XEROX

Service Manual

701P45760

Phaser® 4500/4510

Laser Printers

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Laser Printers

Warning

The following servicing instructions are for use by qualified service personnel only. To avoid personal injury, do not perform any servicing other than that contained in the operating instructions, unless you are qualified to do so.

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2 Theory of Operation

3 Error Messages and Codes

4 General Troubleshooting

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Service Terms

Manual Terms

Various terms are used throughout this manual to either provide additional information on a specific topic or to warn of possible danger present during a procedure or action. Be aware of all symbols and terms when they are used, and always read NOTE, CAUTION, and WARNING statements.

Consumable: Ink, toner, or print cartridge that is consumed. Customer is expected to replace once consumed.

Routine Maintenance Item: Supply item or kit that has a limited life. Customer is expected to replace at end-of-life.

Accessory: A single component or assembly that may be added to a printer; however, it is NOT an option to the product.

Throughout this manual any pieces of information that pertain to just the Phaser 4500 are indicated with **P4500**, and those that pertain to just the Phaser 4510 are indicated with **P4510**. Those that apply to both models do not have either label.

Common Acronyms:

FRU: Field Replaceable Unit

PL: Corresponds to the FRU Parts List.

CRU: Customer Replaceable Unit

ESD: Electrostatic Discharge

Note

A note indicates an operating or maintenance procedure, practice or condition that is necessary to efficiently accomplish a task.
A note can provide additional information related to a specific subject or add a comment on the results achieved through a previous action.

Caution

A caution statement indicates an operating or maintenance procedure, practice or condition that, if not strictly observed, results in damage to, or destruction of, equipment.

Warning

A warning statement indicates an operating or maintenance procedure, practice or condition that, if not strictly observed, results in injury or loss of life.

Product Terms

Caution: A personal injury hazard exists that may not be apparent. For example, a panel may cover the hazardous area.

Danger: A personal injury hazard exists in the area where you see the sign.

Symbols Marked on the Product

Hot surface on or in the printer. Use caution to avoid personal injury.

The surface is hot while the printer is running. After turning off the power, wait 30 minutes.

Use caution (or draws attention to a particular component). Refer to the manual(s) for information.

Do not touch the item.

Power Safety Precautions

Power Source

For 110 VAC printers, do not apply more than 135 volts RMS between the supply conductors or between either supply conductor and ground. Use only the specified power cord and connector. For 220 VAC printers, do not apply more than 254 volts RMS between the supply conductors or between either supply conductor and ground. Use only the specified power cord. This manual assumes that the reader is a Xerox-certified service technician.

Plug the three-wire power cord (with grounding prong) into a grounded AC outlet only. If necessary, contact a licensed electrician to install a properly grounded outlet. If the product loses its ground connection, contact with conductive parts may cause an electrical shock.

Disconnecting Power

Turning the power off using the On/Off switch does not completely de-energize the printer. You must also disconnect the printer power cord from the AC outlet. Position the power cord so that it is easily accessible during servicing so that you may power down the printer during an emergency.

- Disconnect the power plug by pulling the plug, not the cord.
- Disconnect the power cord in the following cases:
  - if the power cord or plug is frayed or otherwise damaged
  - if any liquid or foreign material is spilled into the case
  - if the printer is exposed to any excess moisture
  - if the printer is dropped or damaged
  - if you suspect that the product needs servicing or repair
  - whenever you clean the product

Electrostatic Discharge (ESD) Precautions

Some semiconductor components, and the respective sub-assemblies that contain them, are vulnerable to damage by Electrostatic discharge (ESD). These components include Integrated Circuits (ICs), Large-Scale Integrated circuits (LSIs), field-effect transistors and other semiconductor chip components. The following techniques will reduce the occurrence of component damage caused by static electricity.

Be sure the power is off to the chassis or circuit board, and observe all other safety precautions.

- Immediately before handling any semiconductor components assemblies, drain the electrostatic charge from your body. This can be accomplished by touching an earth ground source or by wearing a wrist strap device connected to an earth ground source. Wearing a wrist strap will also prevent accumulation of additional bodily static charges. Be sure to remove the wrist strap before applying power to the unit under test to avoid potential shock.
- After removing a static sensitive assembly from its anti-static bag, place it on a grounded conductive surface. If the anti-static bag is conductive, you may ground the bag and use it as a conductive surface.
- Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage some devices.
- Do not remove a replacement component or electrical sub-assembly from its protective package until you are ready to install it.
- Immediately before removing the protective material from the leads of a replacement device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
- Minimize body motions when handling unpackaged replacement devices. Motion such as your clothes brushing together, or lifting a foot from a carpeted floor can generate enough static electricity to damage an electro-statically sensitive device
- Handle ICs and EPROMs carefully to avoid bending pins.
- Pay attention to the direction of parts when mounting or inserting them on Printed Circuit Boards (PCB's).

Service Safety Summary

General Guidelines

For Xerox-certified service personnel only: Refer also to the preceding Power Safety Precautions.

Avoid servicing alone: Do not perform internal service or adjustment of this product unless another person capable of rendering first aid or resuscitation is present.

Use care when servicing with power: Dangerous voltages may exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on. Disconnect power before removing the power supply shield or replacing components.

Do not wear jewelry: Remove jewelry prior to servicing. Rings, necklaces and other metallic objects could come into contact with dangerous voltages and currents.

Power source: This product is intended to operate from a power source that will not apply more then 264 volts rms for a 220 volt AC outlet or 140 volts rms for a 110 volt AC outlet between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Warning Labels

Read and obey all posted warning labels. Throughout the printer, warning labels are displayed on potentially dangerous components. As you service the printer, check to make certain that all warning labels remain in place.

Safety Interlocks

Make sure all covers and the printer's control panel are in place and all interlock switches are functioning correctly after you have completed a printer service call. If you bypass an interlock switch during a service call, use extreme caution when working on or around the printer.

CLASS 1 LASER PRODUCT

The Phaser 4500/4510 Laser Printer is certified to comply with Laser Product Performance Standards set by the U.S. Department of Health and Human Services as a Class 1 Laser Product. This means that this is a class of laser product that does not emit hazardous laser radiation; this is possible only because the laser beam is totally enclosed during all modes of customer operation. When servicing the printer or laser unit, follow the procedures specified in this manual and there will be no hazards from the laser.

Servicing Electrical Components

Before starting any service procedure, switch off the printer power and unplug the power cord from the wall outlet. If you must service the printer with power applied, be aware of the potential for electrical shock.

Warning

Turning the power off by using the On/Off switch does not completely de-energize the printer. You must also disconnect the printer power cord from the AC outlet. Position the power cord so that it is easily accessible during servicing.

Warning

Do not touch any electrical component unless you are instructed to do so by a service procedure.

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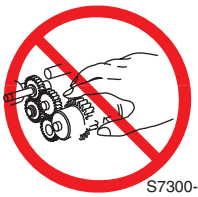
Servicing Mechanical Components

When servicing mechanical components within the printer, manually rotate drive assemblies, rollers, and gears.

Warning

Do not try to manually rotate or manually stop the drive assemblies while any printer motor is running.



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Servicing Fuser Components

Warning

This printer uses heat to fuse the toner image to media. The fuser assembly is VERY HOT. Turn the printer power off and wait at least 5 minutes for the Fuser to cool before you attempt to service the fuser assembly or adjacent components.

Regulatory Specifications

United States (Federal Communications Commision

The equipment described in this manual generates and uses radio frequency energy. If it is not installed properly in strict accordance with Xerox instructions, it may cause interference with radio and television reception or may not function properly due to interference from another device. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiver (device being interfered with).
- Increase the separation between the printer and the receiver.
- Connect the printer into an outlet on a circuit different from that which the receiver is connected.
- Route the interface cables on the printer away from the receiver
- Consult the dealer, Xerox service, or an experienced radio/television technician for help.

Changes or modifications not expressly approved by Xerox can affect the emission and immunity compliance and could void the user's authority to operate this product. To ensure compliance, use shielded interface cables. A shielded parallel cable can be purchased directly from Xerox at www.xerox.com/office/4500supplies.

Xerox has tested this product to internationally accepted electromagnetic emission and immunity standards. These standards are designed to mitigate interference caused or received by this product in a normal office environment. This product is also suitable for use in a residential environment based on the levels tested.

In the United States this product complies with the requirements of an unintentional radiator in part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference; (2) this device must accept any interference received, including interference that may cause undesired operation.

Canada

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est comforme à la norme NMB-003 du Canada.

European Union

The CE mark applied to this product symbolizes Xerox's declaration of conformity with the following applicable Directives of the European Union as of the dates indicated:

January 1, 1995: Low Voltage Directive 73/23/EEC as amended by 98/68/EEC

January 1, 1996: Electromagnetic Compatibility Directive 89/336/EEC

March 9, 1999: Radio & Telecommunications Terminal Equipment Directive 1999/5/EC

This product, if used properly in accordance with the user's instructions, is neither dangerous for the consumer nor for the environment.

To ensure compliance with European Union regulations, use shielded interface cables.

A signed copy of the Declaration of Conformity for this product can be obtained from Xerox.

General Information

In this chapter...

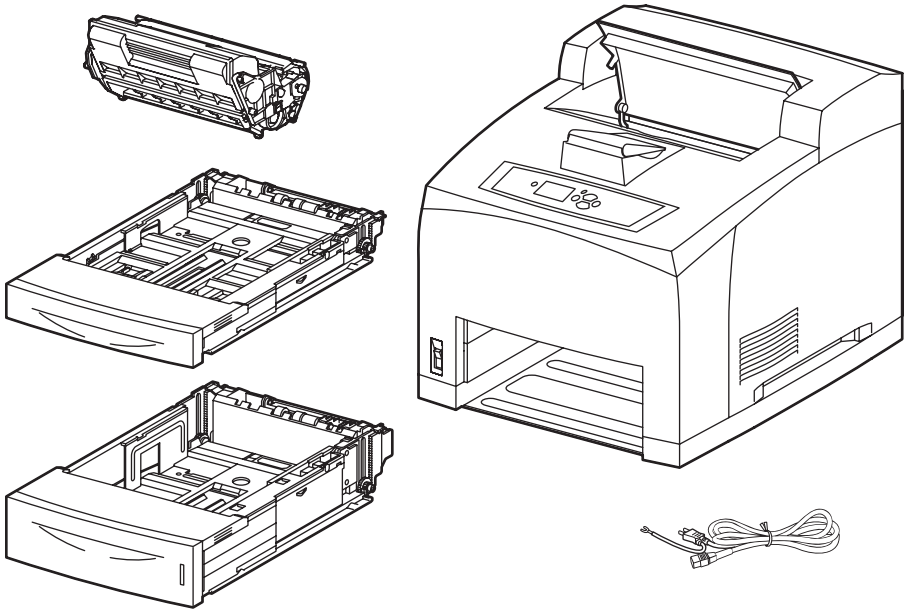
- Printer Introduction and Overview
- Printer Configurations
- Parts of the Printer
- Control Panel
- Image Processor Board (Phaser 4500)
- Image Processor Board (Phaser 4510)
- Consumables and Routine Maintenance Items
- Printer Specifications

Chapter 1

Printer Introduction and Overview

The *Xerox Phaser 4500/4510 Laser Printer Service Manual* is the primary document used for repairing, maintaining, and troubleshooting the printer.

To ensure complete understanding of this product, participation in Xerox Phaser 4500/4510 Service Training is strongly recommended. To service this product, Xerox certification for this product is required.



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Technical Support Information

For updates to the Service Manual, Service Bulletins, knowledge base, etc., go to www.office.xerox.com/partners.

For further technical support, contact your assigned Xerox Technical Support for this product.

Printer Configurations

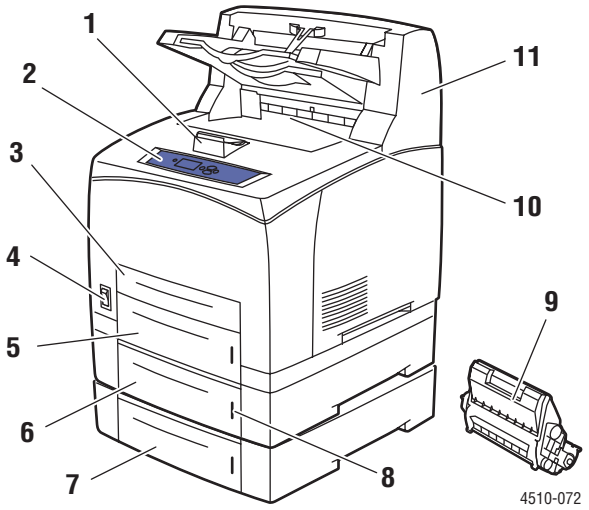
A replaceable configuration card holds configuration information that enables or disables the network features shown in the following table.

Printer Configurations

Features	Printer Configuration			
	B	**N**	**DT**	**DX**
Maximum print speed (letter-size paper) **P4500:** **P4510:**	 36 ppm 45 ppm	 36 ppm 45 ppm	 36 ppm 45 ppm	 36 ppm 45 ppm
Memory **P4500:** **P4510:**	 48 MB 128 MB	 64 MB 128 MB	 64 MB 128 MB	 64 MB 128 MB
PostScript fonts	39	39	39	39 + 97 on hard drive
PCL5e/PCL6	Yes	Yes	Yes	Yes
Job pipelining	Standard	Standard	Standard	Standard
PDF direct print	Yes	Yes	Yes	Yes
Resolutions	600 dpi, True 1200 dpi	600 dpi, True 1200 dpi	600 dpi, True 1200 dpi	600 dpi, True 1200 dpi
USB, Parallel	Yes	Yes	Yes	Yes
10/100BaseTX Ethernet capabilities	Optional	Standard	Standard	Standard
550-sheet feeder (tray 3)	Optional	Optional	Standard	Standard
550-sheet feeder (tray 4)	Optional	Optional	Optional	Optional
Automatic 2-sided printing (requires duplex unit)	Optional	Optional	Standard	Standard
Hard drive	Optional	Optional	Optional	Standard
Job collation (Requires a hard drive)	Optional	Optional	Optional	Standard
Proof Print, Secure Print, Saved Jobs (Requires a hard drive)	Optional	Optional	Optional	Standard
500-sheet stacker	Optional	Optional	Optional	Standard

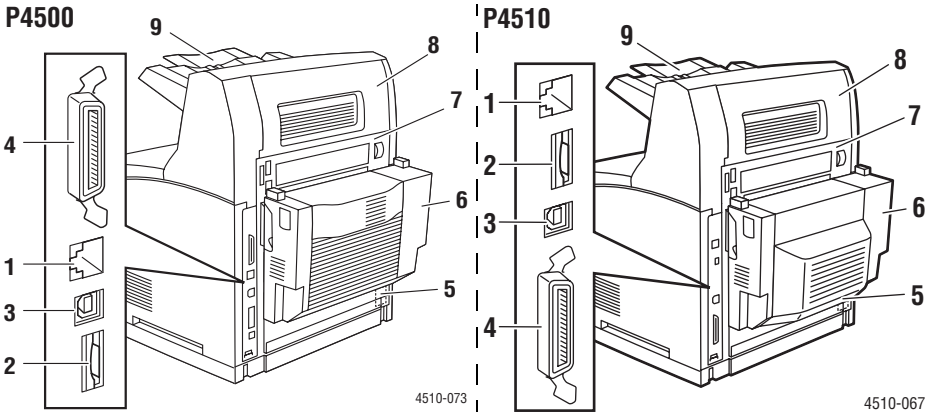
Parts of the Printer

Front View



1. Paper stop
2. Control panel
3. Tray 1
4. On/Off switch
5. Tray 2
6. Optional tray 3
7. Optional tray 4
8. Paper gauge
9. Print cartridge
10. Standard output tray
11. Optional 500-Sheet stacker

Rear View

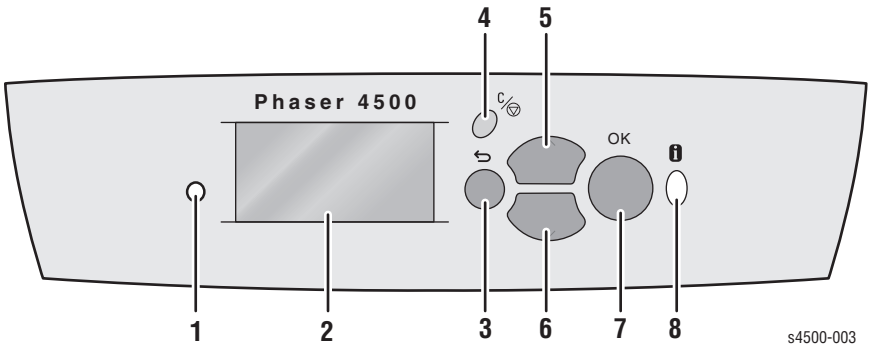


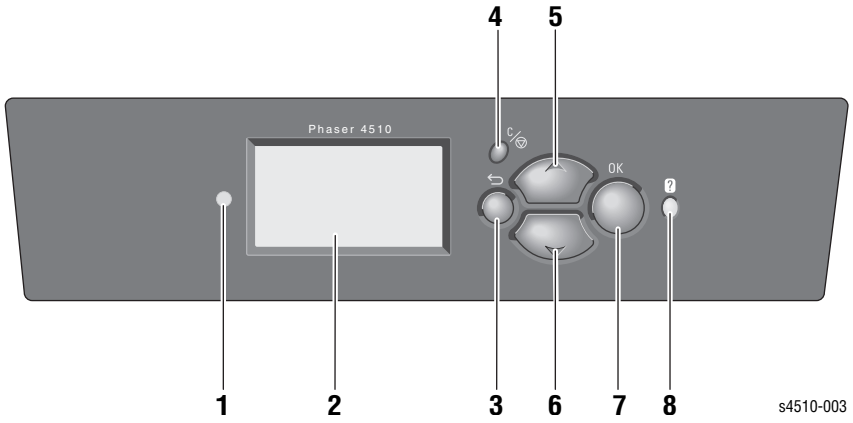
Items 1 - 4 are mounted on the image processor board.

