tr>
<td>PSEntry</td>
<td>Paper Entry Sensor</td>
<td>Flipper Assembly (top, center)</td>
</tr>
<tr>
<td>PSExit1</td>
<td>Paper Delivered to Head Sensor</td>
<td>Delivery Head Assembly (upper back)</td>
</tr>
<tr>
<td>PSExit2</td>
<td>Paper Delivered to Bin Sensor</td>
<td>Delivery Head Assembly (upper back)</td>
</tr>
<tr>
<td>PSFaceUp</td>
<td>Reverse Stepper Motor Sensor</td>
<td>Flipper Assembly (top, center)</td>
</tr>
<tr>
<td>PSFaceFull</td>
<td>Face-up Bin Full Sensor</td>
<td>Flipper Assembly (top, center)</td>
</tr>
<tr>
<td>SW1</td>
<td>Interlock Switch</td>
<td>Middle-back Side</td>
</tr>
<tr>
<td>IR LED</td>
<td>Infrared Light-emitting Diode (for Stapler Assembly)</td>
<td>Delivery Head Assembly (left, center)</td>
</tr>
</tbody>
</table>
Figure 5-24  8-bin Mailbox Sensors, Switches, Motors, and Controller PCA
8-bin Mailbox Operation

Power-on Sequence

During the power-on sequence, the Delivery Head Assembly moves first to the top “home” position at the Face-up Bin. From that position the delivery head moves down, scanning to determine if all the Mailbox bins are installed, if they contain paper, and if they are full. Then the Delivery Head proceeds upward again to the home position and remains there for about 7 seconds. Finally, the Delivery Head Assembly moves to the bottom bin, where it waits for the next command from the Paper Handling Controller.

Note

If one of the bins has been removed or is not seated correctly, the Delivery Head Assembly will not complete the scan and will send an error message to the printer control panel.

Receiving Paper

The printer delivers paper to the 8-bin Mailbox through the left output delivery slot (Input Paper Guide) at a rate of 107 mm per second. Paper arrival is sensed by the PSEntry sensor, which activates the Flipper Roller Motor (M2), causing the paper to move through the 8-bin Mailbox transport and delivery system. See figure 5-23 on page 170.

Delivering Paper

The Delivery Head Assembly on the 8-bin Mailbox moves or stays in the indicated bin according to the commands coming from the Paper Handling Controller on the printer. If paper is designated for the Face-up Bin, the 8-bin Mailbox feeds it through the Flipper Assembly. If paper is designated for one of the Face-down bins, the 8-bin Mailbox feeds it through the Flipper Assembly until the trailing edge is sensed by the PSFaceUp sensor. Then the Flipper Roller Motor (M2) reverses and feeds the paper down between the Transport Belt and the Metal Tape until it reaches the Delivery Head Assembly.

Configuring the Operating Modes

The network administrator chooses the mode of operation through an HP network configuration utility, such as the HP JetAdmin utility or the HP LaserJet utility for the Macintosh. Additionally, on all workstations that print to the printer, the printer driver might need to be set up to reflect the chosen operating mode.
Mailbox Mode

In Mailbox Mode, the network administrator can address each bin as an output destination with a name assigned to it. The printer sends a print job to the selected bin. If the assigned bin is full, the printer either stops printing or sends subsequent pages to the overflow bin, which is also defined by the network administrator.

Job Separator Mode

- Print jobs are automatically sent one job per bin to the first empty bin beginning with the top bin. Non-empty bins are skipped. If all bins have paper, the job will be sent to the first non-full bin starting at the top.
- If a bin fills during delivery, the system will stop. A control panel message indicates that paper needs to be removed before delivery to that bin can continue. Delivery of the job resumes in the same bin when paper is removed.
- To clear a device full condition, empty all bins.

Note
Use of an overflow bin can cause a job to be mixed in two bins.

