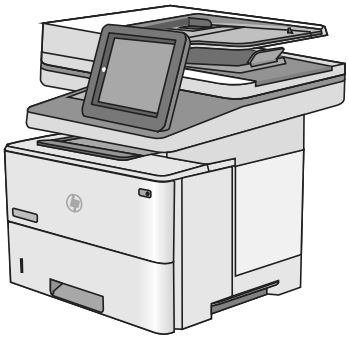
LaserJet Pro M501
LaserJet Enterprise M506
LaserJet Enterprise MFP M527

Troubleshooting Manual



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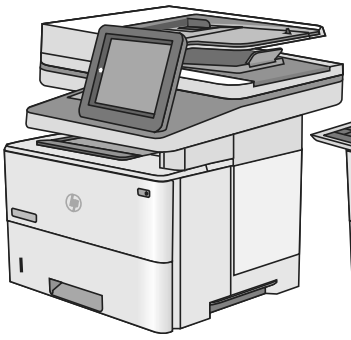

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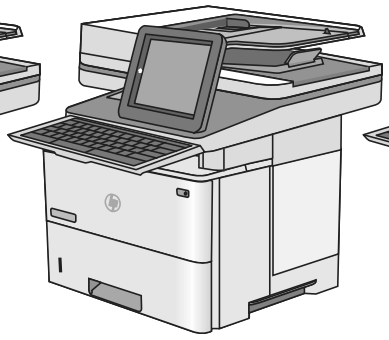

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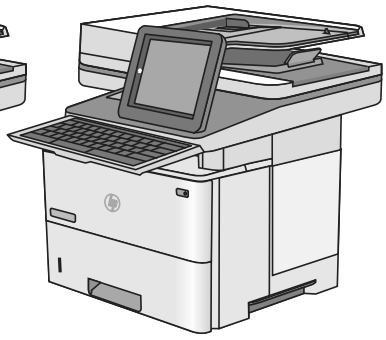

M527z

M501n
M506n

M501dn
M506dn

M506x

www.hp.com/support/ljM501
www.hp.com/support/ljM506
www.hp.com/support/ljM527MFP
For printer part removal and part number information, see the Repair Manual.

HP LaserJet Pro M501, HP LaserJet Enterprise M506, and LaserJet Enterprise MFP M527

Troubleshooting Manual

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Conventions used in this guide

TIP: Helpful hints or shortcuts.

Reinstallation tip: Reinstallation helpful hints, shortcuts, or considerations.

NOTE: Information that explains a concept or how to complete a task.

IMPORTANT: Information that help the user to avoid potential printer error conditions.

CAUTION: Procedures that the user must follow to avoid losing data or damaging the printer.

WARNING! Procedures that the user must follow to avoid personal injury, catastrophic loss of data, or extensive damage to the printer.

For additional service and support information

HP service personnel, go to the Service Access Work Bench (SAW) at http://h41302.www4.hp.com/km/saw/home.do.

Channel partners, go to HP Channel Services Network (CNS) at https://h30125.www3.hp.com/hpcsn.

At these locations, find information on the following topics:

- Install and configure
- Printer specifications
- Up-to-date control panel message (CPMD) troubleshooting
- Solutions for printer issues and emerging issues
- Remove and replace part instructions and videos
- Service advisories
- Warranty and regulatory information

To access HP PartSurfer information from any mobile device, go to http://partsurfermobile.hp.com/ or scan the Quick Response (QR) code below.

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1 Theory of operation

Related documentation and software

HP service personnel, go to the Service Access Work Bench (SAW) at http://h41302.www4.hp.com/km/saw/home.do.

Channel partners, go to HP Channel Services Network (CSN) at https://h30125.www3.hp.com/hpcsn.

Basic operation

The printer routes all high-level processes through the formatter, which stores font information, processes the print image, and communicates with the host computer.

The basic printer operation comprises the following systems:

- The engine-control system, which includes the high-voltage and low-voltage power supplies (HVPS and LVPS), fuser control circuits, and the DC controller printed circuit assembly (PCA)
- The laser/scanner system, which forms the latent image on the photosensitive drum
- The image-formation system, which transfers a toner image onto the paper
- The pickup, feed and delivery system, which uses a system of rollers and belts to transport the paper through the printer
- Accessory (optional paper feeder)

Figure 1-1 Relationship between the main printer systems

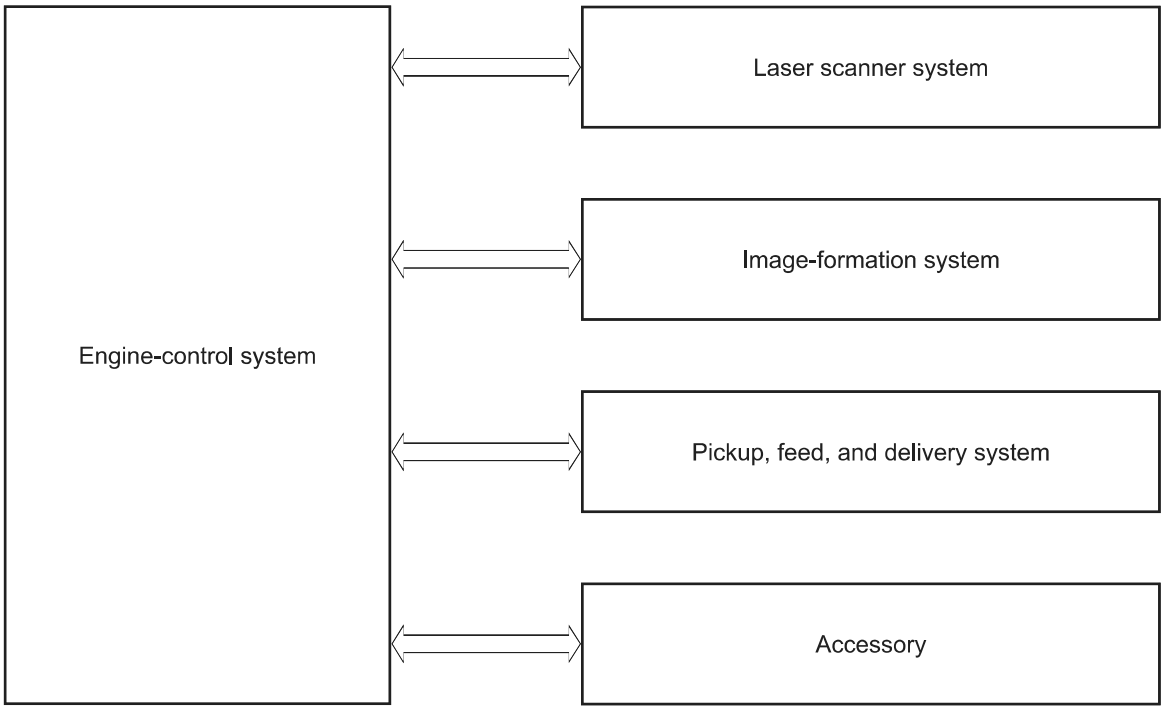
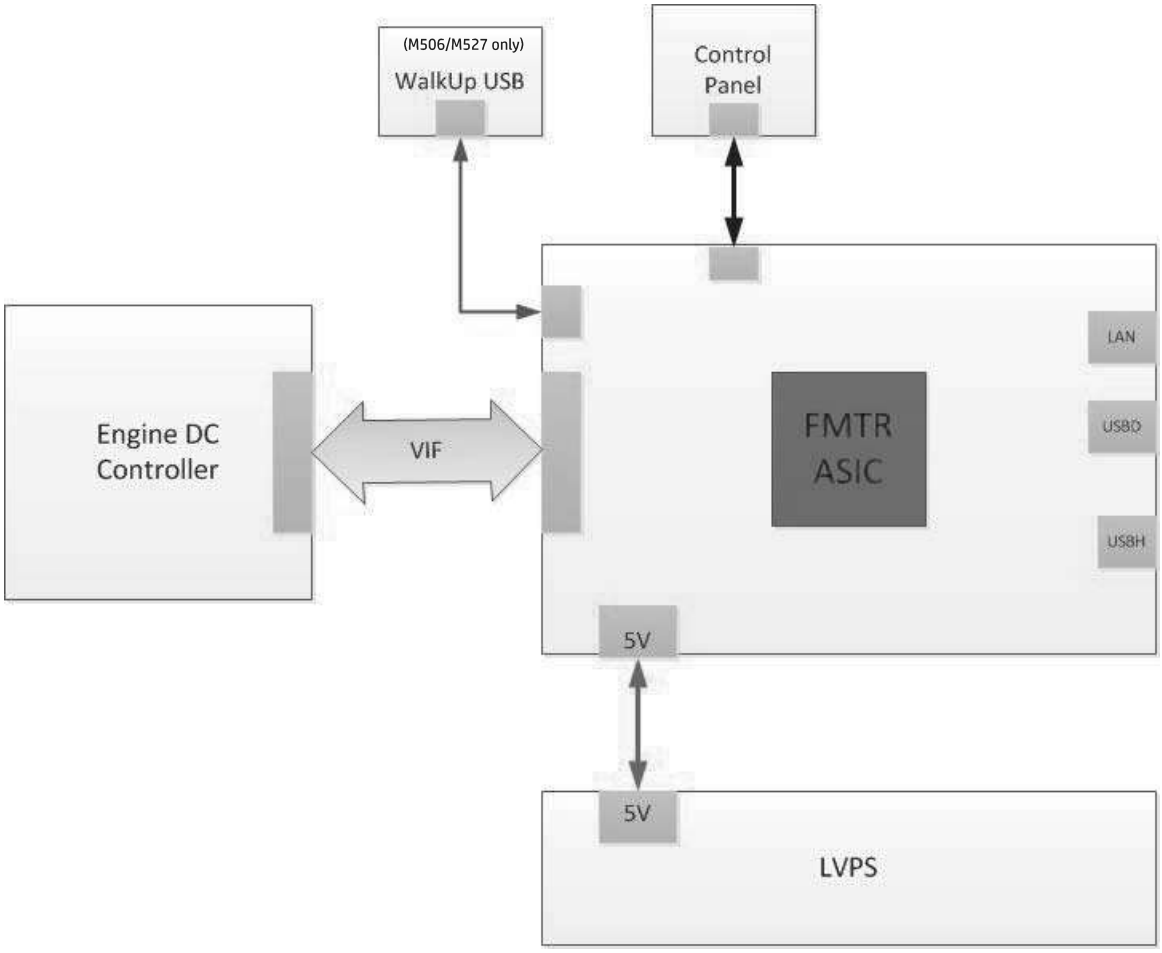


Figure 1-2 System block diagram



Sequence of operation

The DC controller PCA controls the operating sequence, as described in the following table.

Table 1-1 Sequence of operation

Period	Duration	Description
Waiting	From the time the power is turned on, the door is closed, or when the printer exits Sleep mode until the printer is ready for printing.	• Heats the fuser film in the fuser • Detects the toner cartridge • Rotates and stops each motor • Rotates and stops each fan • Cleans the transfer roller
Standby	From the end of the waiting sequence, the last rotation until the formatter receives a print command, or until the printer is turned off.	• Is in the Ready state • Enters Sleep mode if the formatter sends the sleep command • Rotates and stops each fan
Initial rotation	From the time the formatter receives a print command until the paper enters the paper path.	• Rotates each motor • Rotates each fan • Activates the high-voltage power supply (high-voltage bias) • Prepares the laser/scanner unit • Warms the fuser to the correct temperature
Printing	From the time the first sheet of paper enters the paper path until the last sheet has passed through the fuser.	• Forms the image on the photosensitive drums • Transfers the toner to the paper • Fuses the toner image onto the paper
Last rotation	From the time the last sheet of paper exits the fuser until the motors stop rotating.	• Stops each motor • Stops each fan • Stops the high-voltage power supply (high-voltage bias) • Stops the laser/scanner unit • Turns the fuser heater off • If another print command is received, the printer enters the initial rotation period when the last rotation is complete.

Formatter-control system

The formatter performs the following functions:

- Controls sleep mode
- Receives and processes print data from the various printer interfaces
- Monitors control panel functions and relaying printer status information through the control panel and the network or bi-directional interface
- Develops and coordinates data placement and timing with the DC controller PCA
- Stores font information
- Communicates with the host computer through the network or the bidirectional interface

The formatter receives a print job from the network or bidirectional interface and separates it into image information and instructions that control the printing process. The DC controller PCA synchronizes the image formation system with the paper input and output systems, and then signals the formatter to send the print image data.

Sleep delay (M501)

When the printer is in sleep delay mode, the control-panel backlight is turned off, but the printer retains all printer settings, downloaded fonts, and macros. The default setting is a 5-minute idle time. This setting can be changed by using the control panel menus or the HP Embedded Web Server (EWS).

The printer exits sleep delay 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 serial port.
- The control panel is touched (button press or touchscreen touch depending on model).
- A tray is opened.

TIP: Error messages override the sleep delay message. The printer enters sleep mode at the appropriate time, but the error message continues to appear.

Sleep mode (M506/M527)

NOTE: In the General Settings menu (a submenu of the Administration menu), this item is termed Sleep Timer Settings.

This feature conserves power after the printer has been idle for an adjustable period of time. When the printer is in Sleep mode, the printer retains all settings, downloaded fonts, and macros. The default setting is for Sleep mode to be enabled, and the printer enters Sleep mode after a 30-second idle time.

The printer firmware uses a combination of timers and Sleep settings to control when the printer enters a different state, as well as what states the printer will enter. The available states are listed below, in descending order, from using the most power to using the least power:

- **Active**: The printer control panel is fully illuminated. The power button light is illuminated.
- **Shallow sleep**: The printer control panel is dim and the content is grayed out, but is still readable. The power button light is illuminated.

- **Sleep**: The printer control panel is off (blacked out). The power button light blinks once every three seconds.
- **Deep sleep**: The printer control panel is off (blacked out). The power button light blinks once every three seconds. The control panel and power button appearance is the same in this state as the sleep state. However, the printer is drawing less than 1 watt of power in the deep sleep state (as opposed to 6 watts of power in the sleep state).
- **Off**: This state is entered by pressing the power button or removing power from the printer. The power button light is not illuminated.

The printer exits Sleep mode and enters the warm-up cycle when any of the following events occur:

- The printer receives a print job, valid data, or a PML or PJL command.
- A control-panel button is pressed or the touchscreen is touched.
- A cover or door is opened.
- The engine-test switch is pressed.
- A paper tray, other than Tray 1, is opened.

NOTE: If the printer is in the deep sleep state, opening a paper tray will not cause the printer to exit Sleep mode.

NOTE: Printer error messages override the Sleep message. The printer enters Sleep mode at the appropriate time, but the error message continues to appear.

TIP: When the printer is in Sleep mode, the sub-power supply is off and the low-voltage power supply is on.

Auto On / Auto Off mode (M501)

1. On the printer control panel, press the OK button.
2. Open the following menus:
   - System Setup
   - Energy Settings
   - Sleep/Auto Off After
3. Use the arrow keys to select the time for the Sleep/Auto Off delay, and then press the OK button.

Printer job language (PJL)

PJL is an integral part of printer configuration, in addition to the standard printer command language (PCL) and PostScript (PS). With standard cabling, the printer can use PJL to perform a variety of functions, such as these:

- **Two-way communication with the host computer through a network connection or a USB device port:** The printer can inform the host about the control-panel settings, and the control-panel settings can be changed from the host.
- **Dynamic I/O switching:** The printer uses this switching to be configured with a host on each I/O. The printer can receive data from more than one I/O simultaneously, until the I/O buffer is full. This can occur even when the printer is offline.

- **Context-sensitive switching:** The printer can automatically recognize the personality (PS or PCL) of each job and configure itself to serve that personality.
- **Isolation of print environment settings from one print job to the next:** For example, if a print job is sent to the printer in landscape mode, the subsequent print jobs print in landscape only if they are formatted for landscape printing.

Printer management language (PML)

PML allows remote configuration of the printer and status read-back from the printer through the I/O ports.

Control panel

The M501n and M501dn control panel is a 2-line backlit control panel display with numeric keypad and additional buttons for navigating control panel menus.

The M506n and M506dn control panel is a 4-line backlit control panel display with numeric keypad and additional buttons for navigating control panel menus. The M506x control panel is a 10.9 cm (4.3 in) full-color SVGA with infrared touchscreen and adjustable viewing angle.

The control panel for all of the M527 models is a 20.3 cm (8 in) full-color SVGA with infrared touchscreen and adjustable viewing angle.

Easy-access USB port (M506/M527)

All models feature easy-access USB printing, for quickly printing files without sending them from a computer. The printer accepts standard USB flash drives in the USB port near the control panel. It supports the following types of files:

- .pdf
- .jpg
- .prn and .PRN
- .cht and .CHT
- .pxl
- .pcl and .PCL
- .ps and .PS
- .doc and .docx
- .ppt and .pptx

The USB port is disabled by default. Follow the instructions in the printer user guide to enable the USB port and print USB documents.

Wireless (wireless models only)

The M506x and M527z models contain a wireless card to enable wireless direct printing over an 802.11b/g/n wireless connection.

NOTE: This card does not enable the printer to connect to the network.

Low end data model (LEDM) overview (M501)

The low-end data model (LEDM) provides one consistent data representation method and defines the dynamic and capabilities tickets shared between clients and devices, as well as the access protocol, event, security, and discovery methods.

Advanced control language (ACL) overview (M501)

The advanced control language (ACL) is a language that supports printer control and firmware downloads in printers that support both PJL/PCL and host-based printing. Each sequence of ACL commands must be preceded by a unified exit command (UEL) and an @PJL ENTER LANGUAGE=ACL command. The ACL sequence is always followed by a UEL. Any number of commands can be placed between the UELs. The only exception to these rules is the download command. If a firmware download is done, the download command must be the last command in the sequence. It will not be followed by a UEL.

The firmware searches for the UEL sequence when parsing commands. However, while downloading binary data such as host-based code or NVRAM data the firmware suspends UEL parsing. To handle hosts that “disappear” during binary sequences, the firmware times out all ACL command sessions. If a timeout occurs during a non-download command sequence, it is treated as the receipt of a UEL. If a timeout occurs during firmware download, the printer resets.