1. Ethernet 10/100 Base-T connector
2. Configuration card
3. USB connector
4. Parallel cable connector
5. Power receptacle
6. Optional duplex unit
7. Rear cover
8. Stacker rear cover
9. Stacker extension

Control Panel

The control panel consists of one tricolor LED, a display window, and six functional buttons.





1. Status indicator LED
2. Graphic control panel display
3. **Back** button
4. **Cancel** button
5. **Up Arrow** button - scrolls up the menu system
6. **Down Arrow** button - scrolls down the menu system
7. **OK** (select) button
8. **Information (i)** (P4500) or **Help (?)** (P4510) button - for additional explanation or help

LED States

LED State	Printer State
Green	Ready to Print or in Power Saver mode
Flashing Yellow	Warning (but can still print)
Flashing Green	In Standby mode or busy (receiving data, processing data, printing)
Flashing Red	Error; cannot print

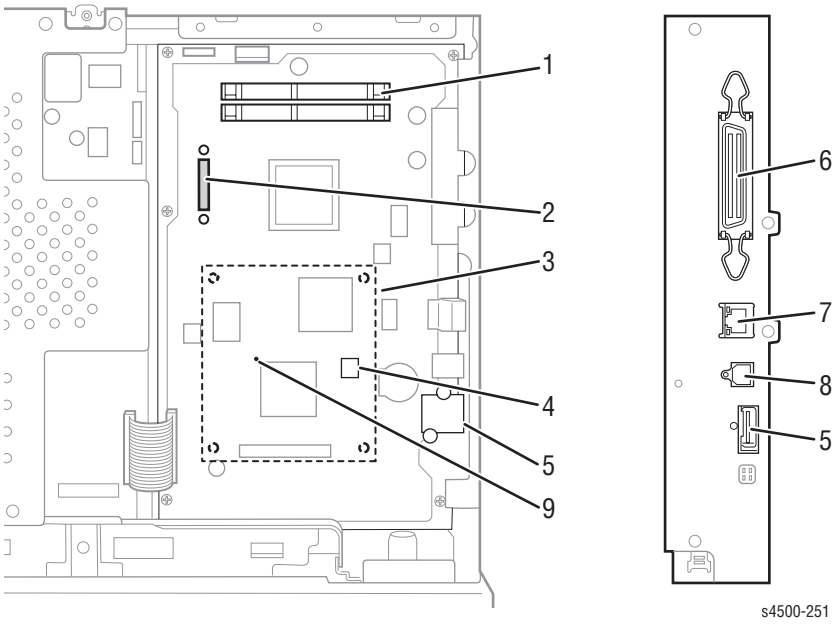
Control Panel Shortcuts

Mode	Buttons Pressed at Power On
Skip execution of POST diagnostics	**OK**
Print Service Diagnostics Map	**Information**
Reset PostScript NVRAM	**Back + OK**
Password Bypass	**Up Arrow + Down Arrow**
Enter Service Diagnostics	**Back + Information**

Image Processor Board (Phaser 4500)

When installing a new image processor board in the printer, you must transfer the following parts from the old board:

- Memory DIMMs
- Hard drive (if installed)
- NVRAM
- Configuration card

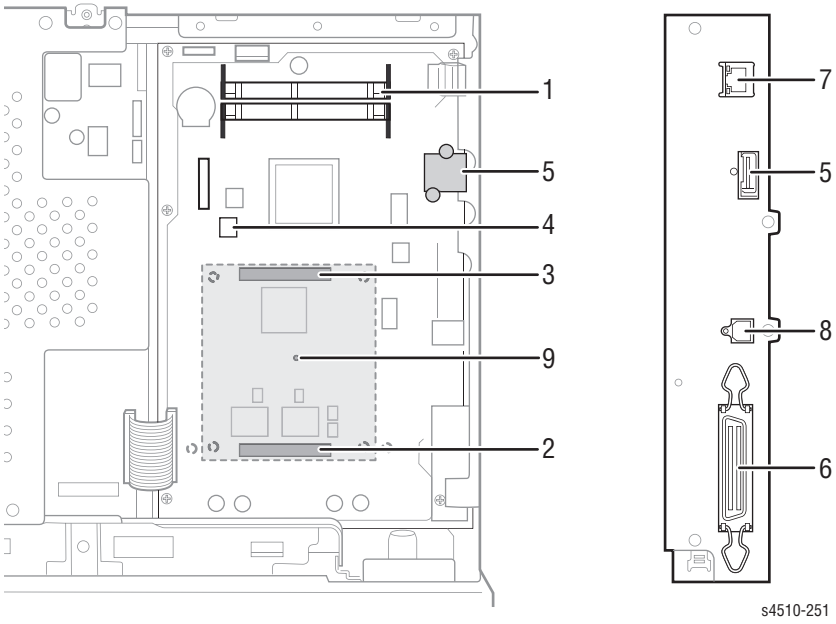


1. Memory (RAM) DIMM 1 and DIMM 2
2. Flash memory (optional)
3. Hard drive (optional)
4. NVRAM
5. Configuration card
6. Parallel connector
7. Ethernet connector
8. USB connector
9. Health LED

Image Processor Board (Phaser 4510)

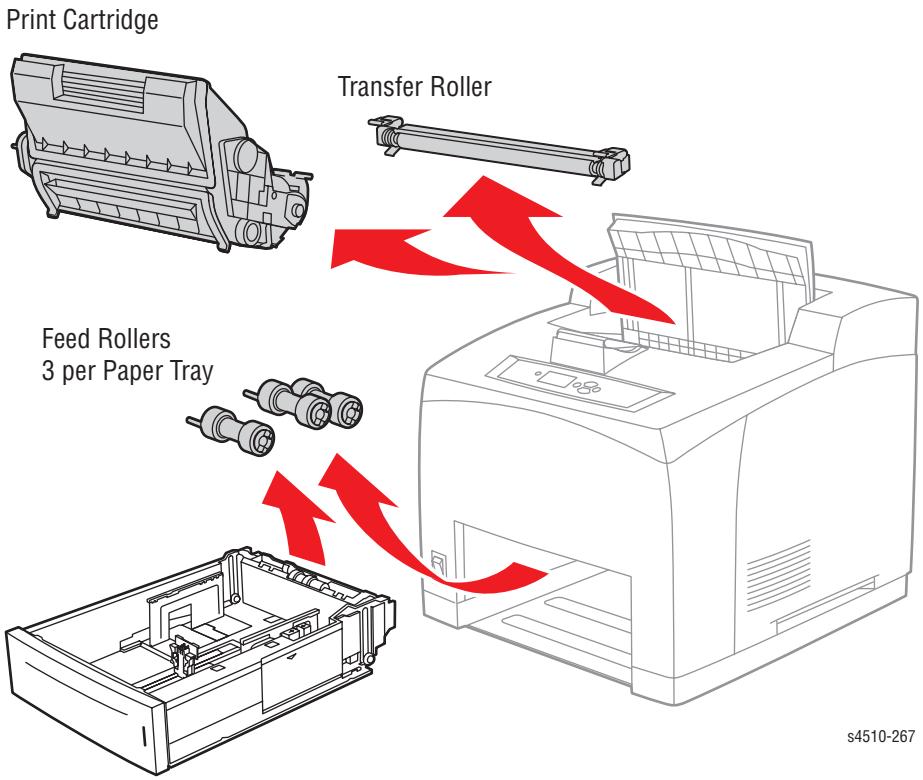
When installing a new image processor board in the Phaser 4510 printer, you must transfer the following parts from the old board:

- Memory DIMMs
- Configuration card
- NVRAM
- Hard drive (if installed)
- Flash memory (if installed)



1. Memory (RAM) DIMM 1 and DIMM 2
2. Flash memory (optional)
3. Hard drive (optional)
4. NVRAM
5. Configuration Card
6. Parallel connector
7. Ethernet connector
8. USB connector
9. Health LED

Consumables and Routine Maintenance Items



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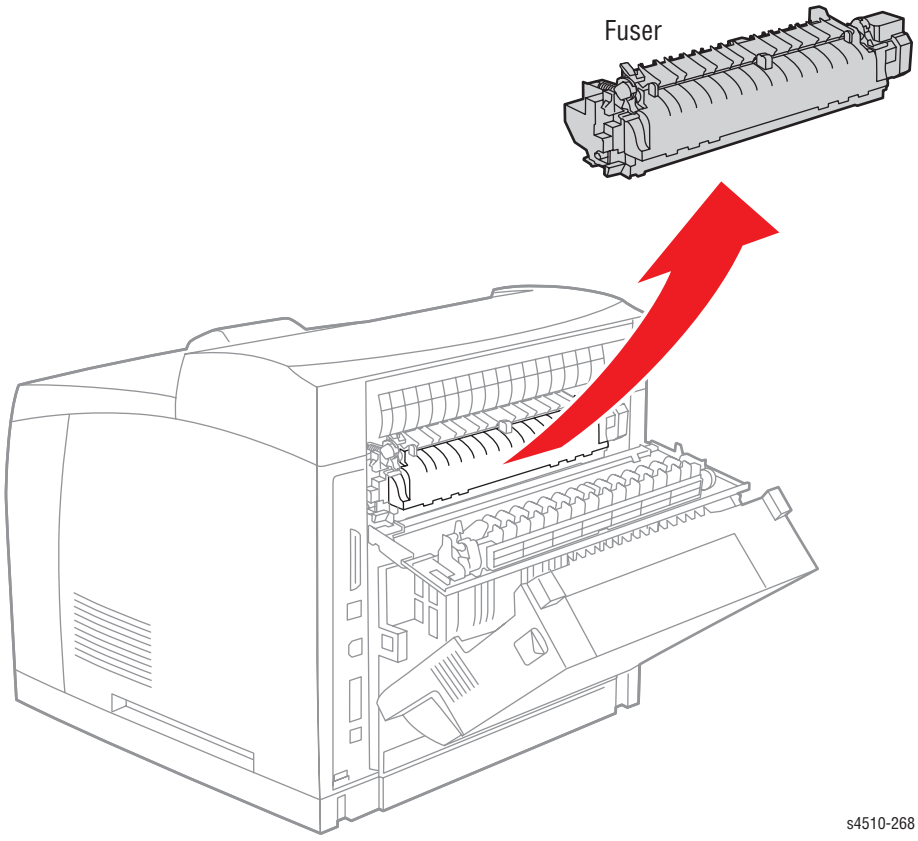

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Supply Life Counters

Internal counters track the usage of the Consumables and Routine Maintenance Items and store the values in NVRAM. The image processor board monitors these counters in order to display the near end-of-life and end-of-life messages.

Print life ratings are based on 5% coverage and an average job length of 4 pages.

Supply	Print Life (Number of Images)
Consumables	
Print cartridge, standard-capacity	10,000
Print cartridge, high-capacity	19,000
Routine Maintenance Items	
Maintenance kit (consists of fuser, transfer roller, and 12 feed rollers)	200,000

Printer Specifications

Physical Dimensions and Clearances

Print Engine Dimensions	Value
Height	404 mm (15.9 in.)
Width	422 mm (16.6 in.)
Depth Depth with paper cassette extended	465 mm (18.3 in.) 524 mm (20.7 in.)
Weight (with 10-K print cartridge)	20.5 kg (45.2 lbs.) (P4500) 23.2 kg (51.0 lbs.) (P4510)
Clearances	**Value**
Top	400 mm (16 in.)
Left	210 mm (8 in.)
Right	300 mm (12 in.)
Front	480 mm (19 in.)
Rear (with duplex unit installed)	230 mm (9 in.)
Total Height requirement	820 mm (32 in.) Add 9.6 cm (3.75 in.) for each 550-sheet feeder
Mounting surface level tolerance	± 5°
550-Sheet Feeder Dimensions	**Value**
Height (to top of feeder assembly)	143 mm (5.6 in.)
Width	422 mm (16.6 in.)
Depth Depth with paper cassette extended	452 mm (17.8 in.) 510 mm (20.1 in.)
Weight	6.3 kg (13.9 lbs.)
Duplex Unit Dimensions	**Value**
Height	219 mm (8.6 in.) (P4500) 238 mm (9.4 in.) (P4510)
Width	352 mm (13.8 in.)
Depth	96 mm (3.8 in.) (P4500) 146 mm (5.8 in.) (P4510)
Weight	1.9 kg (4.2 lbs.)
Stacker Dimensions	**Value**
Height	226 mm (8.9 in.)
Width	418 mm (16.4 in.)
Depth Depth with stacker tray extended	312 mm (12.3 in.) 382 mm (15.1 in.)
Weight	2.6 kg (5.7 lbs.)

Functional Specifications

Characteristic	Specification					
Printing process:	Recording System: Electrophotography (roller charging, magnetic monocomponent toner development) Exposure System: Semiconductor laser beam scanning Transfer System: Roller transfer system Fusing System: Thermal fixing using a heat roller					
Resolution / Addressability	600/1200 dpi					
Print-Quality Modes	Two choices:	600 x 600 dpi True 1200 x 1200 dpi				
Phaser 4500 Continuous operating printing speed	36 pages per minute for plain Letter paper, one-sided printing 34 pages per minute for A4 paper, one-sided printing 21 images per minute for Letter paper, 2-sided printing 21 images per minute for A4 paper, 2-sided printing)					
Phaser 4510 Continuous operating printing speed	45 pages per minute for plain Letter paper, one-sided printing 43 pages per minute for A4 paper, one-sided printing 27 images per minute for Letter paper, 2-sided printing 26 images per minute for A4 paper, 2-sided printing)					
Phaser 4500 First Print-Out from READY state (in seconds); Short Edge Feed	**Paper Size** Letter A4	**Mode** Simplex Duplex Simplex Duplex	**Tray 1** 8.7 12.5 8.7 12.7	**Tray 2** 8.7 12.5 8.7 12.7	**Tray 3** 8.7 12.5 8.7 12.7	**Tray 4** 8.9 12.8 9.0 13.0
Phaser 4510 First Print-Out from READY state (in seconds); Short Edge Feed	**Paper Size** Letter A4	**Mode** Simplex Duplex Simplex Duplex	**Tray 1** 7.9 11.1 7.9 11.2	**Tray 2** 7.9 11.1 7.9 11.2	**Tray 3** 7.9 11.1 7.9 11.2	**Tray 4** 8.2 11.3 8.2 11.4
Phaser 4500 First Print-Out from sleep mode (in seconds); Short Edge Feed	**Paper Size** Letter A4	**Mode** Simplex Duplex Simplex Duplex	**Tray 1** 24.0 27.8 24.0 28.0	**Tray 2** 24.0 27.8 24.0 28.0	**Tray 3** 24.0 27.8 24.0 28.0	**Tray 4** 24.2 28.1 24.3 28.3
Phaser 4510 First Print-Out from sleep mode (in seconds); Short Edge Feed	**Paper Size** Letter A4	**Mode** Simplex Duplex Simplex Duplex	**Tray 1** 24.9 28.1 24.9 28.2	**Tray 2** 24.9 28.1 24.9 28.2	**Tray 3** 24.9 28.1 24.9 28.2	**Tray 4** 25.2 28.3 25.2 28.4
Warm-Up Time	17 seconds					