Virtual Stacker Mode

In Virtual Stacker Mode, printed sheets are stacked face down in the bins from the lowest bin to the top bin, regardless of job boundaries. This mode of operation takes advantage of the total capacity of the mailbox bins. The software sees the mailbox as one logical bin. When the mailbox is full, the system will halt until all bins are emptied.
Collator Mode

- Mopies of a print job are automatically sent one mopy per bin beginning with the top bin.
- If there are more mopies than bins, the delivery resumes sequentially from the top bin until all mopies are delivered.
- If a bin fills during delivery, the system will stop. A control panel message indicates which bin is full, and will display a request to remove paper. Delivery of the mopy resumes in the same bin when paper is removed.
- To clear a device full condition, empty all bins.

Note

Use of an overflow bin can cause a job to be mixed in two bins.

Finisher Components

The 5-bin Mailbox with Stapler is an output-Finisher paper-handling device designed to work with different HP LaserJet printers. It has both mailbox and stapling capability. The stapler unit output bin staples up to 20 sheets (letter and A4,) 20-lb paper), and has a total capacity of 350 stapled sheets.

In addition, this component has 5 Face-down bins with a capacity of 250 sheets each, and 1 Face-up Bin with a capacity of 100 sheets, for a total capacity of 1350 non-stapled sheets. The 8-bin Mailbox and the 5-bin Mailbox with Stapler have similar functionality, performance, and parts. The stapler fits into the Mailbox by removing the three upper bins and the blind cover (see figure 8-14 on page 706 for location of the blind cover).
Figure 5-25  Finisher Paper Path

Figure 5-26  Stapler Motors, Sensors, and Switches
Stapler Unit Operation

All communication and control of the mailbox, the 2000-sheet Input Tray, and the stapler unit is through the Paper Handling Controller. These instructions are sent to the stapler controller PCA located in the lower part of the stapler. Power is provided to the stapler by the 8-bin Mailbox/5-bin mailbox with Stapler external 24V DC power supply through the C-link cable. It handles letter and A4 sizes of plain paper. The stapler can staple up to a maximum of 20 sheets.

Table 5-10. Stapler Motors, Sensors, and Switches

<table>
<thead>
<tr>
<th>Control Device</th>
<th>Title</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>Stapler DC Motor</td>
<td>Stapler Assembly</td>
</tr>
<tr>
<td>M2</td>
<td>Rack Stepper Motor</td>
<td>Top Cover Assembly</td>
</tr>
<tr>
<td>M3</td>
<td>Slider Stepper Motor</td>
<td>Top Cover Assembly</td>
</tr>
<tr>
<td>M4</td>
<td>Retainer DC Motor</td>
<td>Stapler bed Assembly</td>
</tr>
<tr>
<td>IR Sensor</td>
<td>Infra Red Sensor</td>
<td>Stapler bed Assembly</td>
</tr>
<tr>
<td>STL Sensor</td>
<td>Stapler Sensor</td>
<td>Stapler Assembly</td>
</tr>
<tr>
<td>PSRack</td>
<td>Rack Sensor</td>
<td>Top Cover Assembly</td>
</tr>
<tr>
<td>PSSlider</td>
<td>Slider Sensor</td>
<td>Stapler bed Assembly</td>
</tr>
<tr>
<td>PSRetainer</td>
<td>Retainer Sensor</td>
<td>Stapler bed Assembly</td>
</tr>
<tr>
<td>PSBinFull</td>
<td>Output Bin Full Sensor</td>
<td>Stapler bed Assembly</td>
</tr>
<tr>
<td>PSNBinFull</td>
<td>Next Bin Full Sensor</td>
<td>Housing</td>
</tr>
<tr>
<td>STLout</td>
<td>Staples Out</td>
<td>Stapler Assembly</td>
</tr>
<tr>
<td>SW1</td>
<td>Top Cover Interlock Switches (2 in serial)</td>
<td>Right Hinge</td>
</tr>
</tbody>
</table>
Power-On or Reset Sequence

At power-on or reset, events are performed in the following sequence:

1. Stapler Assembly is set to a ready state.
2. Retainer Assembly is turned to its initial position.
3. Rack Assembly is moved to find its home position, which is in the left side of the Top Cover Assembly.
4. Slider Assembly is moved to find its home position, which is inside of the stapler bed.
5. Slider Assembly is moved fully out from the stapler bed to the eject position.
6. Rack Assembly is moved to activate the Exit Flap Assembly.
7. Slider Assembly is moved to its home position.
8. Rack Assembly is returned to its home position.
Main Functional Cycles of the Stapler (Internal Paper Path)