Near field communication (NFC; M506/M527)

The M506x and M527z models support NFC capabilities. NFC enables a connection between the printer and a mobile device, such as a smartphone or tablet, by touching the device to the NFC icon on the bottom of the control panel. Documents and images from the mobile device can then be printed through the wireless card on the printer.

NOTE: The customer can purchase a NFC accessory and add this functionality to other M506/M527 models.

CPU

The formatter incorporates a 1.2 GHz processor.

Input/output (I/O)

The printer supports the following interfaces:

- Hi-Speed USB 2.0
- USB hosts
- 10/100/1000 Ethernet LAN connection with IPv4 and IPv6
- Fax PCA (fax models only)

  NOTE: The M527 includes a fax phone line connection.

- Easy-access USB printing (no computer required; M506/M527)
- HP near field communication (NFC) for printing from mobile devices (M506x and M527z models only)
- Wi-Fi Direct for printing from mobile devices (M506x and M527z models only)

Memory

The formatter incorporates different types of memory and storage to store the printer firmware as well as print-job data and user settings.

NOTE: M501 only: If the printer encounters a problem when managing available memory, a clearable warning message displays on the control panel.

Firmware

For the M501, Memory on the formatter stores the firmware. A remote firmware upgrade process is used to overwrite and upgrade the firmware.

For the M506n, M506dn, M506x, and M527dn models, the embedded MultiMedia Card (eMMC) on the formatter stores the firmware. For the M527c/f and Flow M527z models, the high-performance hard disk stores the firmware. A firmware upgrade process is used to overwrite and upgrade the firmware. The upgrade can use a network connection (remote upgrade) or be accomplished by using a USB flash drive.

Nonvolatile random access memory (NVRAM)

The printer uses NVRAM to store printer and user configuration settings. The contents of NVRAM are retained when the printer is turned off or disconnected.

Random access memory (RAM)

The RAM on the formatter serves as a temporary storage area for printing and system operation.

HP Memory Enhancement technology (MEt)

MEt effectively doubles the amount of standard memory through a variety of font- and data-compression methods.

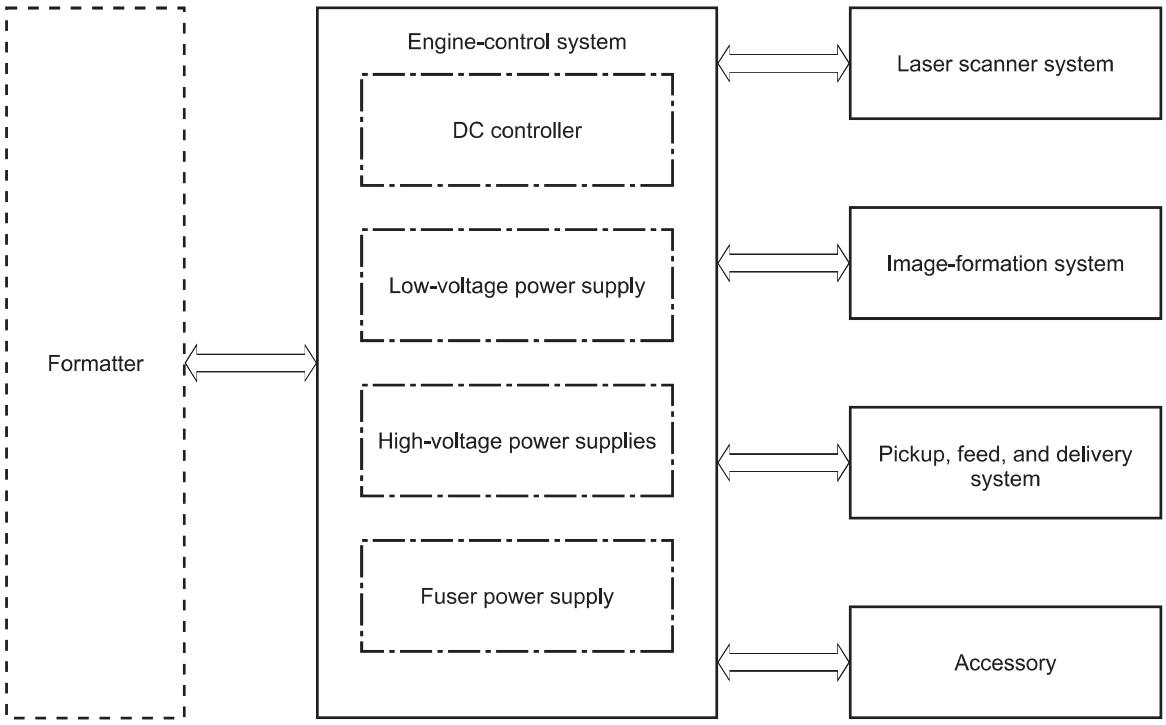
NOTE: MEt is available only when printing in printer command language (PCL) mode. It is not functional when printing in PostScript (PS) mode.

Engine-control system

The engine-control system receives commands from the formatter and interacts with the other main systems to coordinate all printer functions. The engine-control system consists of the following components:

- DC controller
- Low-voltage power supply
- High-voltage power supplies
- Fuser power supply

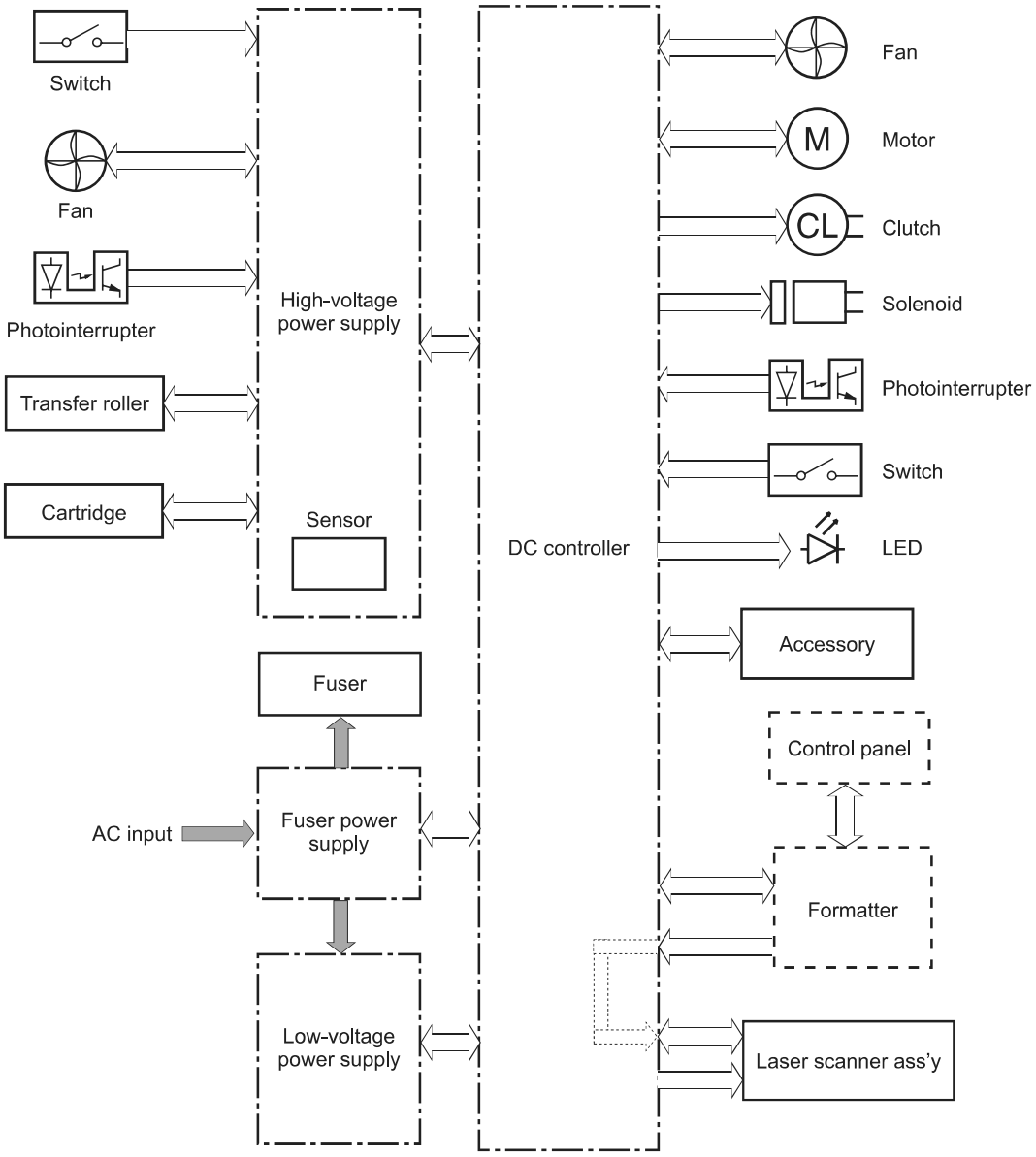
Figure 1-3 Engine-control system



DC controller

The DC controller controls the operation of the printer and its components. The DC controller starts the printer operation when the printer power is turned on and the power supply sends DC voltage to the DC controller. After the printer enters the standby period, the DC controller sends out various signals to operate motors, solenoids, and other printer components based on the print command and image data that the host computer sends.

Figure 1-4 DC controller block diagram



Motors

The printer has four motors. The motors drive the components in the paper-feed and image-formation systems.

The DC controller monitors the fuser motor and the scanner motor to determine if a motor has failed. It notifies the formatter when it encounters the following conditions:

- Startup failure: the motor does not reach a specified speed within a specified time from when the motor starts.
- Rotational failure: the rotational speed of the motor is not in the specified range for a specified time after the motor reaches a specified speed.

Table 1-2 Motors

Abbreviation	Name	Purpose	Failure detection
M1	Fuser motor	Drives the pressure roller and delivery roller; the pressurization and release of the pressure roller; and the engagement and disengagement of the primary and secondary transfer rollers	Yes
M2	Pickup motor	Drives the Tray 1 pickup roller, the Tray 2 pickup and feed rollers, the registration roller, and the feed roller	Yes
M3	Scanner motor	Drives the scanner mirror	Yes
M4	Lifter motor	Drives the Tray 2 lifter	Yes

Fans

The printer has two fans for preventing the temperature from rising in the printer and for cooling the printed pages.

The DC controller determines if there is a fan failure and notifies the formatter if a fan locks for a specified time from when the fan starts.

Table 1-3 Fans

Abbreviation	Name	Cooling area	Type	Speed
FM1	Main fan	Toner cartridge and laser scanner assembly	Intake	Full
FM2	Sub fan	Around the low-voltage power supply and formatter	Intake	Full/half

Solenoids

Table 1-4 Solenoids

Component abbreviation	Component name
SL1	Tray 2 pickup solenoid
SL2	Tray 1 pickup solenoid
SL3	Duplex switchback solenoid (duplex models only)

Clutches

Table 1-5 Clutches

Component abbreviation	Component name
CL1	Duplex re-pickup clutch (duplex models only)

Switches

Table 1-6 Switches

Component abbreviation	Component name
SW1	Power switch
SW2	Cartridge door switch
SW4	Tray 2 detection switch
SW5	Rear door switch
SW201	Test print switch

Photointerrupter sensors

Table 1-7 Photointerrupter sensors

Component abbreviation	Component name
PS1a	Media-width sensor
PS2b	Duplex feed sensor (duplex models only)
PS1	Tray 2 media out sensor
PS2	Top-of-page (TOP) sensor
PS3	Tray 1 media-out sensor
PS4	Output bin media-full sensor
PS11	Registration sensor
PS12	Media surface sensor
PS13	Fuser output sensor

Sensors

Table 1-8 Sensors

Component abbreviation	Component name
TH401	Environment sensor

LEDs

Table 1-9 LEDs

Component abbreviation	Component name
LED1	Power supply LED

Low-voltage power supply

The low-voltage power-supply (LVPS) circuit converts the AC power from the wall receptacle into the DC voltage that the printer components use.

Figure 1-5 Low-voltage power-supply circuit (M501)

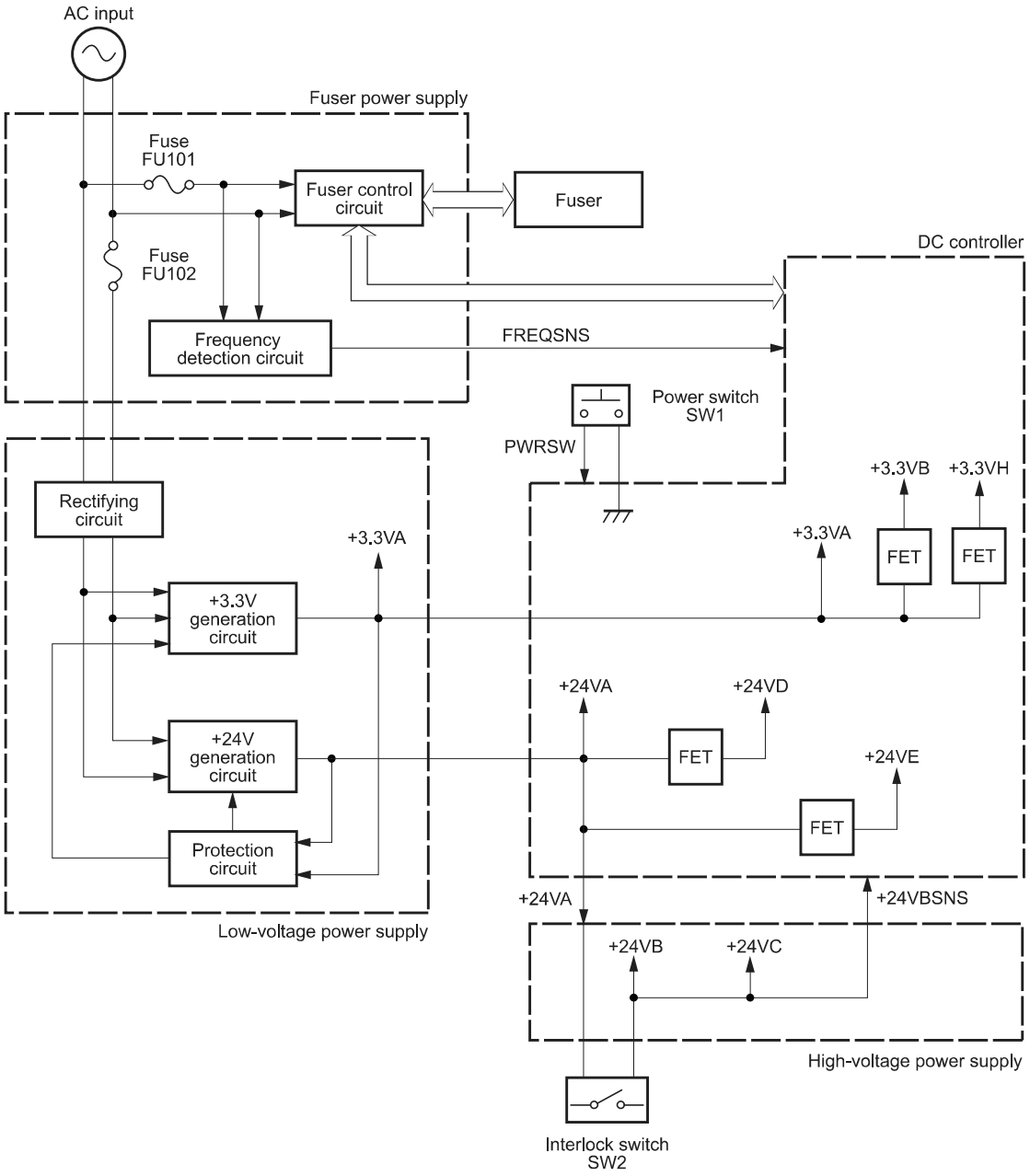
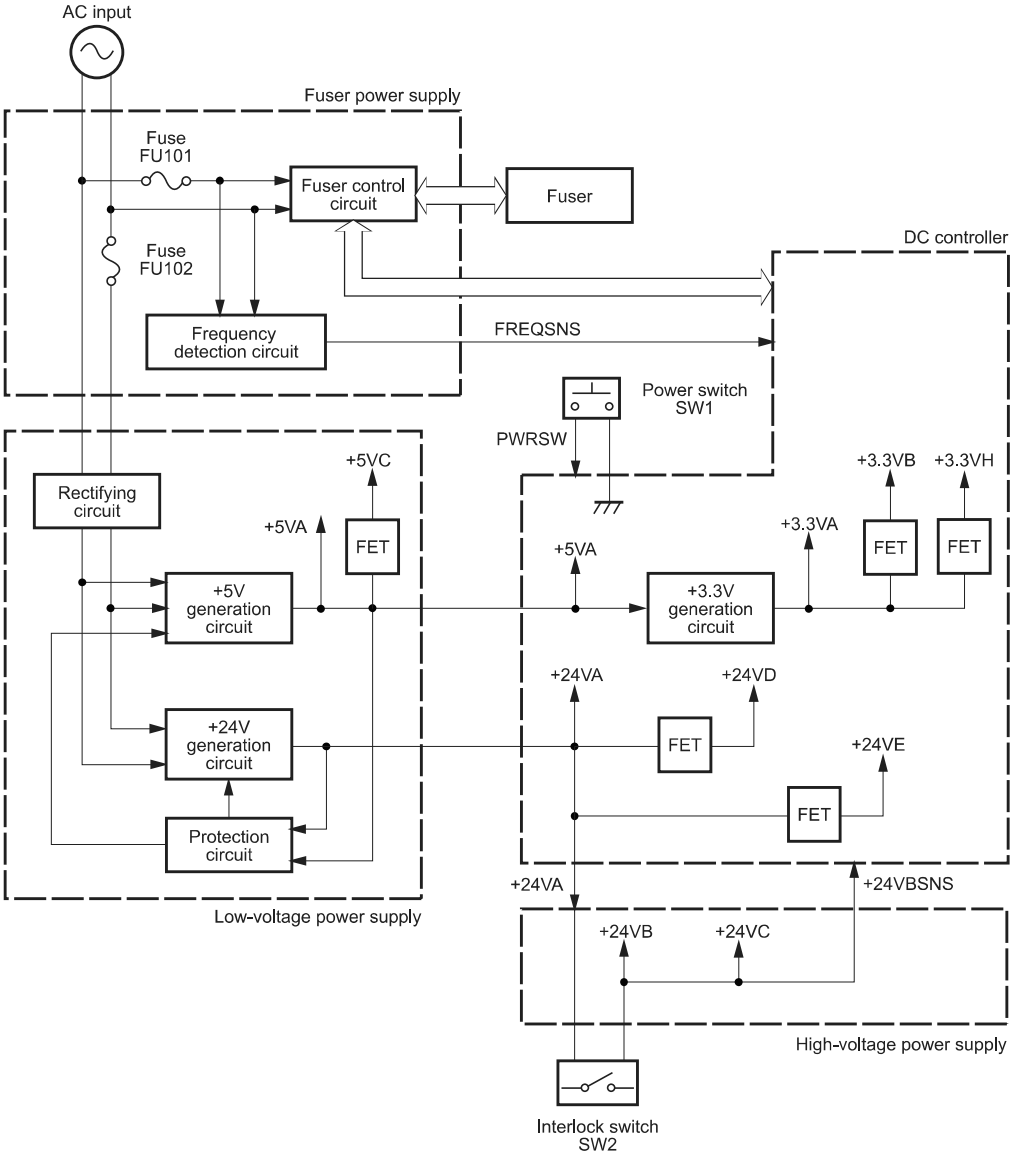


Figure 1-6 Low-voltage power-supply circuit (M506/M527)



Low-voltage power supply voltages description

The low-voltage power supply converts the AC power into two DC voltages, which it then subdivides, as described in the following table.