Electrical Specifications

Characteristic	Specification
Primary Line Voltages	120 VAC nominal, min. 98 V, max. 140 V 220/240 VAC nominal, min. 198 V, max. 264 V
Primary Line Voltage Frequency Range	50/60 Hz ± 3 Hz
Maximum Power Consumption	P4500: 985 W @ 120 V 985 W @ 220/240 V P4510: 1210 W @ 120 V 1270 W @ 220/240 V

Environmental Specifications

Characteristic	Specification	
Temperature:		
Operating	5 to 35° C (41 to 95° F)	
Optimal Performance Range	10 to 32° C (50 to 89.6° F)	
Transportation	-20 to 40° C (-4 to 104° F)	
Humidity (%RH)		
Operating	15 to 85	
Transportation	5 to 85	
Altitude		
Operating	0 to 3,500 meters (11,500 feet)	
Transportation*	0 to 15,000 meters (49,200 feet)	
Acoustic Noise LWA(B)		
	Engine only	**With all options**
Idle	P4500: 4.00 B	—
	P4510: 5.00 B	—
Printing	P4500: 6.62 B	7.30 B
	P4510: 6.95 B	7.50 B
* Air transportation in pressurized cargo space		

ENERGY STAR qualified printer

Media and Tray Specifications

	Trays	Specifications	
Printable Area	All	Within 4 mm of paper edge guaranteed. Edge-to-edge printing supported.	
Supported Media Sizes	Tray 1 Trays 2-4 Tray 1 Trays 2-4 Stacker	Width: Width: Length: Length: Width: Length:	76.2 mm (3.0 in.) ~ 215.9 mm (8.5 in.) 98.4 mm (3.9 in.) ~ 215.9 mm (8.5 in.) 127.0 mm (5.0 in.) ~ 355.6 mm (14 in.) 148.0 mm (5.8 in.) ~ 355.6 mm (14 in.) 88.9 mm (3.5 in.) ~ 215.9 mm (8.5 in.) 139.7 mm (5.5 in.) ~ 355.6 mm (14 in.)
Supported Media Types and Weights	All All All All Tray 1 All All	Bond Labels Transparency Greeting Cards Index Card Stock Tag Stock Cover Stock	(P4500) 60-216 g/m^2 (16-58 lb.) (P4510) 64-216 g/m^2 (17.1-58 lb.) 190 g/m^2 (70 lb. Cover) 60-216 g/m^2 (33-120 lb.) 60-216 g/m^2 (37-133 lb.) 60-216 g/m^2 (22-80 lb.)
Supported Envelopes	All	#10 Commercial (4.12 x 9.5 in.) Monarch (3.87 x 7.5 in.) DL (110 x 220 mm) C5 (162 x 229 mm) B5 (176 x 250 mm) (P4500 only)	
Input Tray Capacity	Tray 1 Trays 2-4	150 sheets 550 sheets Based on 75 g/m^2 (20 lb. bond) paper stock. Capacity is reduced for heavier/thicker stock.	
Output Tray Capacity	Standard Stacker	500 sheets 500 sheets	

Duplex Unit Media Specifications

	Input Tray	Specifications	
Width	Tray 1 Trays 2-4	90 - 216 mm (3.5 - 8.5 in.) 98 - 216 mm (3.9 - 8.5 in.)	
Height	Tray 1 Trays 2-4	140 - 356 mm (5.5 - 14.0 in.) 148 - 356 mm (5.8 - 14.0 in.)	
Supported Media Types and Weights	All	Bond Greeting Cards Index Card Stock Tag Card Stock Cover Stock	P4500: 60-216 g/m^2 (16-58 lb.) P4510: 64-216 g/m^2 (17.1-58 lb.) 190 g/m^2 (70 lb. Cover) 60-216 g/m^2 (33-120 lb.) 60-216 g/m^2 (37-133 lb.) 60-216 g/m^2 (22-80 lb.)

Memory Requirements

Phaser 4500

Characteristic	Specification
Minimum required	64 MB – The Phaser 4500 B configuration reports 48 MB
Maximum supported	256 MB – accepts modules of 64 or 128 MB in combinations to a total of 256 MB
Supported type	PC133 SDRAM in 144-pin SO-DIMM form

Phaser 4510

Characteristic	Specification
Minimum required	128 MB
Maximum supported	512 MB – accepts modules of 128 or 256 MB *only* in combinations to a total of 512 MB
Supported type	PC2700 DDR in 200-pin SO-DIMM form

Theory of Operation

In this chapter...

- Overview of the Phaser 4500/4510 Laser Printer
- Paper Path of the Printer
- Sensors
- Major Assemblies and Functions
- Printer Options

Chapter 2

Overview of the Phaser 4500/4510 Laser Printer

Summary of the Printing Process

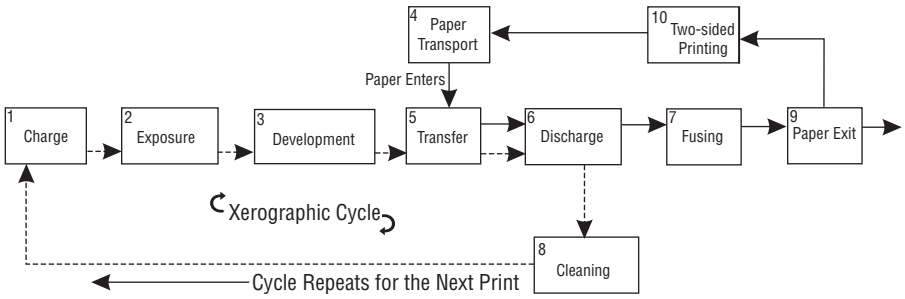
The Phaser 4500/4510 print process consists of the following steps:

1. Charge – The print cartridge contains a bias charge roller that uniformly distributes a negative electrical charge over the photoconductive drum surface.
2. Exposure – The laser assembly scans the surface of the photoconductive drum, which is located inside the print cartridge. The laser diode assembly produces a laser beam which is turned on and off according to a data signal. A 12-sided polygonal mirror in the scanner assembly is rotated at a specified speed. The laser beam is reflected off of the mirror and onto the drum surface through a series of lenses and mirrors. The laser beam scans the drum surface from one end to the other, neutralizing the negative charge to create one line of a latent image on the surface. The drum is rotated and the scan process is repeated to form an image on the drum surface.
3. Development – A magnetic roller in the print cartridge carries a thin layer of toner supplied by an agitator in the cartridge's toner compartment. The charging and metering (CM) blade inside the cartridge applies a negative charge to the toner and spreads the toner onto the magnetic roller. The negatively charged toner is transferred to the areas of the drum surface that have been discharged.
4. Paper transport – Paper size sensors determine the length of the media. Four tabs (one fixed, three movable) located in the paper tray indicate the location of the length guide and thereby identify the media size. Switches located in the left tray guides detect the position of four tabs located on the paper tray. The printer uses a three-roller system to pick paper. Two springs raise the tray's lift plate, along with the paper stack, against the nudger roller of the paper feeder assembly. To pick paper, the nudger roller advances the top sheet to the feed roller and retard roller. The retard roller prevents multi-picks. The feed roller advances the paper to the turn pinch rollers, which feed it to the registration rollers. The registration sensor is the first sensor to detect paper.
5. Transfer – The transfer roller is driven by a gear on the print cartridge. The pressure of the transfer roller against the drum assists in driving the paper through the transfer area. The transfer roller applies a positive charge to the rear surface of the paper. The negatively charged toner image on the drum is attracted to the positive charge on the rear surface of the paper, causing the image to be transferred from the surface of the drum onto the paper.
6. Discharge – The detack saw, located on the transfer roller assembly, helps to separate the paper by partially neutralizing the charge holding the paper to the drum.
7. Fusing – The paper is driven into the fuser, which uses heat and pressure rolls to melt and bond the toner onto the surface of the paper. Heat roller fingers inside the fuser peel off the leading edge of the paper from the Heat roller to prevent the paper from becoming wound around it. An exit sensor detects paper exiting from the fuser.
8. Cleaning – A cleaning blade in the print cartridge scrapes off toner remaining on the drum surface after transfer has occurred. Then, the latent charge pattern remaining on the photoconductive drum is neutralized to prepare the drum for the next exposure cycle.
9. Paper exit – The paper is then advanced upward into the exit rollers and into the selected output tray.

10. Two-sided printing reverses the direction of the exit rollers to route the paper through the duplex unit rollers and back to the registration roller. A sensor in the duplex unit detects the presence of paper.

Block Diagram of the Print Cycle

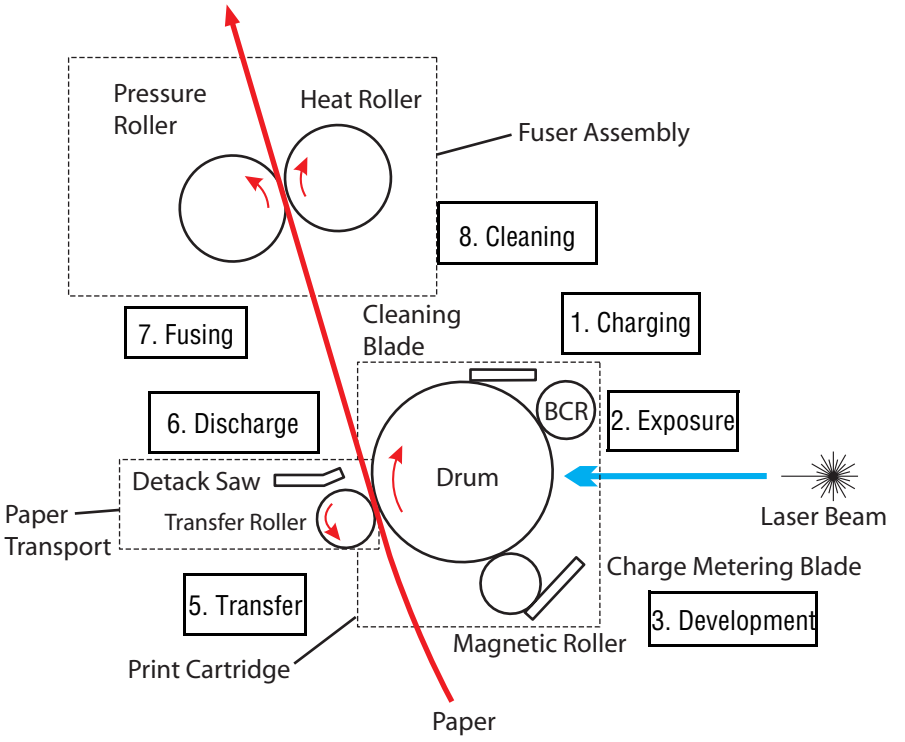
The block diagram of the print cycle shows the sequence of events for the xerographic process (dashed lines) and the paper flow (solid lines) into and out of the printer.



s4500-007

Components Associated with the Xerographic Process

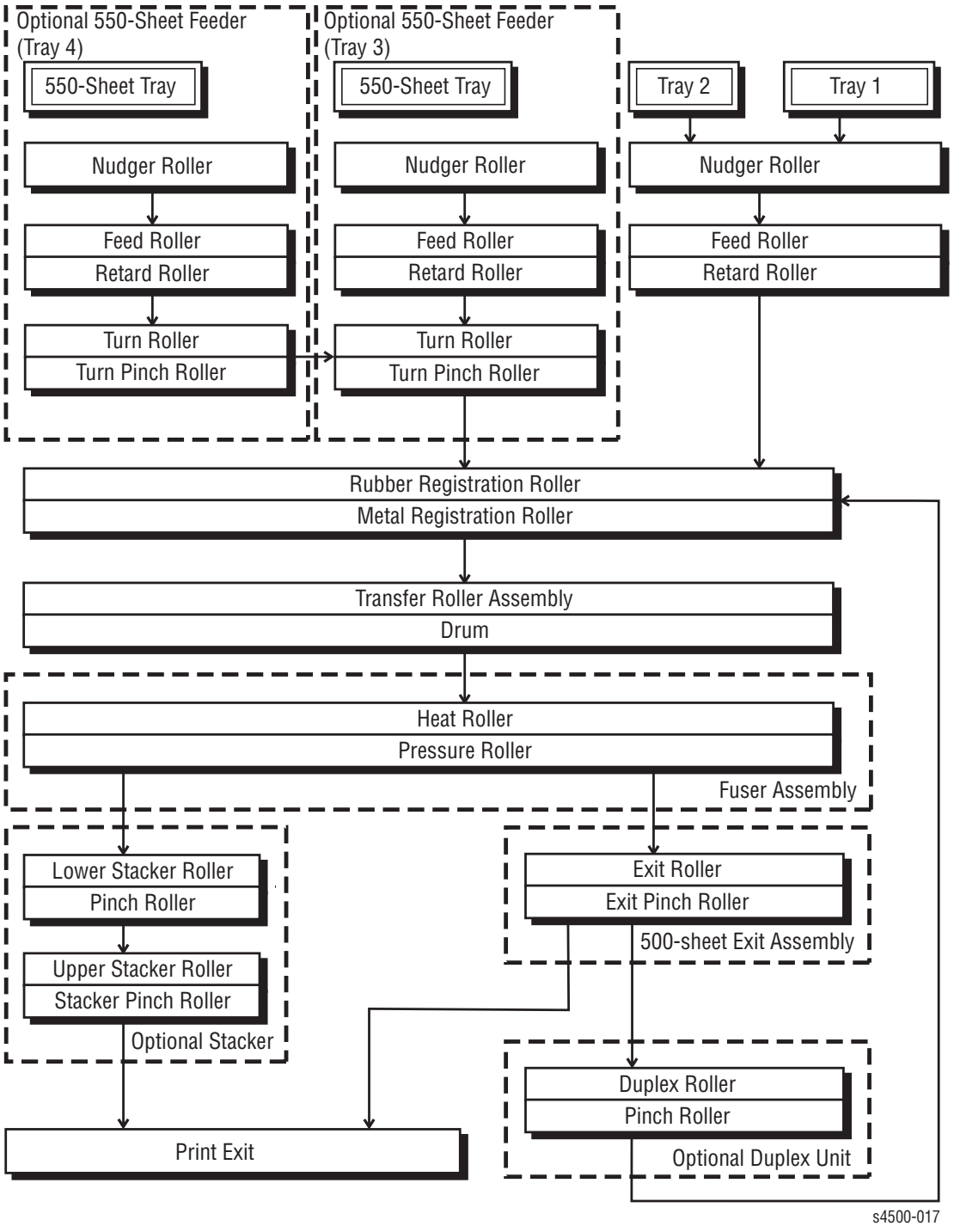
This cut-away side view of the printer shows the location of individual components within the printer, and the major components that are directly related to the print cycle and to the paper path.



s4500-008

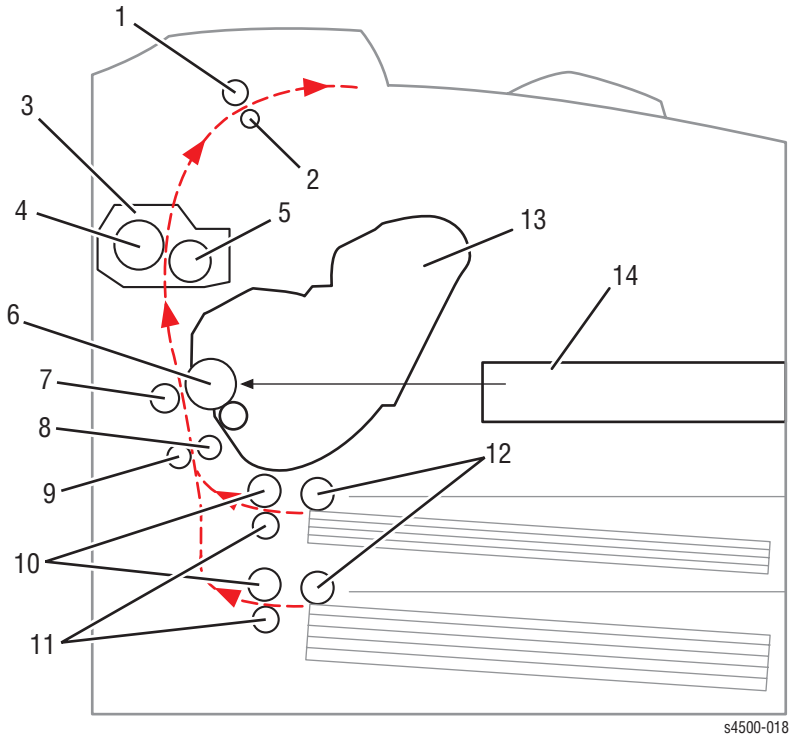
Paper Path of the Printer

Paper is supplied from Trays 1 and 2 or the optional Trays 3 and 4, and is transported into the printer along the paper path shown below.