Paper Feed Cycle

The stapler bed assembly receives the paper from the 8-bin Mailbox/5-bin Mailbox with Stapler Head assembly. The IR Sensor detects when the paper arrives in the stapler. The Retainer (a shaft holding two rubber flexible fingers or anti-curl fingers) rotates once to apply pressure down and backward. This action forces the paper to register against the rear wall of the stapler bed, as well as reduces paper curl. The Registration Pusher (located in the right side of the Top Assembly) registers the paper against the left wall of the stapler bed. This cycle is repeated until the amount of sheets to be stapled is reached (with a maximum of 20).
Stapling Cycle
The Sliders move the stack of sheets to the stapling position. The Registration Pusher applies slight pressure to the stack of sheets toward the left wall of the stapler bed where the stapler is located. Then the stack of sheets is stapled.

Eject Cycle
The stapler bed sliders offset the stacks or jobs. The Off-Set Pusher (located in the left side of the Top Cover Assembly) pushes the stack towards the right side of the stapler bed, whenever it applies. The Sliders move the stack of paper from stapling position to eject position, which is out of the stapler bed (reaching the Wire Frame level). The Wire Frame directs the stack of paper. The Exit Flap Assembly moves down to prevent the job from returning to the stapler bed. The Sliders retract to home position, letting the stack of sheets fall into the output bin. The capacity of the output bin is 350 stapled sheets in jobs of five sheets or equivalent combinations.

Communication Link (Daisy Chain)
Communication Link (C-link) devices include:

- C-link Input Devices:
  - 2000-sheet Input Tray
  - 2 x 500-sheet Input Tray
- C-link Output Devices:
  - 8-bin Mailbox
  - 5-bin Mailbox with Stapler (Includes a Finisher)
  - 7-bin Tabletop Mailbox

Communication and control of the C-link devices is through the paper handling controller mounted on the printer's formatter PCA. The C-link devices (C-link protocol) have their own power supply and controller board that receives signals and commands from the paper handling controller. This communication is illustrated in figure 5-28.
Figure 5-28  Recommended C-link Configuration (Daisy Chain)
Paper Jam Detection

The PIU Sensor (PS2), the Registration Sensor (PS1), the Fuser Delivery Sensor (PS1403), and the Face-down Delivery Sensor (PS1402) detect paper moving through the printer (see figure 5-15 on page 152 and table 5-1 on page 151 for a description of each sensor and illustration of its locations). If a paper jam is detected, the DC Controller immediately stops the printing process and causes a 13.x PAPER JAM message to be displayed on the control panel. If a paper jam occurs in the Envelope Feeder, Duplexer, 2000-sheet Input Tray, 8-bin Mailbox/5-bin Mailbox with Stapler, 2 x 500-sheet Input Tray, or 7-bin Tablet Top Mailbox, the 13.x Paper Jam message will indicate the approximate location. See Chapter 7 for more details.

Printer Timing

The Formatter PCA and the DC Controller PCA share information during printer operation. This information consists of printer status, command, and dot-image data. Figure 5-29 shows the general timing of the printer events. Table 5-11 lists the events that take place during normal printer operation.

Table 5-11. Printer Timing

<table>
<thead>
<tr>
<th>Period</th>
<th>Timing</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAIT</td>
<td>From power on to the end of Main Motor initial rotation.</td>
<td>Clear the drum surface potential and clean the Transfer Roller.</td>
</tr>
<tr>
<td>STBY (standby)</td>
<td>From the end of the WAIT or the LSTR period until the input of the PRNT signal from the Formatter PCA. Or from the end of the LSTR period to power off.</td>
<td>Maintain the printer in the READY state.</td>
</tr>
<tr>
<td>INTR (initial rotation)</td>
<td>From the input of the PRNT signal from the Formatter PCA until the laser diode intensity has been stabilized.</td>
<td>Stabilize the photosensitive drum sensitivity in preparation for printing. Clean the Transfer Roller.</td>
</tr>
<tr>
<td>PRNT (print)</td>
<td>From the end of the initial rotation until the Scanner Motor stops.</td>
<td>Form images on the photosensitive drum based on the VDO signal from the Formatter PCA. Transfer the image to the media.</td>
</tr>
<tr>
<td>LSTR (last rotation)</td>
<td>From the primary voltage (DC) off until the Main Motor stops.</td>
<td>Deliver the last sheet of paper and clean the Transfer Roller.</td>
</tr>
</tbody>
</table>

