PLW SC/NT/NTR/LS

Personal LaserWriter SC, Personal LaserWriter NT,
Personal LaserWriter NTR, Personal LaserWriter LS,
Personal LaserWriter LS/L

Basics

PLW SC/NT/NTR/LS

Product Information

The printers covered in this manual are

- Personal LaserWriter SC
- Personal LaserWriter NT
- Personal LaserWriter NTR
- Personal LaserWriter LS
- Personal LaserWriter LS/L

Compatibility

Not all parts are compatible among the five models. Refer to Illustrated Parts for compatibility cross references.

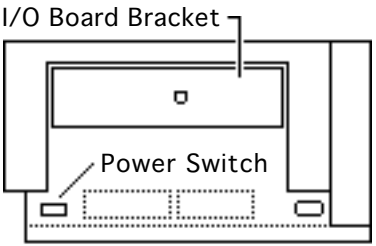
The cassette feeder tray and its associated parts are optional on the LS, LS/L, and NTR models.

Paper Paths

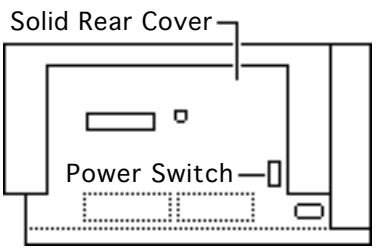
There are four paper paths in the Personal LaserWriter. Paper is fed from the cassette or multipurpose tray and delivered to the face-down or face-up delivery trays.

Note: Face signifies image side. Default delivery is face-down at the top of the printer.

LS–LS/L Identification



Personal LaserWriter LS

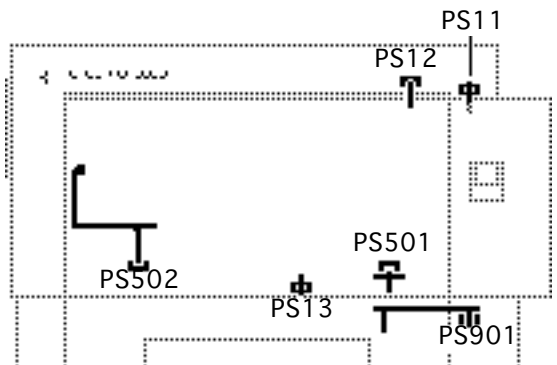


Personal LaserWriter LS/L

The LS/L is a cost-reduced version of the LS but is sold and packaged under the same LS name. Parts are not necessarily interchangeable between the two models.

External distinguishing characteristics:

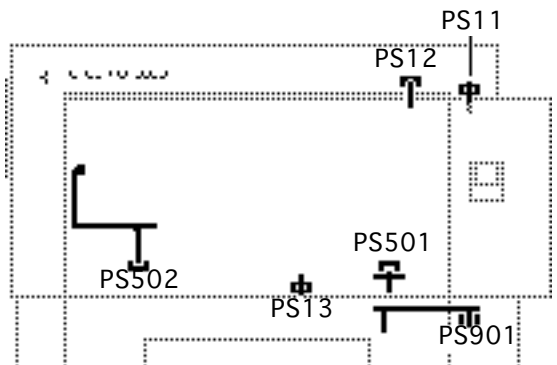
- LS: The power switch is on the left rear of printer; the rear cover has an opening for an I/O board bracket and displays the family number M2000.
- LS/L: The power switch is on the right rear of printer; the rear cover is solid plastic and displays the family number M2002.



Sensing System Theory

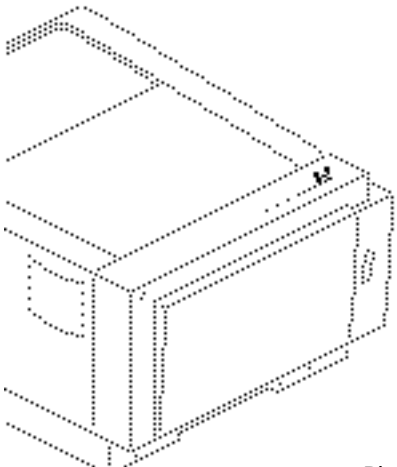
There are six sensors in the Personal LaserWriter: four paper sensors and two printer-open sensors. Each consists of an actuator, a U-shaped photo interrupter, and circuitry that communicates with the controller.

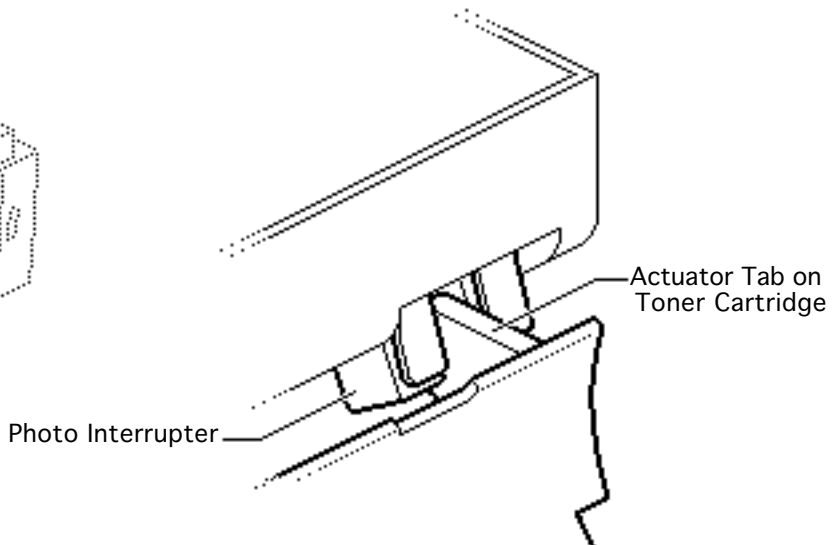
If the actuator is present inside the U, the circuit closes; if it is absent, the circuit opens. In ready state the appropriate circuit is closed.



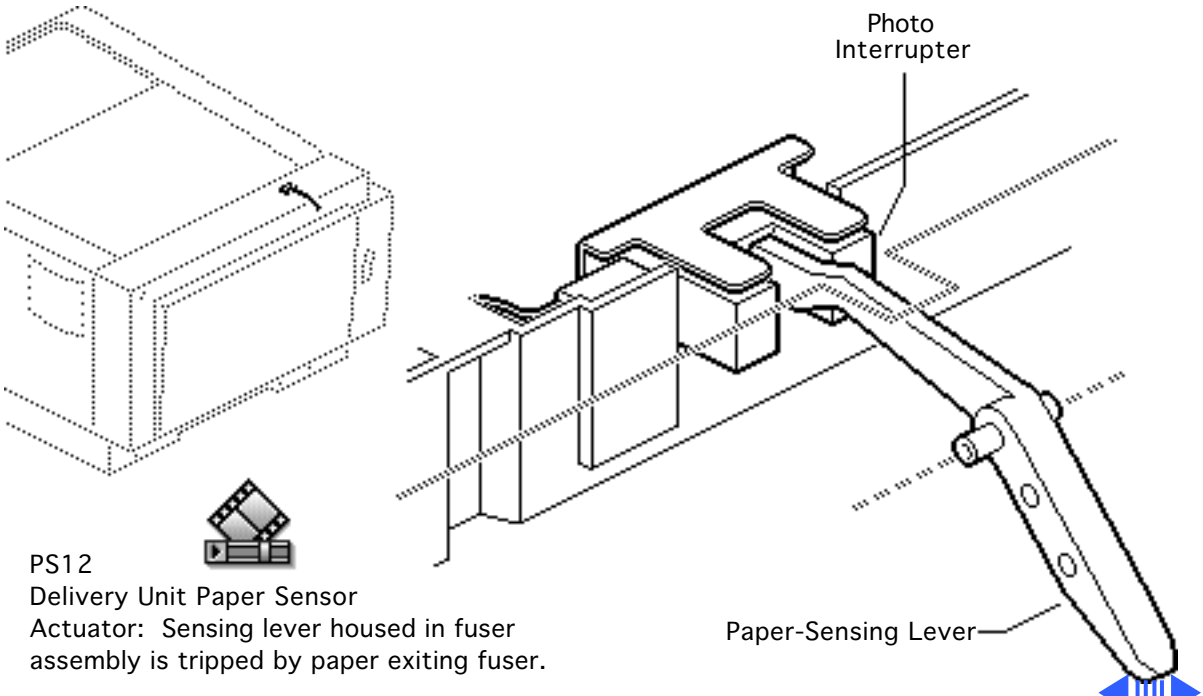
Paper sensors are actuated as an arm or lever swings against movement of paper. Printer-open sensors are actuated as the user shuts a door or cover.

Illustrations on the following cards show each sensor as it would appear in print ready state. Some peripheral elements are deleted for clarity.

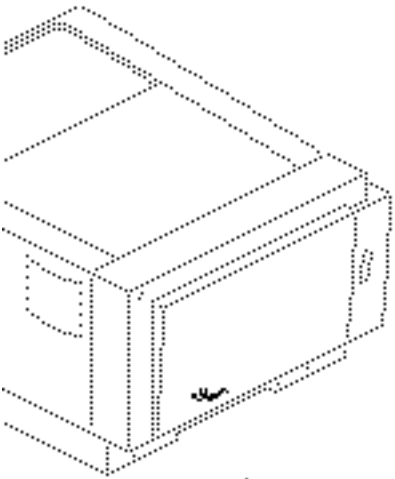


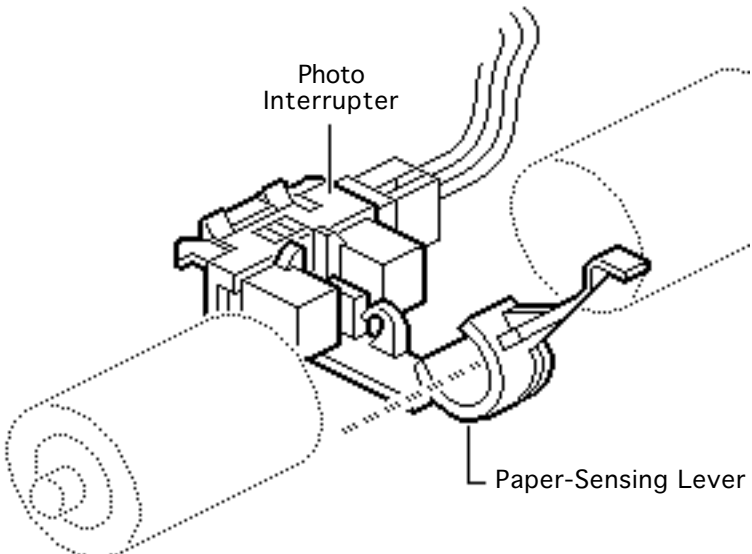


PS11
Toner Cartridge Sensor
Actuator: Toner cartridge shutter flips into position as front door closes.

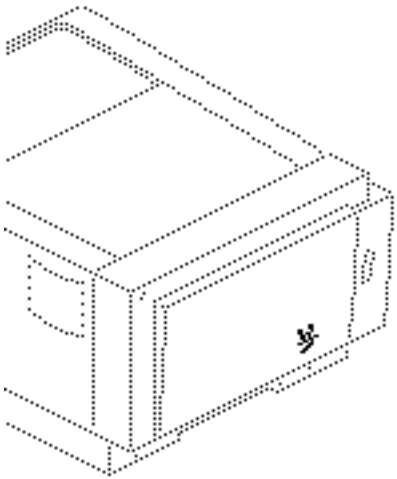


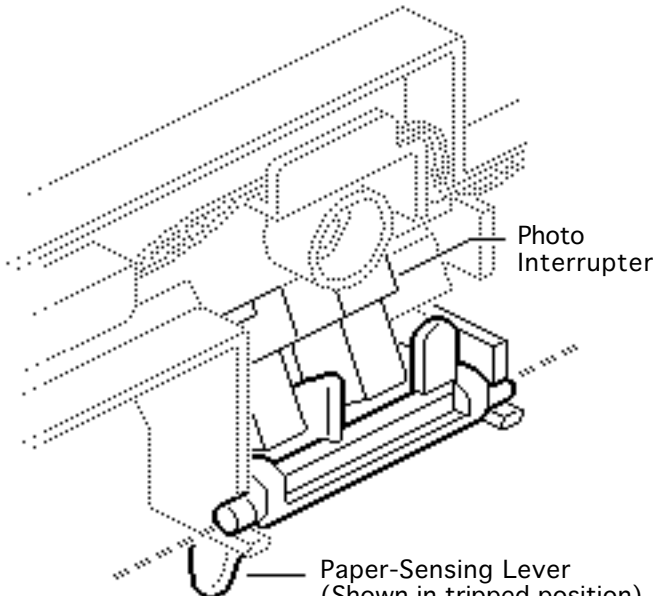
PS12
Delivery Unit Paper Sensor
Actuator: Sensing lever housed in fuser assembly is tripped by paper exiting fuser.



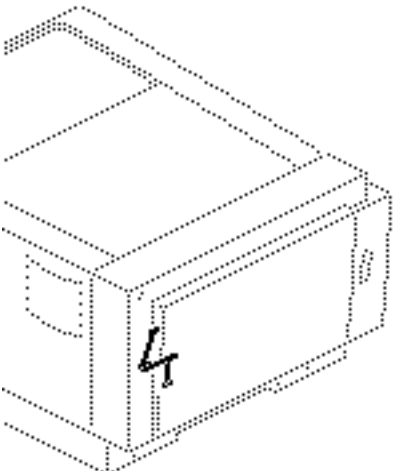


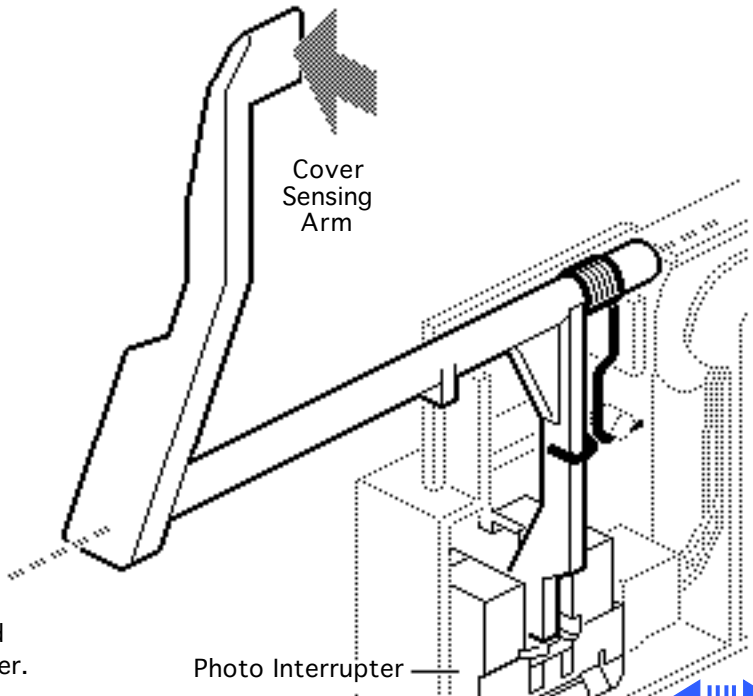
PS13
Pickup Unit Paper Sensor
Actuator: Sensing lever in feeder assembly is tripped by paper entering feed cycle.



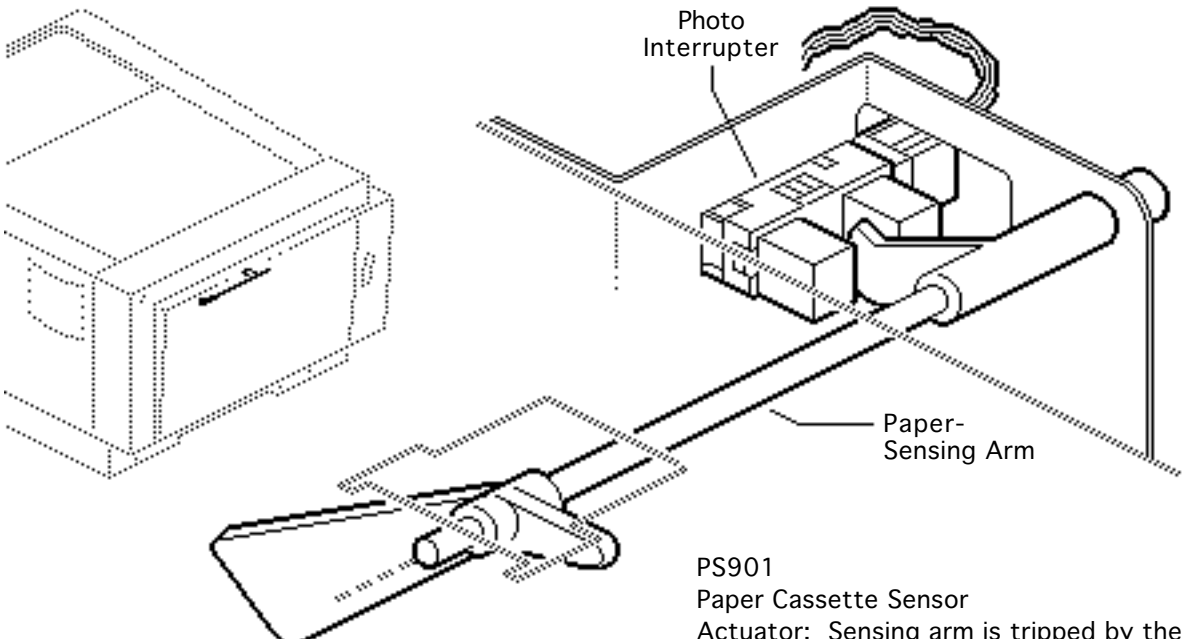


PS501
Multipurpose Tray Sensor
Actuator: Sensing lever in multipurpose cable assembly is tripped by manually fed paper.

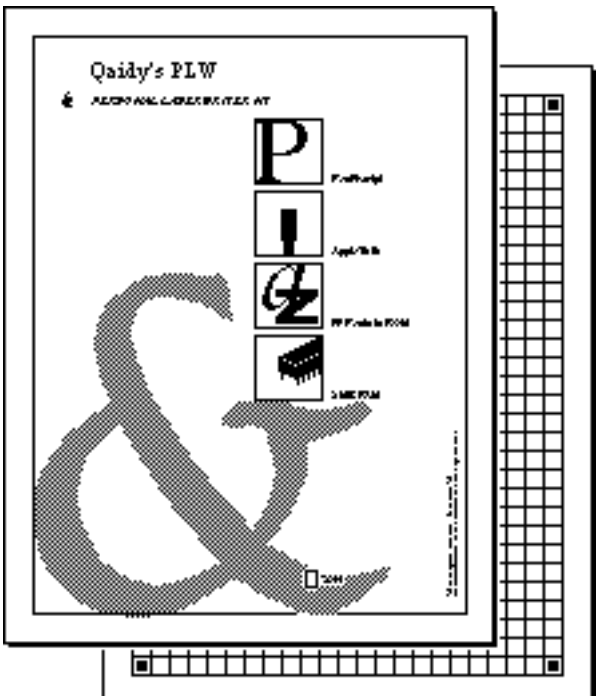




PS502
Face-Up Cover Sensor
Actuator: Sensing arm is tripped by the closing of the face-up ocver.



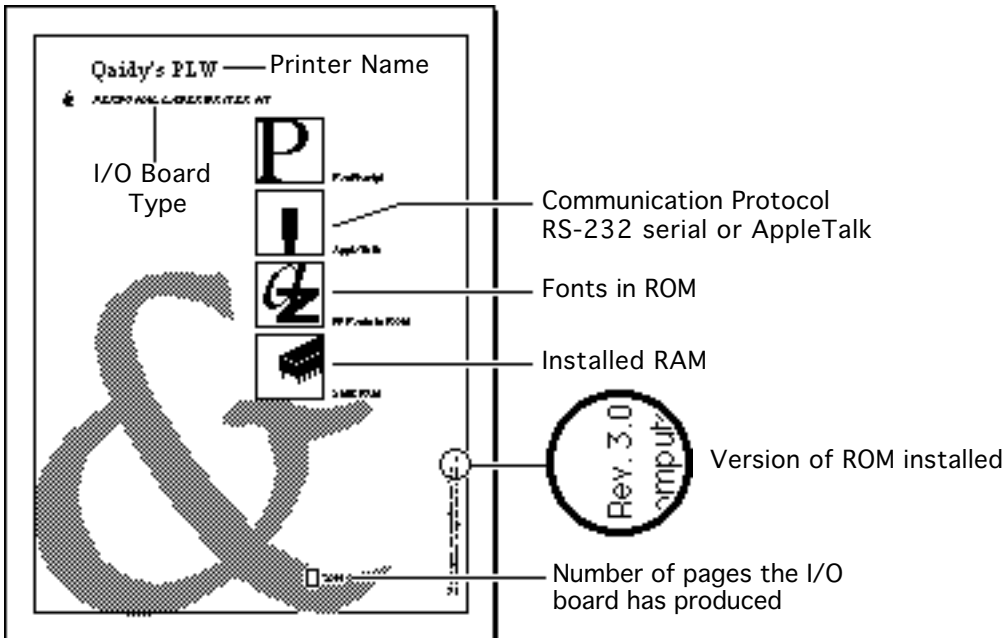
PS901
Paper Cassette Sensor
Actuator: Sensing arm is tripped by the insertion of loaded cassette tray.