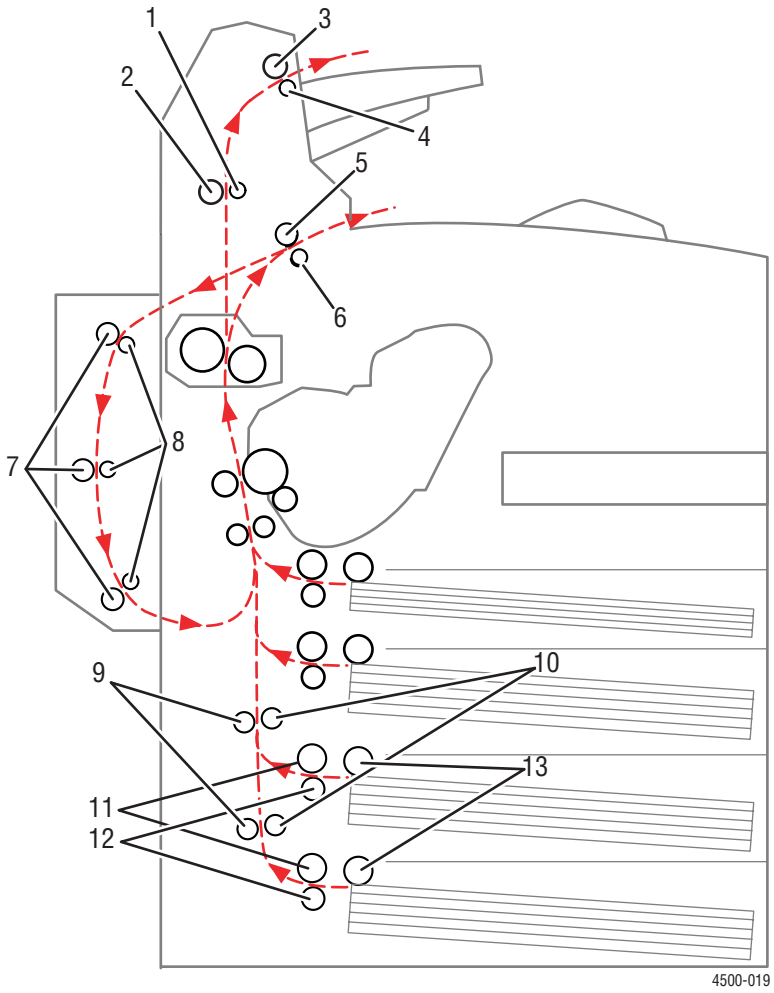
Layout of Paper Transport Path

This cross section of the printer shows the main components directly associated with the paper path and transport in the engine only.



1. Exit roller
2. Exit pinch roller
3. Fuser assembly
4. Pressure roller
5. Heat roller
6. Drum
7. Transfer roller assembly
8. Rubber registration roller
9. Metal registration roller
10. Feed roller assemblies
11. Retard roller assemblies
12. Nudger roller assemblies
13. Print cartridge
14. Laser assembly

This cross section shows the additional components associated with paper transport when the 550-sheet feeders, the duplex unit, and the stacker are installed.



1. Stacker pinch roller
2. Lower stacker roller
3. Upper stacker roller
4. Upper stacker pinch roller
5. Exit roller
6. Exit pinch roller
7. Duplex rollers
8. Duplex pinch rollers
9. Turn pinch rollers
10. Turn roller assemblies
11. Feed roller assemblies
12. Retard roller assemblies
13. Nudger roller assemblies

Sensors

The printer contains a number of sensors of various types that perform a variety of functions. One group of sensors track the progress of the paper along the paper path, and detect if a paper jam occurs. Other sensors detect the presence of the print cartridge, stop printer activity if a door is open, and monitor the fusing temperature. The basic printer has 18 sensors, while a fully-optioned printer has 30 sensors.

The types of sensors in use vary with their function. In general, there are four basic type in use:

- Photo
- Microswitch
- Soft Touch Sensors (STS)
- Magnetic

Most of the photo sensors consist of a LED in one arm of a U-shaped holder, and a photo-transistor in the other arm. When nothing is between the arms of the sensor, light from the LED falls on the photo-receptor, turning it on. If the light is interrupted, the photo-transistor turns off. The on- or off-state of the transistor is used as a signal.

The microswitches are used primarily as interlocks in the printer. They are in a normally open state, and close when actuated. A bank of switches in a holder is used for detecting the size of paper in use in a tray. Cams in the tray close the switches in various combinations (see “Control of Paper Size” on page 2-17) to send a size signal to the controller.

The Soft Touch Sensor has a known value of resistance whose sensitivity varies with temperature.

The magnetic sensor detects the magnetic properties of the toner in the print cartridge.

A fifth sensor in use in the printer is the antenna used to communicate with the CRUM in the print cartridge.

The list of Sensors and interlocks that follows gives each sensor by its name, lists which of the types it is, and briefly describes its function in the printer. The reference column lists manual pages where illustrations show the location of the sensor.

List of Sensors and interlocks

Name	Type	Function	Reference
Paper low	Mechanically actuated photo sensor	Detects low paper condition in 550-Sheet trays 2, 3, and 4 (there is no low-paper sensing in tray 1).	page 2-10 page 2-16
No paper	Mechanically actuated photo sensor	Detects no paper condition in all trays.	Page 2-16
Paper size switches	Microswitch bank	Detects the presence of a tray and the paper size setting of the tray.	Page 2-16 Page 2-41

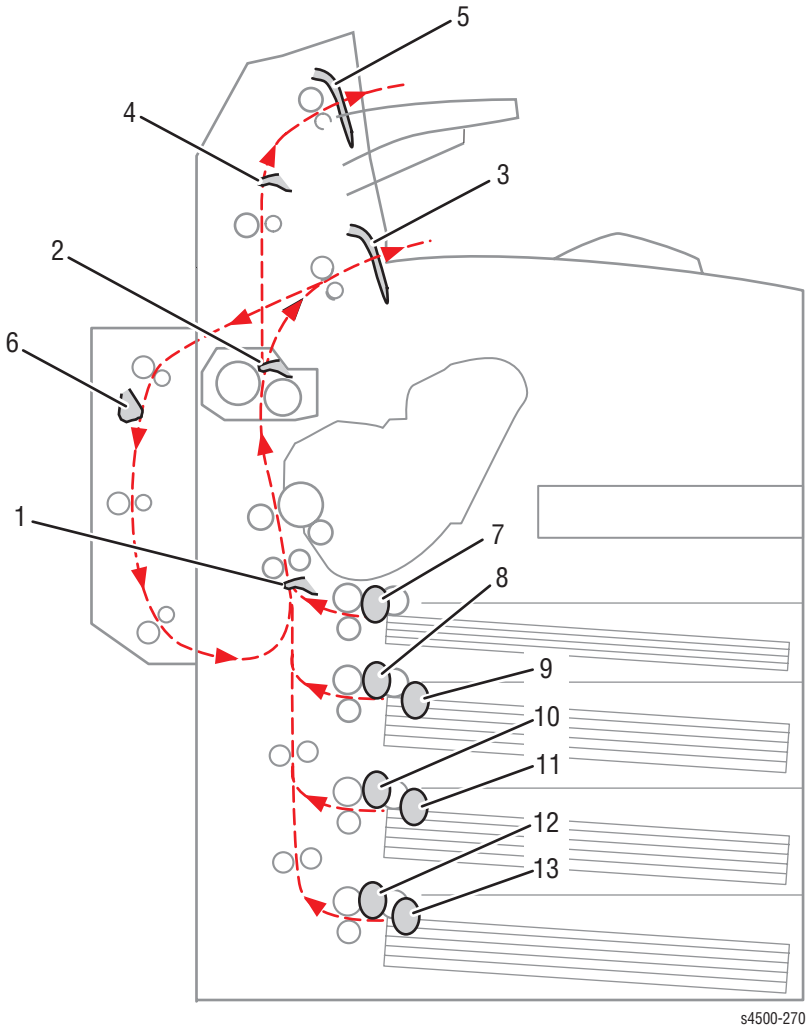
List of Sensors and interlocks

Name	Type	Function	Reference
Registration sensor	Mechanically actuated photo sensor	Detects the paper as it reaches the registration rollers.	Page 2-10 Page 2-16
Toner sensor	Magnetic sensor	Detects the presence of toner in the print cartridge.	Page 2-16
Exit sensor	Mechanically actuated photo sensor	Detects paper as it leaves the fuser.	Page 2-22
Output tray full sensor	Mechanically actuated photo sensor	Detects when the standard output tray is full.	Page 2-27
Temperature sensor	Soft Touch Sensor	Two of these monitor the temperature of the Heat roller.	Page 2-22
Rear cover switch	Microswitch	Interrupts +24 V to the main motor when the rear exit cover is open; in series with 24 V interlock.	Page 2-30
24 V interlock	Microswitch	Interrupts +24 V to the main motor when the top cover is open; in series with rear cover switch.	Page 2-30
Top cover switch (P4500 only)	Microswitch	Interrupts INTERLOCK BEF to indicate the top cover is open.	Page 2-30
Laser interlock (P4500 only)	Microswitch	Interrupts +5 V to laser diode; in series with 5 V interlock switch.	Page 2-30
5 V interlock	Microswitch	Interrupts +5 V to laser diode. In series with laser interlock.	Page 2-30
Start of scan sensor	Photo	Detects the laser beam at the start of a scan.	Page 2-20
Fuser thermostat(s)	Thermostatic switche(s)	Interrupt AC power to the fuser heater in overtemp condition; P4500: two switches in series; P4510: single switch.	Page 2-22
Stacker rear cover switch	Microswitch	Signals the HVPS/engine logic board that the stacker rear cover is open.	Page 2-38
Stacker sensor	Mechanically actuated photo sensor	Senses the presence of paper in the stacker.	Page 2-38

List of Sensors and interlocks

Name	Type	Function	Reference
Stacker offset sensor	Mechanically actuated photo sensor	Senses the position of the stacker offset chute.	Page 2-38
Duplex unit switch	Microswitch	Signals the HVPS/engine logic board that the duplex unit rear cover is open.	Page 2-35
Duplex unit sensor	Mechanically actuated photo sensor	Detects the presence of paper in the duplex unit.	Page 2-35
Stacker full sensor	Mechanically actuated photo sensor	Detects when the stacker output tray is full.	Page 2-38
Optional feeder paper size switch assembly	Microswitch bank	Detects the presence of a tray and the paper size setting of the tray.	Page 2-41
CRUM antenna	Inductive magnetic code reader	Communicates with the print cartridge CRUM.	

Sensors in the Paper Path



1. Registration sensor
2. Fuser exit sensor
3. Output tray full
4. Stacker sensor
5. Stacker full
6. Duplex unit sensor
7. Tray 1 no paper sensor
8. Tray 2 no paper sensor
9. Tray 2 low paper sensor
10. Tray 3 no paper sensor
11. Tray 3 low paper sensor
12. Tray 4 no paper sensor
13. Tray 4 low paper sensor

Major Assemblies and Functions

The functions of the main components of the Phaser 4500/4510 printer are described in the following sections:

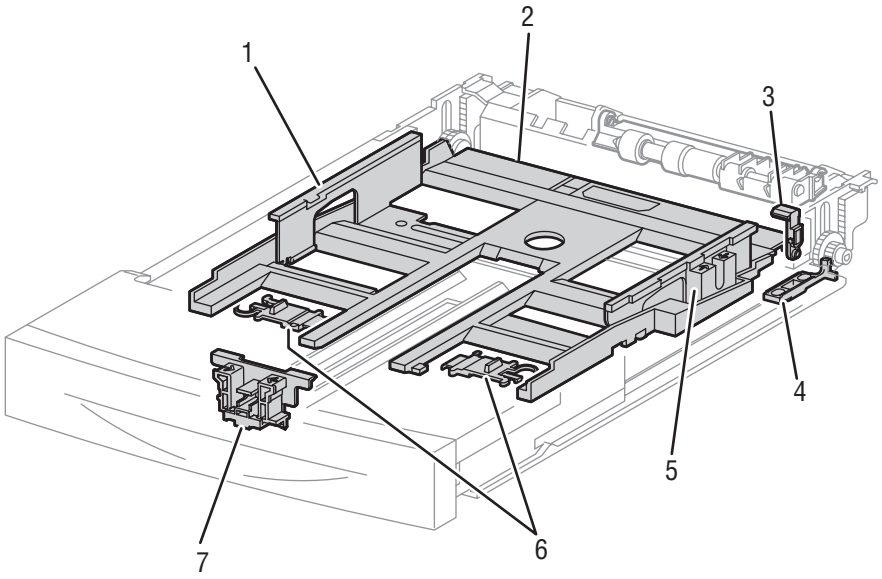
- Paper tray
- Paper feeder
- Print cartridge
- Transfer roller assembly
- Laser assembly
- Fuser
- 500-sheet paper exit
- Drive
- Electrical

Paper Tray

Paper trays include the 150-sheet and 550-sheet trays. Since they are functionally equivalent, only the 150-sheet tray is described here.

The trays adjust to accept various paper sizes. The end and side guides adjust to match paper sizes shorter than A4, or narrower than Letter. To accept paper longer than A4, the tray extension must be unlocked and pulled out, and the end and side guides adjusted to match the size.

Paper Tray Functional Assemblies



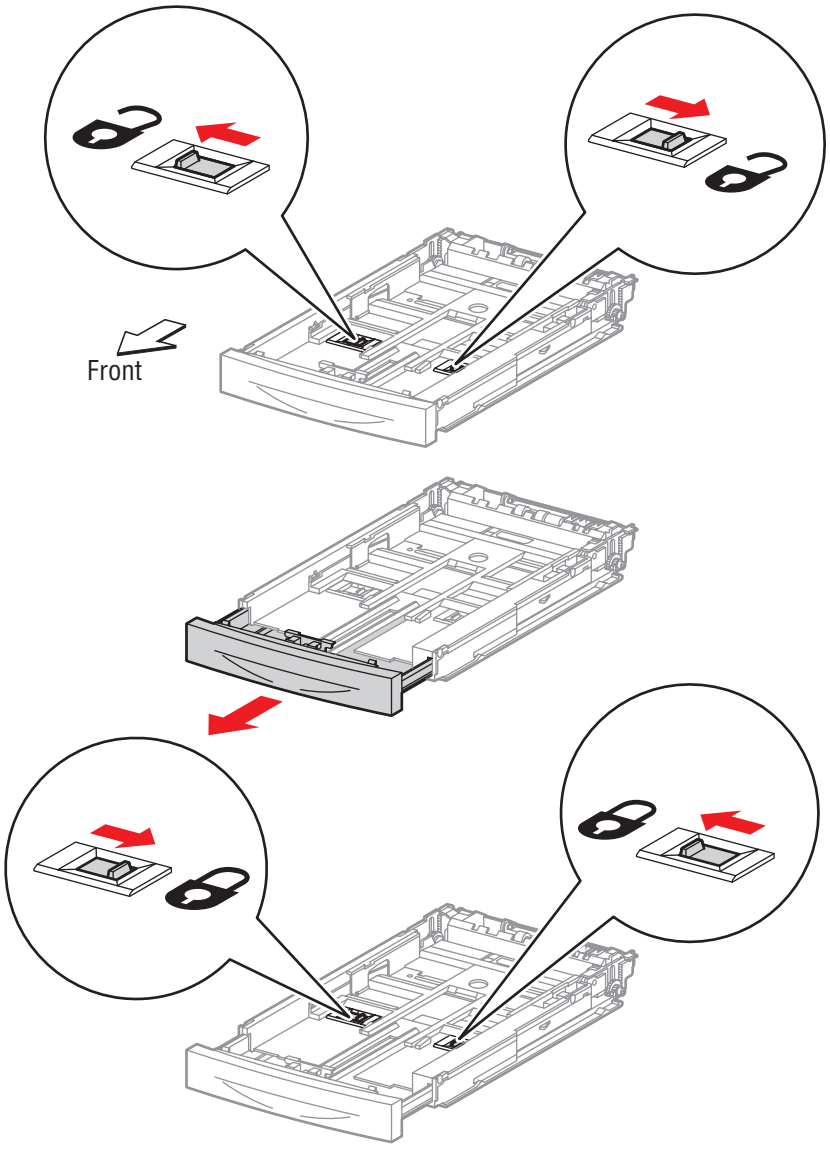
s4500-021

1. Left-side paper guide assembly
2. Bottom plate assembly
3. Bottom lock lever
4. Gear stopper
5. Right-side paper guide assembly
6. Extension lock
7. End guide

Left- and right-side paper guide assemblies The left and right paper guides adjust to fit different paper widths. The guides hold the paper in position in the tray.