Table 1-10 Converted DC voltages

Main DC voltage	Sub-voltage	Behavior
+24 V	+24 VA	Constantly supplied
		Stopped during inactive OFF
		Becomes 4V during active OFF
	+24 VB	Stopped when cartridge door is opened. (SW2)
		Stopped during active OFF or inactive OFF
	+24 VC	Stopped when cartridge door is opened. (SW2)
		Stopped during active OFF or inactive OFF
	+24 VD	Constantly supplied
		Stopped during active OFF or inactive OFF
	+24 VE (M527 only)	Constantly supplied
		Stopped during active OFF or inactive OFF
+5 V	+5 VA	Constantly supplied
		Becomes 3.4V during inactive OFF
	+5 VB	Constantly supplied
		Stopped during active OFF or inactive OFF
	+5 VC	Constantly supplied
		Stopped during inactive OFF
+3.3 V	+3.3 VA	Constantly supplied
	+3.3 VB	Constantly supplied
		Stopped during inactive OFF
	+3.3 VH	Constantly supplied
		Stopped during inactive OFF
		Supplied intermittently during inactive OFF

Over-current/over-voltage protection

The low-voltage power supply automatically stops supplying the DC voltage to the printer components whenever it detects excessive current or abnormal voltage. The low-voltage power supply has a protective circuit against over-current and over-voltage to prevent failures in the power supply circuit.

⚠ **CAUTION:** If DC voltage is not being supplied from the low-voltage power supply, the protective function might be running. In this case, turn the power switch off and unplug the power cord.

Do not turn the power switch on until the root cause is found and corrected.

If the protective function is active, the DC controller notifies the formatter of a low-voltage power supply failure. In addition, the low-voltage power supply has two fuses to protect against over-current. If over-current flows into the AC line, the fuse stops the AC power.

Safety

For personal safety, the printer interrupts +24VB and +24VC power when the cartridge door detection switch is turned off (see Table 1-10 Converted DC voltages on page 19), this stops DC power supply to the following load:

- High-voltage power supply (HVPS)

The remote switch control circuit turns on or off the printer power so that the AC power flows even the power switch is turned off. Unplug the printer power cord before disassembling the printer.

Sleep mode operation (M506/M527)

Sleep mode conserves energy by stopping the power to several components when the printer is idle. If the DC controller detects voltage that is too high when the printer is in Sleep mode, it determines that the low-voltage power supply has failed, and it notifies the formatter.

Low-voltage power supply failure detection (M506/M527)

The DC controller determines a low-voltage power supply failure and notifies the formatter when the low-voltage power supply does not supply +24 V.

Low-voltage power supply functions

The printer has the following low-voltage power supply functions:

Table 1-11 Low-voltage power supply functions

Function	Supported feature
Sleep mode	No
Power supply voltage detection	No
Automatic power OFF	No
Automatic power ON/OFF	No
Active OFF	Yes
Inactive OFF	Yes
Network mode	No
Power switch illumination	Yes
Low-voltage power supply failure detection	Yes
Power save mode	No
Fast boot mode	Yes

High-voltage power supply

The DC controller controls the high-voltage power supply (HVPS) to generate biases. The high-voltage power supply delivers the high-voltage biases to the following components used to transfer toner during the image-formation process:

- Primary charging roller (in the toner cartridges)
- Developing roller (in the toner cartridges)
- Transfer roller
- Pressure roller

High-voltage power supply circuits

The high-voltage power supply contains the following separate circuits.

Figure 1-7 High-voltage power supply circuits

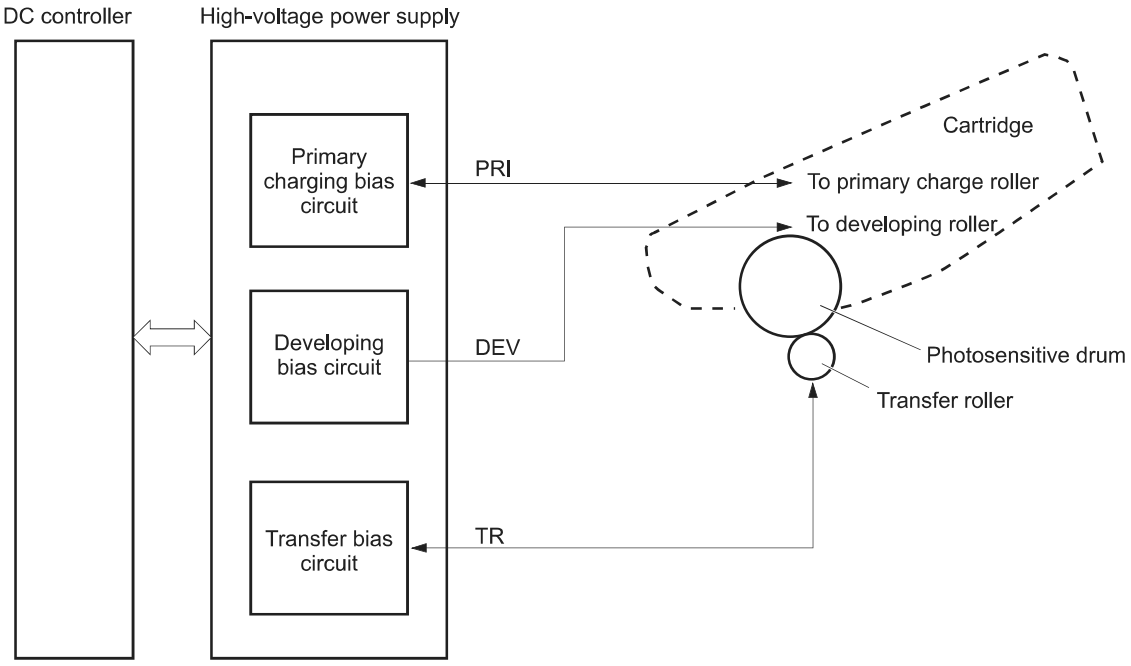


Table 1-12 High-voltage power supply circuits

Circuit	Description
Primary-charging-bias generation	The primary charging bias negatively charges the surface of the photosensitive drum to prepare for image formation.
Developing-bias generation	The developing bias adheres toner to an electrostatic latent image formed on the photosensitive drum.
Transfer-bias generation	The primary transfer bias transfers the toner from the photosensitive drum onto the paper.

Fuser bias

The printer uses instant-on fusing. The fuser bias is DC positive for improved print quality. The fuser bias circuit is located in the high-voltage power supply.

Fuser control

The DC controller and components in the fuser perform the following functions related to fuser operation:

- Control fuser temperature
- Detect fuser failures
- Prevent excessive temperature rise
- Detect remaining life in the fuser
- Determine if the correct fuser is installed

Fuser circuits

The fuser heater control circuit and the fuser heater safety circuit control the fuser temperature according to commands from the DC controller. The fuser consists of the following major components:

Figure 1-8 Fuser components

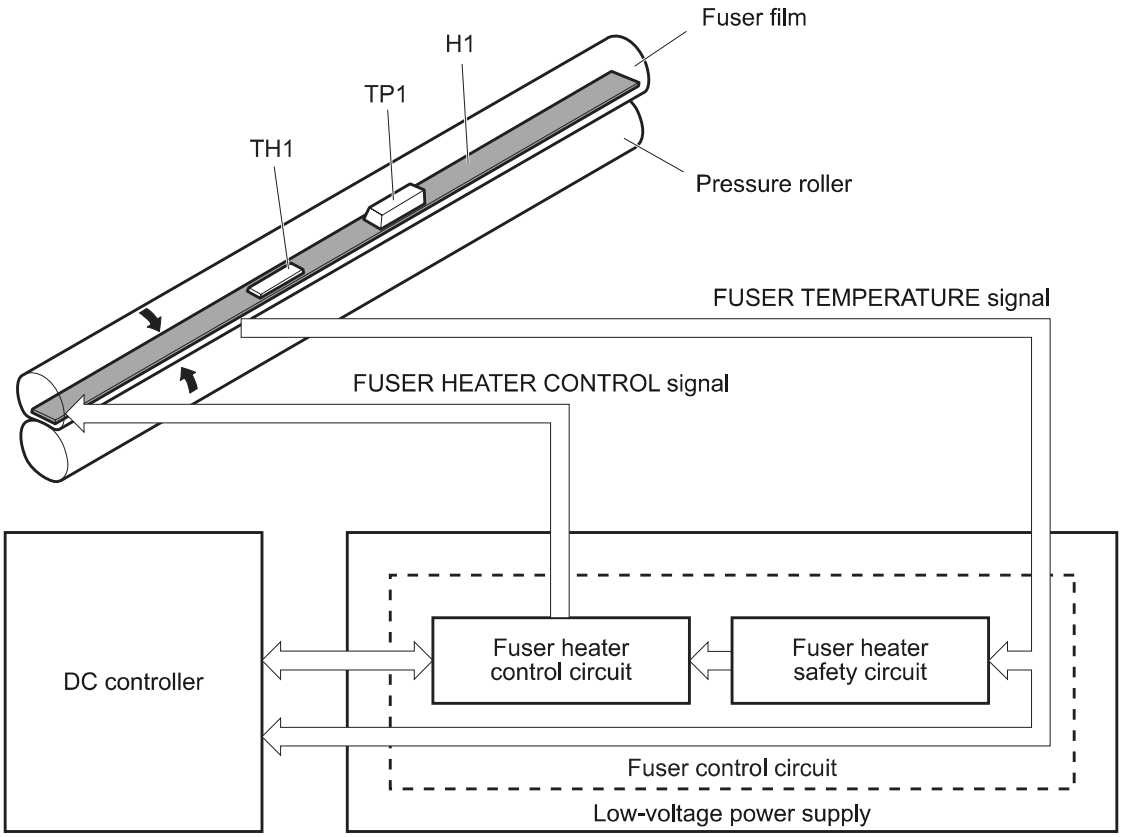


Table 1-13 Fuser components

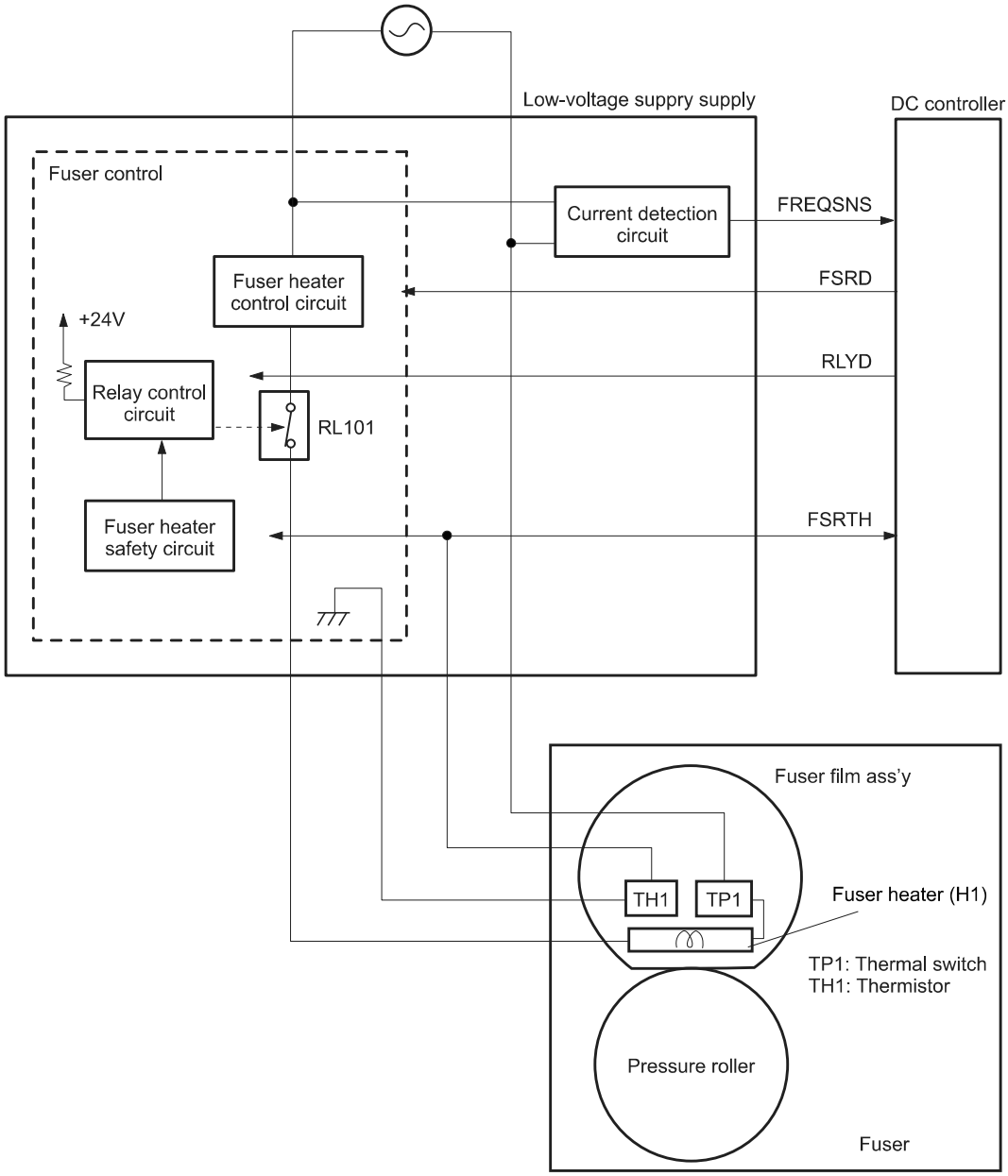
Type of component	Abbreviation	Name	Function
Heaters	H1	Fuser main heater	Heats the center of the fuser sleeve

Table 1-13 Fuser components (continued)

Type of component	Abbreviation	Name	Function
Thermistors (Contact type)	TH1	Main thermistor	Detects the center temperature of the fuser heater
Thermal switch (Contact type)	TP1	Thermal switch	Prevents an abnormal temperature rise in the fuser heater

Fuser control functions

Figure 1-9 Fuser control



The printer has the following fuser control functions.

Table 1-14 Fuser control functions

Failure detection function	Supported feature
Fuser temperature control	Yes
Fuser failure detection	Yes
Frequency detection circuit failure detection	Yes
Fuser pressure release mechanism failure detection	No
Fuser type identification detection	Yes
Fuser presence detection	No
Fuser life detection	Yes
Relay failure detection	No
Fuser roller cleaning	Yes

Fuser heater protection

Fuser heater protection is a feature that detects excessive temperatures in the fuser and interrupts the power supply to the fuser heater.

The following three protective components prevent the fuser heater from excessive rising temperature:

- **DC controller**: When a thermistor or sub-thermistor detects a temperature above a certain threshold, the DC controller interrupts power to the specific heater.
- **Fuser-heater safety circuit**: The fuser heater safety circuit monitors the detected temperature of the sub thermistors.
- **Thermal switch**: If the temperature in the heaters is abnormally high, and the temperature in the thermoswitch exceeds a specified value, the contact to the thermoswitch breaks.

Fuser unit life detection (M506/M527)

The fuser life is tracked by fuser rotations, and not by the number of pages printed. This is a more accurate tracking method since the fuser rotates for every print job. There will be variations in fuser life depending on customer usage. Customers who are running one and two page intermittent jobs with long pauses between each job might reach the fuser low message sooner due to the fuser rotating more times per page than it would for larger print jobs.

Fuser identification (M506/M527)

The printer detects the type and presence of the fuser. The DC controller notifies the formatter when it fails to detect the type or presence of the fuser.

NOTE: This printer detects if a fuser of the correct voltage for the printer is installed. If a fuser of the incorrect voltage is installed, the DC controller notifies the formatter and an error message is displayed on the control panel.

Engine laser/scanner system

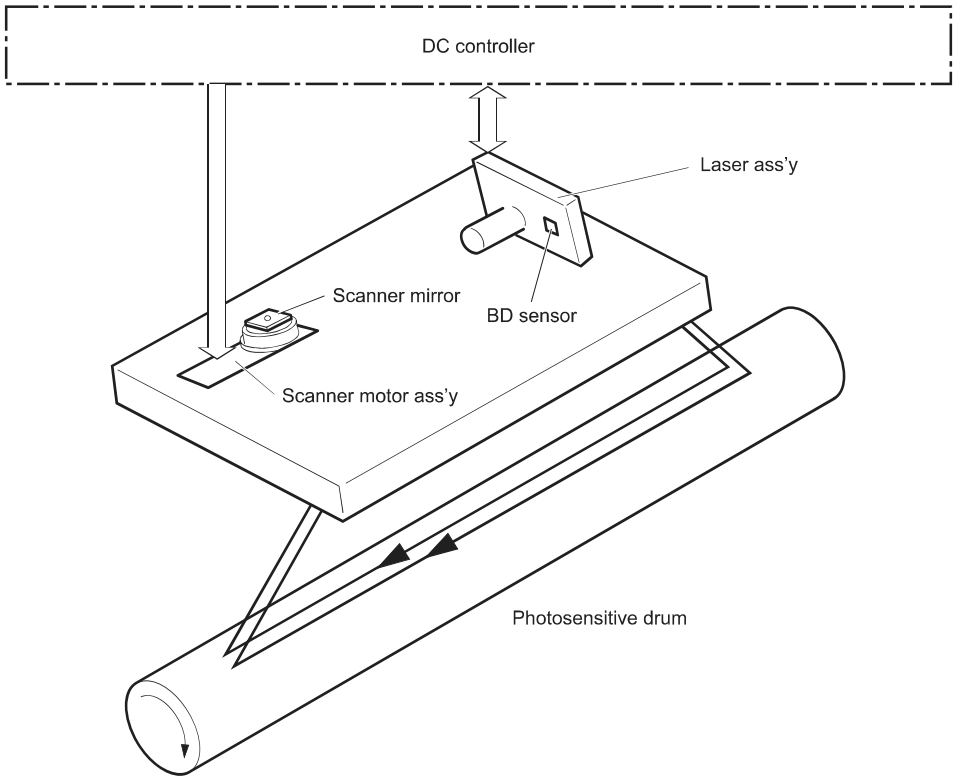
The laser/scanner system forms the latent electrostatic image on the photosensitive drums inside each of the toner cartridges.