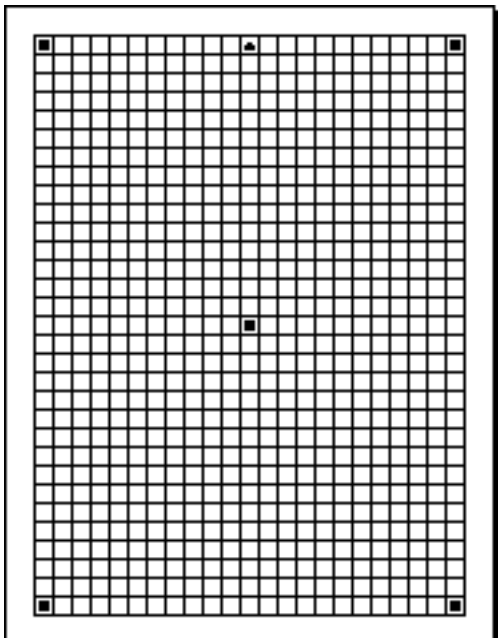
Startup Test Pages

The Personal LaserWriter SC, NT, and NTR generate a startup test page 2 – 3 minutes after you switch on the printer. The LS and LS/L do not produce such a page.

In the NT and NTR the startup test page also shows unit-specific configuration information. The following pages describe each element of the startup test pages.



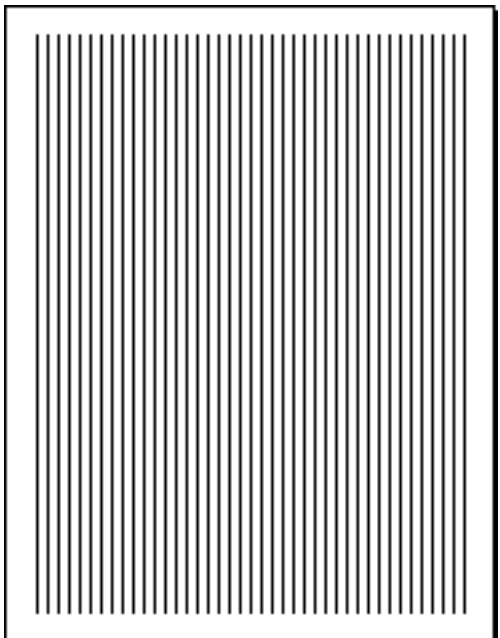
NT/NTR Startup Test Page



SC Startup Test Page

The Personal LaserWriter SC test page consists of a line matrix. The printer generates a test page only if you set its SCSI address to 7 prior to switching on the printer. It continues to print until it is out of paper.

Note: Be sure to set the SCSI address back before resuming printing.

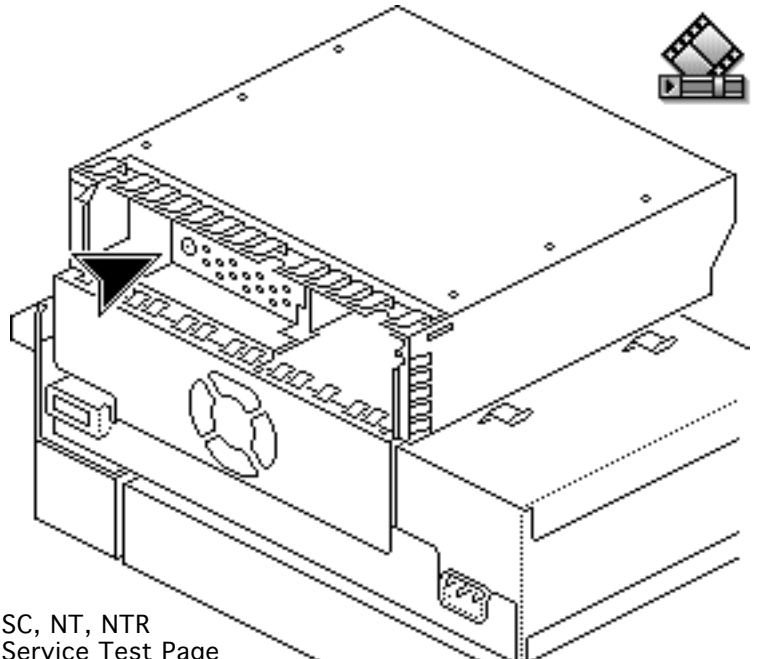


Service Test Page

Service Test Page

Successful printing of a service test page confirms print engine operation.

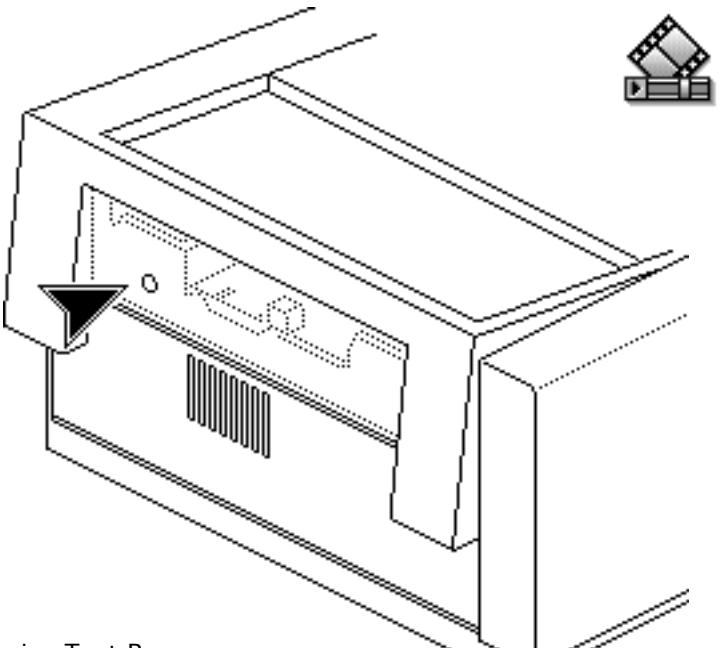
There are three variations in how you run a service test page, depending on the model you are servicing. Each involves using a pencil or similar dowel-shaped tool to depress the service test button on the DC controller board (or serial controller on the LS/L).



SC, NT, NTR
Service Test Page

SC, NT, NTR

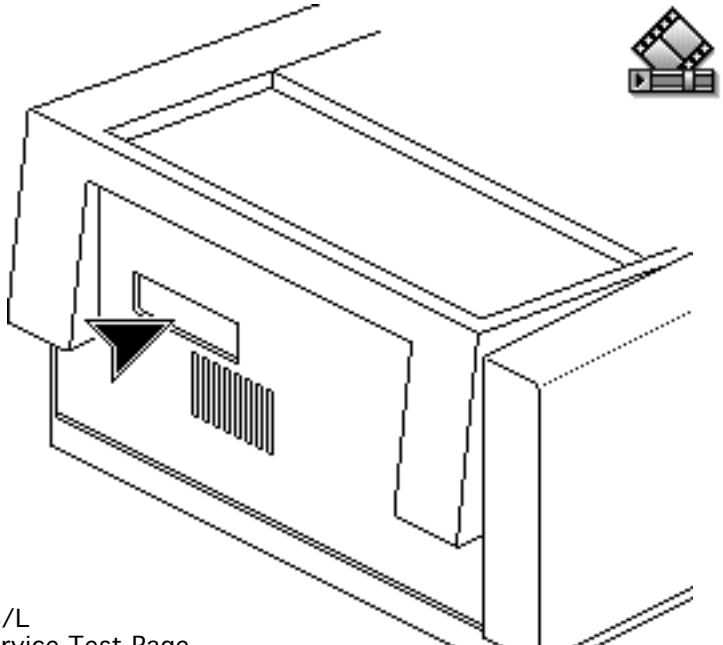
First remove the I/O board. You can then access the test button through the 1/4-inch diameter opening in the I/O shield.



LS
Service Test Page

LS

First remove the I/O board bracket. You can then access the test button through the 1/4-inch diameter opening in the end plate.



LS/L
Service Test Page

LS/L

First remove the test button cover on the rear panel of the printer. You can then access the test button through the opening in the rear panel.

Specifications

PLW SC/NT/NTR/LS

General

Engine	Canon P110 engine
Printing Method	Electrophotography using single-component dry toner
Optical System	Semiconductor laser and a rotating dual-faced scanning mirror
Resolution	300 dpi
Imaging Languages Supported	SC: QuickDraw NT: PostScript, HP LaserJet Plus, and a subset of Diablo 630 NTR: PostScript, HP LaserJet Plus, and a subset of Diablo 630 LS: QuickDraw LS/L: QuickDraw

Intro Dates

SC and NT	July 1990
LS	March 1991
LS/L and NTR	March 1992

Logic Board

CPU

SC: Motorola 68000 microprocessor (7.275 MHz)
NT: Motorola 68000 microprocessor (12 MHz)
NTR: N/A
LS: N/A
LS/L: N/A

DRAM

SC: 1 MB
NT: 2 MB, expandable to 8 MB
NTR: 3 MB, expandable to 4 MB
LS: 512K, expandable to 1 MB
LS/L: 512K, expandable to 1 MB

ROM

SC: 32K
NT: 1.25 MB
NTR: 3 MB
LS: N/A
LS/L: N/A

I/O

SC: SCSI
NT: LocalTalk, RS-232, RS-422
NTR: LocalTalk, RS-232, RS-422, Centronics parallel
LS: RS-422
LS/L: RS-422

Performance

Printing Speed	4 pages per minute maximum; actual performance depends on the application
Print Delivery	Face-down or face-up (manually selectable)
Life Expectancy	150,000 pages with no monthly page limit

Paper

Paper Weights

Cassette feed: 20 lb., single-sheet, photocopy bond
Manual feed: 20-28 lb., letterhead and colored stock, medium-weight transparency material, envelopes, and labels

Cassette Sizes

US letter standard; legal, A4, B5, and envelope cassettes optional

Capacity In

Cassette: 250 sheets
Manual: 50/70 sheet capacities
Envelope cassette: 15 envelopes, minimum size 86 x 178 mm (3.5 x 7 in.), maximum size 188 x 267 mm (7.4 x 10 in.)

Capacity Out

Face-down tray: 50 sheets
Face-up tray: 20 sheets

Built-In Fonts

SC, LS, and LS/L	N/A
NT	Times, Helvetica, Helvetica Narrow, Courier, Symbol, Palatino, ITC Avant Garde, Gothic, ITC Bookman, New Century Schoolbook, ITC Zapf Chancery, and ITC Zapf Dingbats
NTR	Times, Helvetica, Helvetica Narrow, Courier, Symbol, Palatino, ITC Avant Garde, Gothic, ITC Bookman, New Century Schoolbook, ITC Zapf Chancery, ITC Zapf Dingbats, and IBM PC Graphics Extended Character Set (ECS)

Environmental

Temperature	50-90.5° F (10-32.5° C)
Humidity	20-80% relative humidity
Noise Level	Printing: Under 53 dB(A) Standby: Under 43 dB(A)

Electrical

Line Voltage

US/Japan: 100/115 V, 50/60 Hz
Europe/Australia: 220/240 V, 50 Hz

Power Consumption

600 W maximum (100/115 V)
550 W maximum (220/240 V)

Physical

Dimensions

Height: 8 in. (20.3 cm), 9.8 in. (24.8 cm) with cassette feeder
Width: 15 in. (38 cm)

Weight

SC, NT, and NTR: 32 lb. (15 kg)
LS and LS/L: 31 lb. (14.5 kg)

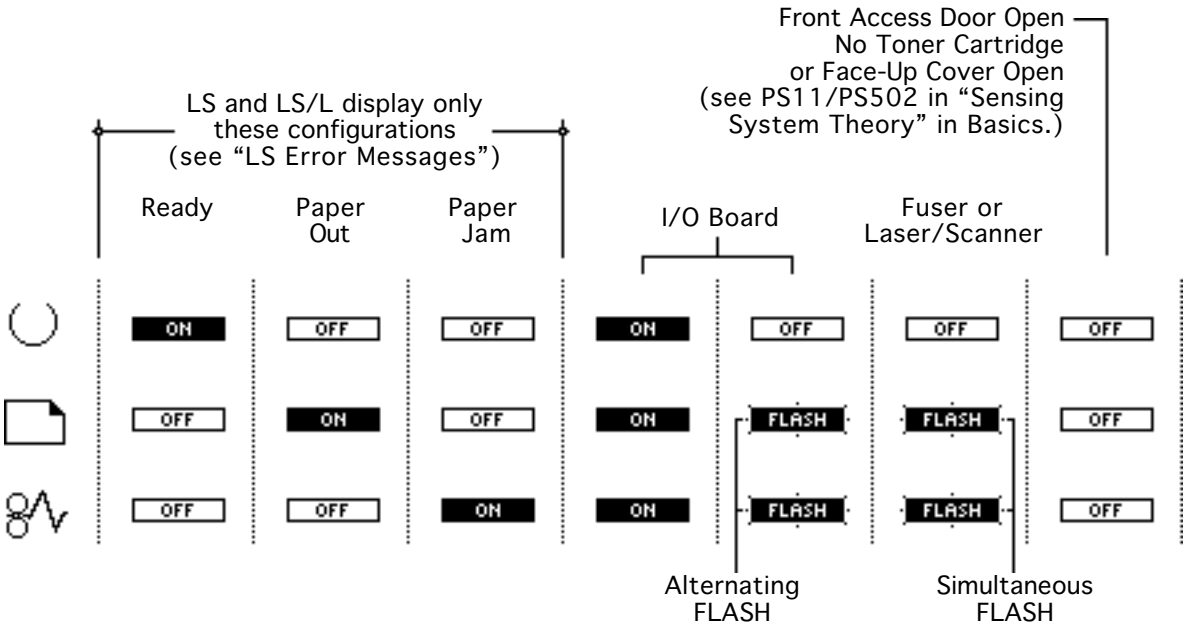
Troubleshooting

PLW SC/NT/NTR/LS

Status Panel LEDs

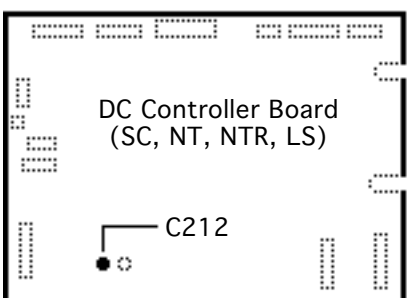
On the next page is an illustration that shows the possible LED patterns that can occur with the Personal LaserWriter.

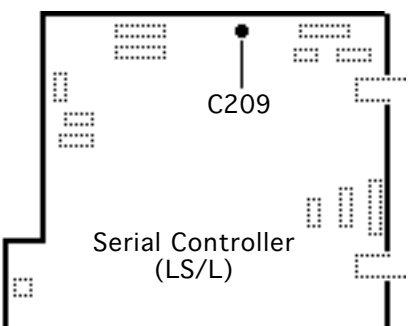
Note: Refer to "Print Engine Check" in Flowcharts for full troubleshooting paths.


Front Access Door Open
No Toner Cartridge
or Face-Up Cover Open
(see PS11/PS502 in "Sensing System Theory" in Basics.)
LS and LS/L display only these configurations (see "LS Error Messages")
Ready
Paper Out
Paper Jam
I/O Board
Fuser or Laser/Scanner
ON
OFF
OFF
ON
OFF
OFF
OFF
OFF
ON
OFF
ON
FLASH
FLASH
OFF
OFF
OFF
ON
ON
FLASH
FLASH
OFF
Alternating FLASH
Simultaneous FLASH

Capacitor Discharge

When there is a failure of the fusing system, the DC controller board shuts off current to the fuser roller heater and charges capacitor C212 to prevent overheating (C209 on the LS/L serial controller board).



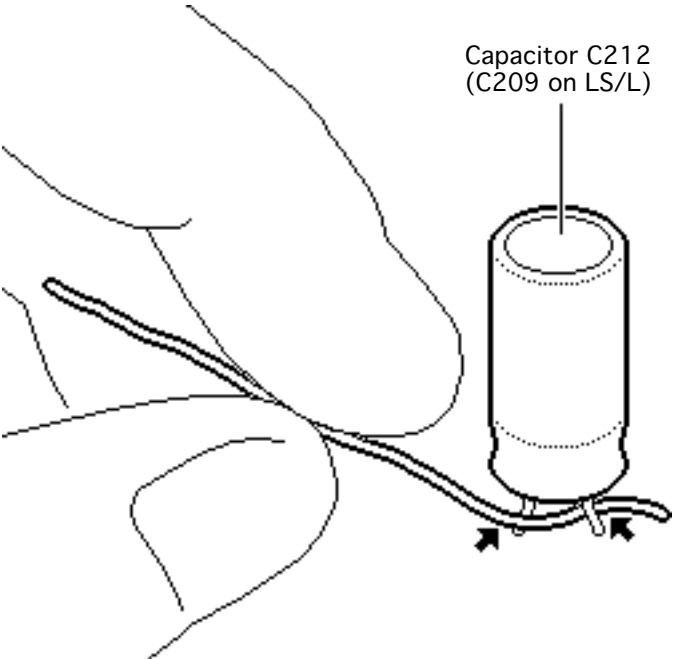


Before you can use the printer again, you must switch the power off and wait 3 minutes for the capacitor to discharge. If you do not want to wait, you can manually discharge the capacitor as described below.

Remove the top cover, locate the capacitor described on the previous page, and carefully jumper the two wires at the base of the capacitor as shown on the next page.

Note: Remove the I/O board and/or shield if you are servicing an SC, NT, or NTR. Remove the PCB shield if you are servicing an LS/L.

Caution: Take care not to damage the board tracings or the components around the capacitor. There are many different tools that can be used to discharge the capacitor: a flat blade screwdriver, paper clip, or aluminum foil doubled over. The tool illustrated is a length of lead solder. It has the advantage of being ductile and is less apt to damage the controller board.


Capacitor C212
(C209 on LS/L)

LS Error Messages

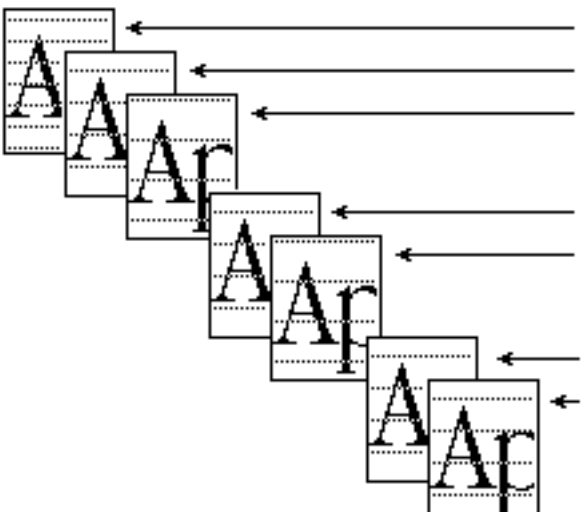
The SC, NT, and NTR display errors through status panel readouts (see “Status LEDs”). The LS and LS/L display errors through alert dialogs on the host computer.

For other hardware-related messages, go to “Print Engine Check.” For non-hardware error messages, follow the prompt given, or call the Apple Technical Assistance Center.

Note: If you are having communication problems with an LS, make sure that you have used the installer to load the printer driver.

Roller Diameters

Repetitive printing defects can often be isolated by measuring the tracking left by rollers. On the next page is a diagram that shows all the rollers in the Personal LaserWriter that come into contact with paper. The dimension given is the distance between tracks.



Toner Cartridge Rollers

1.5" (38 mm): primary charging roller

2.0" (51 mm): developer roller

3.7" (94 mm): photosensitive drum

Fuser Assembly

2.15" (54 mm): lower fuser roller

2.9" (74 mm): upper fuser roller

Other Rollers

1.9" (49 mm): paper feed roller

2.05" (52 mm): transfer roller

Drum Check

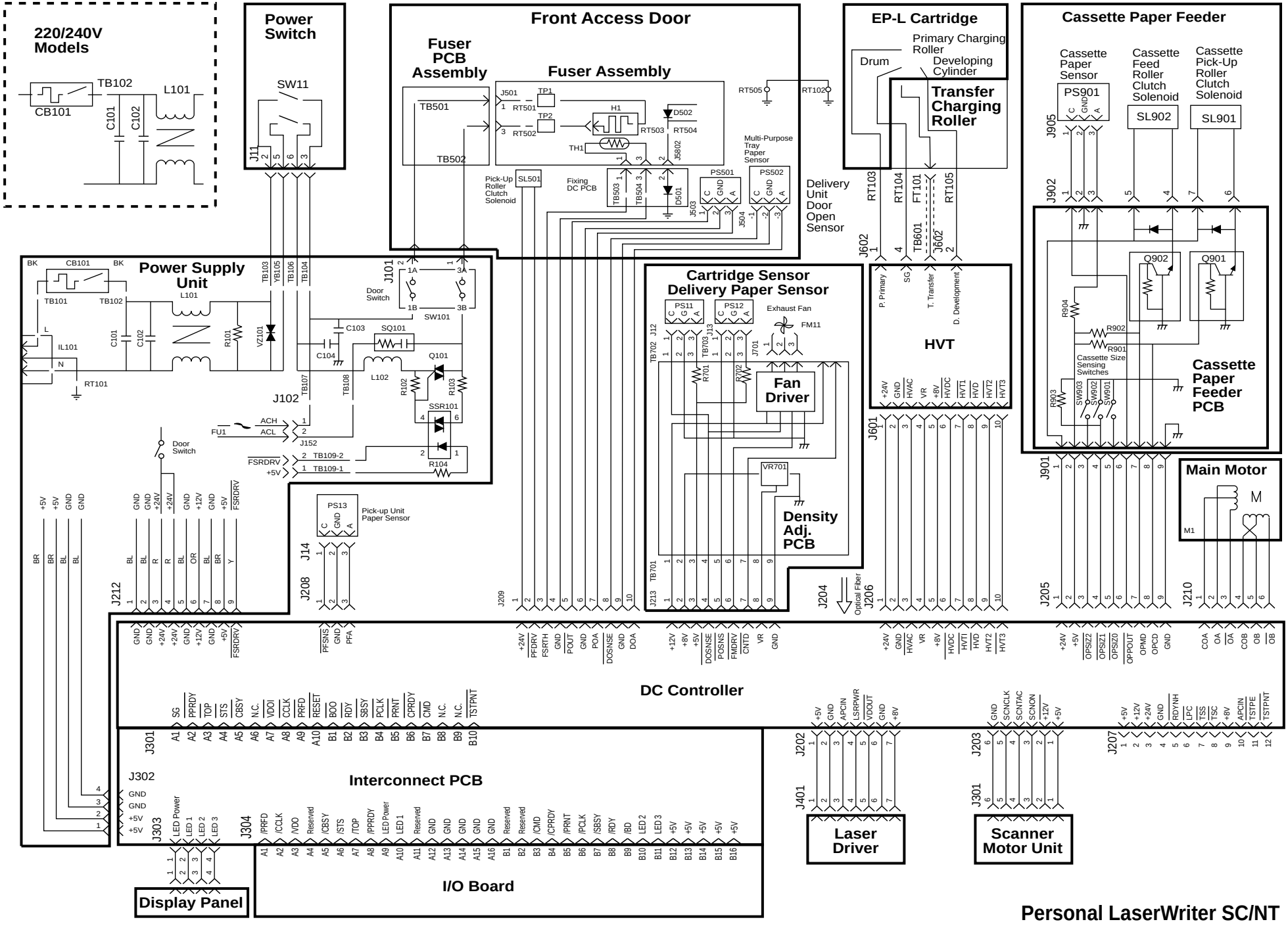
Interrupting a print cycle and inspecting the photosensitive drum can help isolate the cause of print quality problems. If the image on the surface of the drum exhibits the same problem as the printed page, the fault is before the drum, probably somewhere in the scanning system.