Bottom plate assembly The bottom plate assembly is pushed up by the bottom lift spring. The bottom plate is released by unlocking the bottom lock lever and stopper gear. When the bottom plate assembly is pushed up, the supplied paper contacts the nudger roller.

Bottom lock lever and gear stopper These are at the rear of the tray (i.e., the front end in the direction of travel of paper). How these components work is explained in “Paper Lift Mechanism” on page 2-14.



Extension lock The 150-sheet tray extends to accommodate different paper lengths. The extension lock holds the extension in position.

End guide The end guide can be adjusted to different paper sizes by making a forward or backward adjustment. It makes contact with the rear end of the paper, and holds the paper in position front-to-back in the paper tray.

Through the cam action of the sector gear and size rack, the position of the end guide is converted to up and down combinations of the three size switch links on the side of the tray. The links, when in contact with the paper size switches in the left tray guide, turn the switches on or off in combinations that correspond to the paper size.

The paper sizes that can be automatically detected are as follows:

Type	Size (mm × mm)
LETTER SEF	215.9 mm × 279.4 mm (8.5" x 14")
LEGAL 14" SEF	215.9 mm × 355.6 mm (8.5" x 13")
LEGAL 13" SEF	215.9 mm × 330.2 mm (8.5" x 11")
EXECUTIVE SEF	184.2 mm × 266.7 mm (7.25" x 10.5")
A4 SEF	210.0 mm × 297.0 mm (8.27" x 11.69")
B5 (JIS) SEF	182.0 mm × 257.0 mm (7.17" x 9.44")
A5 SEF	149.0 mm × 210.0 mm (5.83" x 8.27")

Paper Lift Mechanism

The Phaser 4500/4510 printer paper trays utilize a unique mechanical paper lift mechanism that eliminates the need for paper lift motors. The mechanism consists of a spring-loaded bottom plate assembly that lifts the paper stack upward to the paper feeder assembly.

When the tray is removed from the printer, a channel in the right tray guide pushes the bottom lock gear downward, lowering the bottom plate assembly until it is locked into place by a spring-loaded gear stopper, one-way lock gear, and the bottom rack lock. The gear stopper engages the bottom lock gear, and the bottom rack lock engages the one-way lock gear, which prevents the bottom plate assembly from rising upward.

The gear stopper is released from the bottom lock gear when the tray is inserted into the printer. Once the gear stopper releases the bottom lock gear, the bottom rack lock holds the bottom plate assembly in place. Then, a metal tab located on the paper feeder assembly presses down on the bottom lock lever. This releases the bottom rack lock and allows the bottom plate assembly to raise the paper stack upward until it contacts the nudger roller and lifts the feeder assembly.

Once the feeder assembly is lifted by the paper stack, the metal tab no longer contacts the lock lever. As paper is fed from the stack, the feeder assembly gradually lowers. When the tab contacts the bottom lock lever, the paper stack raises. This process repeats until the tray is empty.

Paper Feeder

Tray 1 and tray 2 are functionally equivalent in terms of the paper size switch assembly, no paper actuator, and no paper sensor. The component descriptions given here apply to both trays.

Since the low paper actuator and low paper sensor are not part of tray 1, the description of these components applies to tray 2 only.

150-sheet/550-sheet feeder assembly This mechanism moves paper from the paper tray into the printer. The driving force from the main motor is transmitted via the feed clutch assembly to the feed roller and nudger roller, transporting paper from the tray into the printer.

No paper actuator This actuator is kept in a raised position by the paper in the tray. If the tray runs out of paper, the no paper actuator drops and the flag of the no paper actuator moves from between the sensor arms, allowing the sensor to turn on.

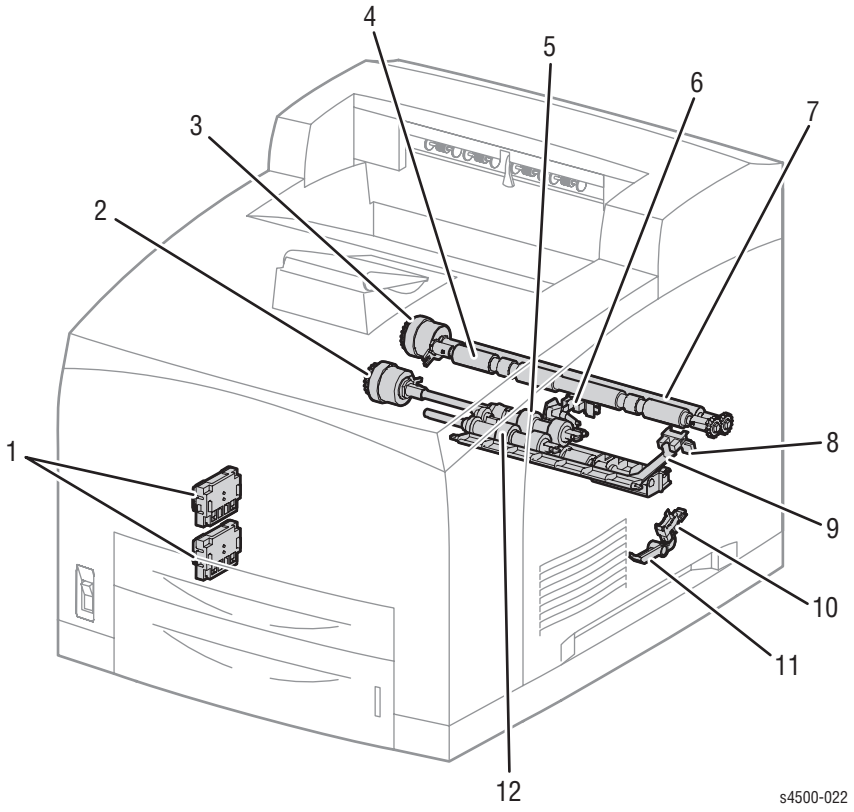
No paper sensor This is a photo sensor that remains in the OFF state when paper is present in the tray. The sensor turns on when there is no paper in the tray and the flag on the no paper actuator moves out of the sensor.

Registration sensor The registration sensor is a photo sensor that detects paper as it arrives at the registration rollers. The paper transported from the paper tray pushes up the actuator of the registration sensor, moving the flag out of the sensor.

Registration clutch This electromagnetic clutch turns on and off to drive the rubber and metal registration rollers, which place the paper in position at the appropriate time for transfer of the developed image from the drum.

Low paper actuator When paper is low in the paper tray installed in tray 2, the arm of the low paper actuator is pushed up by the bottom plate assembly, moving the actuator flag out of the sensor. Low paper sensing occurs only in the 550-sheet feeders, which includes tray 2 and if installed, trays 3 and 4.

Low paper sensor This photo sensor remains in an OFF state until the paper level in the tray drops sufficiently to move the low paper actuator flag out of the sensor.



1. Paper size switch assembly
2. Feed clutch assembly
3. Registration clutch
4. Rubber registration roller
5. Feed roller
6. Registration sensor
7. Metal registration roller
8. No paper sensor
9. No paper actuator
10. Low paper sensor
11. Low paper actuator
12. Nudger roller

Control of Paper Size

Paper size switch assembly The switches in this assembly send signals that indicates the paper size setting of the tray. Cams in the bottom of the tray are positioned by the tray's end guide. At pre-defined paper lengths, actuators on the side of the tray close or open the switches in a pattern that is defined in the printer to correspond to one of the pre-set media sizes.

The following table provides the ON (1) or OFF (0) states of the switches in the paper size switch assembly, corresponding to the paper sizes of the paper tray.

Note

The switches in the paper size switch assembly are denoted by "SW1", "SW2", "SW3", and "SW4", respectively, from the front side.

Paper size	Paper Size Switch Assembly			
	SW1	SW2	SW3	SW4
No cassette	0	0	0	0
Executive SEF	0	0	0	1
B5(JIS) SEF	0	0	1	1
A5 SEF	0	1	0	1
Legal14"SEF	0	1	1	1
Letter SEF	1	0	0	1
A4 SEF	1	1	0	1
Legal13"SEF	1	1	1	1

Xerographics

Print Cartridge

The print cartridge is a customer-replaceable item that consists of the following components:

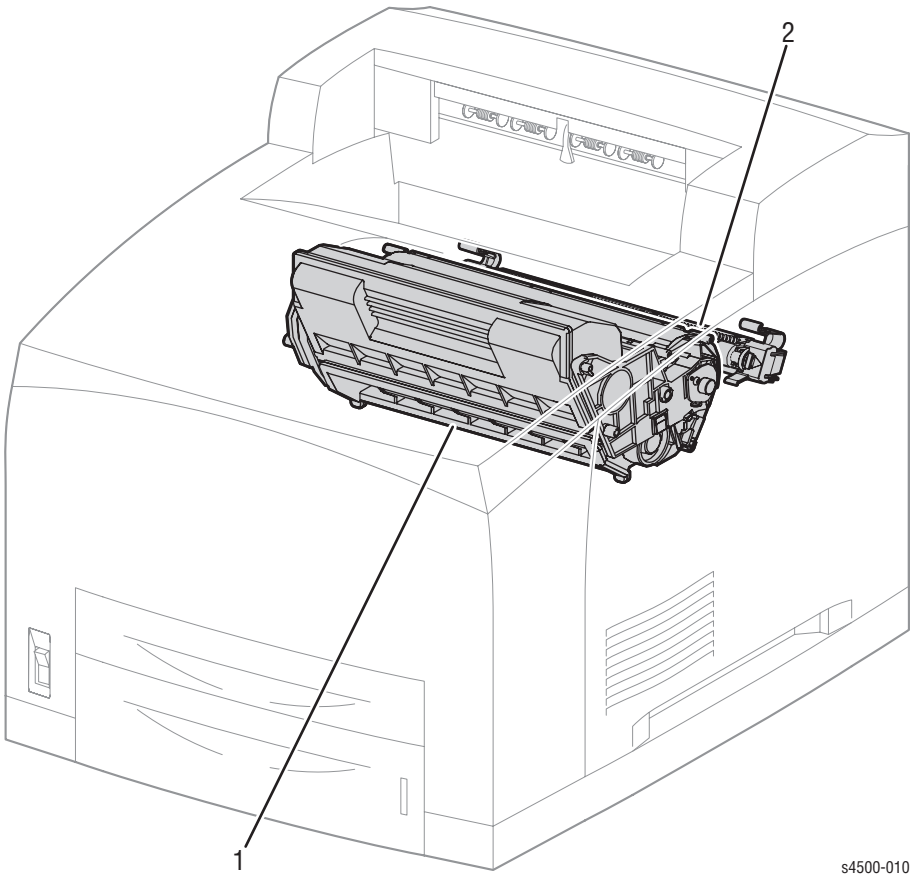
Drum The drum is an aluminum cylinder coated with a layer of photoconductive material that retains electrical charges on its surface until exposed to light, when electrical conduction occurs.

Bias charge roller (BCR) The BCR uniformly distributes electrical charges over the drum surface, and erases a charge pattern remaining from the previous cycle.

Magnet roller A thin layer of toner, supplied by the agitator in the toner compartment, adheres to the surface of this roller, which transports the toner into the gap between the drum and magnet roller.

Charging and metering (CM) blade The CM blade spreads toner into a thin layer over the magnet roller, and applies negative charges to the toner triboelectrically.

Cleaning blade The cleaning blade scrapes off toner remaining on the drum surface after the transfer step.



1. Print cartridge
2. Transfer roller

Laser Assembly

The laser assembly scans the surface of the drum with a laser beam. The laser assembly consists of three components: the laser diode (LD) assembly, the scanner assembly, and the start of scan (SOS) board.

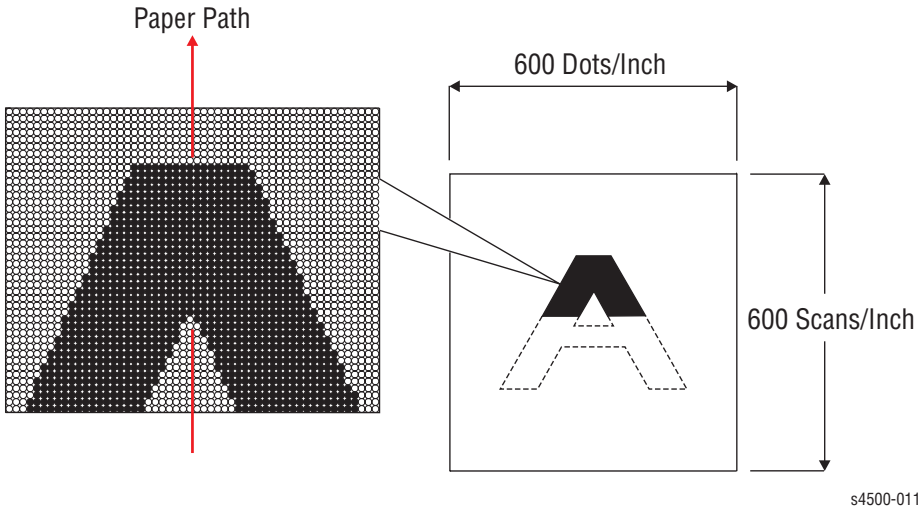
Laser diode (LD) assembly The LD assembly produces a laser beam that is turned on and off according to the print data signal. A single LD is used for 600 dpi, and a dual LD is used for 1200 dpi, generating one beam for 600 dpi and two beams for 1200 dpi.

Scanner assembly This assembly consists of a 12-sided polygonal mirror mounted on the shaft of the scanner motor. As this mirror rotates, it reflects the beam onto the drum surface through lenses and mirrors to scan the beam across the drum.

Start of scan (SOS) board When the laser beam strikes the sensor on the SOS board, the signal generated indicates the initial position of the scan. The initial position where a scan is started on each line is detected. Depending on the print resolution selected, either one beam creates one line, or two beams create two lines at a time.

When the laser beam scans from one end of the drum surface to the other while being turned off and on, one line of a latent image is created. The resolution in the scanning direction (from right to left) is determined by the rotational speed of the scanner motor and by the speed at which the laser is modulated. The resolution in the process direction (from top to bottom) is determined by the number of the scan beams and the rotational speed of the print drum.

Conceptual Diagram of Image Creation by Scanning



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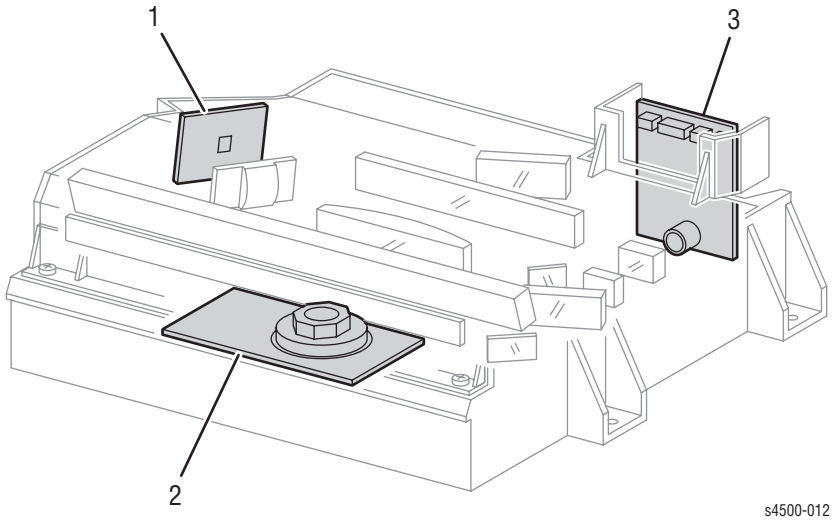
Laser Assembly Functional Parts



1. Start of scan PWB
2. Scanner assembly
3. Laser diode assembly

Laser Control

The scanner motor turns on when it receives a signal from the controller, and turns off after printing ends. The motor remains off in the standby and power-saving states.

There are two faults associated with the scanner motor speed: U2-1 Laser fails at warm-up, and U2-2, Laser fails motor speed.

Two other laser unit faults, U2-3 and U2-4, are associated with LD power. U2-3 occurs when LD power is too high, and U2-4 occurs when LD power is too low.

Transfer Roller Assembly

The transfer roller is held in contact with the drum of the print cartridge, and is driven by the drum gear. When the paper moves between the transfer roller and drum, the transfer roller applies a positive charge to the rear surface of the paper. The negatively charged toner image is attracted by the positive charge on the rear surface of the paper. Thus, the image is transferred from the surface of the drum to the surface of the paper.