The DC controller receives instructions from the formatter regarding the image of the page to be printed. The DC controller signals the lasers to emit light, and the laser beams pass through lenses and onto the scanner mirror, which rotates at a constant speed. The mirror reflects the beam onto the photosensitive drum in the pattern required for the image, exposing the surface of the drum so it can receive toner.

The main components of the laser/scanner system, which are controlled by signals sent from the DC controller, are:

- Laser assembly
- Scanner motor assembly
- Beam detect (BD) sensor
- Scanner mirror

Figure 1-10 Laser/scanner system



Laser/scanner failure detection

The DC controller determines an optical unit failure and notifies the formatter of the error status when any of the following occurs:

- **Beam detect (BD) failure detection**: The scan control board (SCB) does not detect the laser/scanner and/or the beam detect interval is outside a specified range during printing.
- **Laser/scanner motor startup failure**: The scanner motor does not reach a specified rotation frequency within a specified period of time from when the laser/scanner starts up.
- **Laser/scanner motor abnormal rotation**: The laser/scanner motor does not reach a specified rotational frequency within a specified period of time during a print operation.

Safety

The laser/scanner assembly has a mechanical laser shutter. For the safety of users and service technicians, the laser shutter interrupts the optical path of the laser/scanner assembly when the top door is opened (SW101).

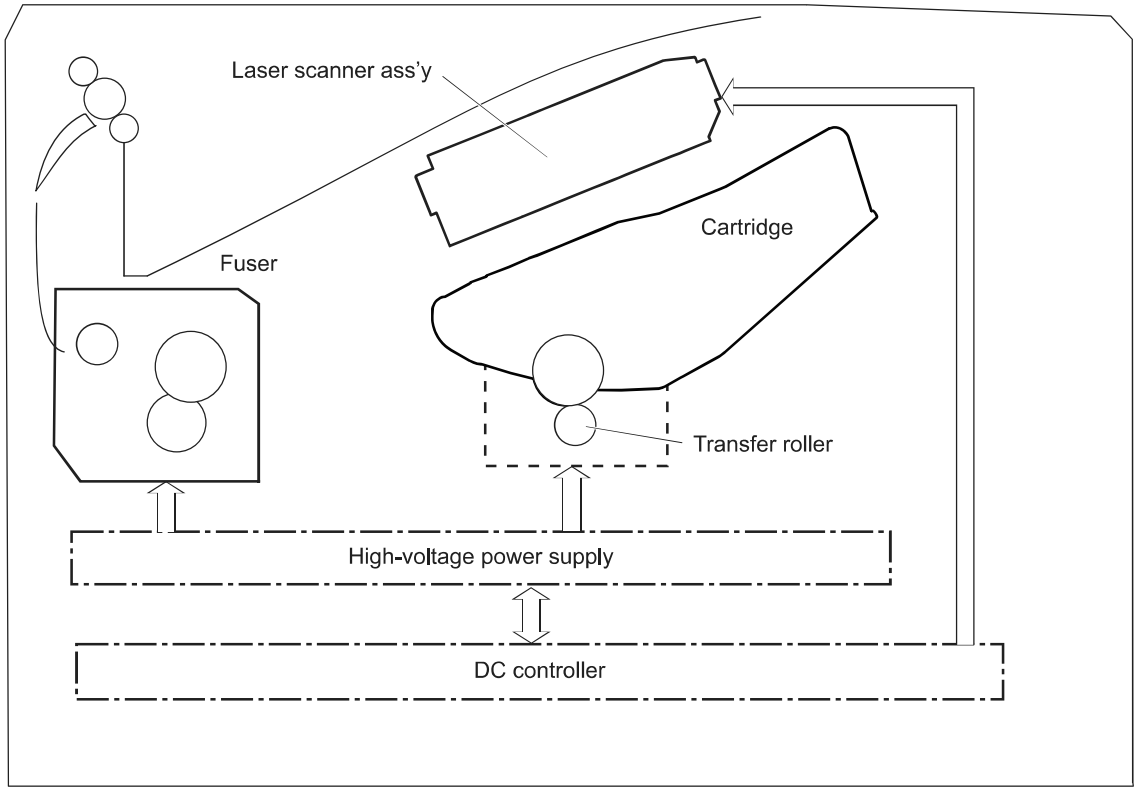
Image-formation process

The image-formation system creates the printed image on the paper. The system consists of the following components:

- Toner cartridge
- Transfer roller
- Fuser
- Laser/scanner
- High-voltage power supply

The DC Controller controls the internal components of the image formation system (according to commands received from the formatter) to form the toner image on the photosensitive drum surface. The toner image is then transferred to the print media and fused.

Figure 1-11 Image-formation system



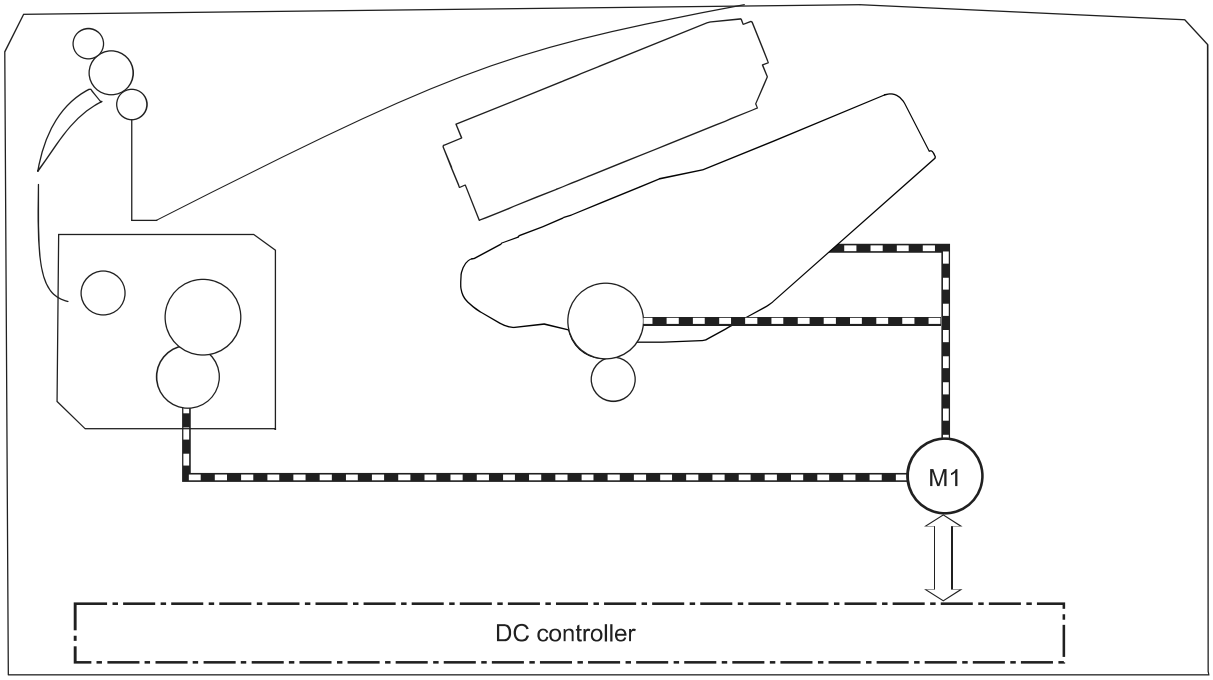
The fuser motor (M1) drives the following image formation components:

- Photosensitive drum
- Developing roller
- Primary charging roller (follows the photosensitive drum)
- Transfer roller (follows the photosensitive drum)

- Pressure roller
- Fuser film (follows the pressure roller)

NOTE: The primary charging roller and developer roller are located in the toner cartridge.

Figure 1-12 Fuser motor



Abbreviation	Component
M1	Fuser motor

The following figure shows the location of the toner-level sensor.

Figure 1-13 Toner-level sensor

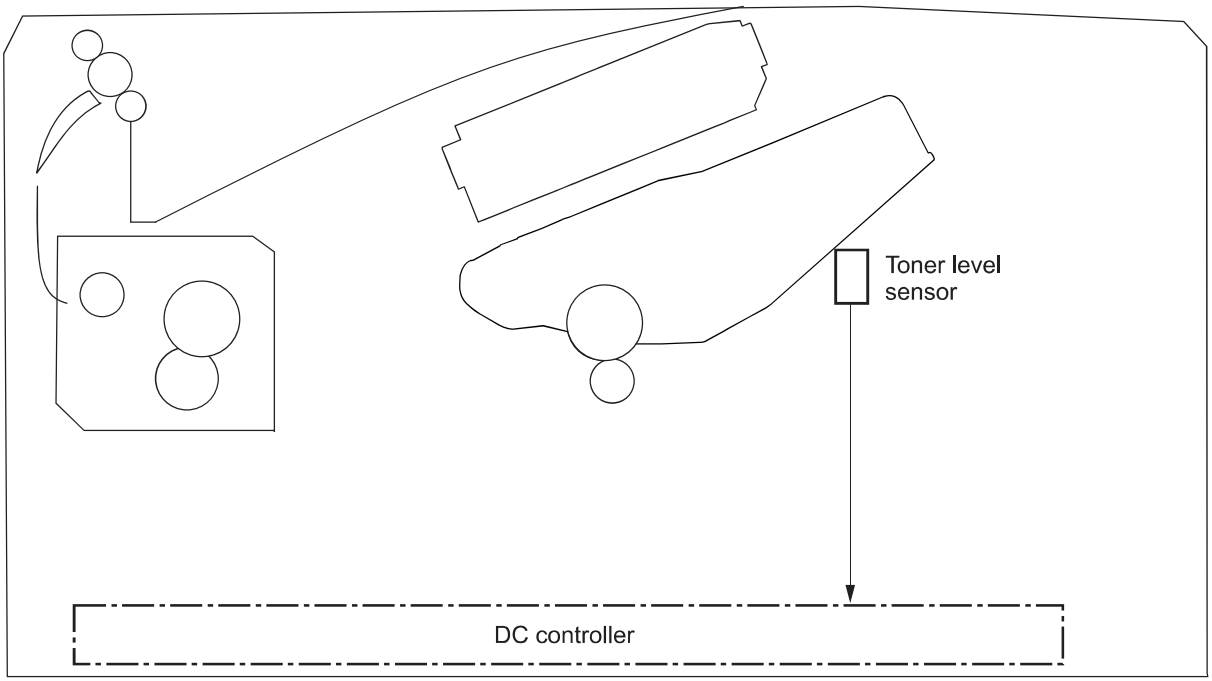


Table 1-15 Sensors

Abbreviation	Component
N/A	Toner-level sensor

The image-formation process consists of seven steps divided into five functional blocks.

Figure 1-14 Image-formation process

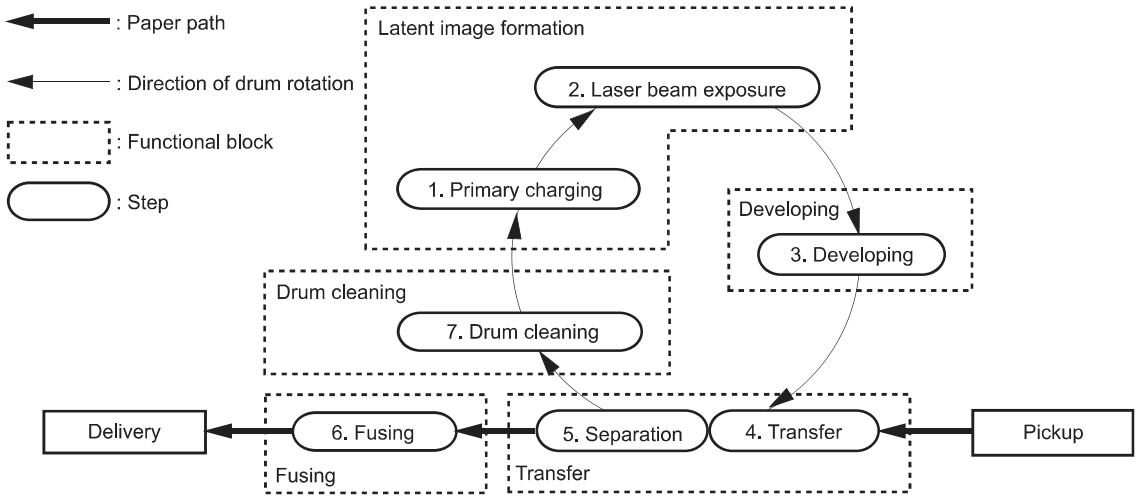


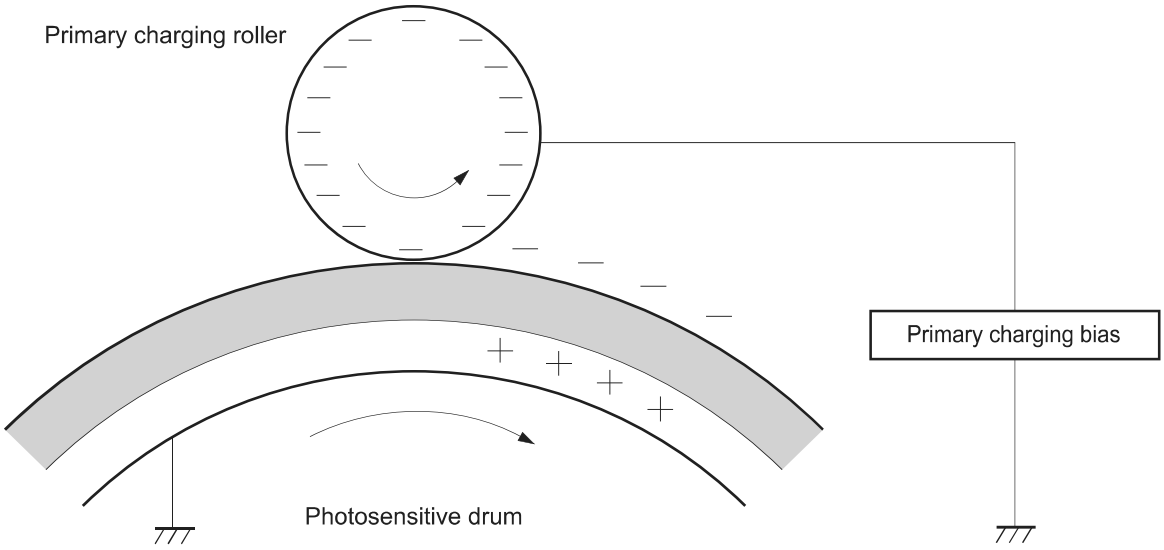
Table 1-16 Image formation process

Functional block	Steps	Description
Latent image formation	1. Primary charging 2. Laser-beam exposure	An invisible latent image forms on the surface of the photosensitive drum.
Development	3. Developing	Toner adheres to the electrostatic latent image on the photosensitive drum.
Transfer	4. Transfer 5. Separation	The toner image transfers to the paper.
Fusing	6. Fusing	The toner fuses to the paper to make a permanent image.
Drum cleaning	7. Drum cleaning	Residual toner is removed from the drum.

Step 1: Primary charging

The primary-charging roller contacts the photosensitive drum and charges the drum with negative potential.

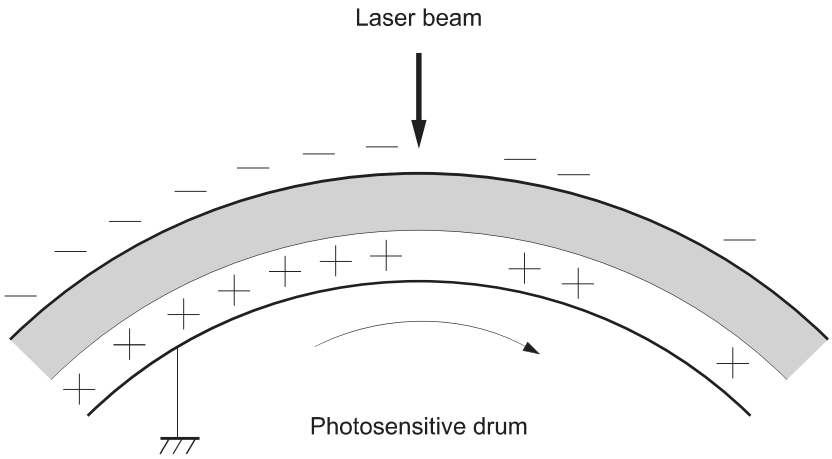
Figure 1-15 Primary charging



Step 2: Laser-beam exposure

The laser beam strikes the surface of the photosensitive drum in the areas where the image will form. The negative charge neutralizes in those areas, which are then ready to accept toner.