If another PRNT signal is sent from the Formatter PCA, the printer returns to the INTR period. If not, it returns to the STBY period.
### Timing chart for two consecutive prints on A4 paper (Lower cassette feed - face-down tray delivery)

Power switch ON

<table>
<thead>
<tr>
<th>Operation</th>
<th>WAIT</th>
<th>STBY</th>
<th>INTR</th>
<th>PRINT</th>
<th>LSTR</th>
<th>STBY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Fixing roller heater (H1, H2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Fan (FM1, FM2, FM3, FM4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Fan (FM5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 PRINT signal (PRINT)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 VERTICAL SYNC signal (IVSYNC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Scanner motor (M1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Scanner motor ready (SCNRDY)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Main motor (MT1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Cassette pick-up solenoid (SL1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Pick-up motor (SMT1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Feed clutch (CL2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Registration clutch (CL1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Pick-up unit paper sensor (PS2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Registration paper sensor (PS1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Feeding unit delivery sensor (PS1403)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Face-down tray delivery sensor (PS1403)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Primary voltage (AC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Primary voltage (DC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Developing bias (AC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 Developing bias (DC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 Transfer voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 Static charge eliminator bias</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 Upper fixing roller bias</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Unit: Seconds)

- **Operation**: Names of various components and processes involved in printing.
- **WAIT**: Time spent in waiting state.
- **STBY**: Time spent in standby mode.
- **INTR**: Time spent in inspection mode.
- **PRINT**: Time spent in printing mode.
- **LSTR**: Time spent in last standby mode.
- **STBY**: Time spent in second standby mode.

- **Notes**: Various time intervals and conditions for each operation.
IEEE 1284 Parallel Cable Information

This cable is IEEE compliant with A-to-C connectors. To take advantage of its enhanced capabilities such as bidirectional communication between the computer and printer, faster transmission of data, and auto configuration of printer drivers, the customer must have the following:

- Support in software applications for these features.
- A parallel cable with the correct pin configuration (see below).

Parallel Cable Pin Configuration

For best results, use the C2946A (3 meter) or C2947A (10 meter) cable or equivalent.

**CAUTION**

Ensure that all power and interface cables on the printer and host computer are properly grounded in compliance with local codes.

Table 5-12. Parallel Cable Pin Assignments

<table>
<thead>
<tr>
<th>Signal Name</th>
<th>Printer Pin Number</th>
<th>Computer Port Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>nSTROBE</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>DATA0</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>DATA1</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>DATA2</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>DATA3</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>DATA4</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>DATA5</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>DATA6</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>DATA7</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>nACKNLG</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>BUSY</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>CALL (PE)</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>SELECT</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>NAutoFd</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>O VDC (GND)</td>
<td>19-35</td>
<td>18-25</td>
</tr>
<tr>
<td>nFAULT</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>nSe/In</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>nINIT</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>PERIPHLH</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>N.C.</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>
Copy Module Functional Overview

Copy Module System

Figure 5-30 Copy Module System Block Diagram

Note

The copy module consists of everything inside the large dotted line. The copy engine consists of the copy module minus the Copy Processor Board.

Mopier

- The Mopier’s hard disk stores the copy module firmware.
- The Copy Connect Extended Input/Output (EIO) Card functions as a pass-through device.
**Copy Module**

- **Power Supply and Main Board Tray Assembly**
  - The Fan Assembly activates while the copy module is turned on. It may run slower if Power Save is on.
  - The Power Supply provides AC to DC power conversion.
  - The Control PCA controls copy module electromechanical functions, imaging system, and errors. It also has an EEPROM which stores the default factory settings particular to each copy module, such as serial number and calibration settings.
  - When you replace the Control PCA, retain the EEPROM from the old PCA and replace it on the new PCA in order to retain the default settings for the HP Digital Copy 320.
  - The Back PCA Board provides a connection between the Copy Processor Board and the Control PCA.
  - The Copy Processor Board is explained on page 187.