If the image on the drum is okay, the fault is after the drum, probably in the fuser assembly, transfer roller, or high-voltage power supply.

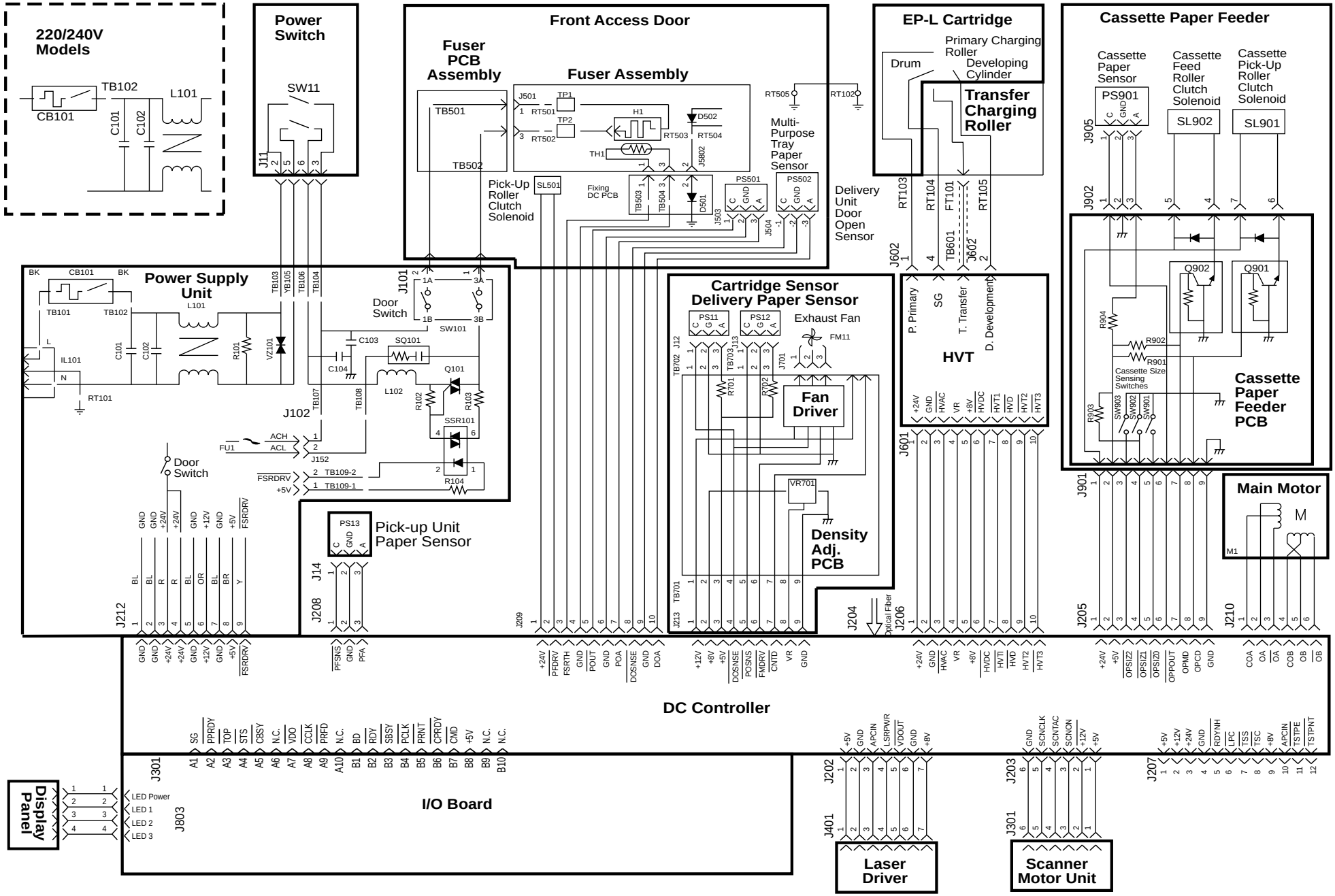
Note: Refer to “Roller Diameters” in this chapter for further quick-check troubleshooting tips.

Flowcharts

The flowcharts for this manual are contained in an interactive file called “PLW SC/NT/NTR/LS Flowcharts.” This file has been derived from the original version of Service Source but is a standalone self-launching application. To launch this file, click the button below..



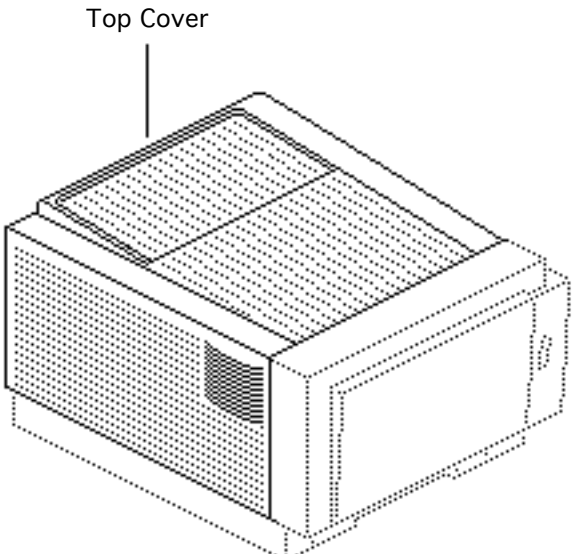
Personal LaserWriter SC/NT Wiring Diagram



Personal LaserWriter LS Wiring Diagram

Take Apart

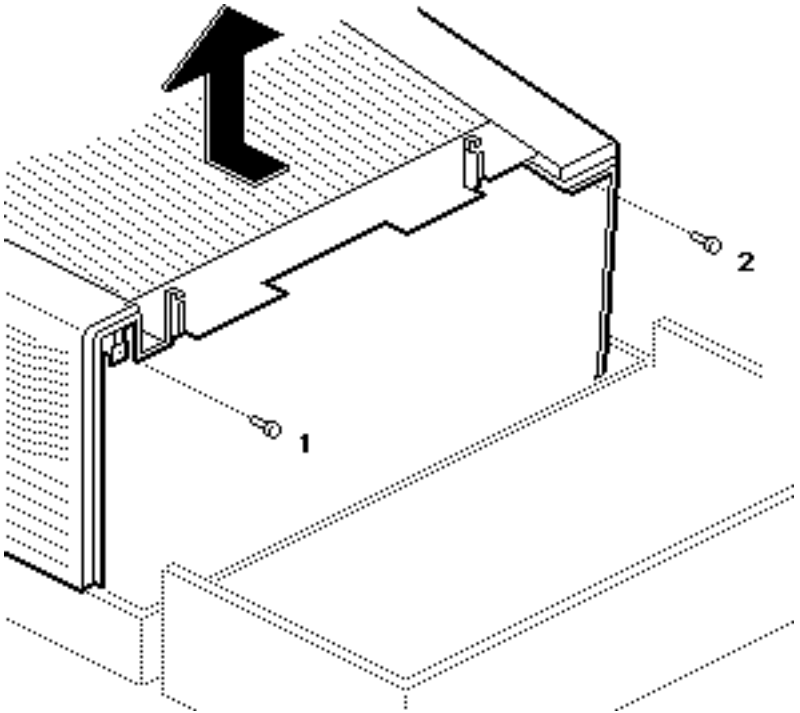
PLW SC/NT/NTR/LS



Top Cover

This topic applies to all models of the printer.

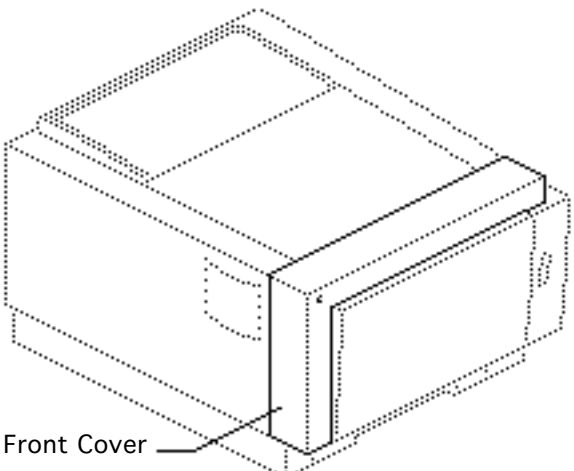
No preliminary steps are required before you begin this procedure.



1 Open the front access door.

2 **Note:** There is a pin on the inside of the rear panel that seats in a notch in the chassis. You must shimmy the cover about an inch toward the rear of the printer to unseat this pin before you can lift off the cover.

Remove the two screws and lift off the top cover.

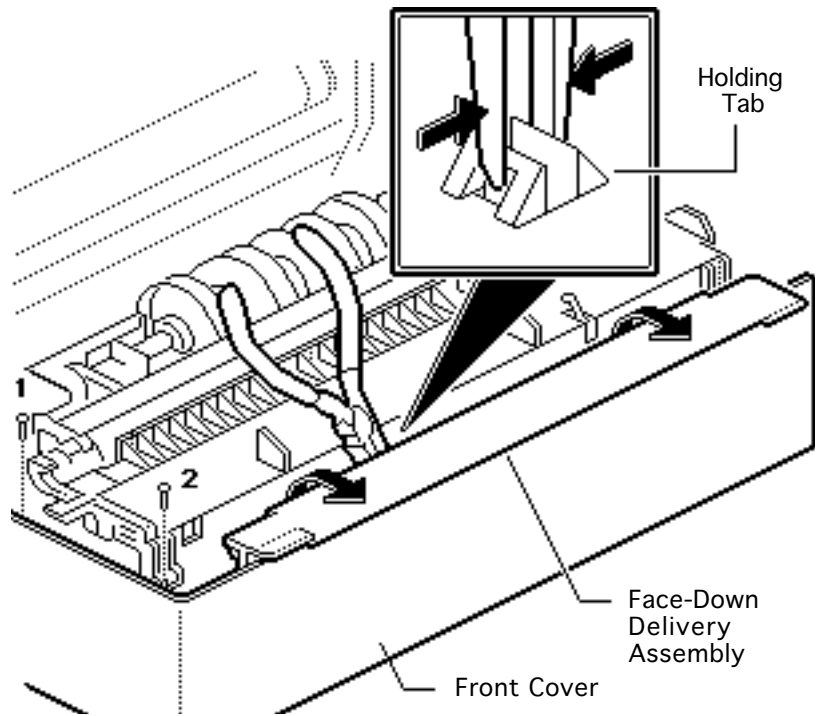


Front Cover

This topic applies to all models of the printer.

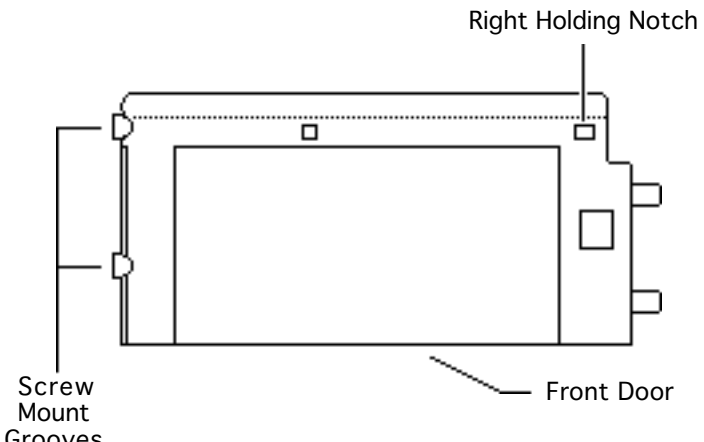
No preliminary steps are required before you begin this procedure.

1 Open the front access door.



2 Remove the two screws that secure the front cover to the front access door. Lift up the face-down delivery assembly and using needlenose pliers release the holding tab.

3 Lift off the front cover.

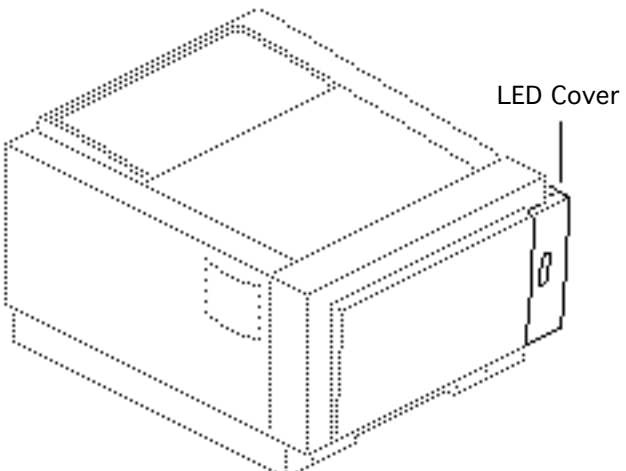


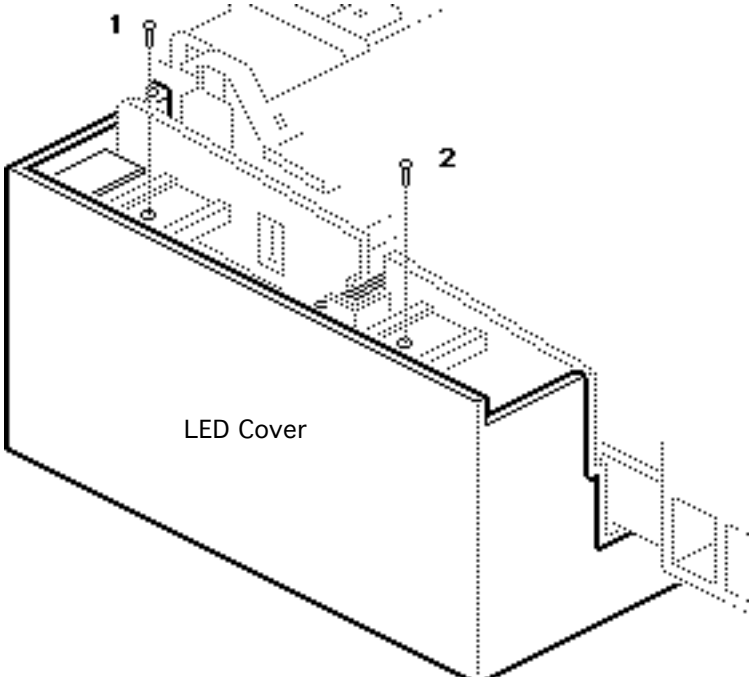
Replacement Note: Lower the multipurpose tray and remove the face-up delivery tray. Insert the right holding tab first, then swing the cover to the left, making sure that the two screw mounts align with the grooves in the side of the door. Press firmly until the front cover snaps into place.

LED Cover

This topic applies to all models of the printer.

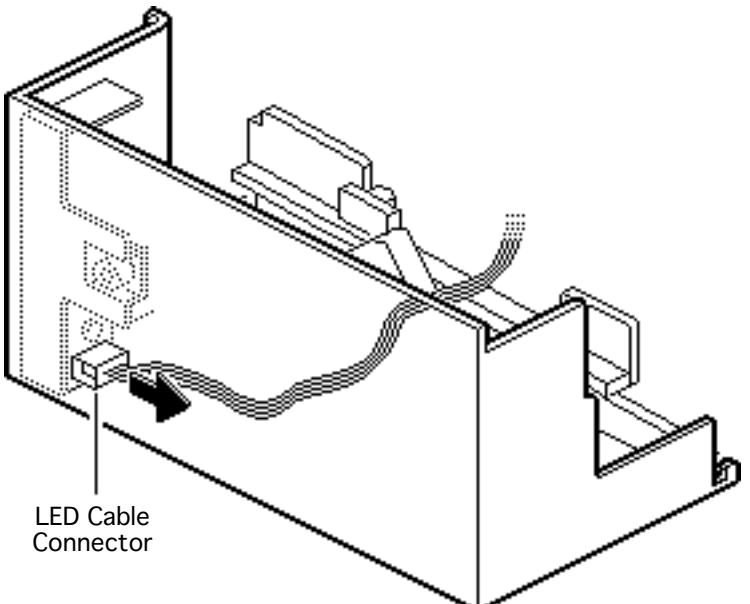
Before you begin, remove the front cover.

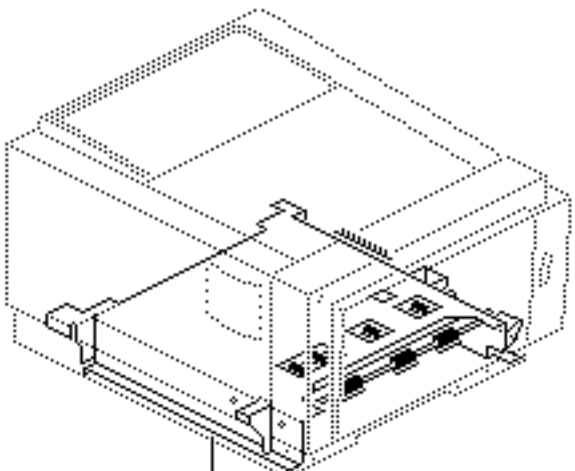




1 Remove the two screws that secure the LED cover to the front access door.

2 Lift off the LED cover and disconnect the LED cable from the LED holder.



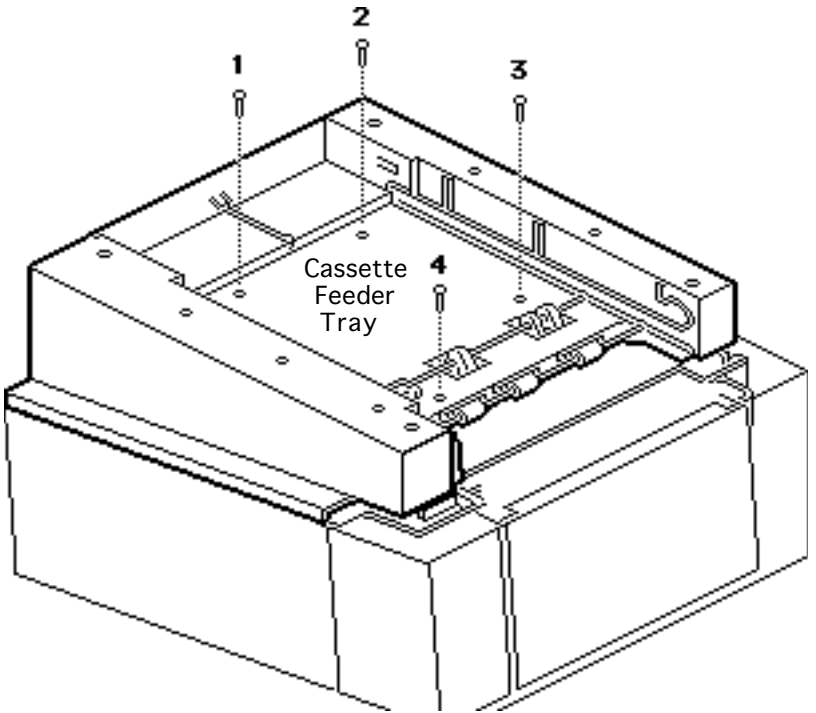


Cassette Feeder Tray

This topic applies to all models of the printer.

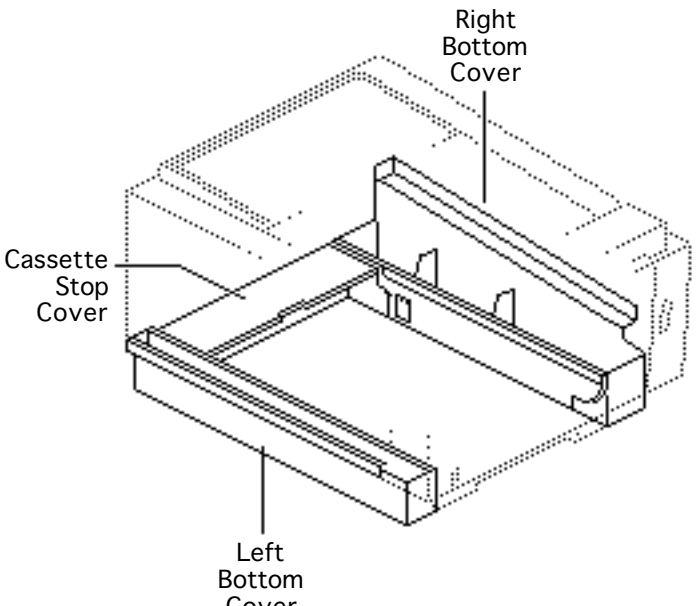
No preliminary steps are required before you begin this procedure.