The detack saw, located on the transfer roller assembly, helps to separate the paper from the drum surface.

Fuser

Heat roller The heat roller is a metal tube with a coated surface and a heater assembly inside. As paper passes between the heat roller and pressure roller, the heat that is applied to the paper melts the toner and fuses it to the paper.

Pressure roller The pressure roller is a metal shaft coated with sponge rubber. It maintains pressure on the paper passing between it and the heat roller. This pressure presses the melted toner against the paper.

Heater assembly

The heater assembly consists of two halogen lamps located in the heat roller. One lamp heats the entire length of heat roller, while the other, shorter rod heats the center. The lamps are controlled by switching the neutral side of the power to each lamp; the lamps use a common hot line.

Temperature sensors These are Soft Touch Sensors (STS) having a known value of resistance that varies with temperature. There are two temperature sensors in the fuser. One is located at the center of heat roller, the other is located where the edge of a letter size sheet of paper comes through. The sensors monitor the temperature of each location to control lighting of the heater rods. The sensors are mounted in contact with the surface of the heat roller. Power to the heater rod is turned on and off using the signals from these sensors, so that the surface temperature of the heat roller can be maintained within a specified range. These signals are also used to provide a first stage of overheat protection.

Thermostats The thermostats are connected in series with the heat roller assembly, and provide a second level of overheat protection. If the first stage of overheat protection does not prevent the fuser from overheating, the thermostats cut off the power-supply circuit for the heater rod. If the paper type is set incorrectly, the pressure roller may melt and adhere. As a countermeasure against this, if the STS detect the higher temperature, but can not prevent the overheat, the thermostats cut power to prevent the pressure roller from melting and adhering.

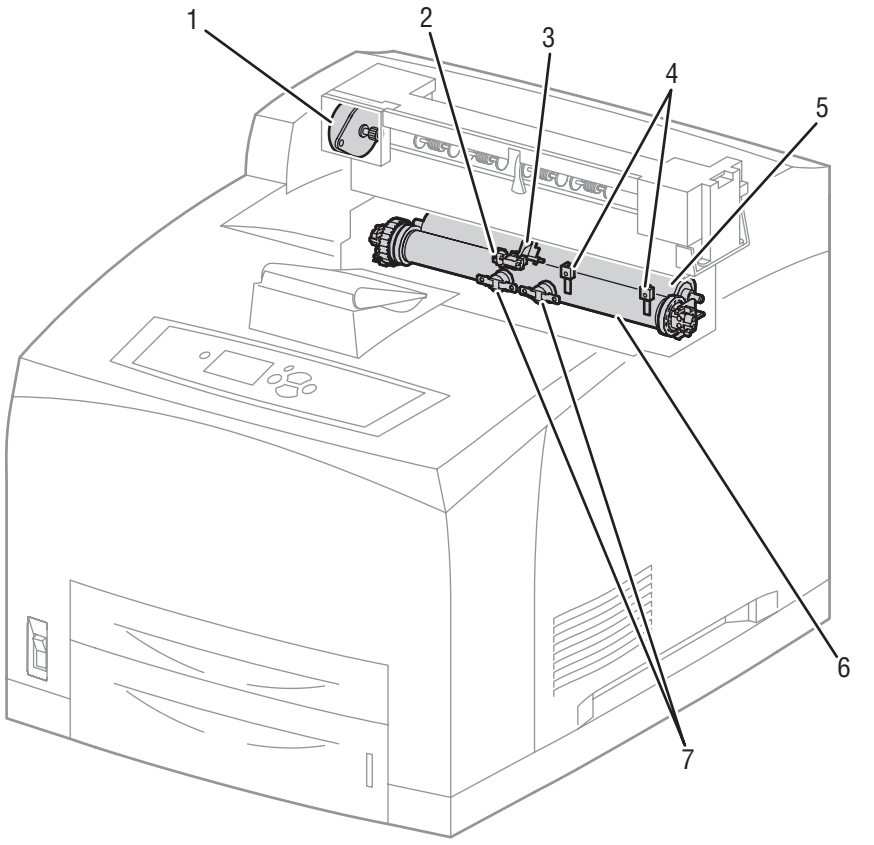
Note

The fuser in the Phaser 4510 uses a single thermostat switch instead of two to perform the same function.

Heat roller fingers These fingers peel off the leading edge of the paper from the Heat roller to prevent the paper from getting wound around the heat roller.

Heat roller diode The negative charge accumulated on the heat roller may deteriorate the toner image on the paper during fixing. The heat roller diode discharges the charge to the frame ground.

Exit sensor This sensor detects the arrival of the paper at a detection point in the exit area positioned behind the fuser. This sensor also detects the discharge of the paper from this point. When the sensor receives light (i.e., paper is present), the signal /EXIT is low.



1. Exit motor assembly
2. Exit sensor
3. Actuator
4. Temperature sensors
5. Pressure roller
6. Heat roller
7. Thermostats (P4510 uses only one)

Fuser Control

The fuser heater control maintains the fuser at a pre-determined control temperature by turning the halogen lamp in the heat roller ON and OFF. The control temperature varies depending on whether or not the printer is at the Ready state, and whether the main motor is operating.

The fuser temperature is considered abnormal when the detected temperature exceeds 250° C, or falls below 130° C.

Temperature Control

At the start of warm-up and when the main motor is at rest, the standby temperature is used as the fuser control temperature. When the main motor is operating except at warm-up, the running temperature is used as the fuser control temperature.

The running temperature and print speed depend on the media type selected for printing. The Phaser 4500 uses four temperature settings while the Phaser 4510 uses six. Print speed slows down for heavy media such as card stock or envelopes, and specialty media such as transparencies. The following tables show the default assignments of temperature setting to media type. The temperature setting assignment for a media type can be changed as explained in “Adjusting Fuser Temperature” on page 6-8.

Phaser 4500 Fuser Temperature Default Settings

Media Type Name	Extra High 215°	High 210° C	Medium 205° C	Low 185° C
Plain Paper			X	
Letterhead			X	
Transparency				X
Labels		X		
Colored Paper			X	
Card Stock		X		
Envelope		X		
Special			X	

Phaser 4510 Fuser Temperature Default Settings

Media Type Name	Extra High 187° C	Very High 215° C	High 212° C	Medium 205° C	Low 190° C	Very Low 170° C
Plain Paper				X		
Transparency						X
Card Stock		X				
Envelope	X					
Labels			X			
Letterhead				X		
Preprinted				X		
Prepunched				X		
Colored Paper				X		

Fuser Warm-Up

The halogen lamp is turned on when the fuser warm-up begins. When the surface temperature of the heat roller (detected by the thermistor) reaches the fuser control temperature (standby temperature), the fuser warm-up is ended.

Fuser Temperature Cycling

The fuser temperature does not remain at a single, constant value, but varies within a temperature range. There are several ranges, which are summarized in the table. Except for Standby, the setting is determined by the media type selection.

Phaser 4500 Fuser Cycling Temperatures

Setting	Temperature		
Standby	Lamp ON 180° C Lamp OFF 185° C		
Medium	1-100 pages: Lamp ON 205° C Lamp OFF 206° C	101-120 pages: Lamp ON 205° C Temp. decreases by.25° C per page	120 + pages: Lamp ON 200° C Lamp OFF 201° C
High	Lamp ON 210° C Lamp OFF 211° C		
Extra High	Lamp ON 215° C Lamp OFF 216° C		
Low	Lamp ON 185° C Lamp OFF 186° C		

Phaser 4510 Fuser Cycling Temperatures

Setting	Temperature		
Standby	Lamp ON 180° C Lamp OFF 185° C		
Low	1-50 pages: Lamp ON 190° C Lamp OFF 191° C	51-62 pages: Lamp ON 190° C Temp. decreases by .25° C per page	63 + pages: Lamp ON 187° C Lamp OFF 188° C
Medium	1-50 pages: Lamp ON 210° C Lamp OFF 211° C	51-70 pages: Lamp ON 210° C Temp. decreases by .25° C per page	71 + pages: Lamp ON 205° C Lamp OFF 206° C
High	Lamp ON 212° C Lamp OFF 213° C		
Very High	Lamp ON 214° C Lamp OFF 215° C		
Extra High	Lamp ON 187° C Lamp OFF 188° C		
Very Low	Lamp ON 185° C Lamp OFF 186° C		

Temperature Stabilization

The fuser automatically enters a stabilization process under two circumstances:

- When the printer is processing thick paper.

  After 50 impressions of continuous printing on thick paper (Thick Paper 1 mode), the fuser lamp turns off, the main motor stops, and the fans rotate at full speed until the temperature of both temperature sensors drops to 190° C or below. Then the printer continues printing the job. The process for Thick Paper 2 is the same, except that it occurs after 30 impressions of continuous printing on thick paper.

- When the side fuser temperature sensor (STS) detects an abnormally high temperature (over 245° C), the printer stops the print job and enters the cool-down process consisting of:

  - Clearing the paper path of all paper
  - Continuing to run the main motor (Time-out 200 sec.)
  - Running the fans at full speed
  - Controlling fuser temperature with short lamp

  This process continues until the target control temperature of 180° C - 185° C (Standby) is reached.

Fuser Problems (U4 Error Code)

Major causes of a U4 error include the following:

- Warm-up failure – Fuser warm-up not complete within 110 seconds after starting.
- Cool-down error – Cool-down process not complete within 200 seconds.
- Low trouble temperature – The fuser temperature drops to the low trouble temperature (approximately current control temperature, minus approximately 25° C).
- High trouble temperature – The fuser temperature rises to the high trouble temperature (approximately current control temperature, plus approximately 35° C).
- STS circuit open
- STS failure – The heat rod remains on for at least 10 seconds after warm-up has completed.

Power Shutoff to the Fuser

The printer shuts off power to the Fuser for the following reasons:

- Fuser abnormality (U4)
- Paper jam
- Cover open — top, rear, duplex unit, stacker
- Laser assembly (ROS) abnormality (U2)
- CPU or NVRAM abnormality (U6)
- Main motor assembly abnormality (U1)
- Fan abnormality (U5)
- Fuser Pause command issued
- Xerographics failure
- Duplex unit failure
- Stacker failure
- Option tray unit failure

Paper Exit Assembly

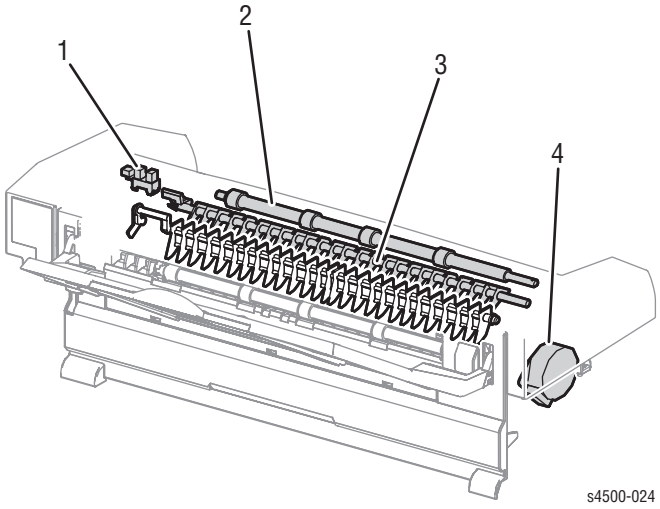
The paper exit assembly discharges the printed paper out of the printer, sending it either to the standard output tray or to the optional stacker.

Exit motor assembly This motor drives the exit roller that conveys paper to each output tray. If the optional duplex unit is installed, this motor also reverses and inserts paper into the duplex unit.

Exit roller This roller transports the printed paper sent out from the Fuser, to the standard output tray.

Output tray full sensor This sensor detects that the standard output tray is full, using the stack full actuator.

Stacker exit gate This gate switches the paper transport path interlocking with the stacker gate link. When the gate solenoid assembly installed in the optional stacker operates, the stacker gate link is pushed down by the spindle of the solenoid assembly. The gate blocks the normal paper output path and switches the output direction to the stacker output tray.



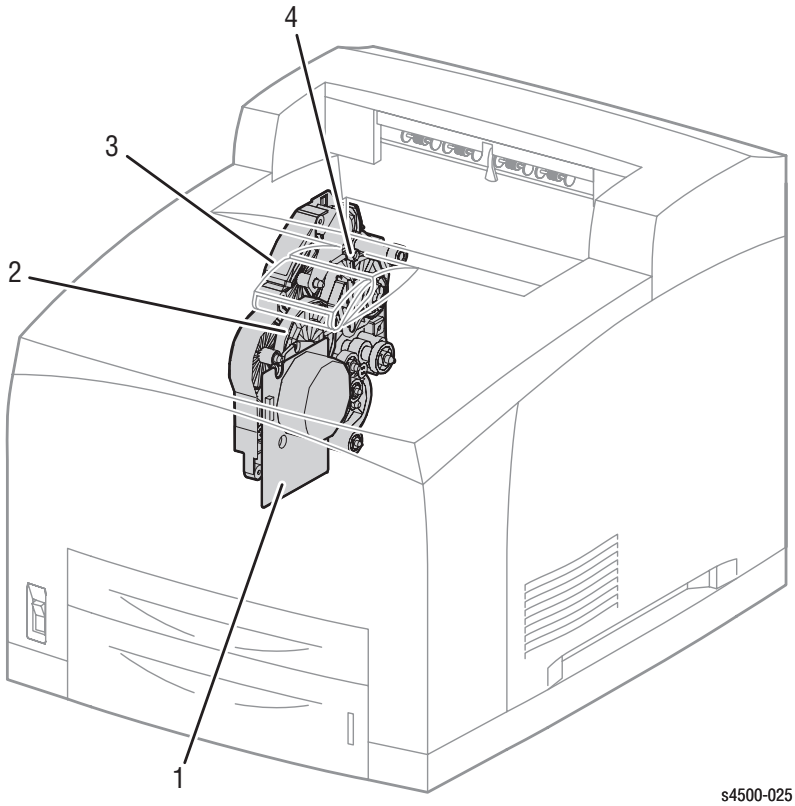
1. Output tray full sensor
2. Exit roller
3. Stacker exit gate
4. Exit motor assembly

Drive

Gear assembly housing The gears in this housing transmit power from the main motor to various parts of the printer.

Gear assembly plate This transmits power from the main motor to the print cartridge.

Link lever This connects and disconnects the drive force from the main motor to the fuser assembly. When the top cover is opened, the link lever pushes up gear 8 in the gear assembly housing disconnecting gear 9 and thus, the fuser assembly. As the link lever moves up and down, gear 4 in the gear assembly plate moves right and left via gear link 3, and drive to the print cartridge drum is connected or disconnected.



1. Main motor
2. Gear assembly plate
3. Gear assembly housing
4. Link lever

Electrical

24 V interlock This safety switch interrupts 24 VDC from the LVPS to the HVPS/engine logic board and main motor when the top cover is open. This switch operates in series with the rear cover switch. See “Schematic Diagram of Phaser 4500 Power Distribution and Interlocks” on page 2-31, or “Schematic Diagram of Phaser 4510 Power Distribution and Interlocks” on page 2-32.

5 V interlock This safety interrupts 5 VDC power from the LVPS to the LD assembly of the laser assembly when the top cover is open. This interlock works in series with the laser interlock. See “Schematic Diagram of Phaser 4500 Power Distribution and Interlocks” on page 2-31, or “Schematic Diagram of Phaser 4510 Power Distribution and Interlocks” on page 2-32.

Rear cover switch This safety switch interrupts 24 VDC from the LVPS to the HVPS/engine logic board and main motor when the rear cover is open. This switch operates in series with the 24 V interlock. See “Schematic Diagram of Phaser 4500 Power Distribution and Interlocks” on page 2-31, or “Schematic Diagram of Phaser 4510 Power Distribution and Interlocks” on page 2-32.

Main fan This vents air inside the printer to prevent an excessive rise in the inside temperature.

Sub fan This fan takes outside air into the printer to prevent an excessive rise in the inside temperature. This is mounted near the laser assembly in the center on the front side.

LVPS The low voltage power supply provides 5 V and 3.3 V for logic circuits, 5 V for the laser diode, and 24 V for motors and clutches. **P4510:** The LVPS board includes the DC-DC converter (described below) as an integral part.

HVPS/engine logic board The functions of the HVPS and engine controller are brought together on a single circuit board. The HVPS provides high AC and DC voltages to the BCR (charging), magnet roller (development), transfer roller (transfer), and detack saw (peeling). The engine logic controls the printing operation according to the information obtained through communications with the image processor and from sensors and switches.

Image processor board This receives data from the host computer, performs printing, and controls the whole printer.