- **ADF Unit**
  - The ADF Assembly provides all mechanics to move paper.
  - The LED Assembly provides feedback from the paper empty sensor to the user. If paper is loaded correctly, the LED is green and a tone sounds.
  - The ADF Motor Unit drives the ADF’s paper handling mechanics.
  - The Sensor Unit Assembly has 8 sensors (4 paper width sensors to detect standard paper types; 1 ADF open sensor, and 3 paper-handling sensors).
  - Charge Coupled Device (CCD)/Optics convert reflected light to electronic signals. Also includes mirrors and lenses to point the reflected light.
  - The ADF Lamp illuminates the original document.
  - The Lamp Inverter PCA controls and provides power to the ADF Lamp.
● Carrier Unit (a movable optics system under the flatbed glass, used to copy the front side of ADF jobs and flatbed jobs)
   • Charge Coupled Device (CCD)/Optics convert reflected light to electronic signals. Also includes mirrors and lenses to point the reflected light.
   • The Carrier Unit Lamp illuminates the original document.
   • The Lamp Inverter PCA controls and provides power to the Flatbed Motor Unit with Belt.
   • The Flatbed Motor Unit drives the Carrier Unit back and forth under the flatbed glass.

● Front Panel (LC touch screen and keypad interface)
● Home Position Sensor (detects obstruction of Carrier Unit, a bad Flatbed Motor or Belt)
● Junction PCA (a pass-through connection from the Control PCA to the Carrier Unit, Flatbed Motor Unit, Front Panel, and Home Position Sensor)

**Function and Layout of the Copy Processor**

![Copy Processor and key components](image)

**Figure 5-31** Copy Processor and key components

**Note** The Copy Processor is a replaceable unit.
Functions

- Controls the Front Panel display
- Monitors touch screen inputs
- Controls communication from the copier engine (no unsolicited data flows from the copier engine)
- Performs image processing (grayscale to dithered black and white)
- Initiates and controls communication to the Mopier
  - The interface is IEEE 1394 based, 200 MB per second total bus speed.
  - Copy module firmware is downloaded from the Mopier’s hard disk to the Copy Processor.
  - The user inputs settings through the touch screen Front Panel to the Copy Processor to the Mopier.
  - The Mopier sends status responses to the Copy Processor.
  - Mopier control commands go from the Copy Processor to the Mopier.
  - Image data is sent to the Mopier, essentially printer ready strip buffer data.

Key Components

- 2 PM44s [Image processing Digital Signal Processor (DSP)]
- 1 16-bit Motorola 68306 micro-controller
- 1 boot ROM, which provides code to start 1394 communication and begin to download the operating system
- 1 1394 interface and connector
- 1 DRAM
Power Up Process

Copy Processor Board

There are 4 main stages of the power-up process of the Copy Processor. Each of the four stages are represented by an icon displayed on the Digital Copy 320's front panel. If a Digital Copy 320 does not successfully boot up, the icons displayed will assist the field technician in diagnosing the failure.

While first power-up icon is displayed:

1. The 16-bit Motorola 68306 microprocessor boots itself from the ROM.
2. The Copy Processor performs minimum checks (Level-1 checks) on ROM.
3. The Copy Processor polls the keypad for initial key status (to determine whether to start up in Service Mode).
4. The Copy Processor begins performing self-checks. (During Level II checks on the Copy Processor, the user can let go of any keys held down. This is a short phase with no animation.)

While second power-up icon is displayed:

5. The connection to the HP Mopier 320 starts over the IEEE 1394 interface and looks for the HP Mopier 320. This stage may take more time if the printer is not powered on and ready. If the HP Mopier 320 is not available, the Copy Processor continuously monitors the bus to find one. Therefore, the power-on order between the HP Mopier 320 and the Copy Module does not matter.

While third power-up icon is displayed:

6. The unit begins download of the Copy Module Firmware (CMF) from the HP Mopier 320's hard disk to the Copy Processor's DRAM. This may take up to two minutes, although 60-70 seconds is most typical. The hourglass icon is animated during this time and a progress bar is displayed.
While fourth power-up icon is displayed:

7  When the download is complete, the unit begins a checksum test on download, initializes the system, and continues to display the icons until it can display the HP Digital Copy 320 Module’s main menu.