Note: The cassette feeder tray and its associated parts are optional on the LS, LS/L, and NTR models.



1 Turn the printer upside down so that it is resting on its top.

2 Remove the four mounting screws and lift off the cassette feeder tray.

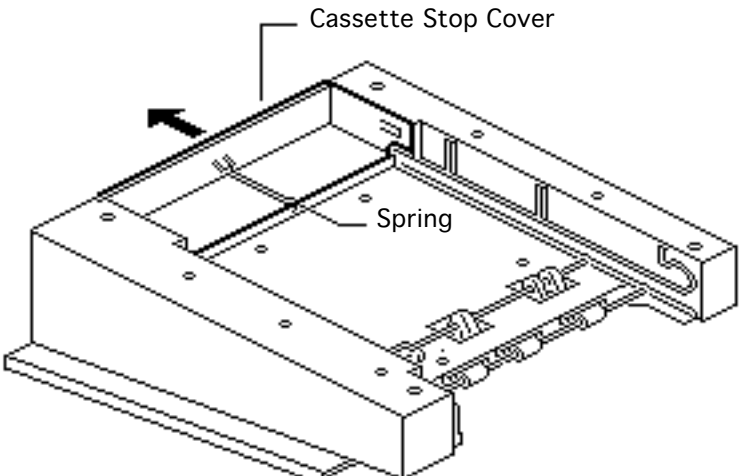


Pedestal Covers

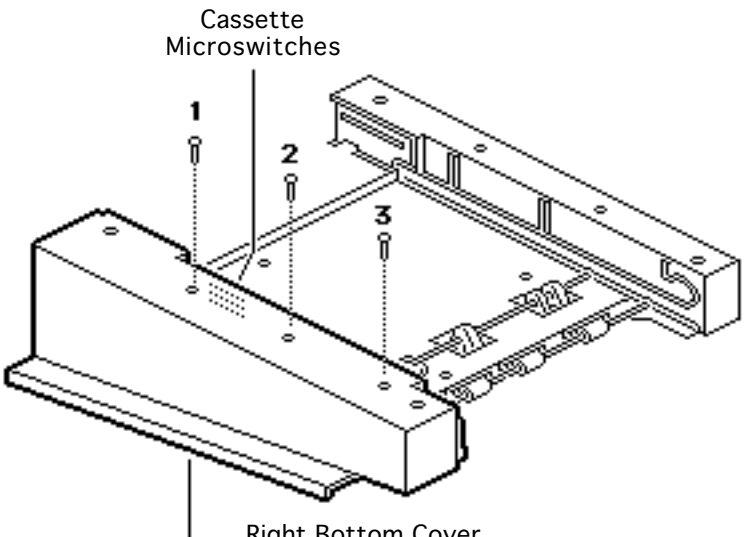
This topic applies to all models of the printer.

Before you begin, remove the cassette feeder tray.

Note: The cassette feeder tray and its associated parts are optional on the LS, LS/L, and NTR models.



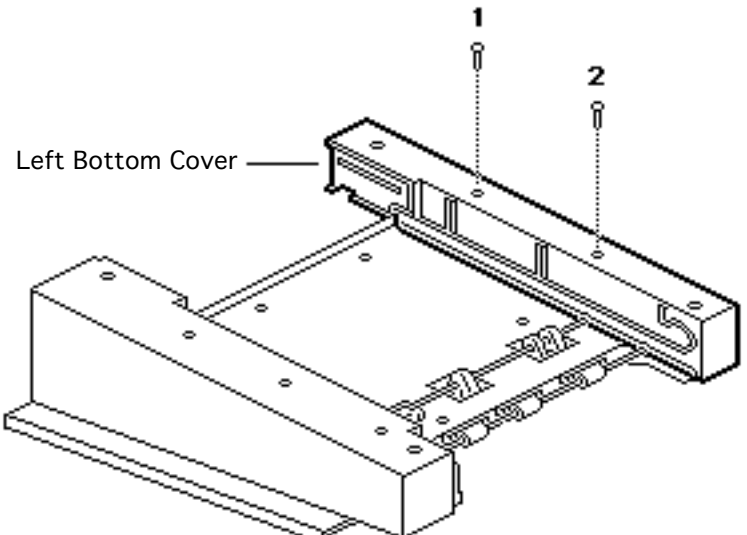
1 Unhook the spring from the cassette feeder tray, and remove the cassette stop cover.



2 **Caution:** Be careful not to damage the cassette microswitches when removing or replacing the right bottom cover.

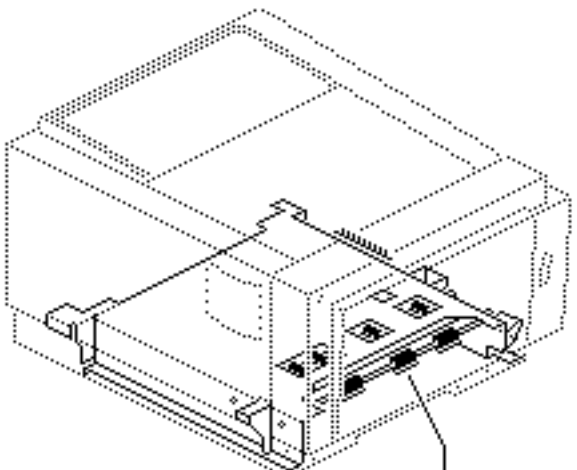
If you need to take apart the right bottom cover, remove the three screws that secure it to the cassette feeder tray.

3 Lift off the right bottom cover.



4 If you need to take apart the left bottom cover, remove the two screws that secure it to the cassette feeder tray.

5 Lift off the left bottom cover.



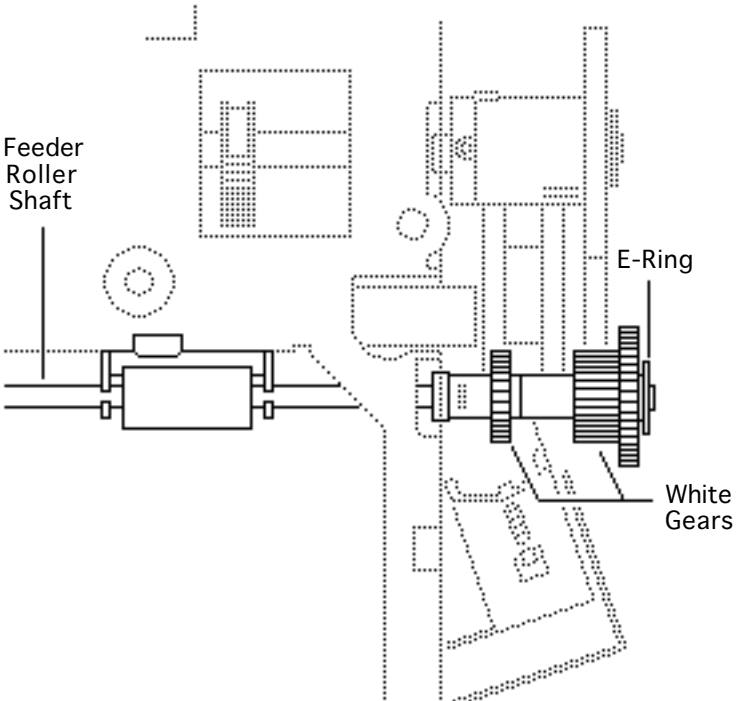
Cassette Feeder Roller Shaft

This topic applies to all models of the printer.

Before you begin, remove the following:

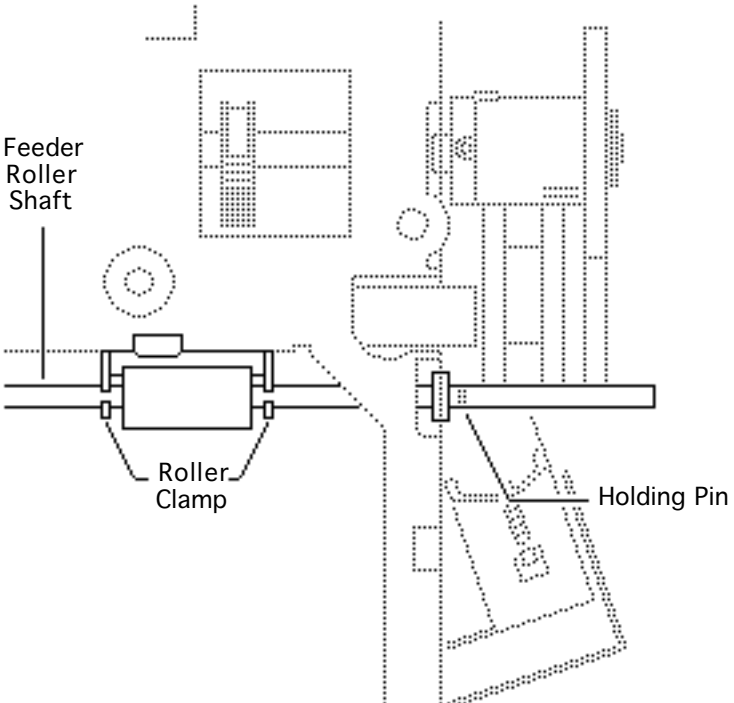
- Cassette feeder tray
- Pedestal covers

Note: The cassette feeder tray and its associated parts are optional on the LS, LS/L, and NTR models.



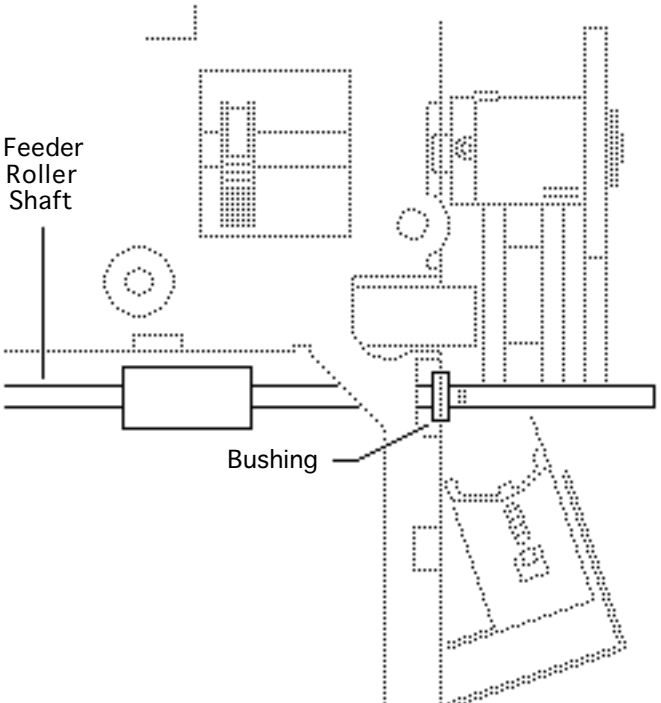
1 Using a small screwdriver or grip-ring pliers, remove the E-rings at each end of the feeder roller shaft (opposite end not shown).

2 Slide off the two white gears.

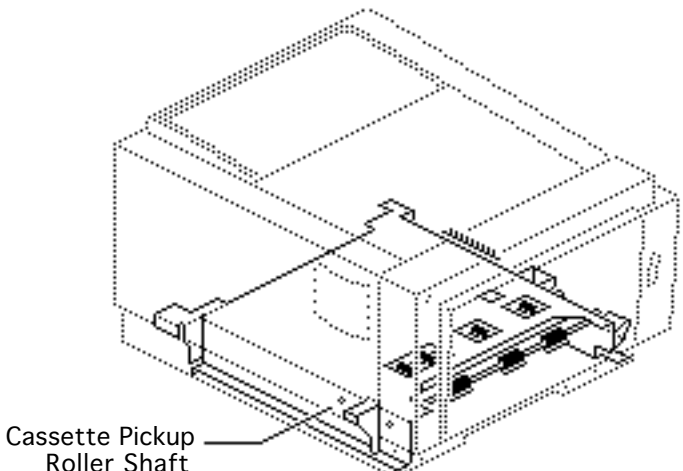


3 Remove the holding pin.

4 Unhook the three plastic feeder roller clamps (rightmost clamp is shown).



5 Slide the bushings off each end of the feeder roller shaft (opposite end not shown) and remove the shaft from the cassette feeder tray.



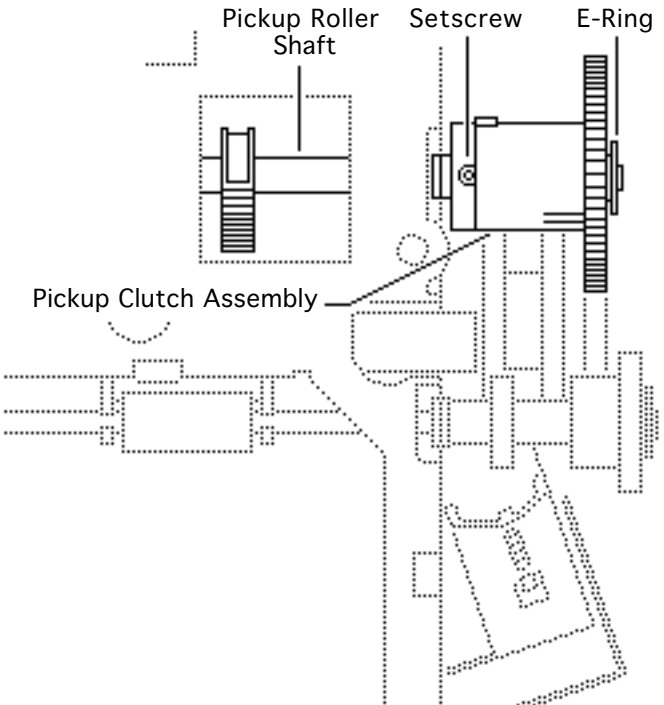
Cassette Pickup Roller Shaft

This topic applies to all models of the printer.

Before you begin, remove the following:

- Cassette feeder tray
- Pedestal covers

Note: The cassette feeder tray and its associated parts are optional on the LS, LS/L, and NTR models.

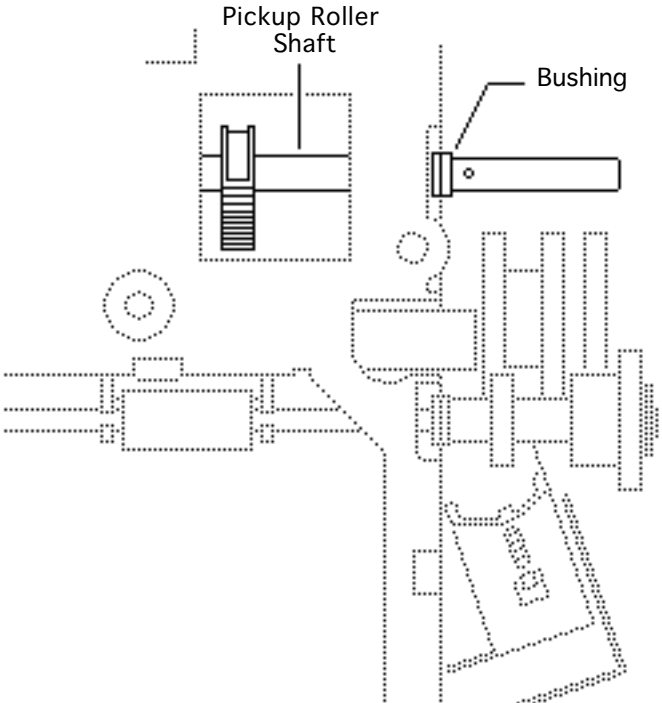


1 Using a small screwdriver or grip-ring pliers, remove the E-rings at each end of the pickup roller shaft (opposite end not shown).

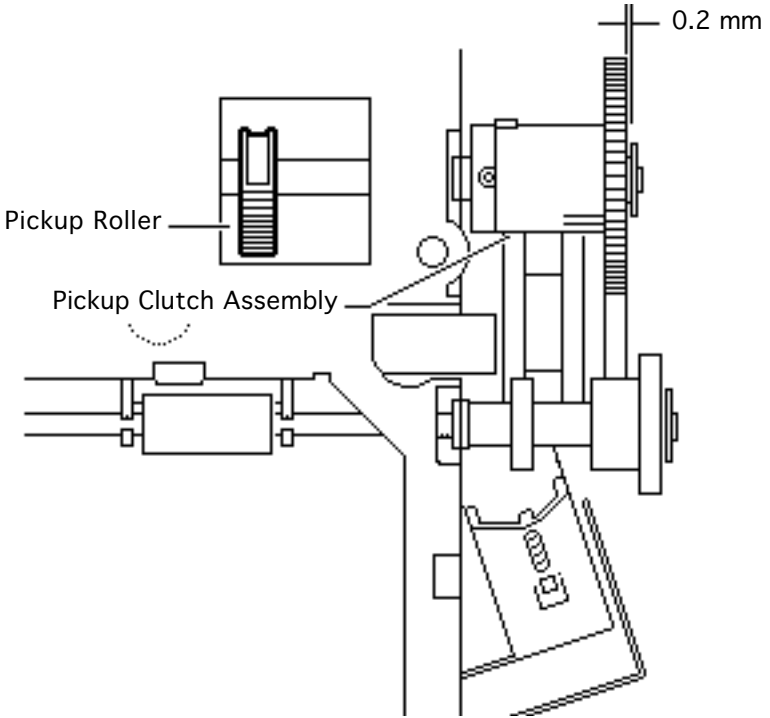
2 **Note:** Do not lose the small metal holding pin mentioned in the following step. You will need the pin when replacing the pickup roller.

Using a 1.5 mm Allen wrench, loosen the setscrew and remove the

clutch assembly. The holding pin from the roller shaft will fall into your hand.



3 Slide the bushings off each end of the pickup roller shaft (opposite end not shown) and remove the shaft from the cassette feeder tray.

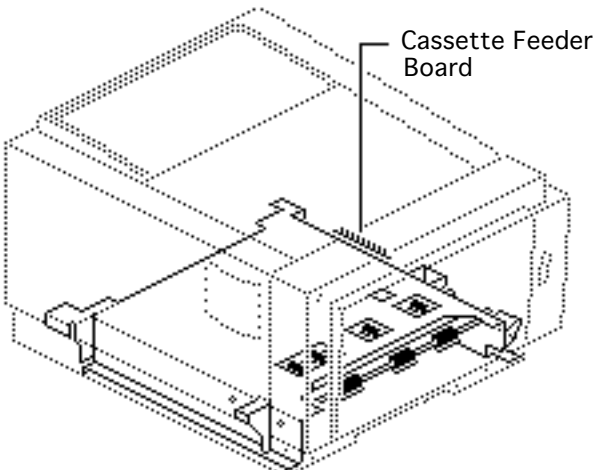


Replacement Note: When replacing the pickup roller shaft, give special care to the following:

- Rotate the roller shaft so that the crescent-shaped pickup rollers protrude through the sheet metal.
- Be careful not to let the holding pin slide out of the shaft when sliding the pickup roller clutch onto the roller shaft.
- Place a 0.2-mm thickness gauge between the cassette

pickup roller clutch and the E-ring.

- Adjust the setscrew so that the distance between the pickup roller clutch and the E-ring is 0.2 mm. Then tighten the setscrew into position.



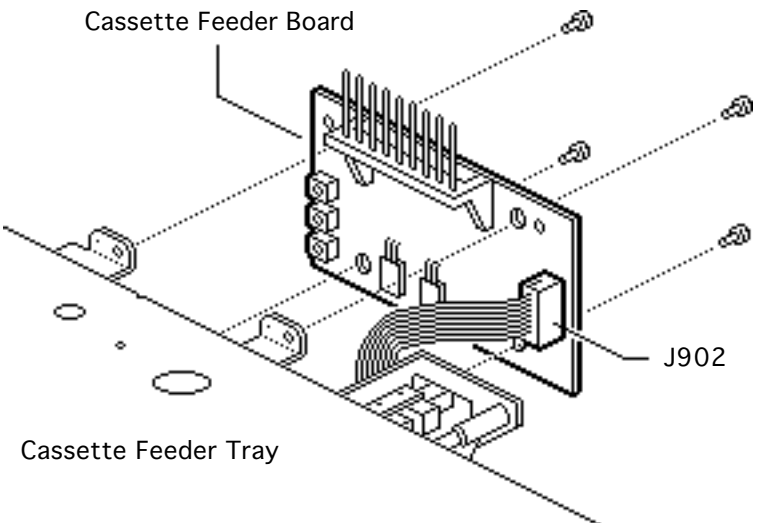
Cassette Feeder Board

This topic applies to all models of the printer.

Before you begin, remove the following:

- Cassette feeder tray
- Cassette stop cover
- Right bottom cover

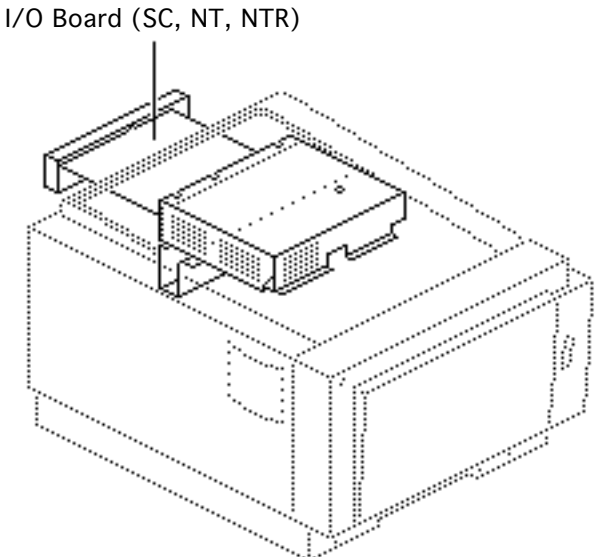
Note: The cassette feeder tray and its associated parts are optional on the LS, LS/L, and NTR models.