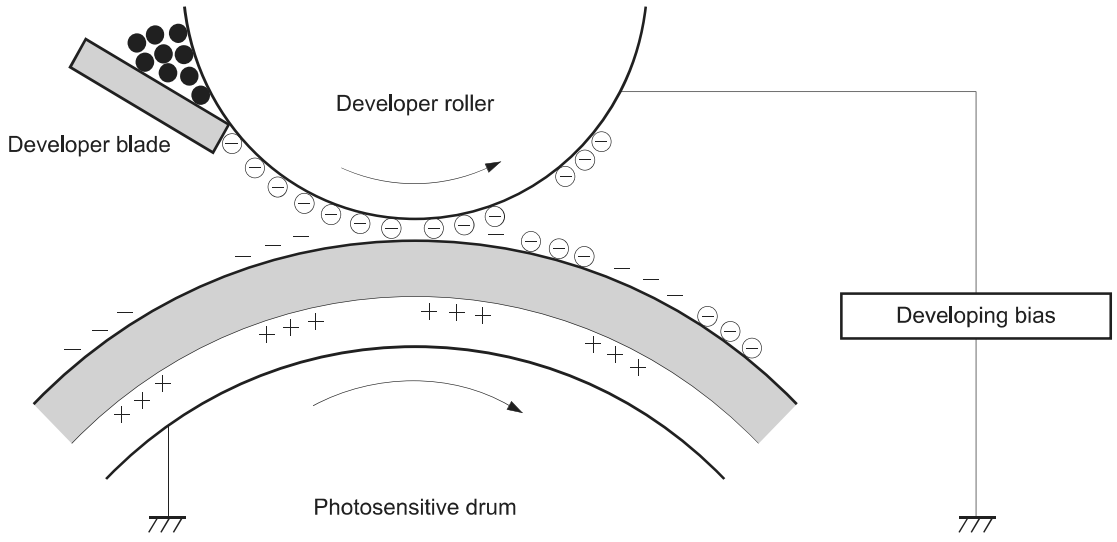
Figure 1-16 Laser-beam exposure



Step 3: Development

Toner acquires a negative charge as the developing cylinder contacts the developing blade. Because the negatively charged surface of the photosensitive drums have been neutralized where they have been struck by the laser beam, the toner adheres to those areas on the drums. The latent image becomes visible on the surface of each drum.

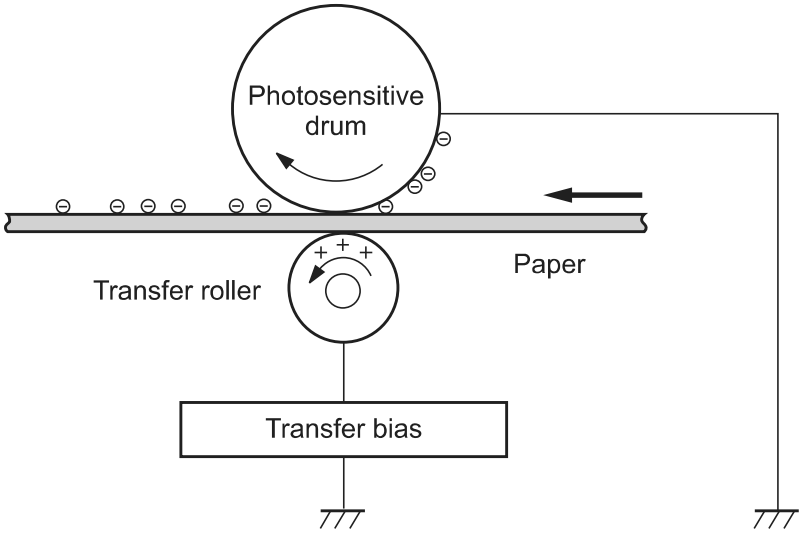
Figure 1-17 Development



Step 4: Transfer

The toner image on the photosensitive drum transfers to the paper. Transfer bias applied to the transfer roller attracts the negatively-charged toner to the paper.

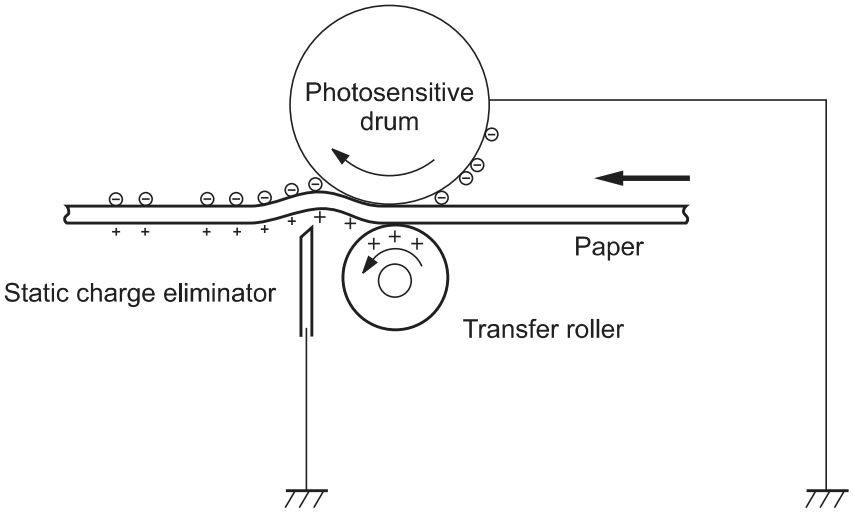
Figure 1-18 Primary transfer



Step 5: Separation

The elasticity of the paper and the curvature of the photosensitive drum cause the paper to separate from the photosensitive drum. The static-charge eliminator removes excess charge from the paper to make sure that the toner fuses correctly.

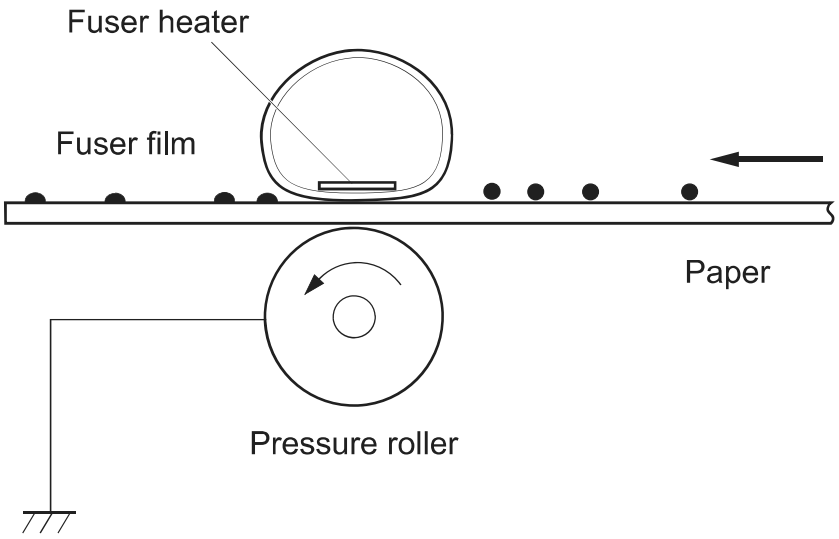
Figure 1-19 Separation



Step 6: Fusing

To create the permanent image, the paper passes through heated, pressurized rollers to melt the toner onto the page. Fusing bias is added to the pressure roller to improve the print quality.

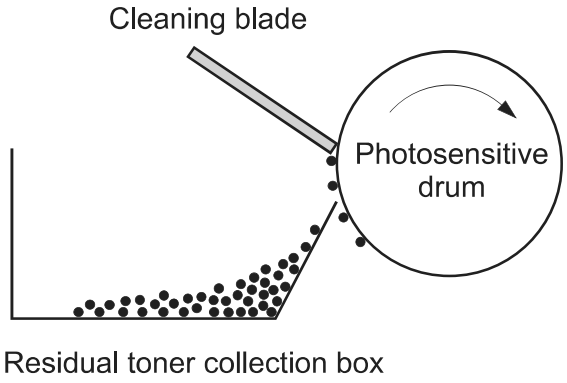
Figure 1-20 Fusing



Step 7: Drum cleaning

The cleaning blade scrapes the residual toner off the surface of the photosensitive drum, and toner is deposited in the toner-collection portion of the cartridge.

Figure 1-21 ITB cleaning



Toner cartridge

The printer has one toner cartridge.

Design

The toner cartridge is filled with toner and consists of the following components:

- Photosensitive drum
- Developer roller
- Primary-charging roller
- Memory chip

The DC controller rotates the drum motor to drive the photosensitive drum, developer roller, and the primary-charging roller.

Figure 1-22 Toner cartridge system

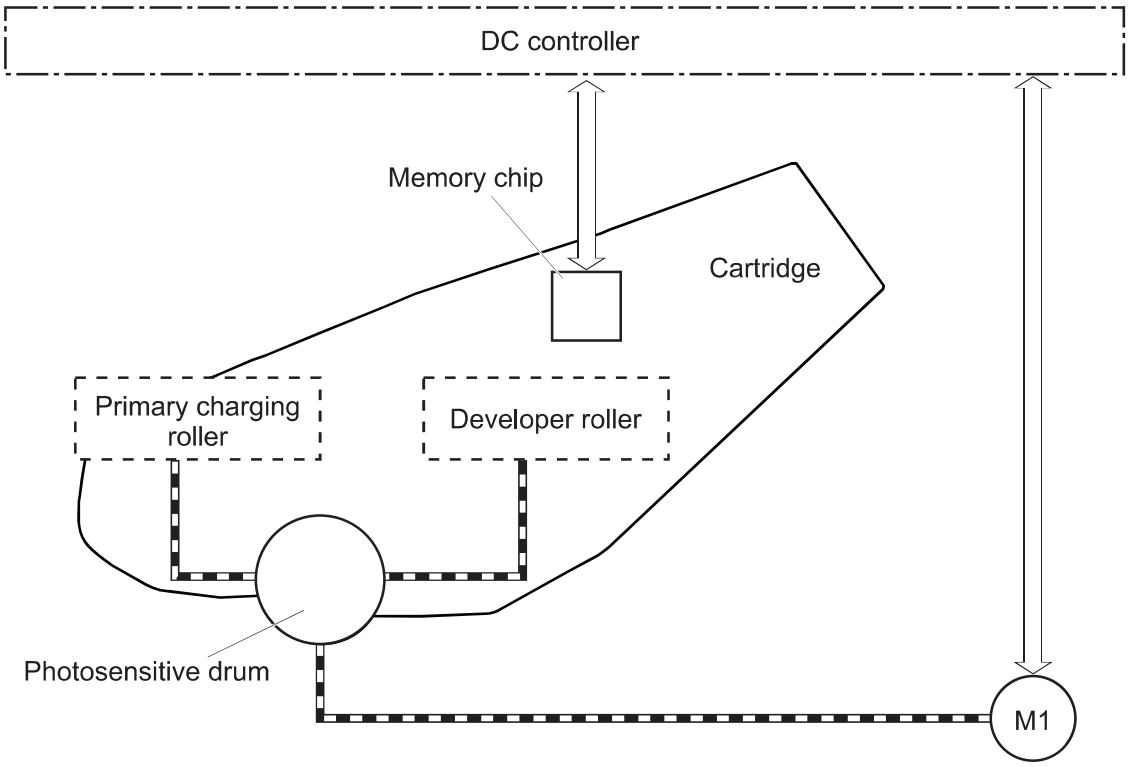


Table 1-17 Toner cartridge functions

Function	Supported feature
Toner cartridge presence detection	Yes
Toner level detection	Yes
Toner cartridge life detection	Yes
Toner cartridge mis-installation detection	Not applicable (one cartridge)

Table 1-17 **Toner cartridge functions (continued)**

Function	Supported feature
Drum discharge	No
Transfer cleaning	Yes

Memory chip

The memory chip is non-volatile memory that stores information about the usage of the toner cartridge and helps protect the customer from counterfeit cartridges. This chip is also used to detect the presence of a cartridge within the printer. The printer reads and writes the data in the memory chip.

NOTE: The memory chip does not store any customer print, scan, copy, fax, or digital send information. The memory chip also supports the printer Jet Intelligence toner cartridge management functions.

Toner seal

The toner cartridge seal is opened automatically when the toner cartridge is installed into the printer.

Toner level and cartridge life detection

Toner level detection: The DC controller detects the remaining toner in the cartridge by the optical detection method and then notifies the formatter of the remaining toner level.

Cartridge life detection: Cartridge life detection is measured in two ways.

1. Toner level:
   - For the first 75% of cartridge life, toner level is measure through pixel counting by the DC controller. Once the level reaches 25%, the toner level sensor utilizes electrical properties to determine the amount of toner remaining.
2. Rotations of internal components (OPC and developer):
   - The DC controller monitors these two life parameters and reports them to the formatter as percent life remaining. End of cartridge life is determined by the lower value of the two.

JetIntelligence

JetIntelligence supports two features for managing toner cartridges.

- The authentication feature allows customers to specify the use of only genuine HP toner cartridges in the printer.
- The anti-theft feature enables locking a cartridge to a specific printer or fleet of printers.

Authentication

The genuine HP authentication feature allows a customer to specify that only genuine HP supplies can be used in a printer. If a non-HP or used supply is installed, the printer will not print. This feature is disabled by default, and can be enabled or disabled from the control panel or the Embedded Web Server (EWS).

If a genuine HP toner cartridge from another printer is moved to a printer with this feature enabled, the toner cartridge will authenticate and print, unless the toner cartridge has passed the low state. If the toner cartridge has passed the low state, an **Unauthorized Cartridge** message displays on the control panel.

If a non-HP toner cartridge is used in a printer with this feature enabled, the message **Unauthorized Cartridge** appears on the control-panel display.

NOTE: If a customer suspects they have a counterfeit cartridge, they should report it by going to www.hp.com/go/anticounterfeit and selecting **Report now**.

The printer still functions normally.

Anti-theft

The toner cartridge anti-theft feature allows a customer to configure the printer to automatically lock genuine HP toner cartridges to a specific printer or fleet of printers when they are installed. A locked toner cartridge will only work in the specified printer or fleet of printers. This feature prevents toner cartridges from being stolen and used in another printer, or from being moved from an authorized printer to an unauthorized printer. This feature is disabled by default, and can be enabled or disabled from the control panel, the Embedded Web Server (EWS), or Web Jetadmin.

When the anti-theft feature is enabled, the toner cartridge in a printer will only work in the specified printer or fleet of printers. If a locked toner cartridge is moved to another printer, the cartridge will not print and the message **Protected Cartridge** appears on the control-panel display.

NOTE: When a toner cartridge is locked to a specific printer or fleet of printers, it cannot be unlocked. This is a permanent operation.

Pickup, feed, and delivery system

The DC controller controls the pickup, feed, and delivery system according to commands from the formatter. The pickup, feed, and delivery system uses a series of rollers to move the paper through the printer.

The pickup, feed, and delivery system consists of the following three functional blocks. The DC controller controls each block to pick up, feed and deliver the paper.

- **Pickup-and-feed-block**: Controls the movement of the paper from each pickup source to the fuser inlet
- **Fuser-and-delivery-block**: Controls the movement of the paper from the fuser to the delivery destination
- **Duplex block**: Controls the movement of the paper from the duplex switchback unit to the duplex re-pickup unit (duplex models only)

Figure 1-23 Pickup, feed, and delivery system

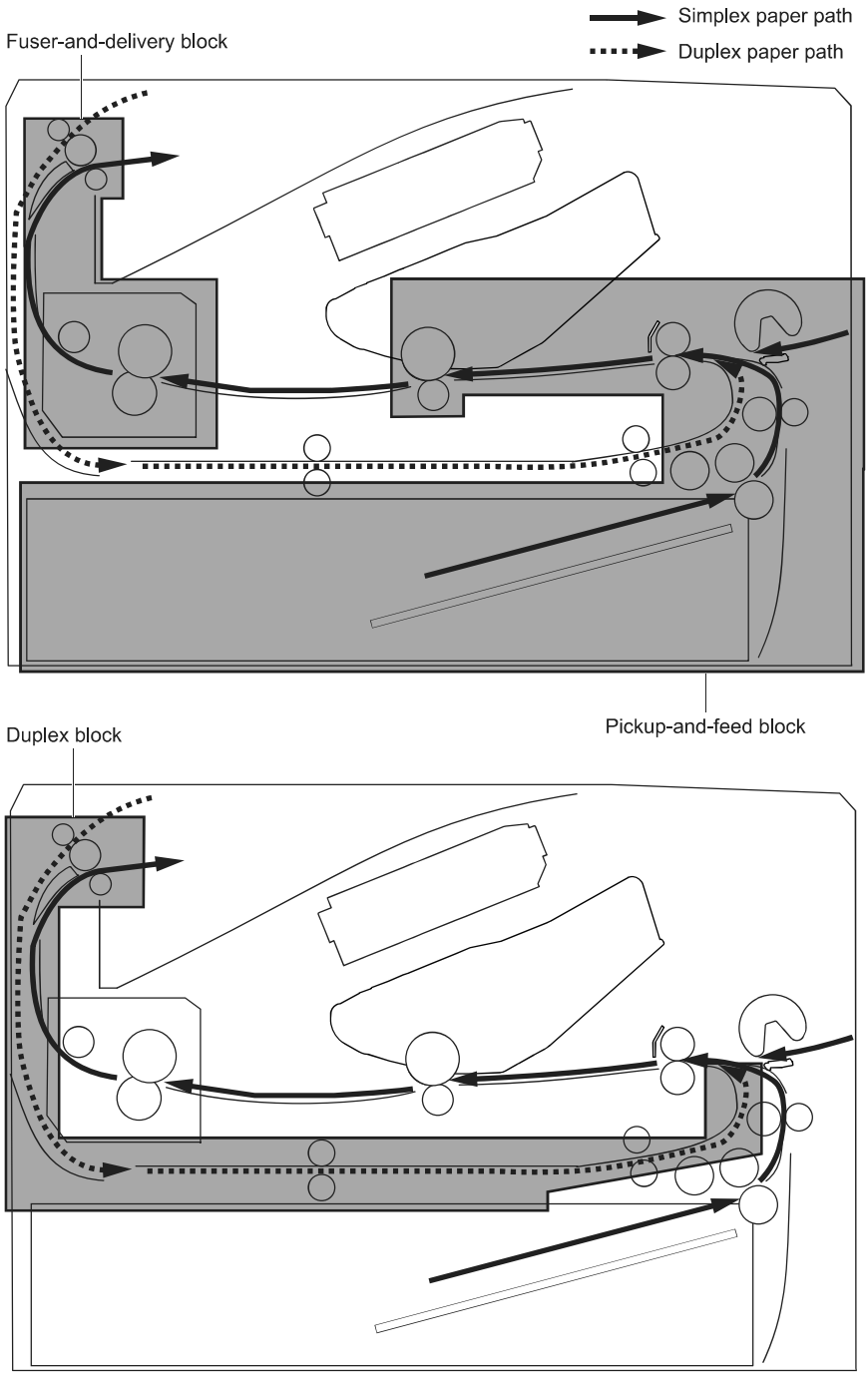


Table 1-18 Pickup, feed and delivery system functions

Function	Supported feature
Tray 2 media size detection	No
Tray 2 media presence detection	Yes
Tray 2 media level detection	No

Table 1-18 Pickup, feed and delivery system functions (continued)

Function	Supported feature
Tray 2 lift-down control	No
Tray 2 multiple-feed prevention mechanism	Yes
Tray 1 media presence detection	Yes
Tray 1 media width detection	No
Tray 1 last-media detection	No
Skew-feed prevention mechanism	Yes
Media detection	No
OHT detection	No
Image leading edge positioning	Yes
Media length detection	Yes
Media width detection	Yes
Pressure roller pressure release control	No
Output bin media-full detection	Yes
Automatic delivery	Yes
Duplex switchback control (duplex models only)	Yes
Duplex feed control (duplex models only)	Yes

Photo sensors and switches

The following figure shows the photo sensors and switches for the pickup, feed, and delivery system.