8  Initial key state and Level II failure (if any) are written to the Display Manager and are reported to the Front Panel as Boot Error XXXX. See “Boot Errors” on page 655 for a definition of XXXX.

9  The microprocessor jumps to the code in DRAM and never returns to the code in ROM. Then the Copy Module Operating System starts up in Service Mode, if the user was pressing the appropriate keys when power-up began (see Step 3), or the main menu is displayed.

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**Note**

Icons are drawn at the start of the stage. If the stage fails, the icon will be overdrawn with the error icon.
Copy Module

▼ The fan comes on.
▼ The start button LED lights yellow and then goes off.
▼ The Carrier Unit moves to the home position, as detected by the Home Position Sensor. (A grinding noise indicates the shipping lock is in place or an object is blocking the Carrier Unit.)
▼ The ADF clears any paper loaded or partially in the paper path.
▼ The back light on the Front Panel turns on. (Stopping here indicates that the unit has a bad display or connection. This is particularly true if the Copy Processor is functional.)
▼ HP Digital Copy 320 displays on the screen to confirm that the display and connections are good and the Copy Processor is able to boot from ROM.
▼ The copy module polls for an HP Mopier 320. If it is not there, the copy module will continuously monitor the bus for one. (The power on order does not matter for the Mopier or copy module.)
▼ The four icons and the status bar display.
▼ The main menu displays.
● The copy module awaits the start command.
Mopier

▼ The Mopier performs startup procedures.

Note

The Scanner Service Agent is part of the copy module firmware that loads from the Mopier's hard disk drive into the Mopier's RAM on power up. When this happens, you see Loading Program 1 on the front panel of the Mopier. This program runs continuously, instructing the Mopier how to handle requests and information from the copy module.

▼ The Mopier loads the Scanner Service Agent from the Mopier hard disk drive. Loading Program 1 displays on the Mopier's Front Panel. Additional programs may be added later for support of additional functionality.

● The Scanner Service Agent checks the printer’s product ID field to see if the printer is an HP Mopier 320. If it is not, the Scanner Service Agent will ignore requests from the copy module. Loading Program 1 will still display on the printer’s Front Panel, but the program remains dormant. See “Notes About the HP Mopier 320 Product ID” below.

Note

The units must be power cycled once the copy module firmware is installed. The copy module firmware will not work with any printer other than an HP Mopier 320.

Notes About the HP Mopier 320 Product ID

The product ID for the Mopier 320 is stored in NVRAM. If NVRAM fails or the formatter is replaced, the product ID is not lost because it is backed up on the printer's hard disk drive, beneath the FAT so that it is not lost if the disk is initialized. In the case of a hard disk failure and subsequent replacement, the product ID will be backed up again to the new hard disk.

CAUTION

Do not replace the Mopier’s hard disk drive and Formatter at the same time. Doing so will cause the printer’s product ID to revert to the HP LaserJet 8100, causing the Scanner Service Agent to be dormant, which in turn will cause the HP Digital Copy 320 to not boot up.

In the unlikely event that an HP Mopier 320 reverts to a LaserJet 8100 (confirmed by printing a configuration page), contact HP support for assistance to reprogram the printer’s product ID.

Another reason not to replace the hard disk drive and Formatter at the same time is the loss of page counting.
ADF Simplex Operation

▼ The user inputs commands (through the touch screen and buttons) which are then sent to the Copy Processor Board.

▼ The Copy Processor displays the appropriate screens on the copy module’s LCD based on the user’s inputs. The screens displayed are based on the screens downloaded from the Mopier.

▼ The user presses the **START** button and the copy module receives the ADF read command. (The ADF or flatbed is determined by the ADF paper loaded sensor.)

▼ The bottom document placed face-down in the chute is fed through the ADF. Paper size is detected by the Paper Size Sensor (A3, A4, B4, B5). This will tell the ADF Motor when to stop.

▼ The Carrier Unit reads the white reference and then moves to the ADF read position.

▼ The ADF Motor starts to feed the paper. The top sensor detects the edge of the page.