1 Remove the four black screws that secure the cassette feeder board to the feeder tray.

2 Disconnect connector J902.

3 Remove the cassette feeder board from the cassette feeder tray.

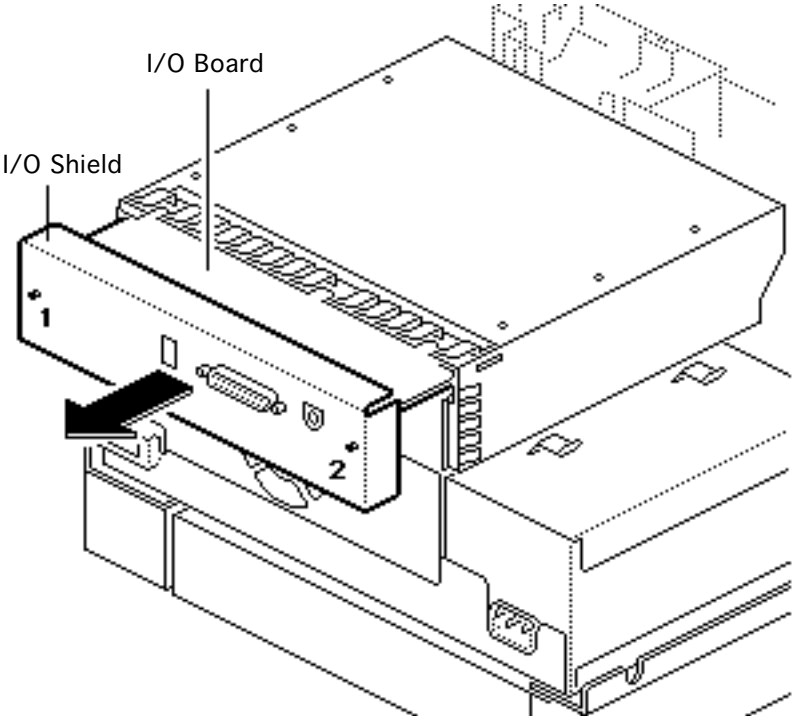


I/O Board (SC, NT, NTR)

This topic applies to the only SC, NT, and NTR models.

Before you begin, remove the top cover.

Note: If the I/O board is removed from the printer, the LEDs no longer function.



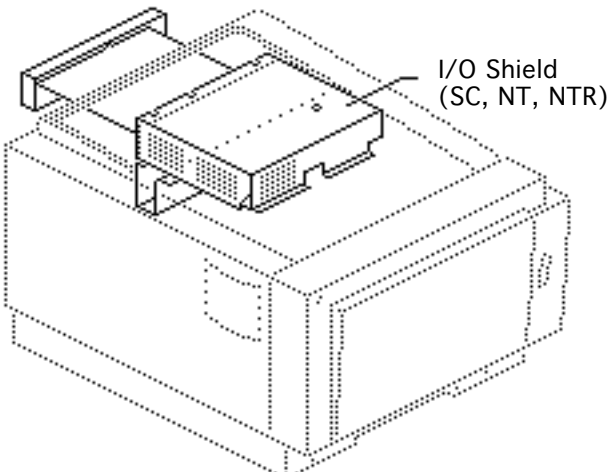
1 Loosen the two screws that secure the I/O board to the shield.

2 Handling the I/O board only by the metal bracket, carefully slide the I/O board out of the I/O shield.

Note: Before returning an I/O board to Apple, remove the metal connector bracket. Keep this bracket and install it on the replacement I/O board. If you are replacing an NTR board that has Rev. 4.0 ROMs, you need to remove

the ROMs and install them on the replacement board. Refer to “NTR ROM Upgrade” in Upgrades for complete information.

Replacement Note:
Reinstall the I/O board component-side down.

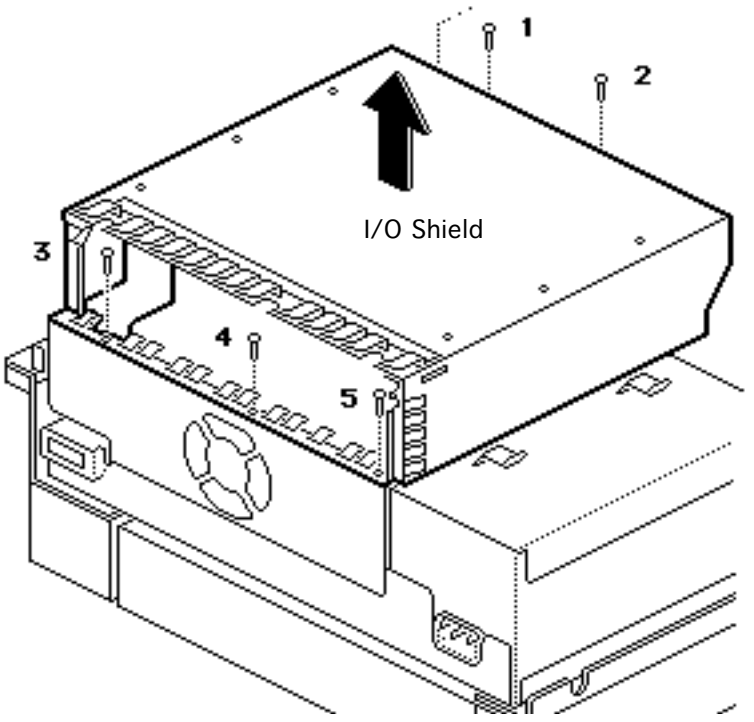


I/O Shield (SC, NT, NTR)

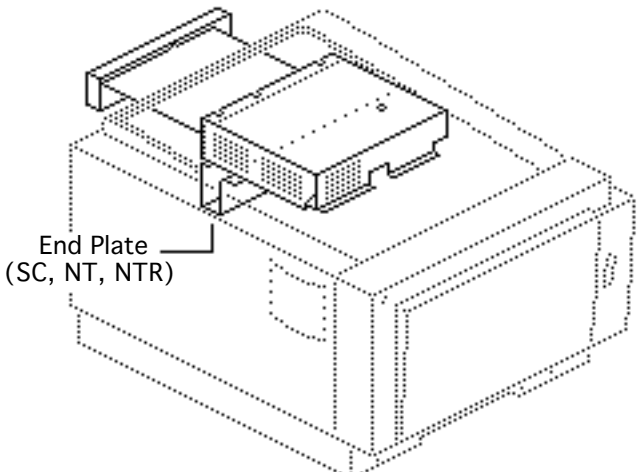
This topic applies only to the SC, NT, and NTR models.

Before you begin, remove the following:

- Top cover
- I/O board



1 Remove the five mounting screws and lift the I/O shield from the chassis.

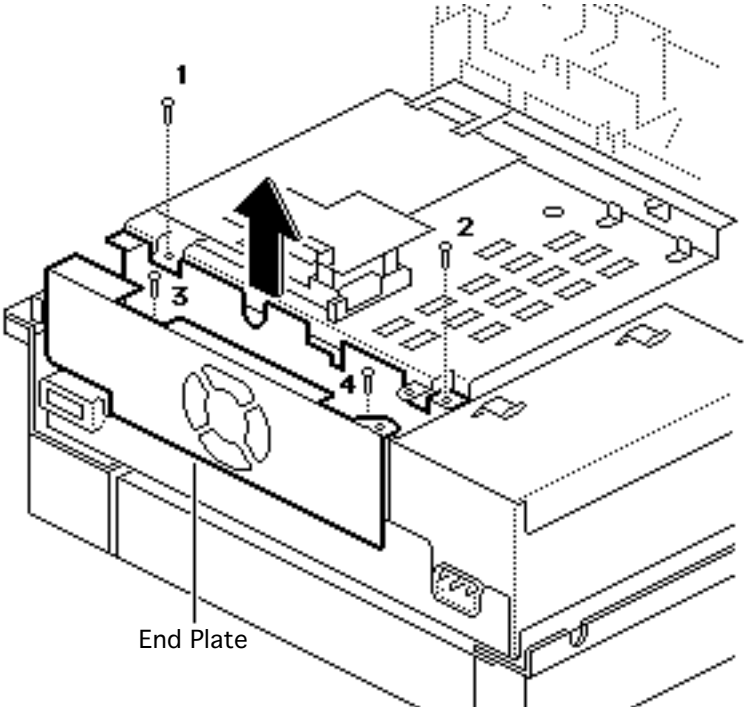


End Plate (SC, NT, NTR)

This topic applies only to the SC, NT, and NTR models.

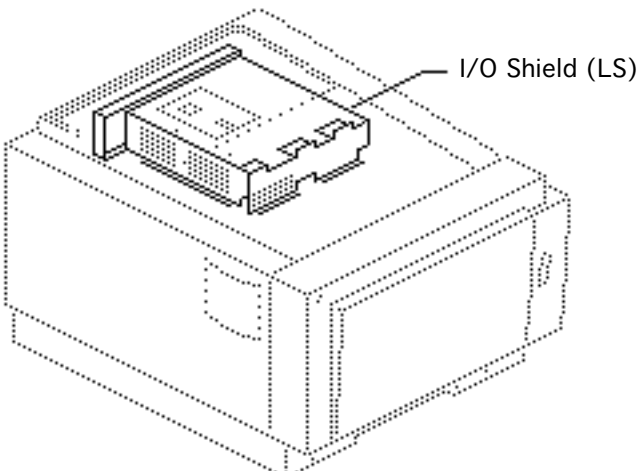
Before you begin, remove the following:

- Top cover
- I/O board
- I/O shield



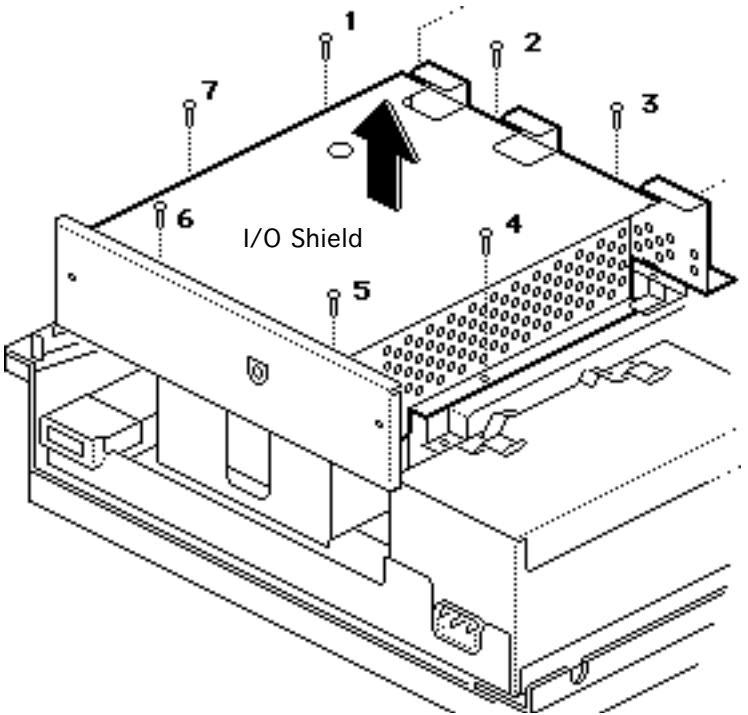
1 Remove the four mounting screws and lift the end plate out of the chassis.

I/O Shield (LS)

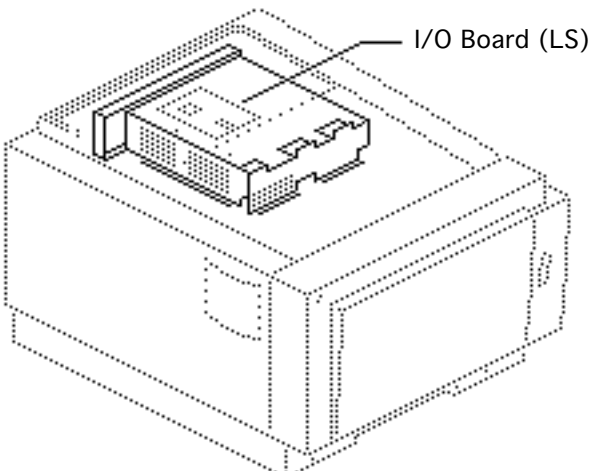


This topic applies only to the LS model.

Before you begin, remove the top cover.



1 Remove the seven screws that secure the I/O shield and lift the I/O shield from the printer.

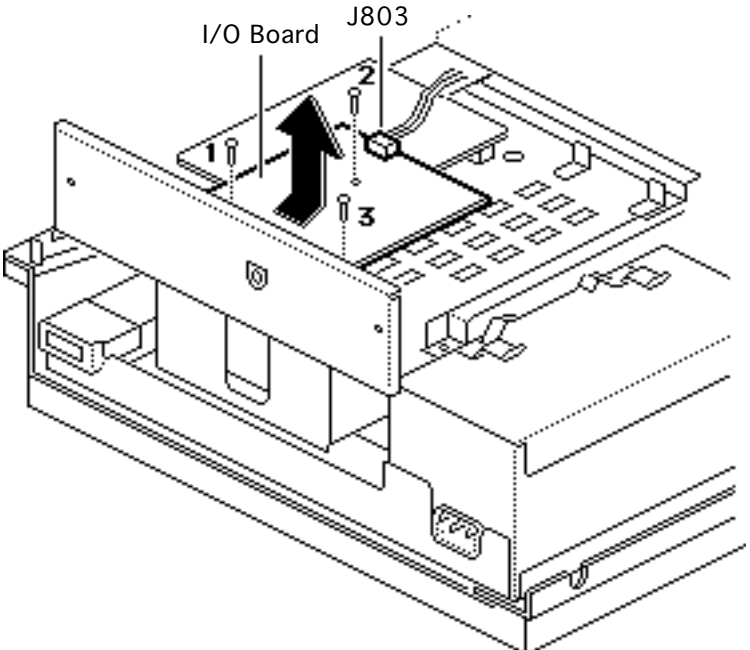


I/O Board (LS)

This topic applies only to the LS model.

Before you begin, remove the following:

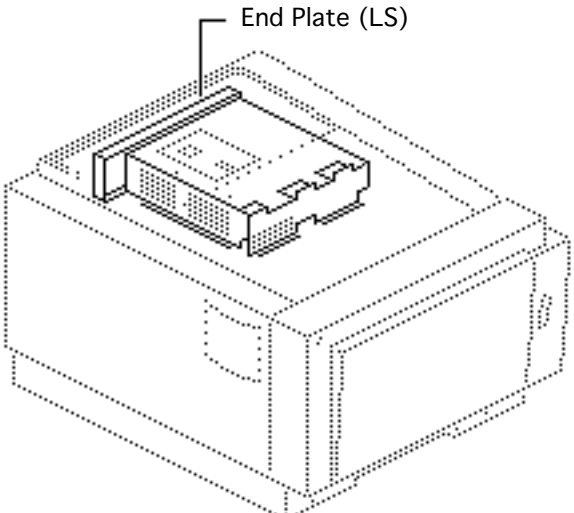
- Top cover
- I/O shield (LS)



1 Disconnect the cable from connector J803 on the I/O board.

2 Remove the three screws that secure the I/O board in place.

3 Holding the board only by the edges, disengage it from the I/O bracket. Gently lift straight up, and disconnect the I/O board from the controller board.

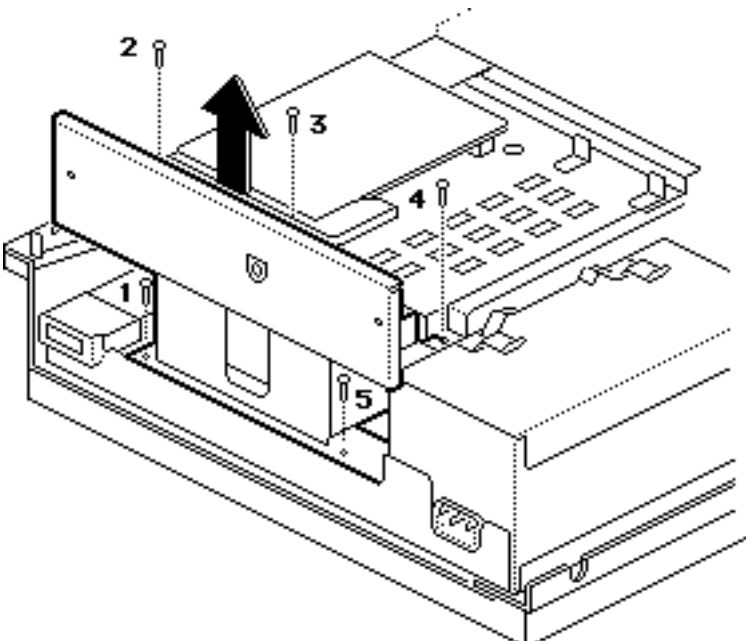


End Plate (LS)

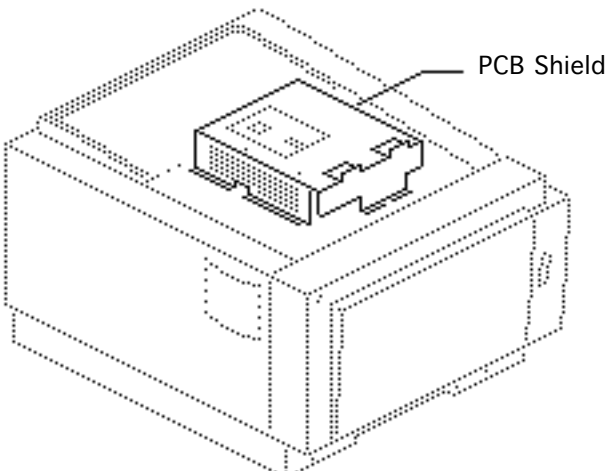
This topic applies only to the LS model.

Before you begin, remove the following:

- Top cover
- I/O shield (LS)
- I/O board (LS)



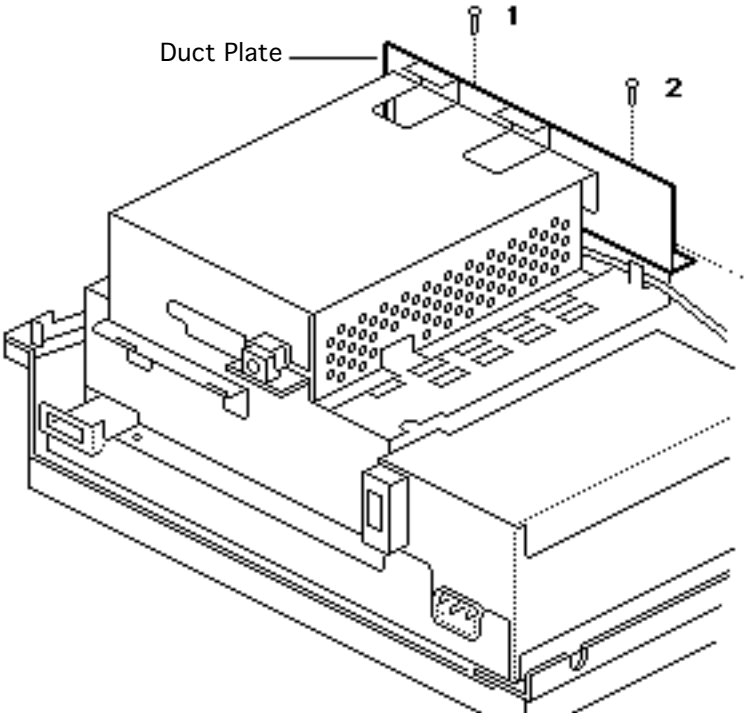
1 Remove the five mounting screws and lift the end plate out of the chassis.



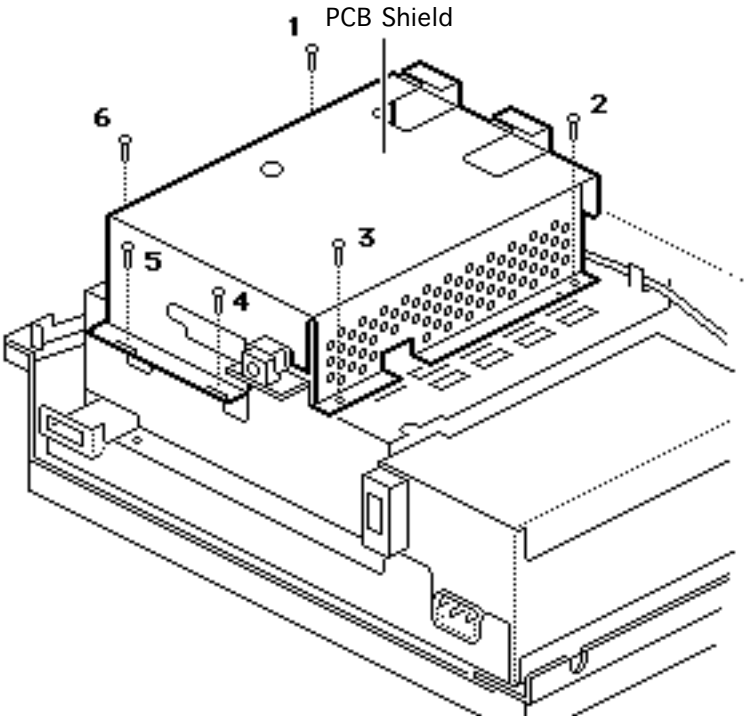
PCB Shield

This topic applies only to the LS/L model.