Figure 1-24 Photo sensors and switches

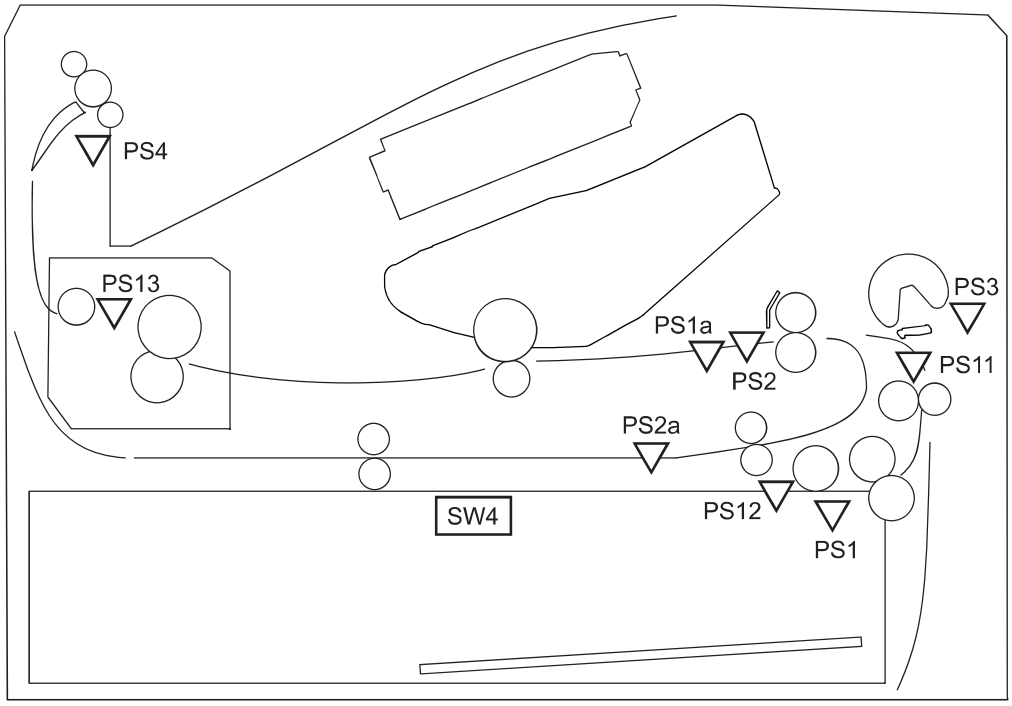


Table 1-19 Photo sensors and switches

Abbreviation	Component
PS1a	Media width sensor
PS2b	Duplex feed sensor (duplex models only)
PS1	Tray 2 media out sensor
PS2	TOP sensor
PS3	Tray 1 media out sensor
PS4	Output bin media-full sensor
PS11	Registration sensor
PS12	Media surface sensor
PS13	Fuser output sensor
SW4	Tray 2 detection switch

Motors, clutches, and solenoids

The following figure shows the motors, clutches, and solenoids for the pickup, feed, and delivery system.

Figure 1-25 Motors, solenoids, and clutches

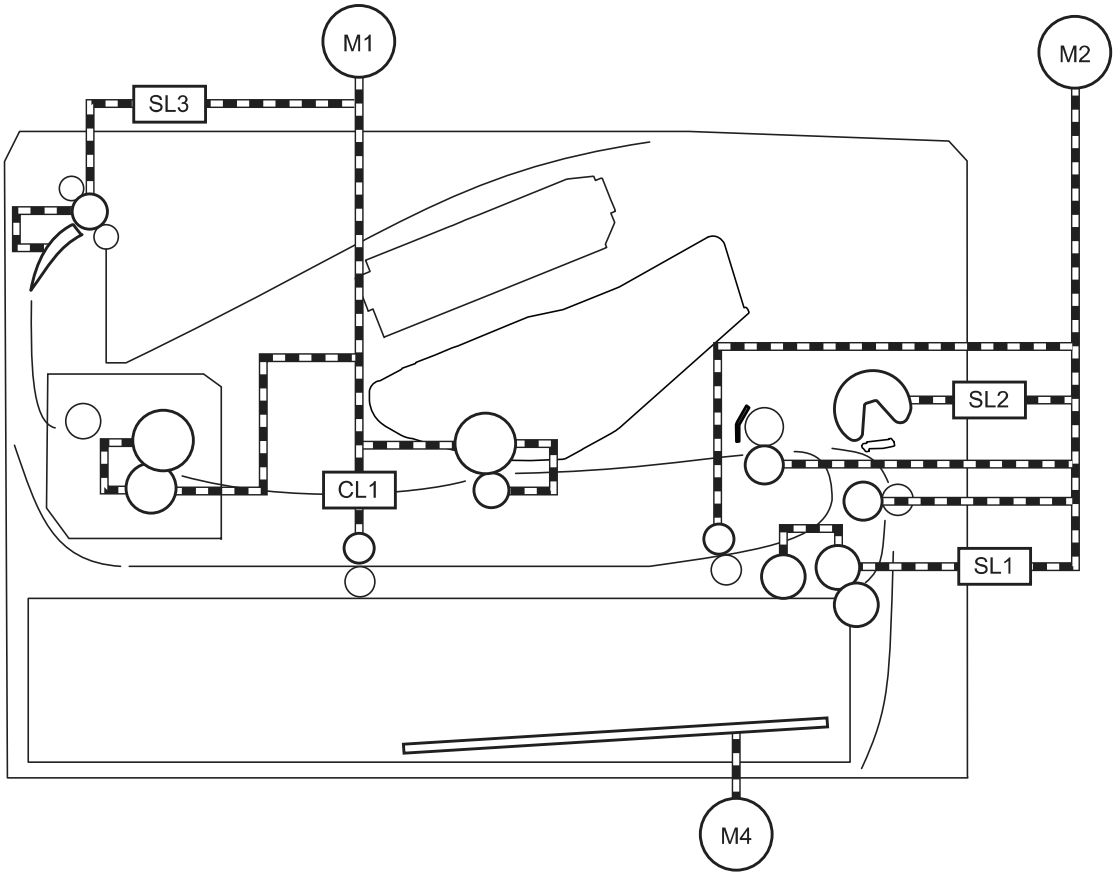


Table 1-20 Motors, solenoids, and clutches

Abbreviation	Component
M1	Fuser motor
M2	Pickup motor
M4	Lifter motor
SL1	Tray 2 pickup solenoid
SL2	Tray 1 pickup solenoid
SL3	Duplex switchback solenoid (duplex models only)
CL1	Duplex re-pickup clutch (duplex models only)

Tray 1 (multipurpose)/Tray 2 (base printer)

Moving paper from Tray 1 and Tray 2 involves the interaction of multiple components within the printer. The following sections describe these processes.

Tray 1 paper pickup and feed

The printer picks up one sheet of paper from Tray 1.

Following are the sequence of steps for the Tray 1 pickup operation.

NOTE: Tray 1 and Tray 2 are optimal for paper pickup when using special paper or media other than 20 lb plain paper. For Tray 1, the printer increases the number of attempts to pick up a page, which increases the reliability of successfully picking the page from the tray and decreases the possibility of a mis-pick jam.

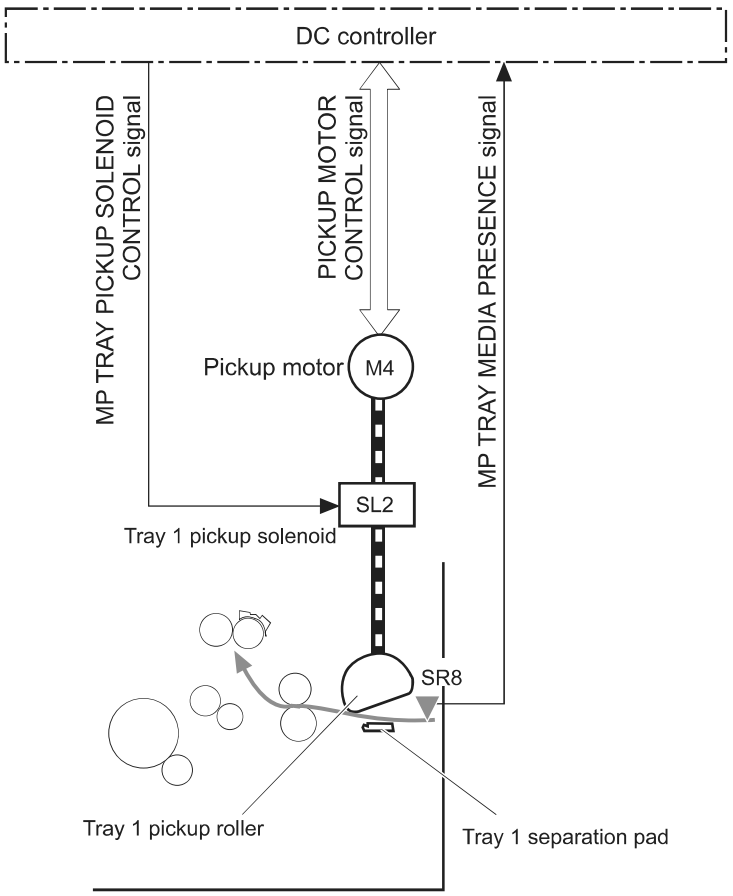
HP recommends using Tray 1 or Tray 2 if the printer is experiencing excessive or reoccurring jams from trays other than Tray 1 and Tray 2, or for print jobs that require media other than 20 lb plain paper.

Always use Tray 1 when printing envelopes or labels.

1. The pickup motor reverses when a print command is received from the formatter.
2. When the DC controller turns on the Tray 1 pickup solenoid, the Tray 1 pickup roller rotates and the lifting plate lifts.
3. As the lifting plate rises, the paper is picked up.
4. The Tray 1 separation pad removes any multiply-fed sheets, and one sheet is fed into the printer.

The Tray 1 media-out sensor (SR8) detects whether paper is present in Tray 1.

Figure 1-26 Tray 1 pickup mechanism



Tray 2 paper presence detection

The Tray 2 media-out sensor (SR12) detects the presence of paper in Tray 2.

The DC controller notifies the formatter when the Tray 2 media-out sensor detects that paper is absent.

Tray 2 lift operation

The printer keeps the paper stack surface at the correct pickup position. The Tray 2 lift-up operation is performed under the following conditions:

- The printer is turned on
- Tray 2 is installed
- The paper stack surface in Tray 2 lowers

The operational sequence of the Tray 2 lift-up is as follows:

1. The lifter motor (M4) rotates and the lifter moves up.
2. When the Tray 2 media stack surface sensor 2 detects the stack surface of media, the lifter motor stops.
3. The lifter motor rotates again to lift the lifter when the Tray 2 media stack surface sensor 1 detects the stack surface and then lowers during printing.

When a Tray 2 media stack surface sensors does not detect the stack surface within a specified time period after the lifter motor starts rotating, the DC controller determines a lifter motor failure and notifies the formatter.

Tray 2 paper pickup

Following are the sequence of steps for the Tray 2 pickup operation.

NOTE: Tray 1 and Tray 2 are optimal for paper pickup when using special paper or media other than 20 lb plain paper. For Tray 1, the printer increases the number of attempts to pick up a page, which increases the reliability of successfully picking the page from the tray and decreases the possibility of a mis-pick jam.

HP recommends using Tray 1 or Tray 2 if the printer is experiencing excessive or reoccurring jams from trays other than Tray 1 and Tray 2, or for print jobs that require media other than 20 lb plain paper.

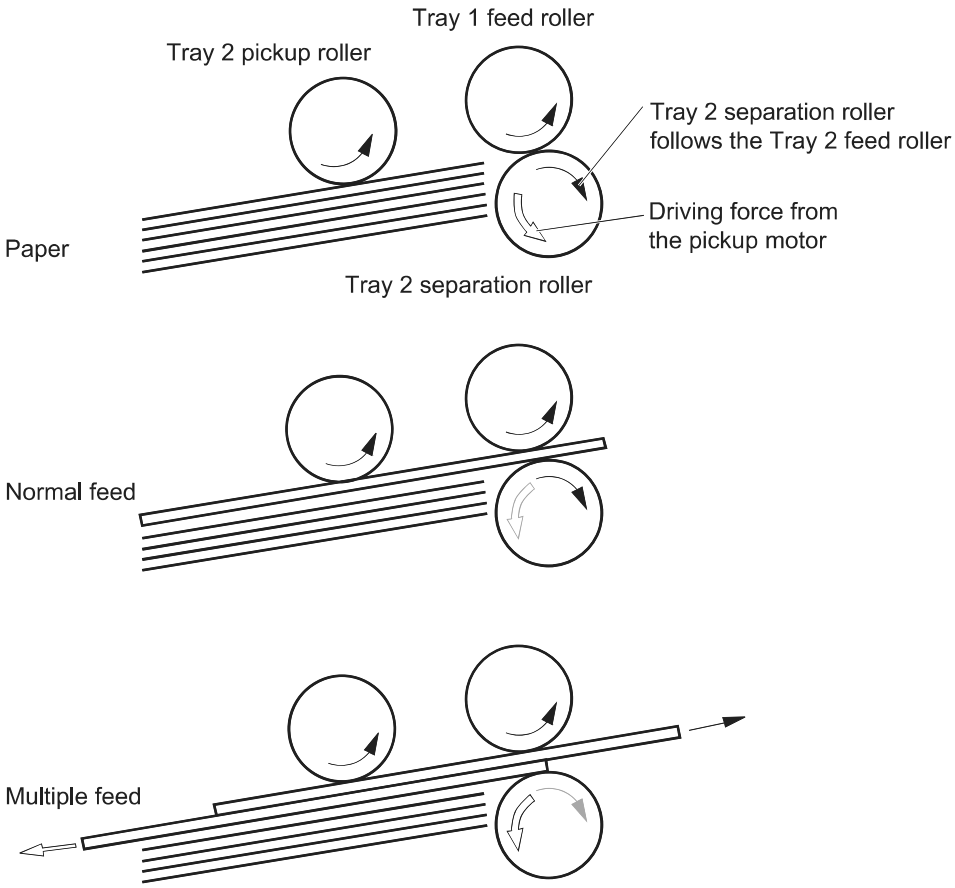
1. The printer is turned on or Tray 2 is inserted.
2. The tray lift-up operation raises the lifting plate so paper can be picked up.
3. The pickup motor rotates when a print command is received from the formatter.
4. The Tray 2 pickup roller and Tray 2 feed roller rotate.
5. The Tray 2 pickup solenoid turns on at a specified time.
6. The Tray 2 pickup cam rotates.
7. As the pickup arm lowers, the Tray 2 pickup roller touches the surface of the paper stack.
8. One sheet of paper feeds into the printer.

Tray 2 multiple-feed prevention

The printer uses a separation roller method to prevent multiple sheets of print media from entering the paper path.

The separation roller overruns if just one sheet of paper is picked. If two or more sheets are picked, only the top sheet will be fed to registration and the multiply-fed sheets will be held at the pickup location by the separation roller. This printer does not have an actively-driven separation roller.

Figure 1-27 Tray 2 multiple-feed prevention



Tray 2 presence detection

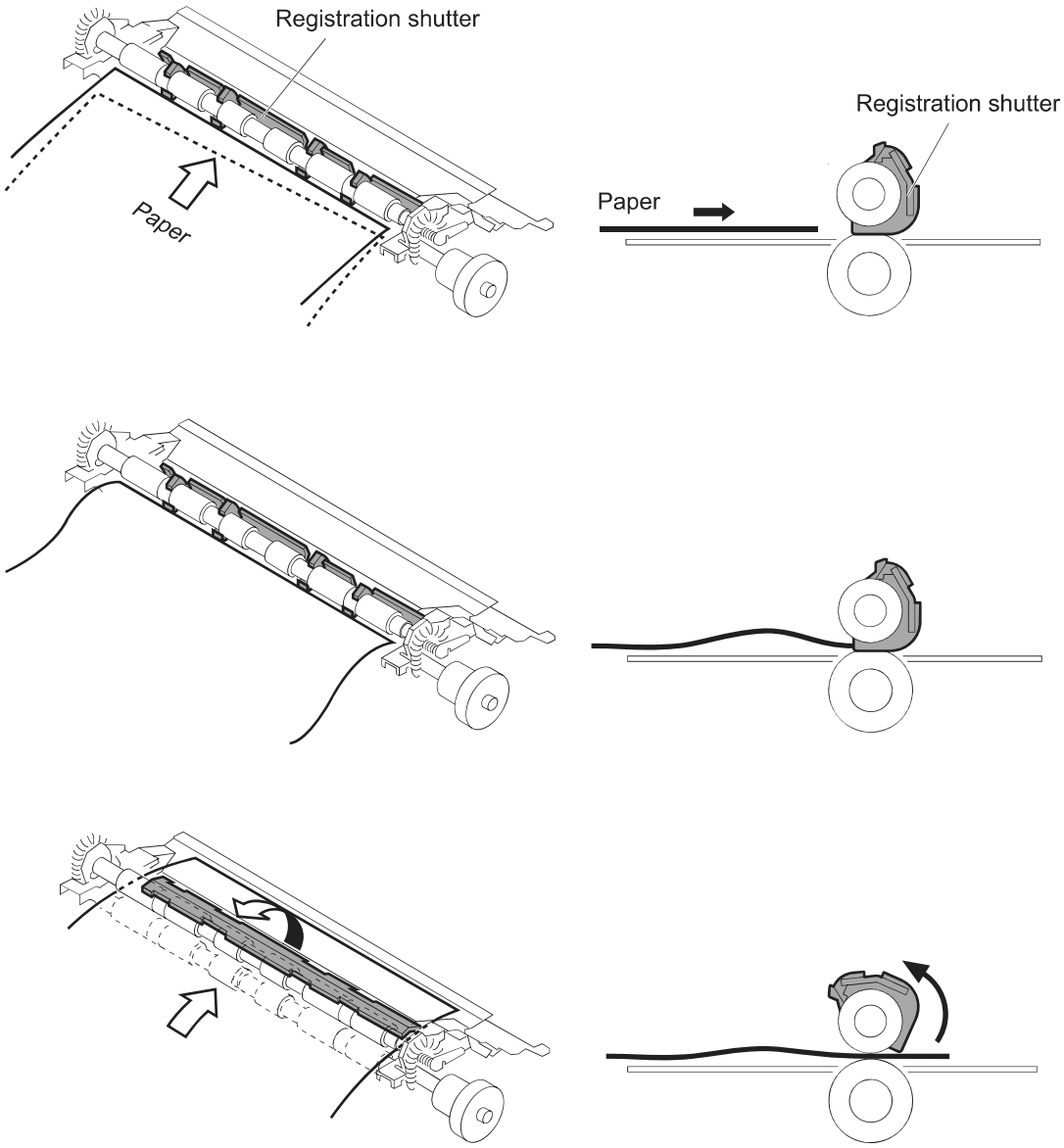
The Tray 2 presence sensor is in the lifter drive unit. The sensor detects the tray-presence sensor flag and determines whether Tray 2 is installed correctly.