▼ The copy module counts the number of motor pulses to reach the end of the page. It also determines mispicks, double or misfeeds, and end of page when the data ends.

▼ The image is scanned by the copy module engine, as explained on page 196.

▼ The page is stacked in the output tray. This process repeats until the chute is empty.

● The ADF Motor stops and the copy module awaits the next command.
ADF Duplex Operation

▼ The user inputs the duplex command from the touch screen on the Front Panel.
▼ Frontside data is the same as simplex operation.
▼ Both the backside and frontside are copied simultaneously by two Charge Coupled Device (CCD) arrays on the HP Digital Copy 320. (A Charge Coupled Device is a miniature photometer that measures light and converts the measured value to analog voltage.)
▼ Backside data is copied and stored into the backside image buffer residing on the copy engine.
● After the frontside buffer has been sent to the Copy Processor, the data stored in the backside buffer is then sent to the Copy Processor.

Flatbed Operation

▼ The user inputs commands (through the touch screen and buttons) which are then sent to the Copy Processor Board.
▼ The Copy Processor displays the appropriate screens on the copy module’s LCD based on the user’s inputs. The screens displayed are based on the screens downloaded from the Mopier.
▼ The user presses the START button and the copy module looks for paper loaded in the ADF. If no paper is found, the copy module receives the flatbed read command.

Note The user interface is identical from ADF copy to flatbed copy.

▼ The Carrier Unit reads the white reference and then moves to the right to read from the flatbed glass and proceeds in steps for user specific paper length.
▼ The copy engine scans the image (see page 196).
● The Carrier Unit returns to the home position and the HP Digital Copy 320 awaits the next command.
Checks Executed when the Start Button is Pressed

- Paper jam
- ADF open
- Lamp intensity
- Lamp fuse
- Motor fuse
- Detect paper loaded (on ADF)
Image Path

**Figure 5-32** Image path (1 of 2)

**Step 1:** The light source illuminates a horizontal strip of the image called the raster line.

**Step 2:** Reflected light is gathered and guided by lenses and a series of mirrors and is then captured by a 4864 pixel element Charge Coupled Device (CCD) array. The CCD converts analog voltages into raw digital grayscale information.

**Step 3:** Raw digital image data is sent from the copy module’s CCD to PM-44s. The PM-44s convert raw digital information into a Mopier ready bit stream, dithered black and white with layouts such as N-up, duplex, staple, and so forth, and sends it to the Mopier via the 1394 cable. Data format is strip buffer raster data. The copy module firmware on the Mopier adds Printer Job Language (PJL) control commands later.
**Repeat**: One horizontal line or raster line of the image is captured in a step and the Carrier Unit or ADF mechanically moves to the next step. The distance moved determines the subscan sampling rate (1/300 inch = 300 ppi, 1/600 = 600 ppi).

---

**Note**

Pages load face down on the ADF. The backside optics are in the ADF above the frontside optics, which are in the Carrier Unit, below the glass.
Communication to the Mopier

**Note**
The Copy Connect EIO is essentially a pass through device.

- Data is handed from the Copy Connect EIO to the Scanner Service Agent (SSA), which is part of the copy module firmware that runs in the Mopier's RAM and shows *Loading Program 1 on* the Mopier's Front Panel when loaded successfully.

- The copy module firmware adds several Printer Job Language (PJL) control codes to set resolution, printer language and page layout.

- The data stream goes around the Mopier’s normal image processing system directly into page memory. This allows for the high speed at which copied pages can be printed.

**Communication Channels**

- Image data: high speed uni-directional 1394 channel
- All other communications: bidirectional 1394 channel

**Print Job Interrupt**

There are two levels at which a user can interrupt a network print job to make a copy on the copy module:

- Low priority - when you place a document in the ADF or touch any of the buttons on the copy module, all incoming network jobs are held until the copy module is finished copying.

- High priority - Select *JOB INTERRUPT* on the touch screen. The current mopy job is interrupted at the copy boundary. For instance, if the Mopier is printing copy 3 of 5, it will finish copy 3 and hold copies 4 and 5 until the copy module is finished copying.
Paper Path and Sensors

Figure 5-33 Locations of ADF Sensors
**Figure 5-34**  ADF Sensors functional diagram