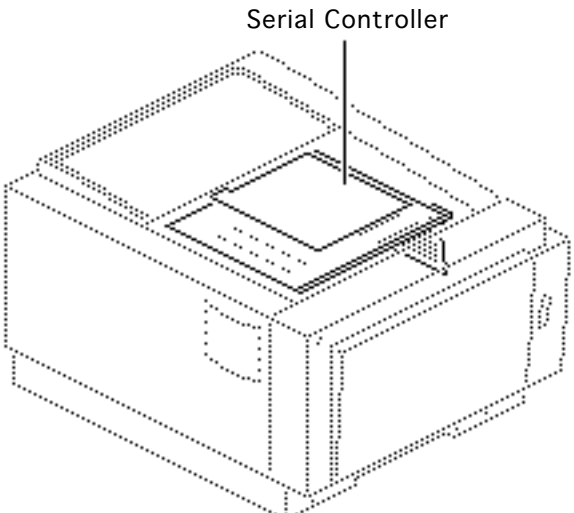
Before you begin, remove the top cover.



1 Remove the two screws that secure the duct plate to the printer chassis. Lift out the duct plate.



2 Remove the six screws that secure the PCB shield to the printer chassis. Lift out the PCB shield.

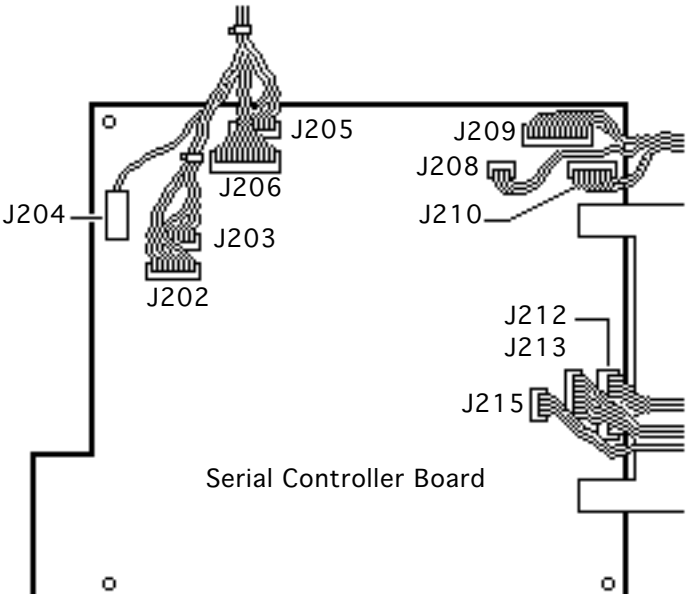


Serial Controller

This topic applies only to the LS/L model.

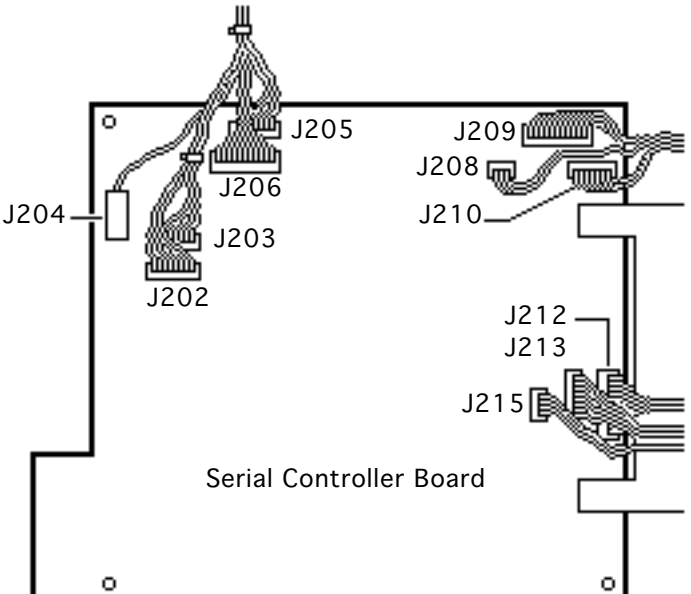
Before you begin, remove the following:

- Top cover
- PCB shield

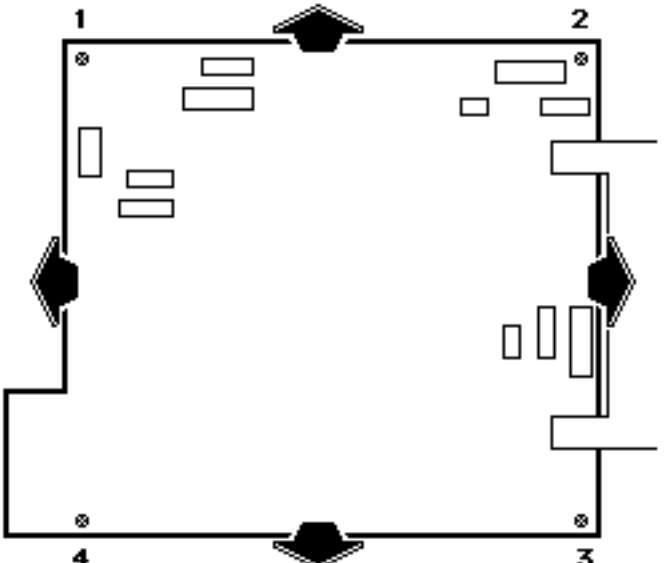


Warning: Never disconnect optical fiber cable J204 when the printer is powered on. Its invisible laser beam can damage your eyes.

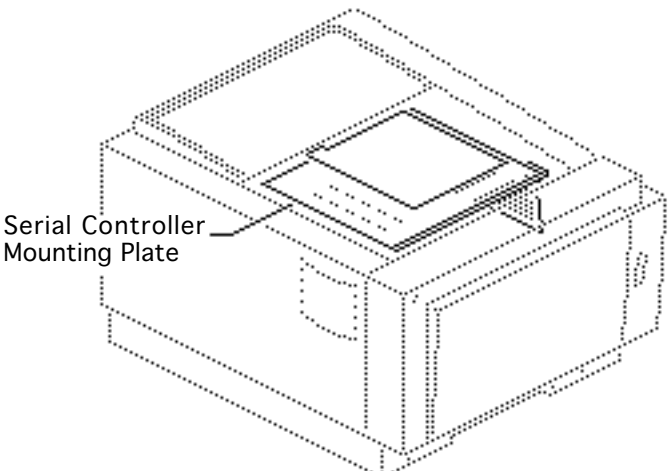
1 Disconnect the following cables from the serial controller board:
- Laser assembly board cable from J202
- Scanner motor board cable from J203
- Optical fiber cable from J204
- Cassette feeder board cable from J205



- High-voltage power supply cable from J206
- Paper pickup sensor cable from J208
- Fuser assembly cable from J209
- Main motor cable from J210
- DC power supply cable from J212
- Fan-and-sensor board cable from J213
- Status light cable from J215



2 Remove the four mounting screws and lift the board from its mounting plate.



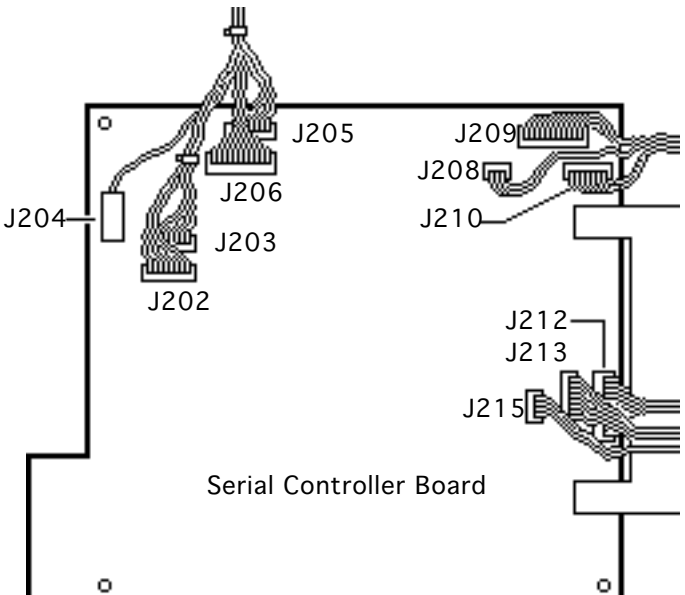
Serial Controller Mounting Plate

This topic applies only to the LS/L model.

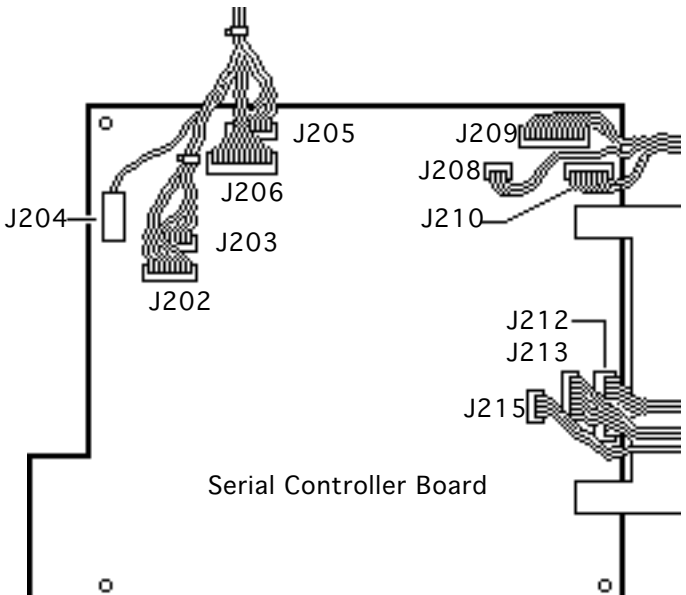
Before you begin, remove the following:

- Top cover
- PCB shield

Warning: Never disconnect optical fiber cable J204 when the printer is on. Its invisible laser beam can damage your eyes.

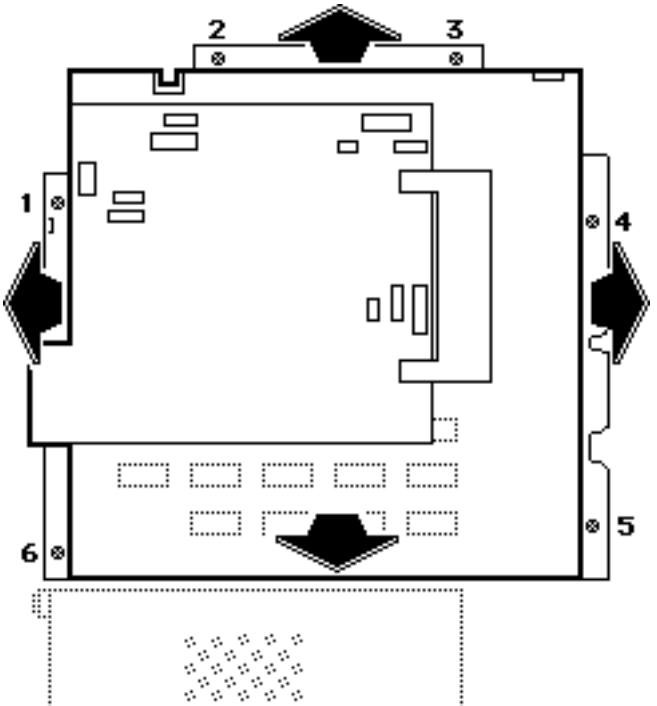


1 Disconnect the following cables from the serial controller board:
- Laser assembly board cable from J202
- Scanner motor board cable from J203
- Optical fiber cable from J204
- Cassette feeder board cable from J205
- High-voltage power supply cable from J206
- Paper pickup sensor cable from J208
- Fuser assembly cable from J209



- Main motor cable from J210
- DC power supply cable from J212
- Fan-and-sensor board cable from J213
- Status light cable from J215

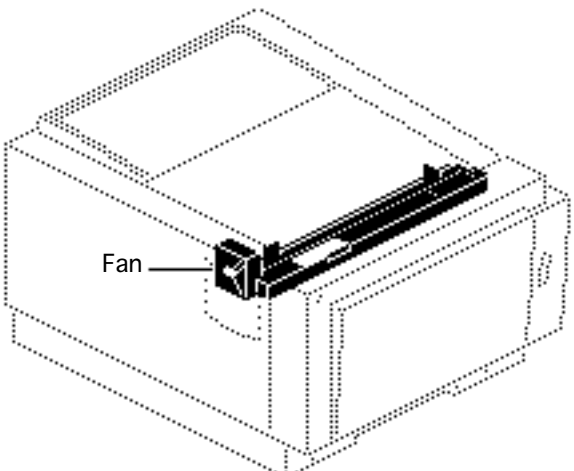
2 Remove the cables from the cable retainer near J212.



3 Remove the six screws that secure the serial controller mounting plate to the chassis. Lift the mounting plate out of the printer.

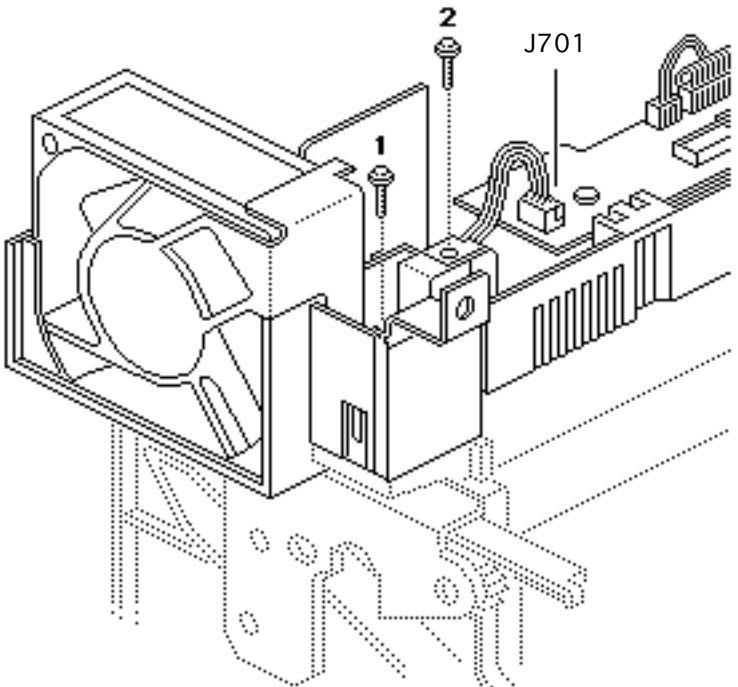
Replacement Note: The two metal tabs along the rear mate into the chassis on the LS/L model.

Fan



This topic applies to all models of the printer.

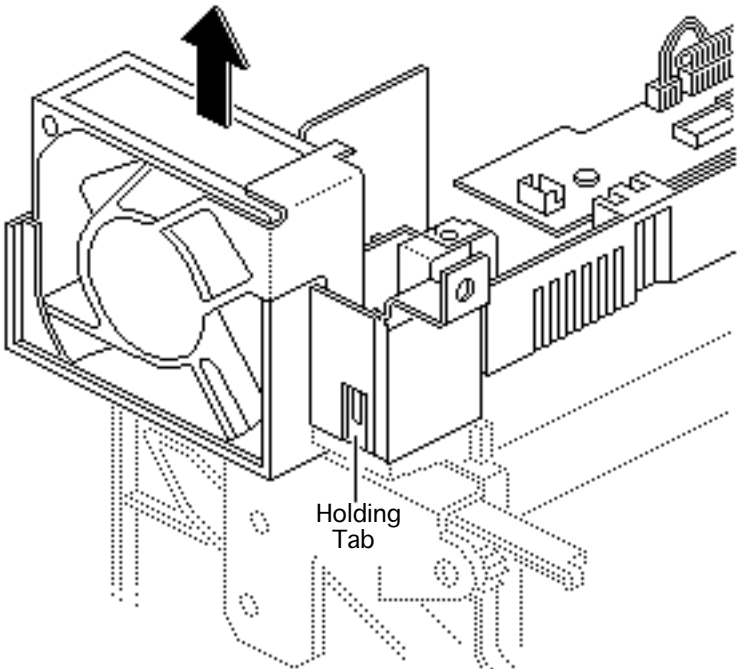
Before you begin, remove the top cover.



1 Remove the two fan mounting screws.

2 Using small diagonal cutters, carefullly cut the tie-wrap that secures the fan cable.

3 Disconnect fan connector J701 from the density-adjusting board.

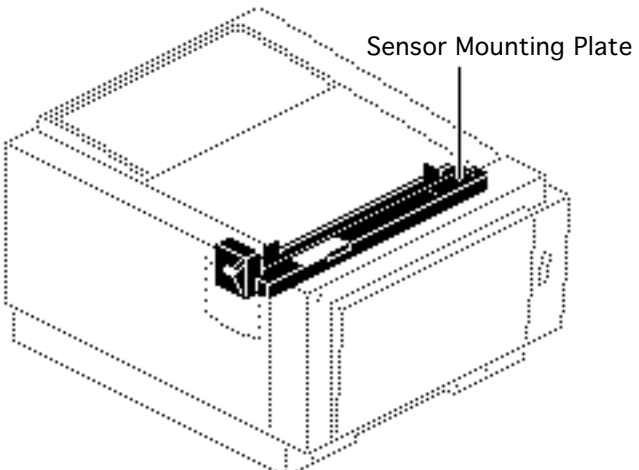


4 Unlatch the holding tab and lift out the fan bracket and the fan.

Replacement Note:

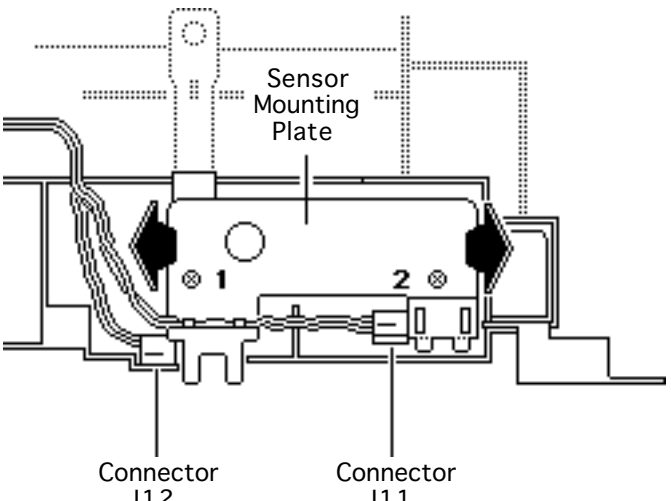
- Install the fan with the label facing out.
- Place the gold-colored grounding plate over the fan bracket.

Sensor Mounting Plate



This topic applies to all models of the printer.

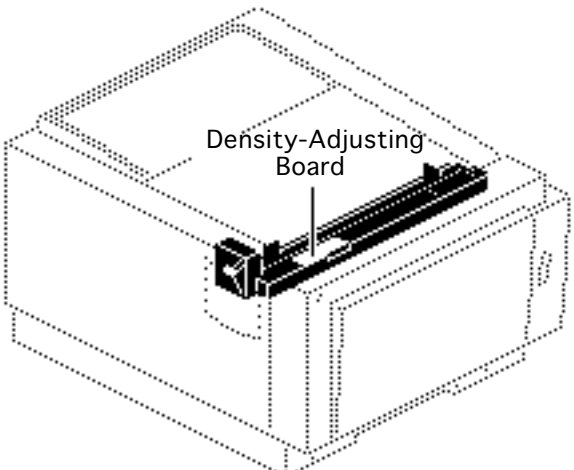
Before you begin, remove the top cover.



1 Remove the two black mounting screws and washers and slightly lift the sensor mounting plate.

2 Disconnect connectors J11 and J12 and lift out the sensor mounting plate.

Replacement Note:
Connect connectors J11 and J12 before seating the sensor mounting plate.



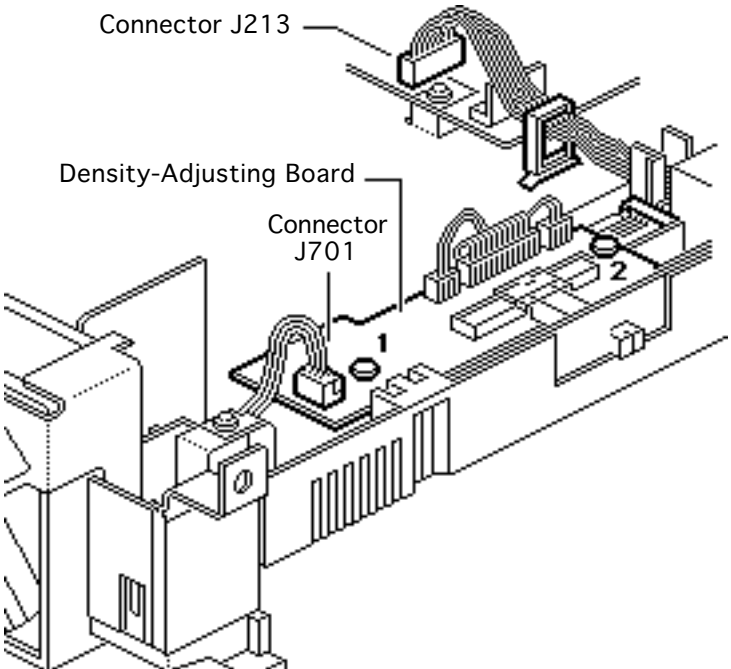
Density-Adjusting Board

This topic applies only to the SC, NT, NTR, and LS models.

Before you begin, remove the following:

- Top cover
- I/O board
- I/O shield
- Sensor mounting plate

Note: In the LS/L, this is called the “Fan-and-Sensor Board” (see next topic).