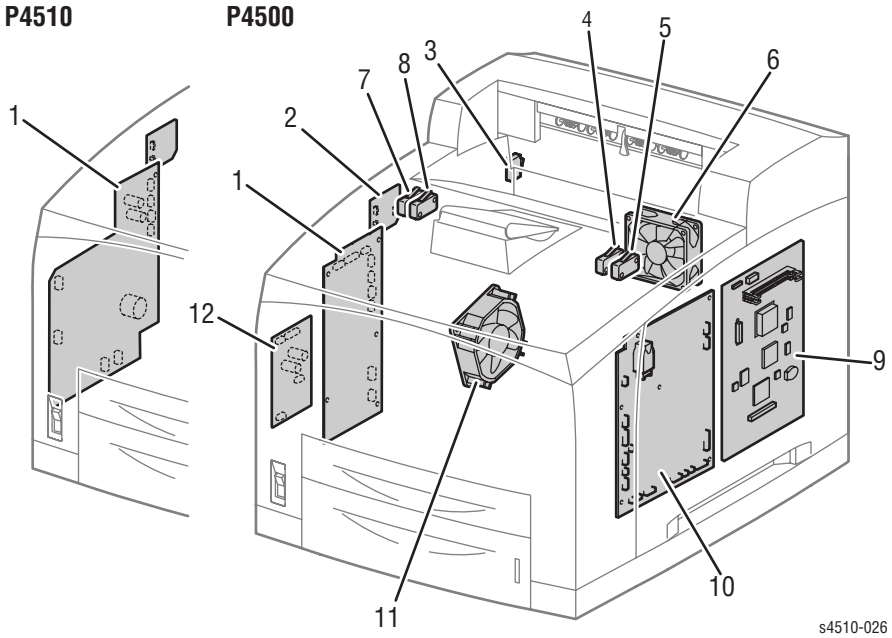
Exit motor PWBA This controls the exit motor assembly according to a signal from the HVPS/engine logic board.

Interlock switch assembly This assembly consists of the following two safety switches. See “Schematic Diagram of Phaser 4500 Power Distribution and Interlocks” on page 2-31.

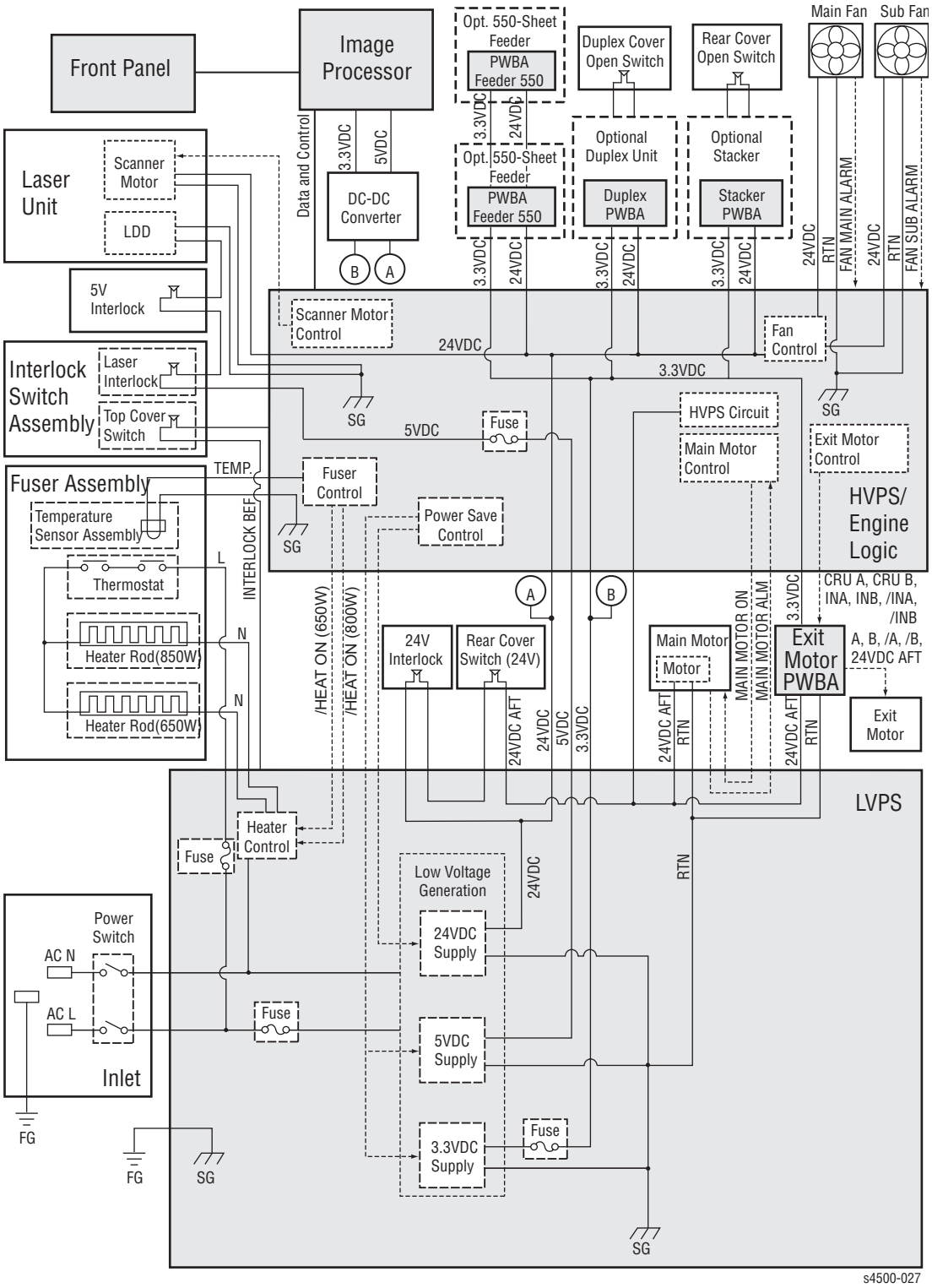
Top cover switch **P4500:** This safety interlock interrupts the INTERLOCK BEF signal between the LVPS and the HVPS/engine logic board to indicate that the top cover is open.

Laser interlock **P4500:** This safety switch interrupts 5 VDC from the LVPS to the LD assembly of the laser assembly when the top cover is open. This switch operates in series with the 5 V interlock.

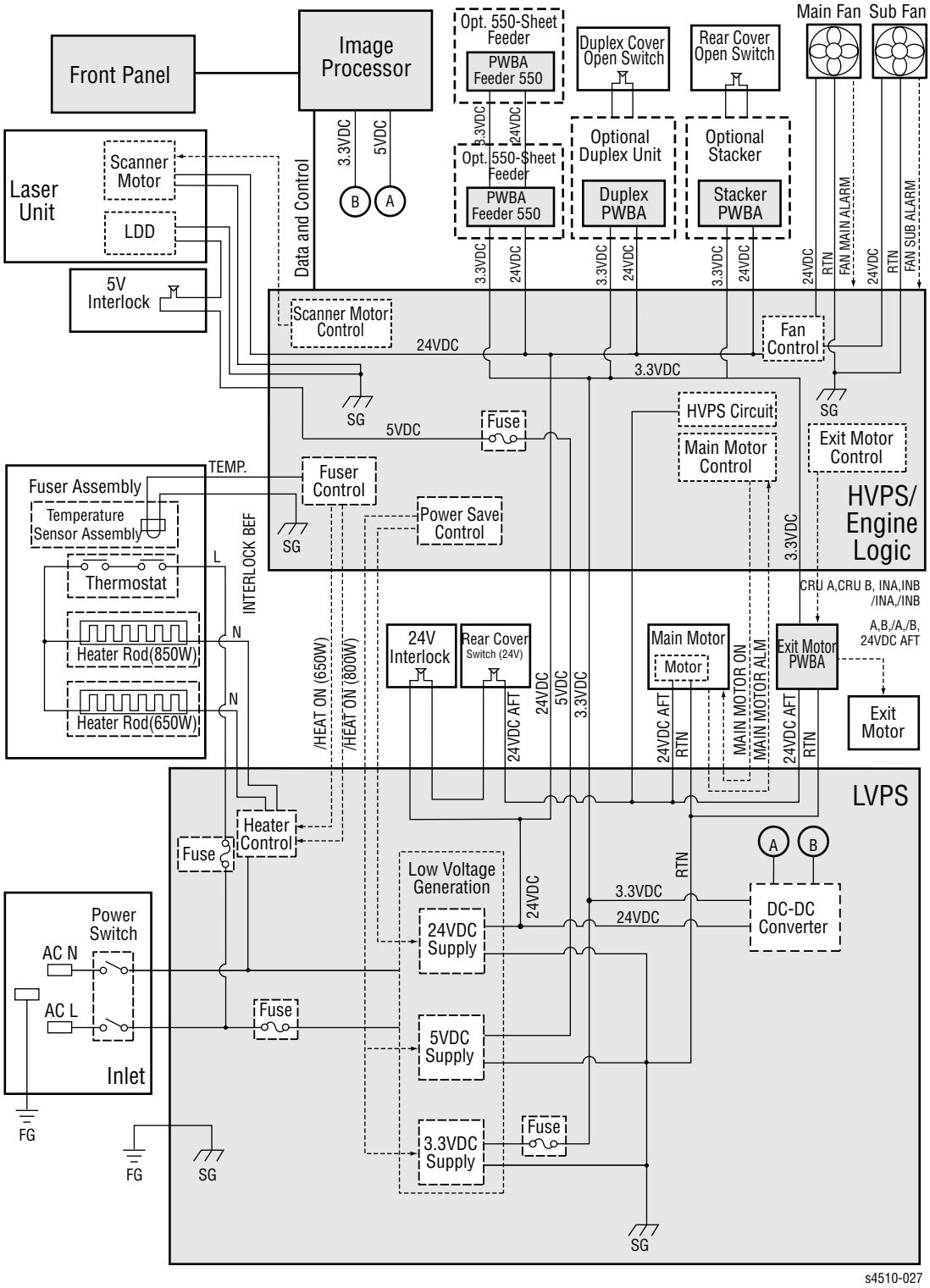
DC-DC converter The DC-DC converter uses 24 V and 3.3 V from the LVPS to supply 5 V and 3.3 V to the image processor board. By using the 24 V, the DC-DC converter supplies additional power for the optional hard drive and several other subcircuits.
P4500: The DC-DC converter is on a separate circuit board from the LVPS.
P4510: The DC-DC converter is an integral part of the LVPS.



1. LVPS (includes DC-DC converter in P4510)
2. Exit motor PWBA
3. Rear cover switch
4. Laser interlock (P4500 only)
5. Top cover switch (P4500 only)
6. Main fan
7. 5 V interlock
8. 24 V interlock
9. Image processor board
10. HVPS/engine logic board
11. Sub fan
12. DC-DC converter (separate board in P4500; integrated into LVPS in P4510)



Schematic Diagram of Phaser 4500 Power Distribution and Interlocks



s4510-027

Schematic Diagram of Phaser 4510 Power Distribution and Interlocks

Printer Options

Three options are available for the Phaser 4500/4510 printer:

- Duplex unit
- Stacker
- 550-sheet feeder

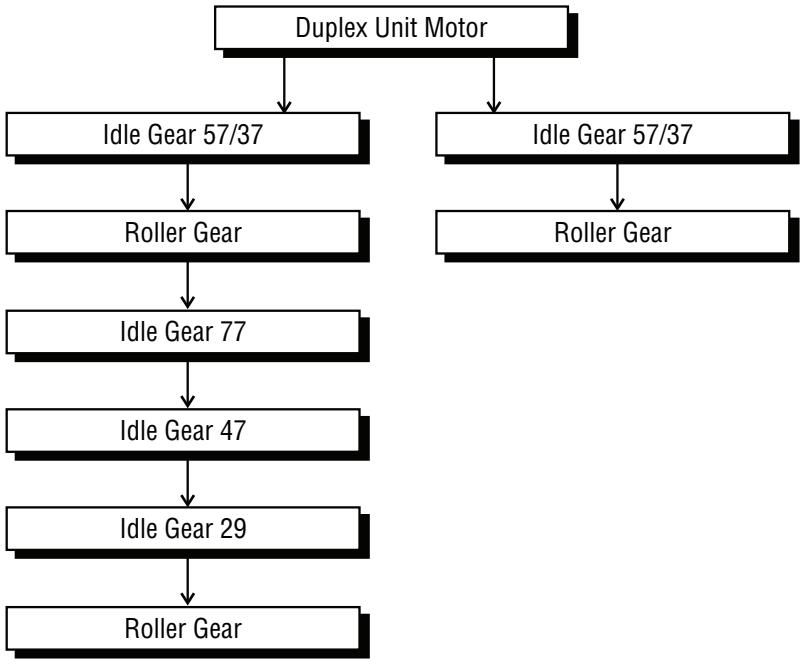
Paper transport information for the options is discussed earlier in this chapter.

Duplex Unit

The duplex unit used on the Phaser 4510 differs from the one used on the Phaser 4500. While the two units function exactly the same, they use different motors due to the difference in speed, and they are shaped differently due to the change in the location of the cooling fan.

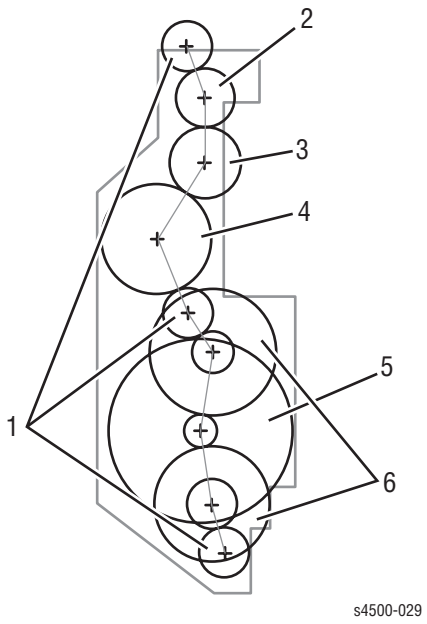
Drive Transmission Path

The rotating force of the duplex unit motor is transmitted by various gears to components requiring mechanical drive as shown in this flow chart and the gear layout that follows.



s4510-028

Gear Layout



1. Roller gears
2. Idle gear 29
3. Idle gear 47
4. Idle gear 77
5. Duplex unit motor
6. Idle gear 57/37

Functional Components

Two-sided printing is enabled by mounting the duplex unit on the rear side of the base engine.

Duplex unit switch This switch detects that the duplex unit lower housing and duplex unit housing cover are closed.

Duplex unit sensor This sensor detects the presence or absence of paper in the duplex unit.

Duplex unit fan This fan vents air within the duplex unit and takes in outside air, to prevent abnormal temperature rise in the duplex unit.

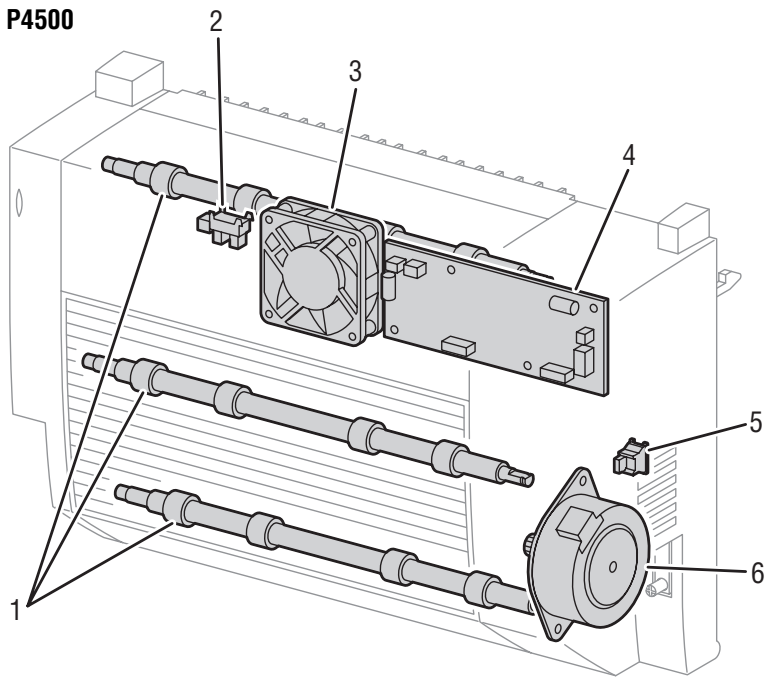
Duplex roller This roller feeds the paper having the printed first surface back into the printer through the duplex unit, to print on the second surface.