Tray 2 skew feed prevention

The printer can straighten the paper without slowing the feed operation.

1. The leading edge of paper strikes the registration shutter, and the leading edge is aligned with the shutter.
2. As the feed rollers keep pushing the paper, the paper warps.
3. When the force is great enough, the registration shutter rotates, and the paper passes through straightened.

Figure 1-28 Skew-feed prevention



Feed speed control

The DC controller adjusts the feed speed to improve the print quality depending on the paper type. The paper is fed at a specified speed according to the print mode designated by the formatter.

Table 1-21 **Print mode and feed speed**

Print mode	Feed speed[1]	Media sensor detection
Normal	1/1	Yes
Heavy media 1	Pro	No
Heavy media 2	1/2	Yes
Heavy media 3	1/3	Yes

Table 1-21 **Print mode and feed speed (continued)**

Print mode	Feed speed[1]	Media sensor detection
Light media 1	1/1	Yes
Light media 2	1/1	Yes
Light media 3	1/3	Yes
Glossy media 1	1/3	Yes
Glossy media 2	1/3	Yes
Glossy media 3	1/3	Yes
Glossy film	1/3	Yes
Envelope 1	1/2	No
OHT	1/3	Yes
Label	1/2	No
Designated media 1	1/2	No
Designated media 2	1/3	No
Designated media 3	Pro	No

[1] Feed speeds
1/1 speed = 210 mm/s
Pro speed = 174 mm/s
1/2 speed = 105 mm/s
1/3 speed = 70 mm/s

Duplexing unit

When duplexing, the fuser motor (M1) reverses the paper and feeds it through the paper path to print the second side.

Duplexing reverse and duplex feed control

The duplex reverse control reverses the paper after the first side is printed and feeds it to the duplex re-pickup position to print the second side of the page.

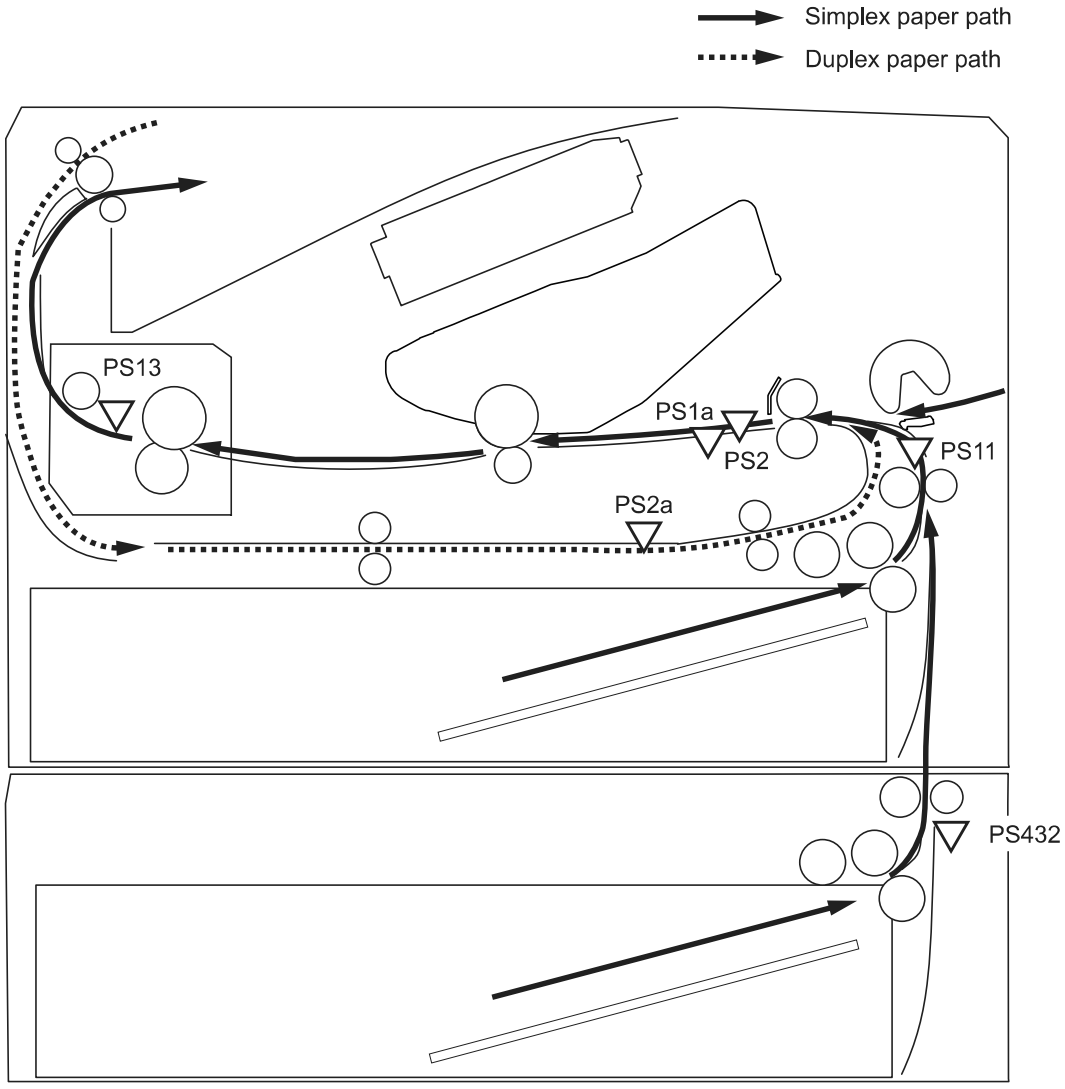
1. At a specified time after the first side of a page is printed, the fuser motor rotates, and the duplex reverse solenoid is turned on.
2. The duplex flapper moves, and the paper feeds to the duplex reverse unit.
3. After a specified period of time, the fuser motor reverses, and the paper feeds to the duplex feed unit.
4. The fuser motor and the pickup motor move the paper to the duplex re-pickup position.
5. The fuser motor and the duplex feed clutch stop, and the paper feed operation pauses.
6. After a specified period of time, the fuser motor rotates, and the duplex feed clutch is turned on. The paper is then picked up again.

Jam detection/prevention

The printer uses the following sensors to detect the paper as it moves through the paper path and to report to the DC controller if the paper has jammed.

- Top of page (TOP) sensor (SR2)
- Media width sensor (SR1a)
- Fuser output sensor (SR13)
- Duplex feed sensor (SR2a)
- Registration sensor (SR11; M506/M527)
- Paper feeder feed sensor (SR432; M506/M527)

Figure 1-29 Jam detection sensors



The printer determines that a jam has occurred if one of these sensors detects paper at an inappropriate time. The DC controller stops the print operation and notifies the formatter.

Table 1-22 Jams that the printer detects

Jam	Description
Media input delay jam 1	Media did not reach the registration sensor in time.
Media input delay jam 2	Media did not reach the source tray feed sensor in time.
Media input delay jam 3	Media did not reach the tray 3 feed sensor in time.
Duplex re-feed jam 1	Media did not reach the registration sensor in time.
Media input stay jam 1	Media remained at the registration sensor longer than legal-sized media should remain.
Fuser delivery delay jam 1	Media did not reach the fuser output sensor in time.
Fuser delivery stay jam 1	Media stayed at fuser output sensor longer than it should stay. Media is in duplex path.
Fuser delivery stay jam 2	Media stayed at fuser output sensor longer than it should stay. Media is in simplex path.
Wrap jam 1	Media is first detected at fuser output sensor and then disappeared from the sensor before it should have disappeared.
Door open jam	A door is open while paper is moving through the printer.
Residual Media in paper path jam 1	Media detected in the paper path.

Input accessories

NOTE: An optional 550-sheet paper feeder is available for this printer. The M506/M527 printers support up to three of these paper feeders at a time. The M501 printer supports one paper feeder.

Tray 3-5

The 550-sheet paper feeder is installed under the printer. It picks up paper and feeds it into the printer.

NOTE: The M501 printer supports one paper feeder. The M506/M527 printers support three paper feeders.

Figure 1-30 550-sheet paper feeder paper path

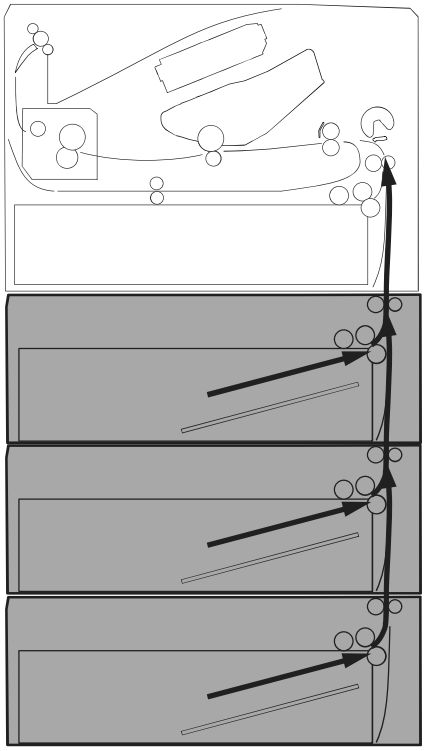


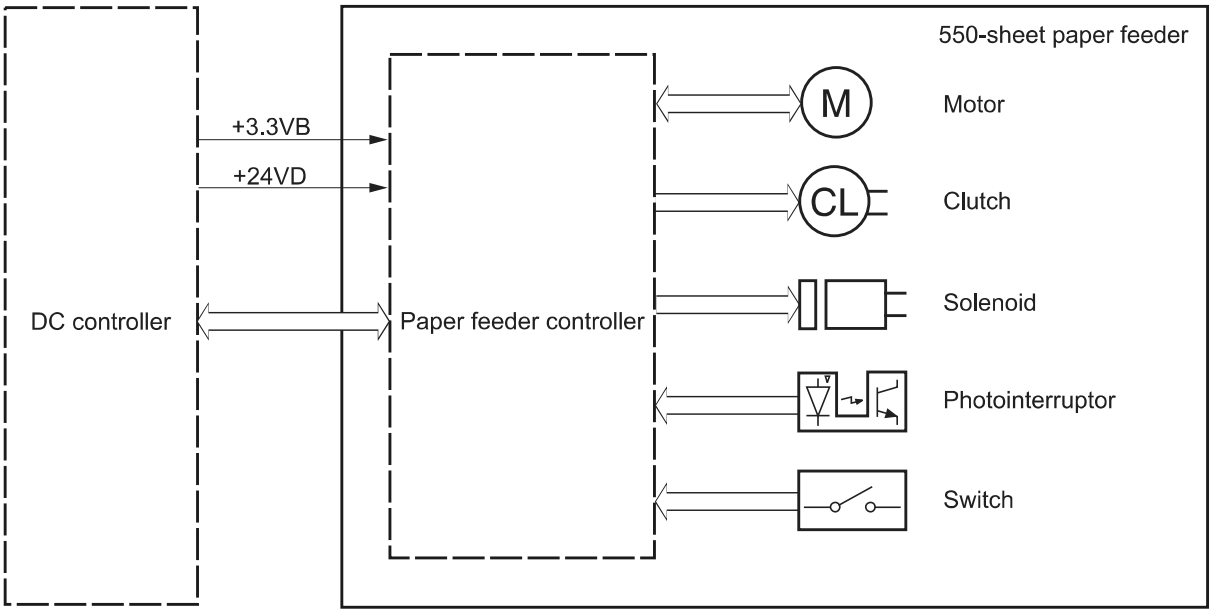
Table 1-23 **Tray 3 functions**

Function	Supported feature
Cassette lift-up control	Yes
Cassette presence detection	Yes
Cassette media size detection	No
Cassette media stack surface detection	Yes
Cassette media out detection	Yes
Cassette media level detection	No
Multiple-feed prevention	Yes
Automatic delivery	Yes

Driver PCA

The paper feeder controller controls the operational sequence of the paper feeder.

Figure 1-31 Tray 3-5 driver PCA



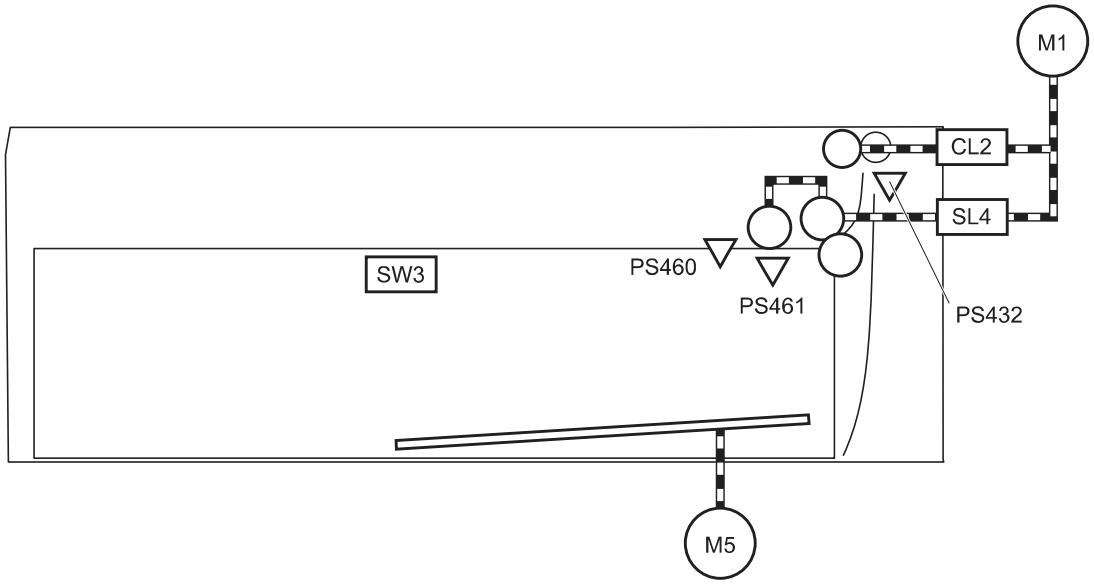
Electrical components

The 550-sheet paper feeder has one motor for lifting the tray and feeding paper.

Component type	Abbreviation	Component name
Motor	M5	Optional tray lifter motor
Solenoid	SL4	Cassette pickup solenoid
Clutch	Cl2	Feed clutch
Switch	SW3	Cassette detection switch
Photointerrupter	PS460	Media surface sensor
	PS461	Cassette media out sensor
	PS432	Feed sensor

Paper pickup

Figure 1-32 Paper pickup and feed components



The paper feeder contains several motors, solenoids, sensors, and switches, as described in the following table.

Table 1-24 **Paper pickup and feed components**

Component type	Abbreviation	Component name
Motors	M1	Fuser motor
	M5	Lifter motor
Clutch	CL2	Feed clutch
Solenoid	SL4	Cassette pickup solenoid
Switches	SW3	Cassette detection switch
Sensors	PS460	Media surface sensor
	PS461	Cassette media out sensor
	PS432	Feed sensor

Multiple feed prevention

The Trays 3-5 multiple-feed prevention for the paper feeder is operated in the same way as that of Tray 2.

Tray presence detection

The Trays 3-5 tray presence detection for the paper feeder is the same as that of Tray 2.

Tray lift operation

The 550-sheet paper feeder keeps the paper stack surface at the correct pickup position. The tray lift operation occurs under the following conditions:

- The printer is turned on
- The tray is inserted
- The paper stack surface of the tray lowers

The sequence occurs as follows:

1. The feeder tray-lifting motor rotates and the lifter moves up.
2. When the paper-feeder media-stack-surface sensor detects the stack surface of the paper, the lifting motor stops.
3. The lifting motor rotates again to lift the lifter when the paper-feeder media-stack-surface sensor detects the stack surface, and then lowers during printing.