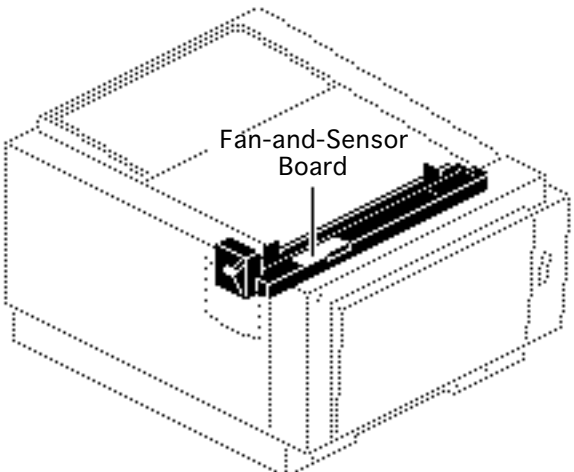


1 Disconnect fan connector J701 from the density-adjusting board.

2 Disconnect connector J213 from the DC controller board.

3 Remove the cables from all the various cable retainers.

4 Remove the two black mounting screws and washers and lift out the density adjusting board.



Fan-and-Sensor Board

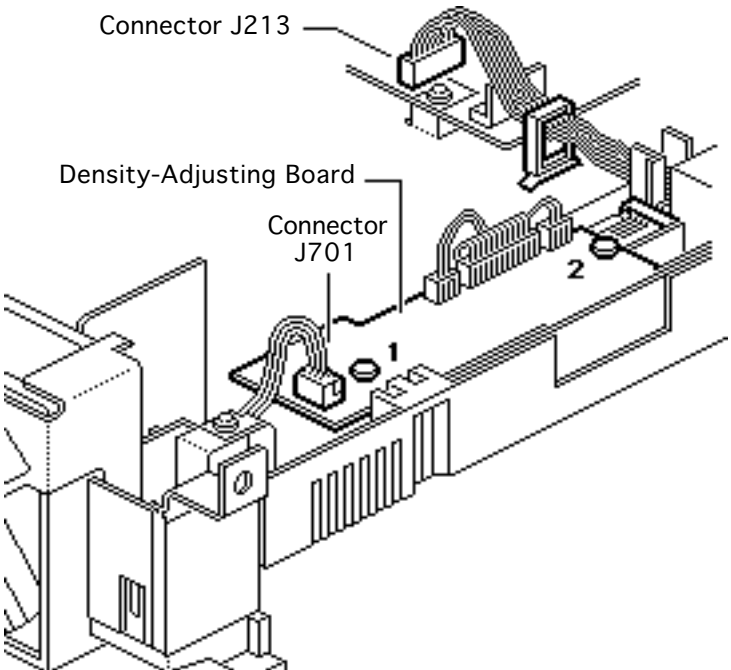
This topic applies only to the LS/L model.

Before you begin, remove the following:

- Top cover
- PCB shield
- Sensor mounting plate

Note: This board is similar to the density-adjusting board found in the SC, NT, NTR, and LS models (see previous topic). Density adjustment is controlled in

software on the Personal LaserWriter LS/L, so the board at this location has been redesigned and renamed to reflect its remaining functions.

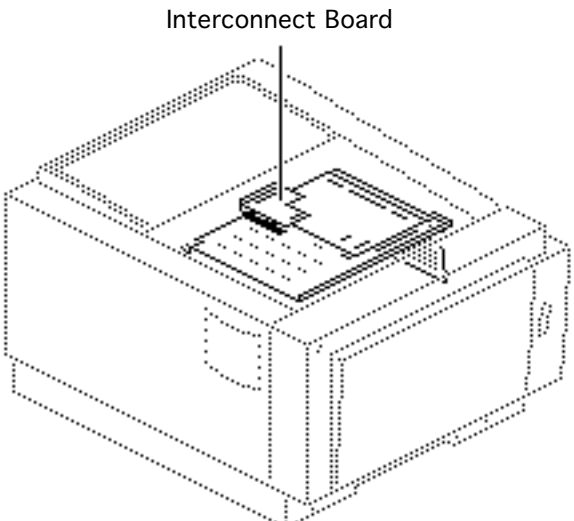


1 Disconnect fan connector J701 from the fan-and-sensor board.

2 Disconnect connector J213 from the serial controller.

3 Remove the cables from all the various cable retainers.

4 Remove the two black mounting screws and washers and lift out the fan-and-sensor board.

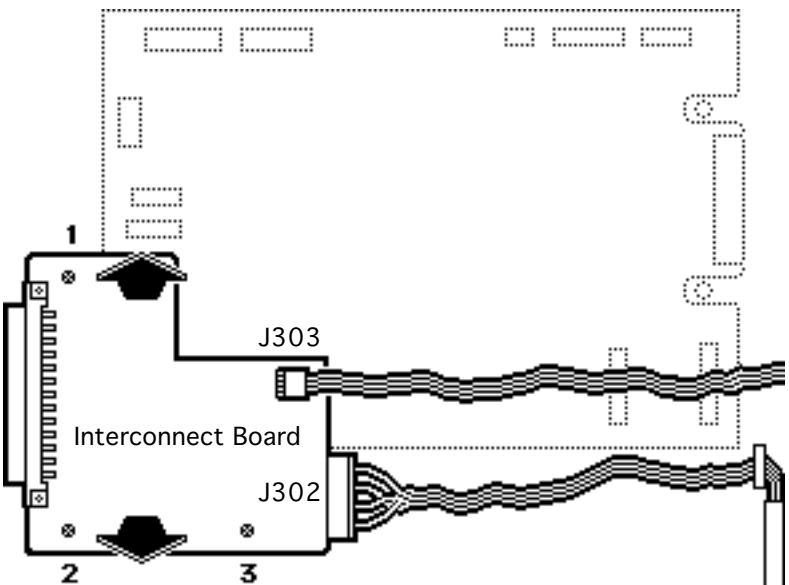


Interconnect Board

This topic applies only to the SC, NT, and NTR models.

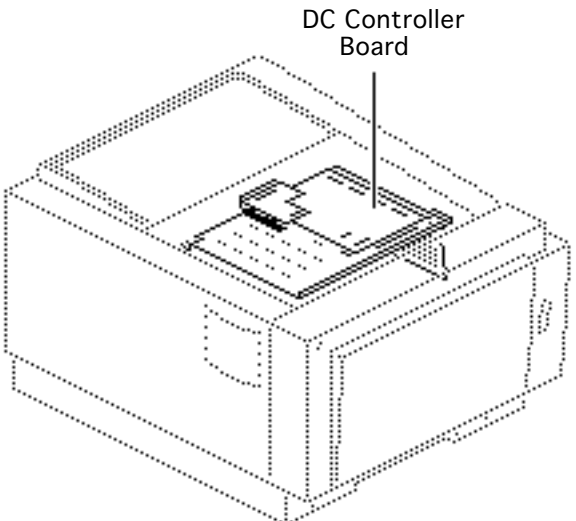
Before you begin, remove the following:

- Top cover
- I/O board
- I/O shield



1 Carefully disconnect the cables from interconnect board connectors J302 and J303.

2 Remove the three black mounting screws and lift out the interconnect board.



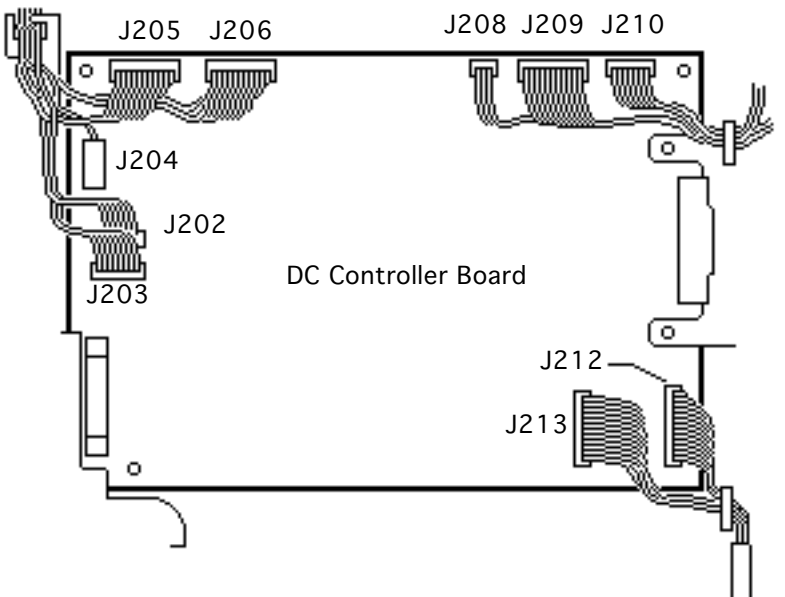
DC Controller Board

This topic applies only to the SC, NT, NTR, and LS models.

Before you begin, remove all following items present in the model:

- Top cover
- I/O board and shield
- Interconnect board

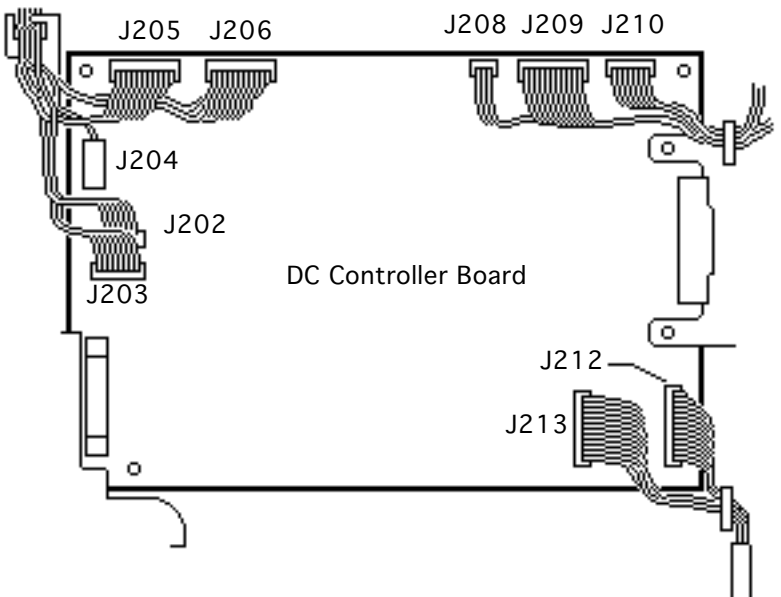
Note: Perform this procedure only when you're replacing the controller board itself. If you're replacing a deeper module,



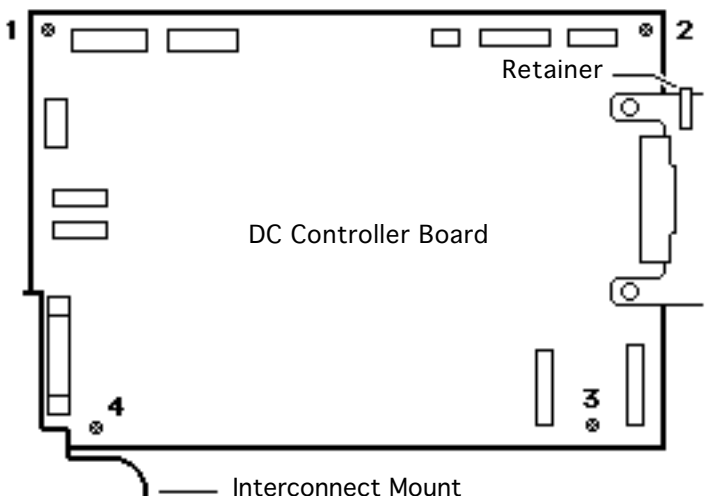
perform the “DC Controller Mount Plate” topic.

⚠**Warning:** Never disconnect optical fiber cable J204 when the printer is powered on. Its invisible laser beam can damage your eyes.

1 Disconnect the following cables from the DC controller board:
- Laser assembly board cable from J202
- Scanner motor board cable from J203
- Optical fiber cable from J204



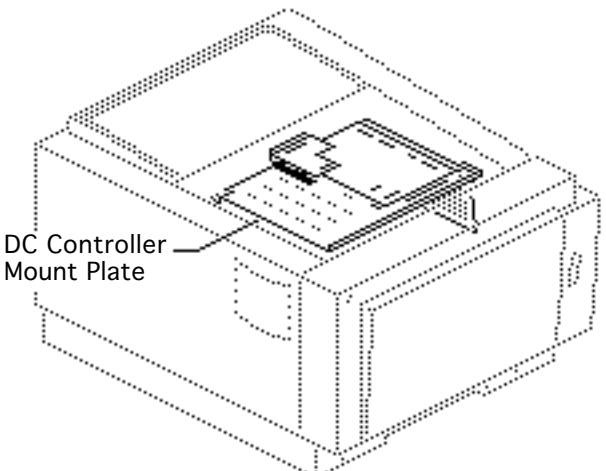
- Cassette feeder board cable from J205
- High-voltage power supply cable from 206
- Paper pickup sensor cable from J208
- Fuser assembly cable from J209
- Main motor cable from J210
- DC power supply cable from J212
- Density-adjusting board cable from J213



2 Remove the cables from the one board-mounted retainer.

3 Remove the four mounting screws and lift the DC controller board from its mounting plate.

Replacement Note: Be sure that the left rear edge of the DC controller board slides snugly into the notch in the black interconnect mount.



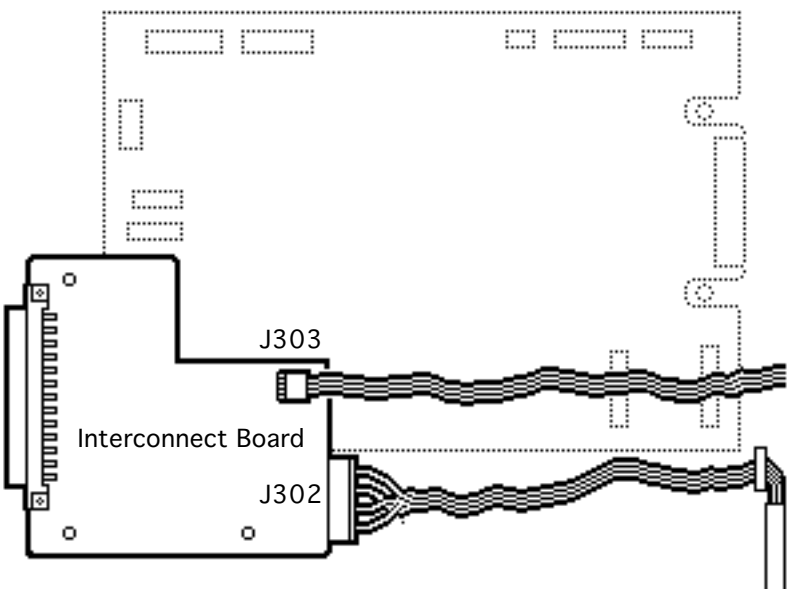
DC Controller Mount Plate

This topic applies only to the SC, NT, NTR, and LS models.

Before you begin, remove the following:

- Top cover
- I/O board and shield
- End plate

Note: Perform this procedure only when you're replacing the controller board itself. If you're replacing a deeper module, perform the "DC Controller

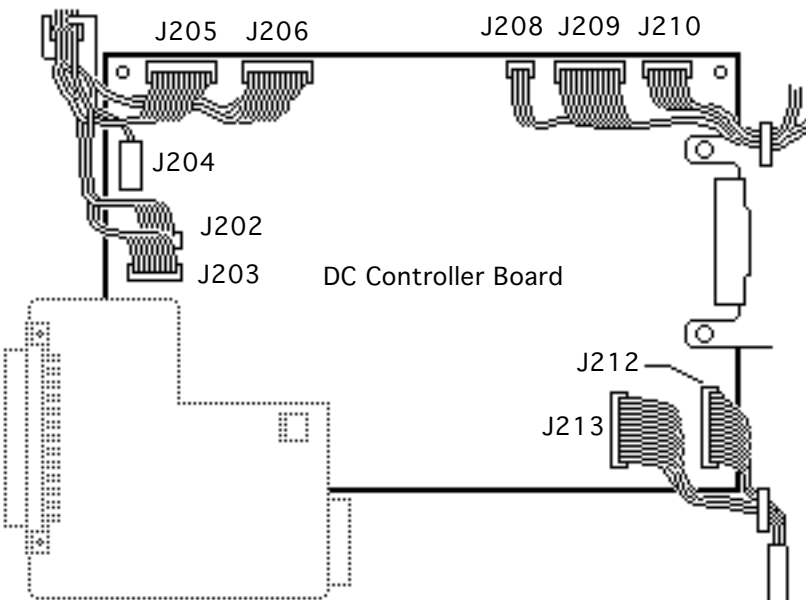


Mount Plate" topic.

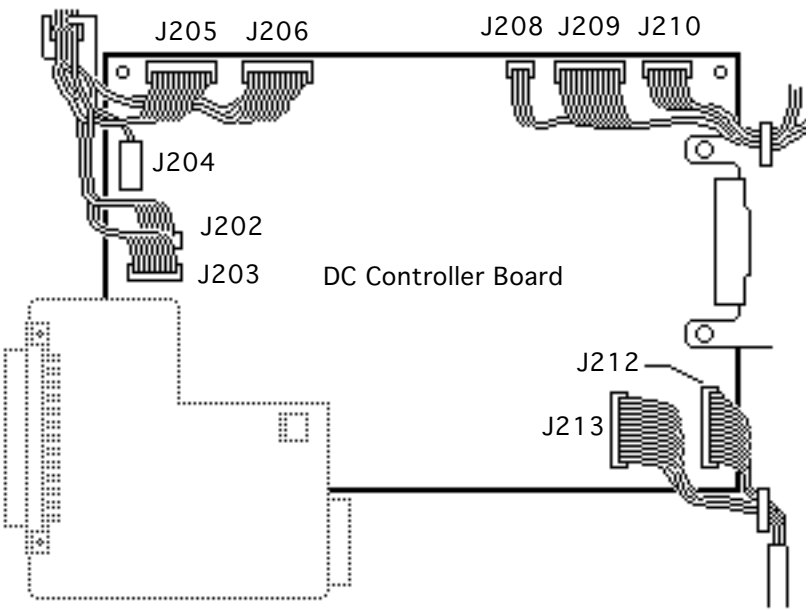
Warning: Never disconnect optical fiber cable J204 when the printer is powered on. Its invisible laser beam can damage your eyes.

Note: The following step does not apply to the Personal LaserWriter LS.

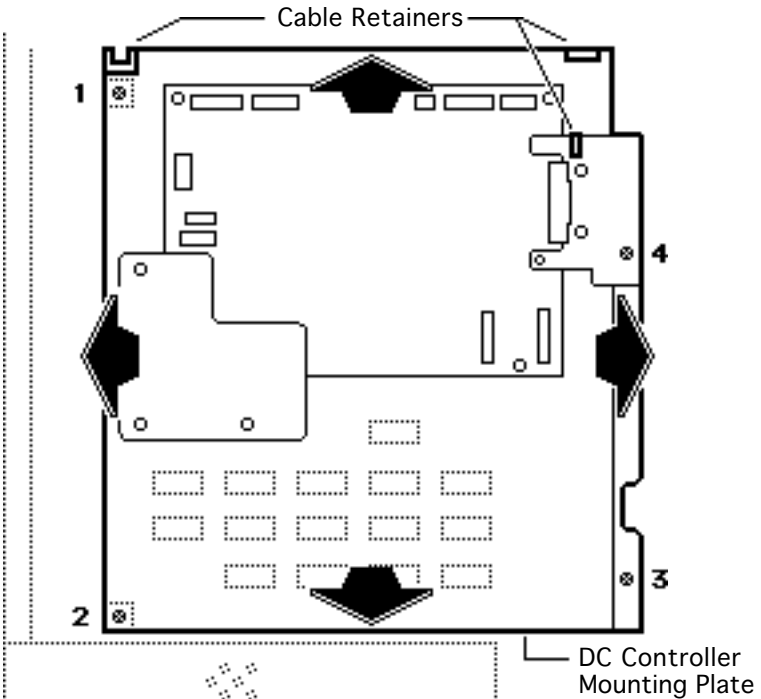
1 Carefully disconnect the cables from interconnect board connectors J302 and J303.



2 Disconnect the following cables from the DC controller board:
- Laser assembly board cable from J202
- Scanner motor board cable from J203
- Optical fiber cable from J204
- Cassette feeder board cable from J205

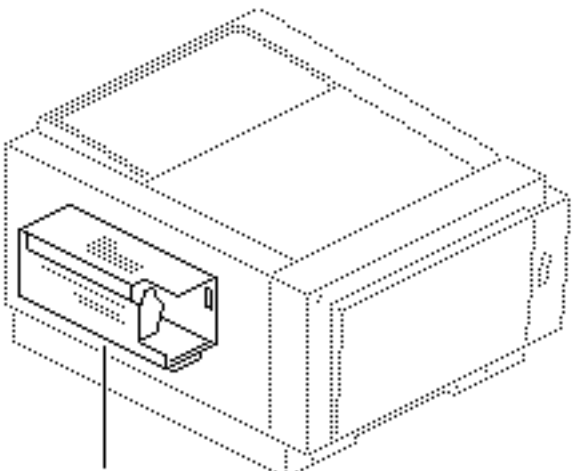


- High-voltage power supply cable from J206
- Paper pickup sensor cable from J208
- Fuser assembly cable from J209
- Main motor cable from J210
- DC power supply cable from J212
- Density adjusting board cable from J213



3 Remove the cables from the three cable retainers.

4 Remove the four mounting screws and lift out the DC controller mounting plate.

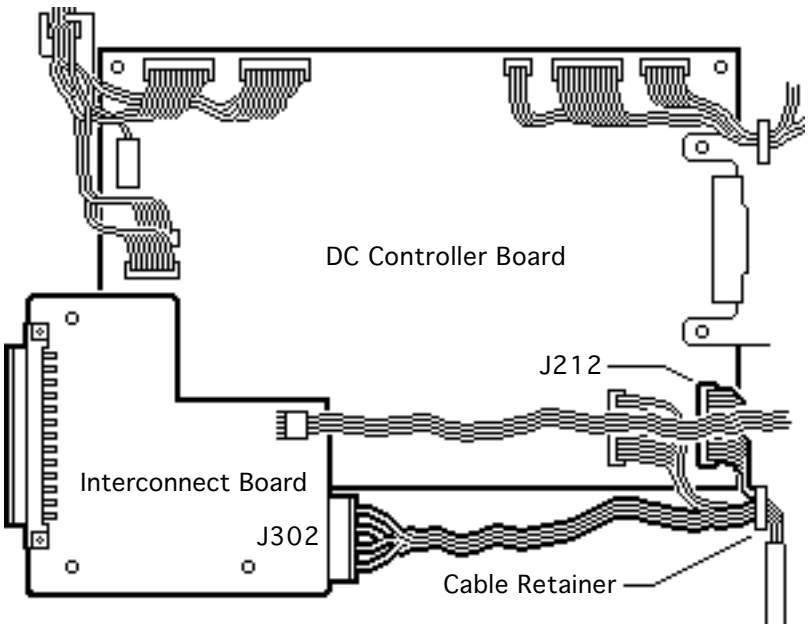


Power Supply (SC, NT, NTR)

This topic applies only to the SC, NT, and NTR models.