Duplex unit PWBA The CPU on the duplex unit PWBA receives instructions from the HVPS/engine logic board and information from sensors and switches, and controls paper transport through the duplex unit.

Duplex unit motor This motor drives the three duplex rollers, which transport the paper through the duplex unit.

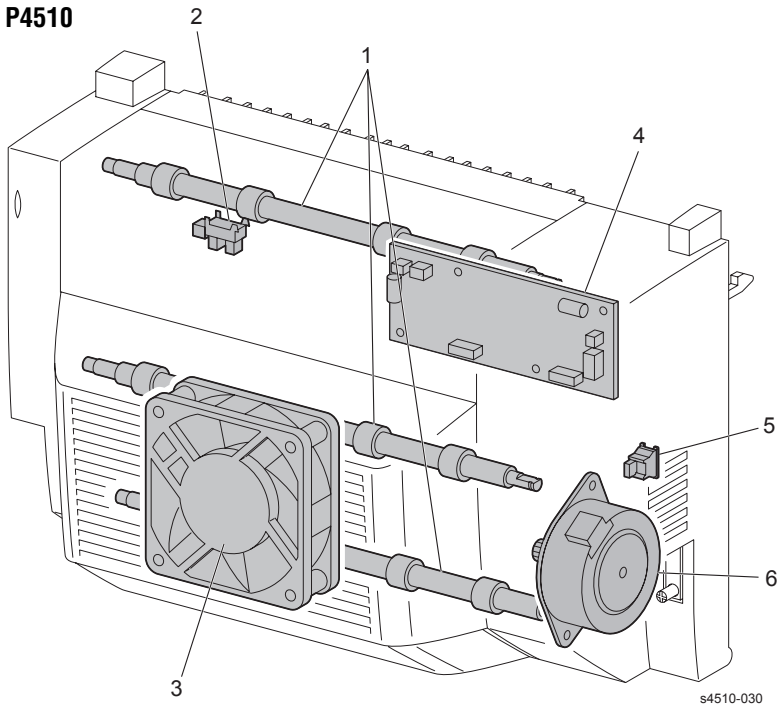
Phaser 4500 and 4510 Duplex Units

P4500



s4500-030

P4510



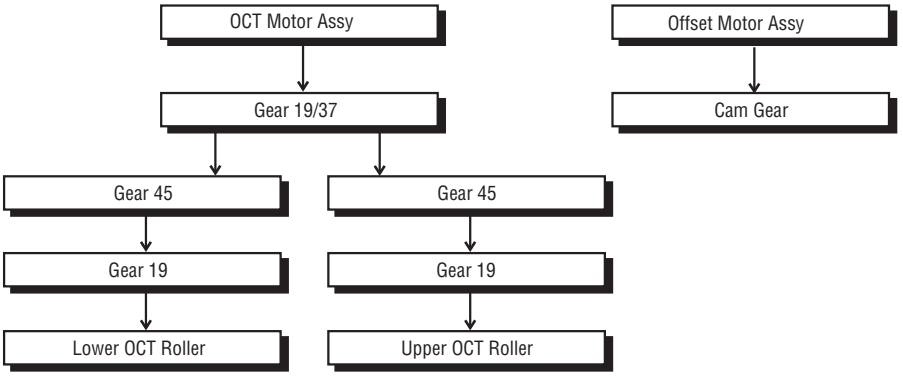
s4510-030

1. Duplex unit rollers
2. Duplex unit sensor
3. Duplex unit fan
4. Duplex unit PWBA
5. Duplex unit switch
6. Duplex unit motor

Stacker

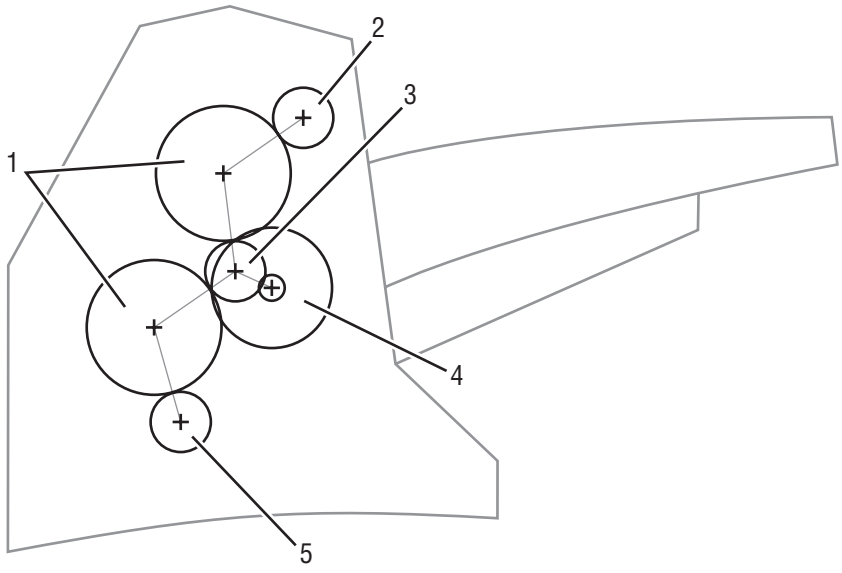
Drive Transmission Path

The rotating force of the stacker motor assembly is transmitted by various gears to components requiring mechanical driving force as shown in this flow chart and the gear layout that follows.



s4500-031

Gear Layout



s4500-032

1. Gear 45
2. Gear 19
3. Gear 19/37
4. Stacker motor assembly
5. Gear 19

Paper Transport Path

When the stacker is installed on the printer, the paper is transported as shown in the illustration on page 2-6. The main components that transport paper through the stacker are shown in the diagram on page 2-4

Functional Components

Offset output is enabled by mounting the stacker on top of the 500-sheet paper exit.

Stacker motor assembly This motor drives the lower stacker roller and upper stacker roller, which transport printed paper to the stacker tray.

Offset motor assembly This motor drives the offset chute assembly via the gear cam.

Gate solenoid assembly This solenoid switches the output paper path between the standard and stacker paper output trays. When the gate solenoid assembly activates, the solenoid armature pushes the stacker Gate Link to operate the stacker exit gate, which reroutes the paper to the stacker paper output tray.

Stacker PWBA The CPU on the stacker PWBA receives instructions from the HVPS/engine logic board and information from sensors and switches, and controls paper transport through the stacker.

Stacker rear cover switch This switch detects when the stacker rear cover is open.

Stacker sensor This sensor detects the presence or absence of paper in the stacker.

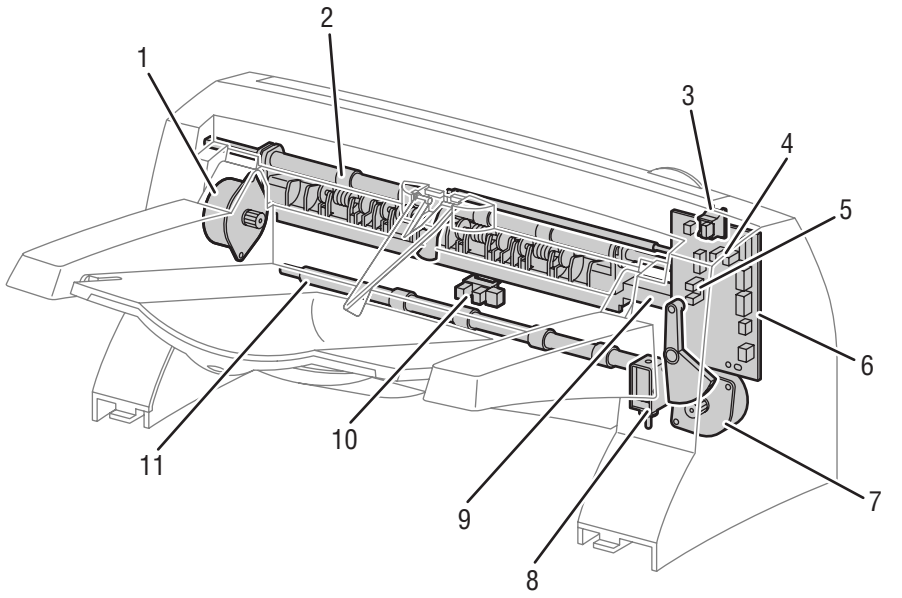
Stacker full sensor This sensor is located on the stacker PWBA, and detects when the stacker output tray is full, using the stack full actuator.

Offset Sensor This sensor is located on the stacker PWBA, and detects an offset operation, using the actuator in the Offset Chute.

Lower stacker roller This roller transports the printed paper coming out of the Fuser to the Upper stacker roller.

Upper stacker roller This roller discharges the printed paper sent from the Lower stacker roller into the stacker paper output tray.

Offset chute assembly This assembly is driven by the offset motor assembly and Cam gear to move right and left during paper output to offset the output of the printer.

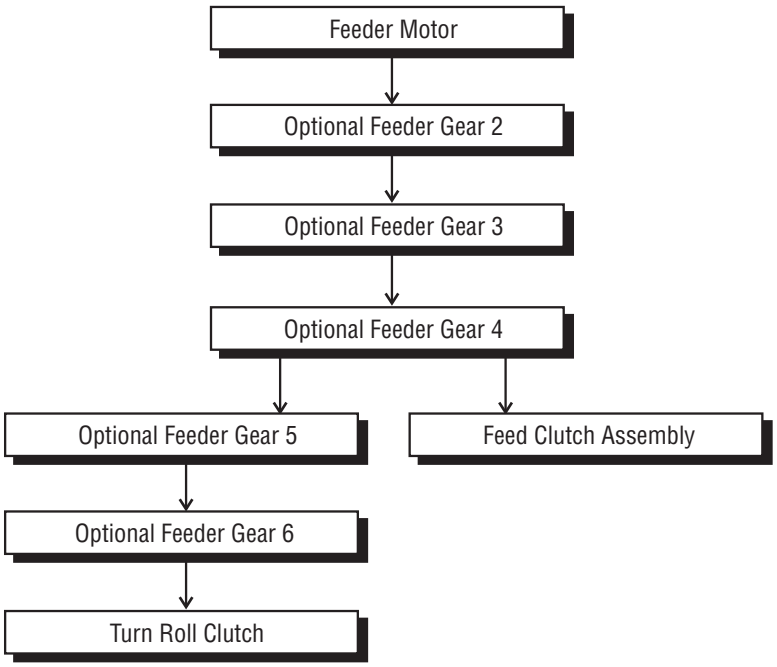


1. Stacker motor assembly
2. Upper stacker roller
3. Rear cover switch
4. Full Stack Sensor
5. Offset Sensor
6. Stacker PWBA
7. Offset motor assembly
8. Gate solenoid assembly
9. Offset chute assembly
10. Stacker sensor
11. Lower stacker roller

Optional 550-Sheet Feeder

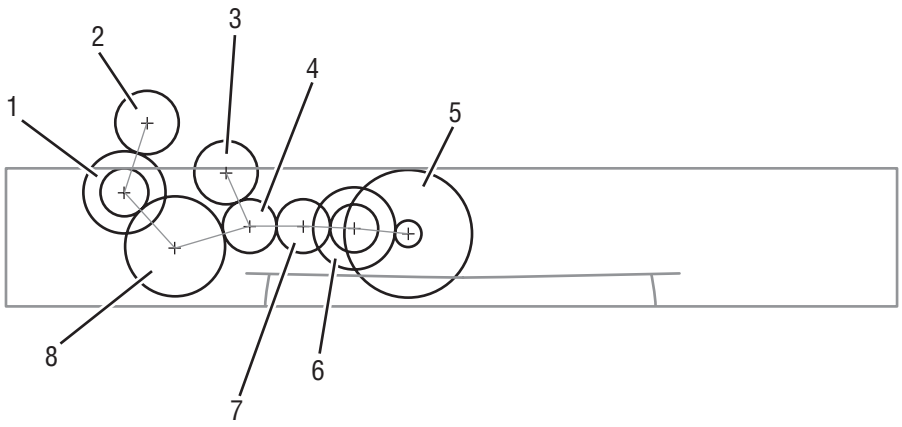
Drive Transmission Path

The rotating force of the feeder motor is transmitted by various gears to components requiring mechanical driving force as shown in this flow chart and the gear layout that follows.



s4500-034

Gear Layout



s4500-035

1. Optional feeder gear 6
2. Turn roller clutch
3. Feed clutch
4. Optional feeder gear 4
5. Feeder motor
6. Optional feeder gear 2
7. Optional feeder gear 3
8. Optional feeder gear 5

Functional Components

The paper tray used in the optional feeder is identical to the 550-Sheet paper tray used by the base engine, so the description of the paper tray is omitted here.

Option paper size switch assembly A bank of switches for setting the size of paper supplied from each paper tray is mounted in the left tray guide. A signal indicating the paper size is transmitted as a voltage to the HVPS/engine logic board.

No paper actuator This actuator is kept in a raised position by the paper in the tray. If the paper tray runs out of paper, the no paper actuator drops and the flag of the no paper actuator moves from between the sensor arms, allowing the sensor to turn on.

No paper sensor This is a photo sensor that remains in the OFF state when paper is present in the tray. The sensor turns on when there is no paper in the tray and the flag on the no paper actuator moves out of the sensor.

Low paper actuator When paper is low in the paper tray, the arm of the low paper actuator is pushed up by the bottom plate assembly, moving the actuator flag out of the sensor.

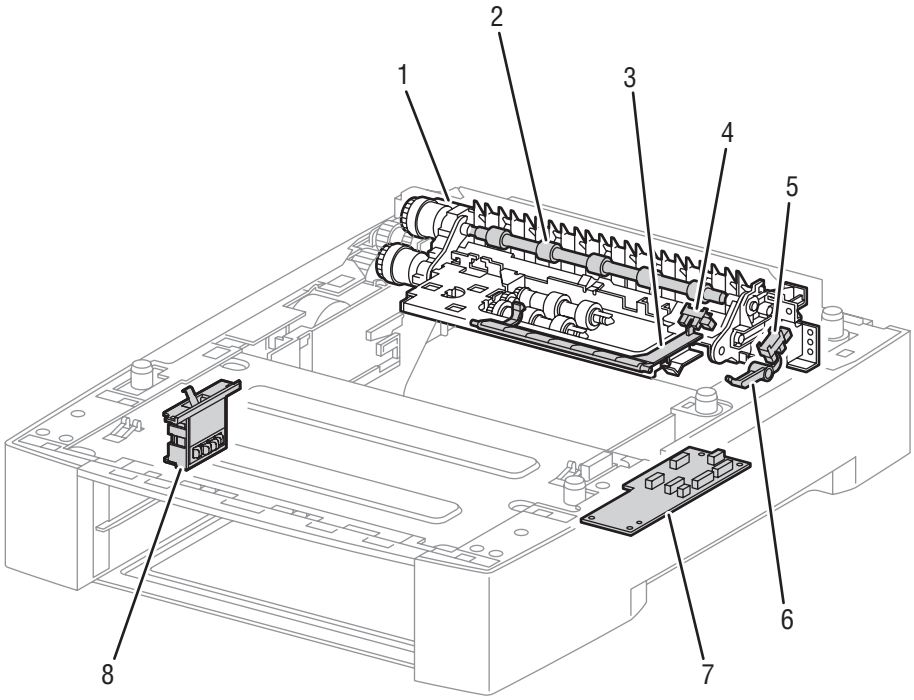
Low paper sensor This photo sensor remains in an OFF state until the paper level in the tray drops sufficiently to move the low paper actuator flag out of the sensor.

Optional 550-sheet feeder This is a mechanism for supplying paper from the paper tray into the printer. The driving force from the feeder motor is transmitted via the feed clutch assembly to the feed roller and nudger roller, transporting paper from the tray into the printer.

As the nudger roller picks up paper and the paper level lowers, the position of the nudger roller drops accordingly. The lowered nudger roller pushes down the lock lever of the bottom plate assembly, releasing it. The spring below the bottom plate assembly pushes it up and lifts the paper, which lifts the nudger support assembly off of the lock lever of the bottom plate assembly stopping its upward motion.

Turn roller This roller, working with the turn pinch roller, advances the paper picked by the nudger and feed rollers into the printer. The feeder motor drives the turn roller through the turn roller clutch.

550-sheet feeder PWBA A CPU installed in the 550-sheet feeder PWBA receives instructions from the HVPS/engine logic board and from sensors and switches; the CPU controls feeding operation in the 550-sheet feeder.



s4500-036

1. Optional 550-sheet feeder
2. Turn roller
3. No paper actuator
4. No paper sensor
5. Low paper sensor
6. Low paper actuator
7. 550-sheet feeder PWBA
8. Option paper size switch assembly

Error Messages and Codes

In this chapter...

Chapter 3