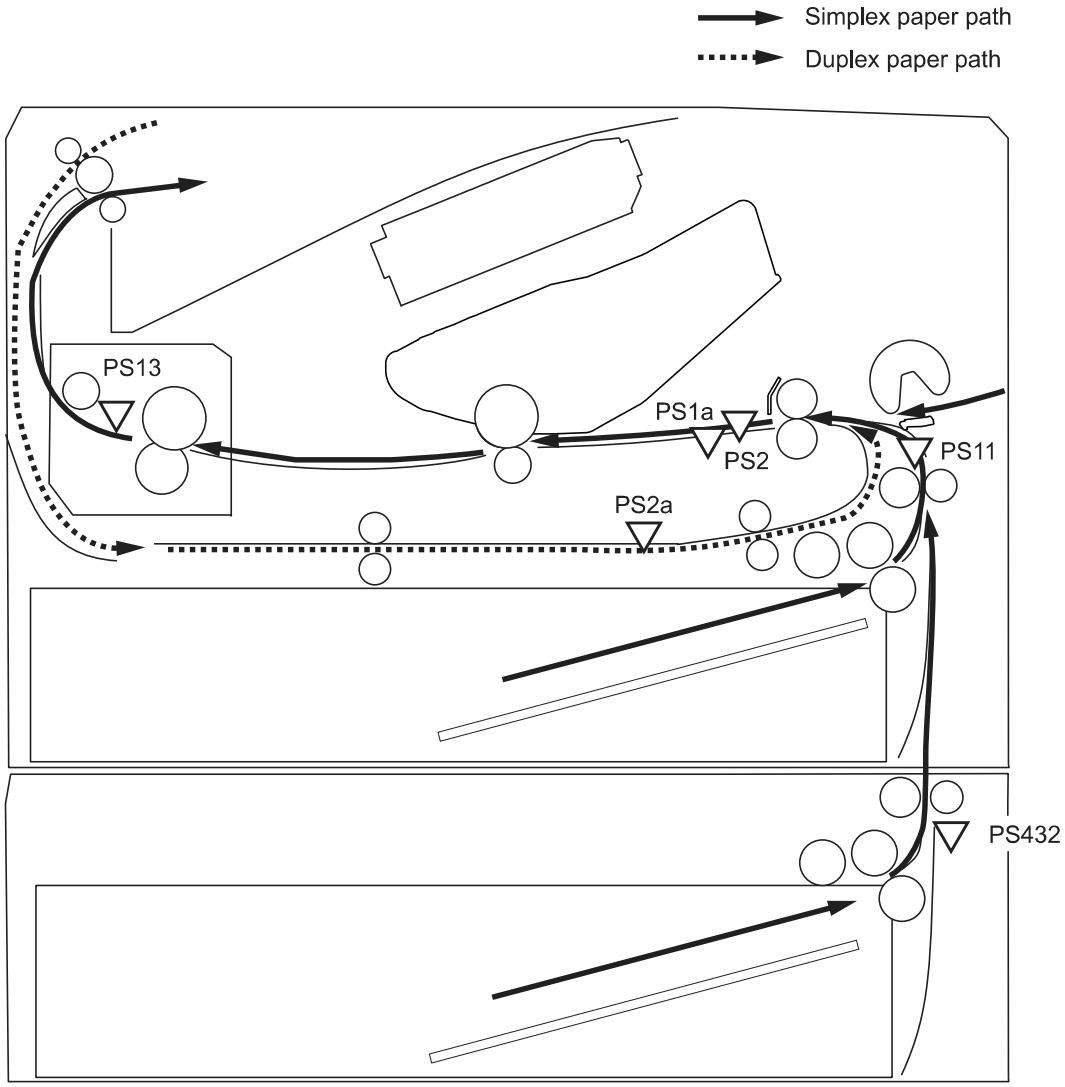
If a tray media-stack-surface sensor does not detect a stack surface within a specified period after the lifting motor starts rotating, the paper feeder driver determines that the lifting motor has failed and notifies the formatter through the DC controller.

The paper-feeder driver notifies the formatter if either of the paper-feeder media-stack-surface sensors fails to detect the stack surface within a specified period from when a lift-up operation starts.

Jam detection

The 550-sheet paper feeder uses the paper feeder feed sensor (SR432) to detect the presence of paper and to check whether paper has jammed.

Figure 1-33 Jam detection (1x550-sheet paper feeder)



The 550-sheet paper feeder detects the following jams:

- **Media input delay jam 1 (550-sheet paper feeder)**: Paper did not reach the registration sensor in time.
- **Media input delay jam 2 (550-sheet paper feeder)**: Paper did not reach the source tray feed sensor in time.
- **Media input delay jam 3 (550-sheet paper feeder)**: Paper did not reach the tray 3 feed sensor in time.
- **Pickup stationary jam (550-sheet paper feeder)**: The feed sensor does not detect the trailing edge of paper within a specified time after the sensor detects the leading edge.
- **Residual paper jam (550-sheet paper feeder)**: The feed sensor detects the presence of paper for a specified time during an automatic delivery operation.
- **Right door open jam (550-sheet paper feeder)**: The right door open is detected during a paper feed operation.

Scanning and image capture system (M527)

NOTE: This section is for the M527 printer only.

Figures in this section might look slightly different from your printer, but they are correct for the M527 printer. All the information provided in this section is correct for this printer.

The scanner is a carriage-type platen scanner which includes the frame, glass, scan module, and a scan control board (SCB). The scanner has a sensor to detect legal-sized media and a switch to indicate when the document feeder is opened.

The document feeder and control panel are attached to the scanner. If the scanner fails, it can be replaced as a whole unit. The scanner replacement part does not include the document feeder, control panel, or SCB.

Document feeder system (M527)

NOTE: This section is for the M527 printer only.

Document feed system

This section describes the following:

- Sensors in the document feeder
- Document feeder paper path
- Simplex single-pass scanning
- Electronic duplexing (e-duplex) single-pass scanning
- Deskew operation
- Document feeder hinges

The printer supports single-pass electronic duplexing (e-duplex) copy jobs. Two separate scan modules scan the front-side and back-side of an e-duplex copy job page in a single pass through the document feeder.

For the WF class, this ADF supports a smart background which auto-crops and adjusts the image extents.

Sensors in the document feeder

The document feeder contains the following sensors:

- **ADF paper present sensor**: Detects whether a document is present in the document feeder. If paper is present in the document feeder when copies are made, the printer scans the document using the document feeder. If no paper is present when copies are made, the printer scans the document using the scanner glass.
- **ADF Y (length) sensor**: Detects whether a legal-size original is present in the document feeder.
- **ADF jam cover sensor**: Detects whether the document feeder cover is open or closed.
- **ADF paper path deskew sensor**: Detects the top of the page as it enters the deskew rollers.
- **ADF paper path pick success sensor**: Detects a successful one page feed from the document feeder tray.

  NOTE: This sensor uses ultrasonic sound to detect a multi-page paper feed.

- **Paper path sensor 1**: Detects the top of the page as it approaches the front-side scan module (document feeder glass).

Figure 1-34 Document feeder sensors

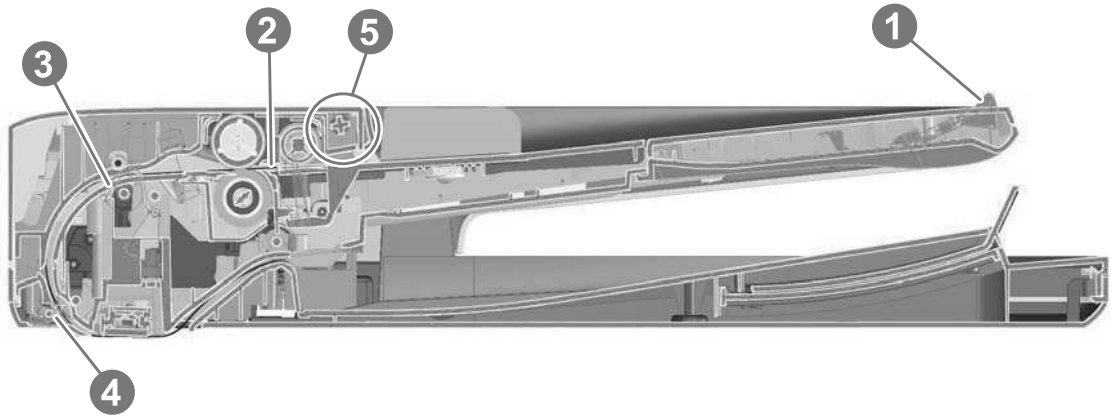


Table 1-25 Document feeder sensors

Item	Description
1	ADF Y (length) sensor
2	ADF paper present sensor
3	ADF deskew sensor
4	Paper path sensor 1 **NOTE:** For an e-duplex copy job, this sensor is used to activate the front-side scan module (in the scanner base) and the front-side background selector (in the document feeder), if needed.
5	ADF jam cover sensor (open the jam access cover and insert a folded piece of paper to activate the flag)

Document feeder paper path

Figure 1-35 Document feeder paper path

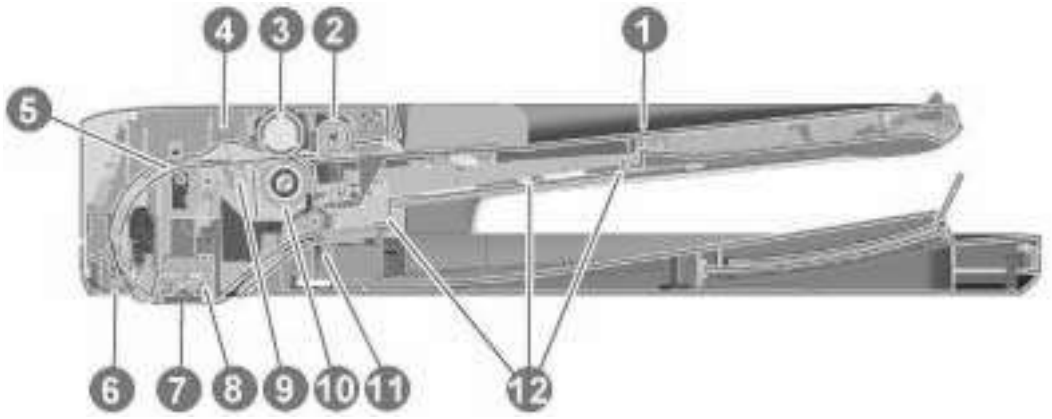


Table 1-26 Document feeder paper path

Item	Description	Item	Description
1	Input tray	7	Front-side scan module **NOTE:** This scan module (document feeder glass) is located in the scanner base.
2	Pre-pick roller	8	Back-side scan module

Table 1-26 **Document feeder paper path (continued)**

Item	Description	Item	Description
3	Pick roller	9	ADF pick success transmitter
4	ADF pick success receiver	10	Separator roller
5	Deskew drive roller	11	Exit drive roller
6	Prescan drive roller	12	Lift plate

Document feeder simplex operation

Following is the basic sequence of operation for a document feeder simplex job.

1. The ADF jam cover sensor detects when the cover door is in the closed position.
2. The ADF paper present sensor activates when paper is loaded onto the input tray.
3. The feed motor rotates to raise the lift plate and starts to pick the loaded paper.
4. The ADF multi-pick (ultrasonic) sensor activates when the leading edge of the media is driven past the sensor. The printer firmware registers a successful pick operation.
5. The ADF paper path deskew activates when the leading edge of the paper passes it. The printer firmware registers the leading edge of the paper position.
6. The leading edge of the paper drives into the nip point of the deskew drive roller and the deskew pinch rollers. This creates a buckle of paper by the nip point for pick-skew correction.
7. The deskew motor rotates the deskew drive roller to pull the paper into the prescan drive roller.
8. The pick motor stops turning and allows both the pick and feed roller to turn freely while the paper is pulled in by the deskew drive roller.
9. The feed motor rotates to drive the paper into the prescan front-side sensor. The firmware registers the leading edge position of the paper as the multi-pick sensor activates.
10. The feed motor continues to rotate and drive the leading edge of the paper through the preset distance from the multi-pick sensor to the front-side scan zone. The scanner begins the scanning and data retrieval process.
11. The ADF multi-pick (ultrasonic) sensor deactivates when the trailing edge of the paper passes the sensor. The firmware registers the trailing edge of the paper position.
12. The feed motor continues to rotate and drive the trailing edge of the paper through the preset distance from the ADF multi-pick (ultrasonic) sensor to the front-side scan zone. The scanner ends the scanning and data retrieval process.
13. The feed motor continues to rotate and ejects the trailing edge of the paper into the output bin.
14. One of the following occurs:
    - If the copy job is complete, the ADF paper present sensor deactivates. The feed motor reverses rotation to raise the pick roller.
    - If the copy job is not complete, the ADF paper present sensor is active. The printer firmware detects additional pages in the input tray and the process repeats.

Document feeder e-duplex operation

Following is the basic sequence of operation for a document feeder simplex job.

NOTE: For an e-duplex copy job, the background scan operation begins immediately after the simplex sequence of operation ends.

1. The feed motor continues to drive the paper until the leading edge activates the prescan back-side sensor. The printer firmware registers the position of the leading edge of the paper.
2. The feed motor continues to rotate to drive the leading edge of the paper through the preset distance from prescan back-side sensor to the back-side background selector scan zone. The back-side background scan module begins scanning and retrieval of the data.
3. The prescan back-side sensor deactivates when the trailing edge of the paper passes it. The printer firmware registers the trailing edge of the paper position.
4. The feed motor continues to rotate to drive the trailing edge of the paper edge past the back-side background selector scan zone.
5. The feed motor continues to rotate and ejects the trailing edge of the paper into the output bin.
6. One of the following occurs:
    - If the copy job is complete, the ADF paper present sensor deactivates. The feed motor reverses rotation to raise the pick roller.
    - If the copy job is not complete, the ADF paper present sensor is active. The printer firmware detects additional pages in the input tray and the process repeats.

Deskew operation

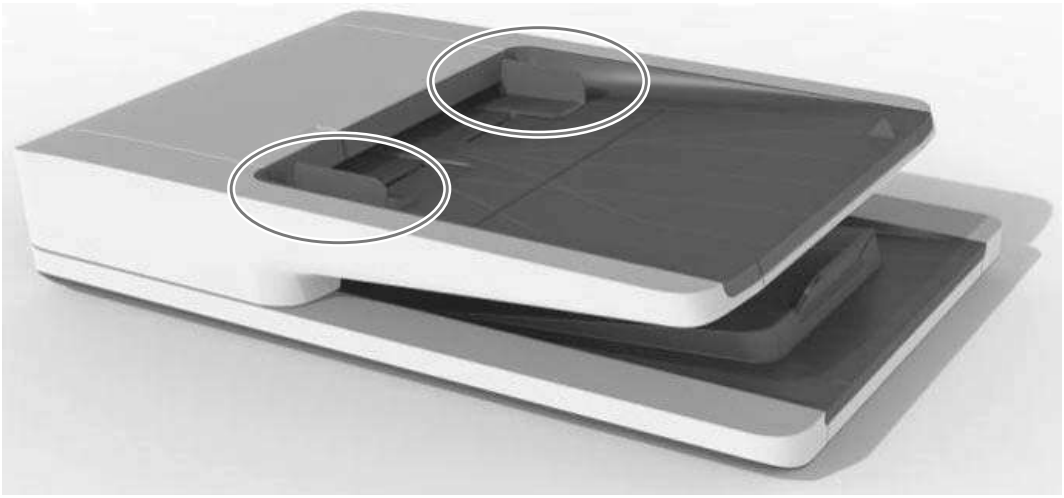
Sliding side guides on the input tray make sure that the paper stack is correctly aligned at the center of the input tray when paper is loaded in the tray. The correct position of the loaded paper is parallel with the direction of travel into the document feeder paper path.

The document feeder further reduces paper skew due to improper loading of paper in the input tray by buckling the paper to create a paper buffer.

The document feeder aligns the leading edge of the paper parallel with the deskew drive rollers before it is driven further into the document feeder paper path.

NOTE: If the page to be copied is smaller than the minimal sliding guide setting, do not use the document feeder for the copy job. Attempting to copy too small of a page using the document feeder can result in document feeder jams and/or damage to the original page. Instead, use the flatbed glass to copy the page.

Figure 1-36 Deskew operation



Document feeder hinges

The document feeder hinges allow positioning the assembly vertically above the scanner glass to accommodate the placement of books and other objects up to 25 mm (1.0 in) in height on the scanner glass. The document feeder still closes (the bottom of the ADF is kept parallel to the scanner glass) and allows the printer to operate.

The document feeder hinges provide height adjustment of 25 mm (1.0 in) when a maximum downward force of 4.5 kg (10 lb) is applied at the front edge of the assembly, with the fulcrum (such as the spine of a book) centered on the scanner glass and parallel to its long axis.

The document feeder will withstand a downward force of about 4.5 kg (10 lb) applied at the front edge center of the assembly—when the fulcrum (such as the spine of a book) is located anywhere on the scanner glass and parallel to its long axis—without breaking, deforming, detaching or experiencing performance degradation.

The document feeder hinges support the assembly in the open position and prevent the document feeder from suddenly closing in a damaging or loud manner.

The hinges can hold the document feeder static in all positions higher than 100 mm (3.93 in); measured at the front of the assembly. Less than 2.3 kg (5 lb) of force is required to open or close the document feeder.

The hinges allow the document feeder to open to an angle of between 60º and 80º from the horizontal position (this angle will not allow the printer to tip over).

Figure 1-37 Document feeder open (book mode)

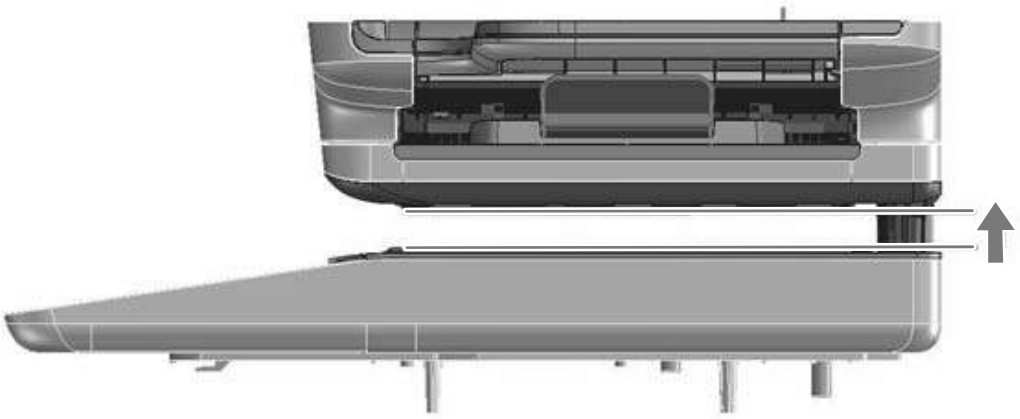


Figure 1-38 Document feeder open (60º to 80º)