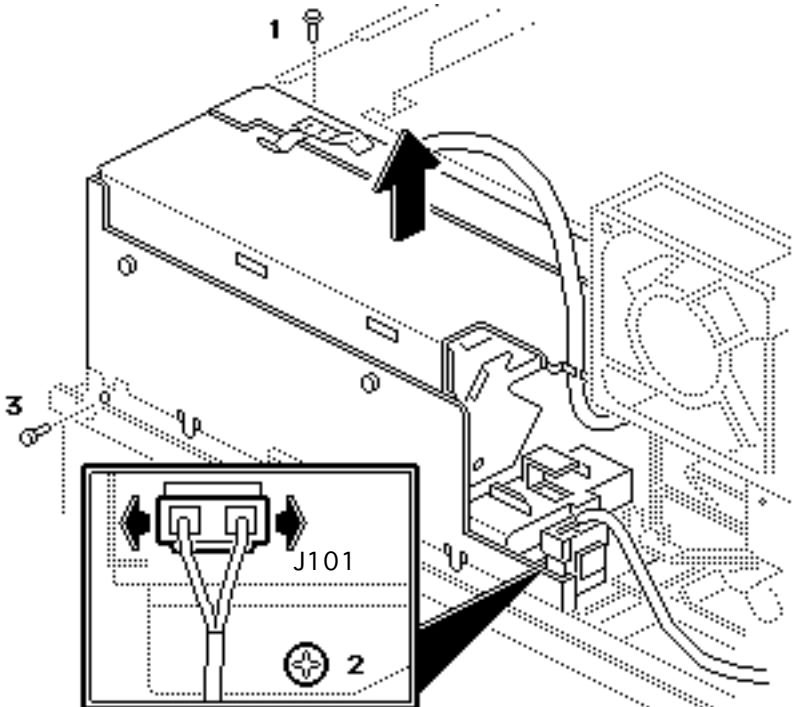
Before you begin, remove the following:

- Top cover
- I/O board
- I/O shield
- End plate



1 Disconnect the power supply cable from power switch connector SW11 at the back right of the printer (not shown). Remove the power cable from the cable retainer.

2 Disconnect the power supply cables from DC controller board connector J212 and interconnect board connector J302. Remove the power cables from the cable retainer.



3 Disconnect connector J101 by squeezing it and then lifting up.

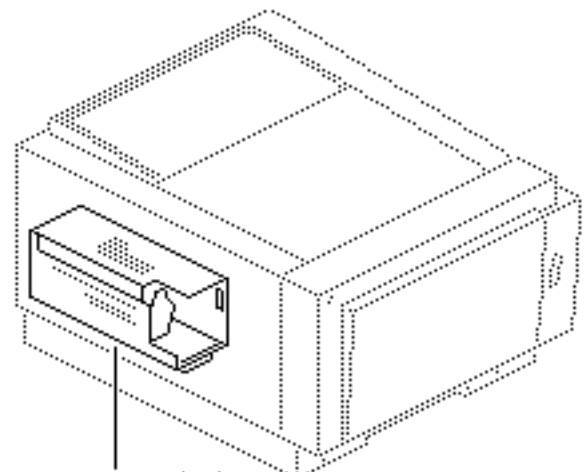
4 Remove the three mounting screws and lift out the power supply.

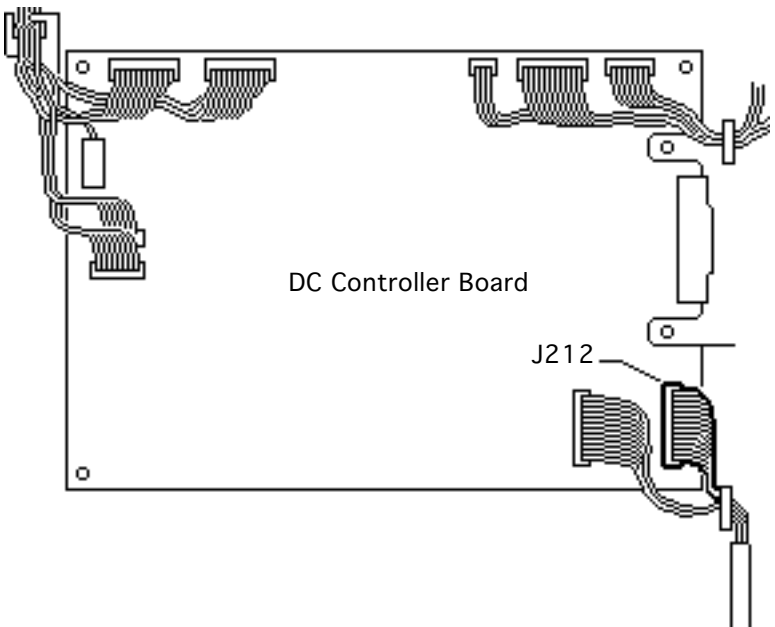
Power Supply (LS)

This topic applies only to the LS model.

Before you begin, remove the following:

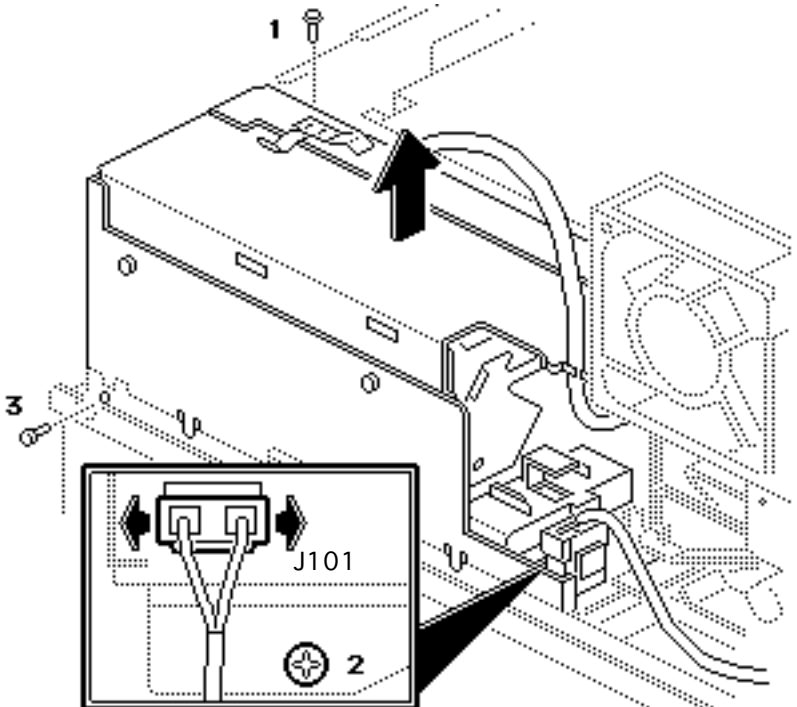
- Top cover
- I/O board
- End plate





1 Disconnect the power supply cable from power switch connector SW11 (not shown). Remove the power cable from the cable retainer.

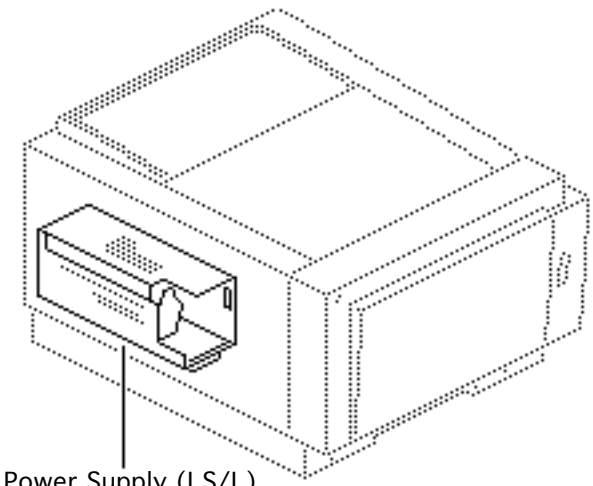
2 Disconnect the power supply cable from DC controller board connector J212 and remove the cable from the cable retainer.



3 Disconnect connector J101 by squeezing it and then lifting up.

4 Remove the three mounting screws and lift out the power supply.

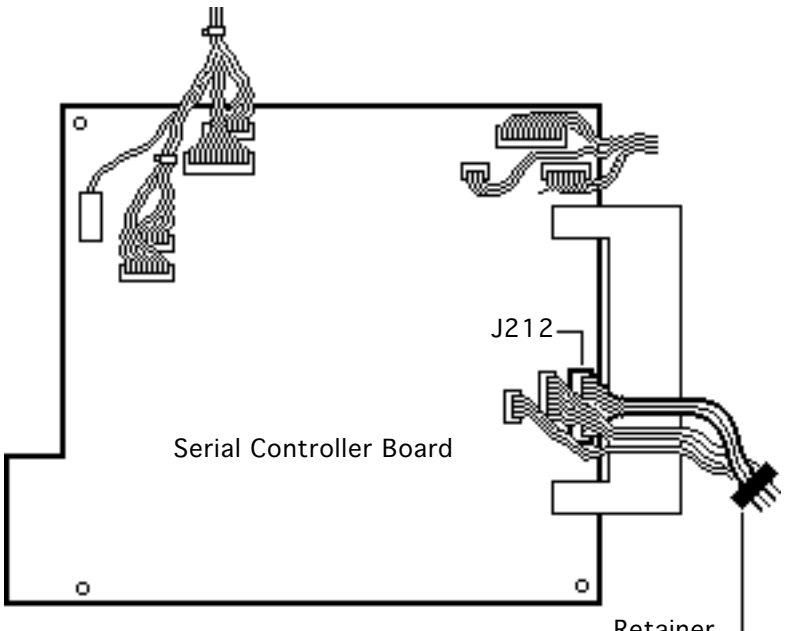
Power Supply (LS/L)



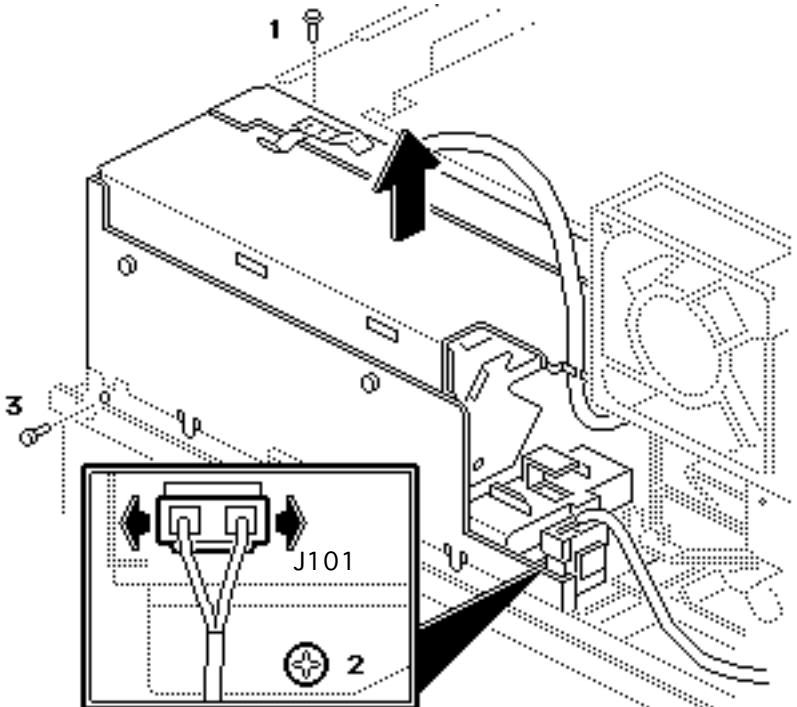
This topic applies only to the LS/L model.

Before you begin, remove the following:

- Top cover
- PCB shield

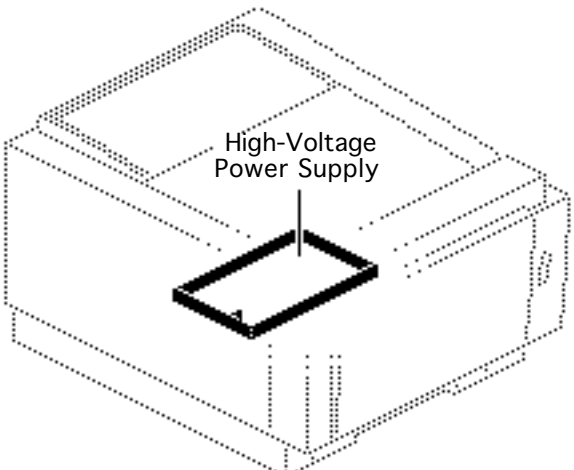


1 Disconnect connector J212 from the serial controller and remove the cable from the black cable retainer near J212.



2 Disconnect connector J101 by squeezing it and then lifting up.

3 Remove the three mounting screws and lift out the power supply.

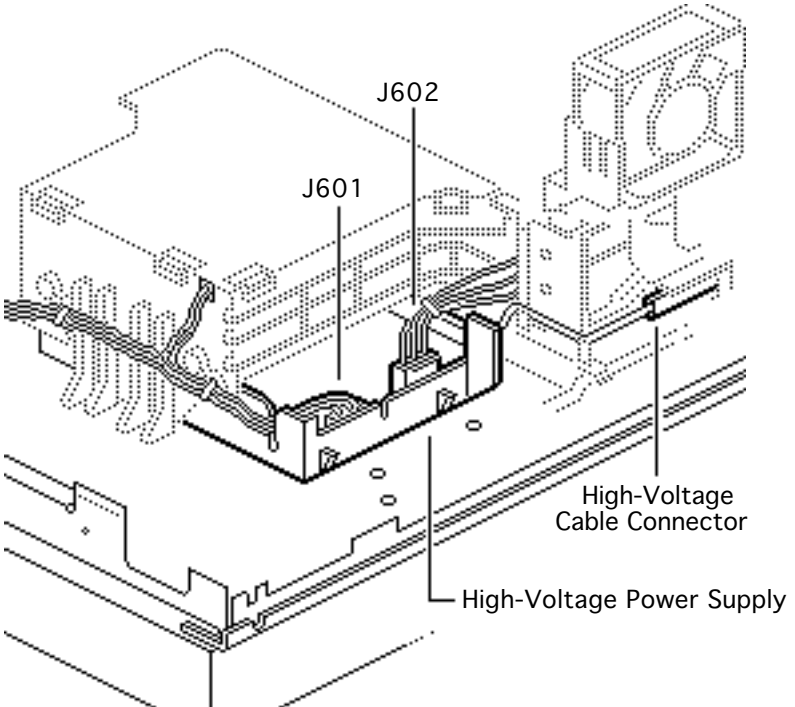


High-Voltage Power Supply

This topic applies to all models of the printer.

Before you begin, remove all following items present in the model:

- Top cover
- I/O board
- I/O shield
- End plate
- PCB shield
- Power supply



1 Lift and draw out the plastic tray containing the high-voltage power supply.

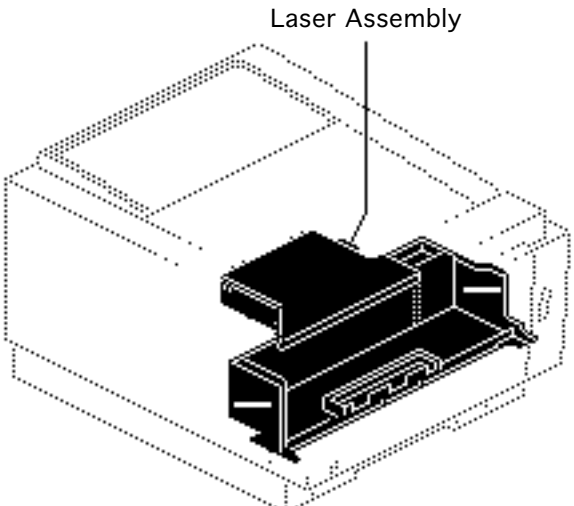
2 Disconnect connectors J601, J602, and the high-voltage cable connector.

3 Remove the high-voltage power supply.

Note: The high-voltage power supply does not ship with the plastic tray or grounding plate.

Replacement Note: Make sure that the high-voltage

cable connector nests snugly in the guide tabs on the rear of the contact assembly.

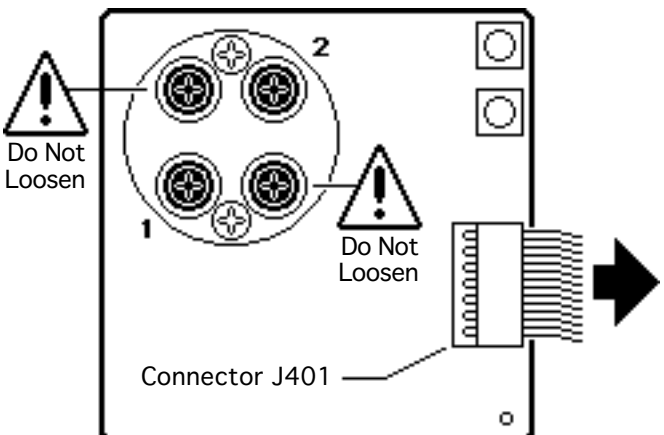


Laser Assembly

This topic applies to all models of the printer.

Before you begin, remove all following items present in the model:

- Top cover
- I/O board
- I/O shield
- End plate
- DC controller mount plate
- PCB shield
- PCB mounting plate



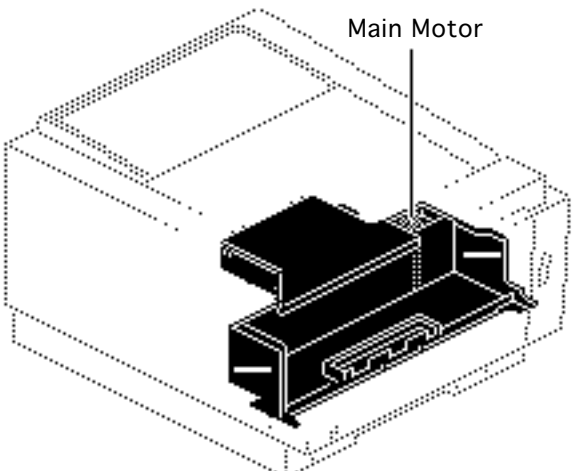
Laser Assembly

1 Disconnect connector J401.

2 **Caution:** Never loosen the two black screws at the upper left and lower right. If these screws are loosened, the laser assembly will lose alignment and will have to be replaced.

Remove the two recessed mounting screws at the lower left (1) and the upper right (2) of the laser assembly.

3 Lift out the laser assembly.

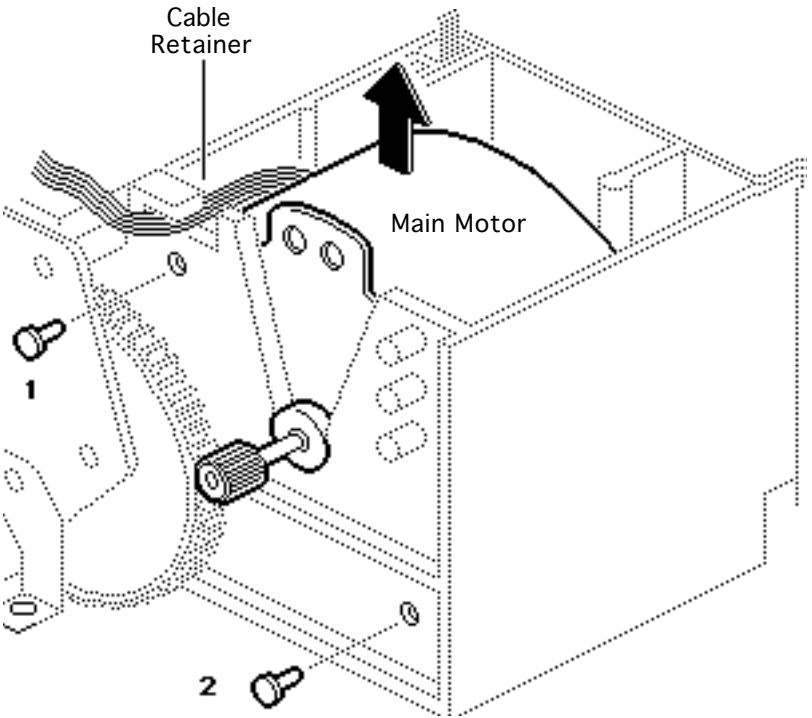


Main Motor

This topic applies to all models of the printer.

Before you begin, remove all following items present in the model:

- Top cover
- I/O board
- I/O shield
- End plate
- DC controller mount plate
- PCB shield
- PCB mounting plate

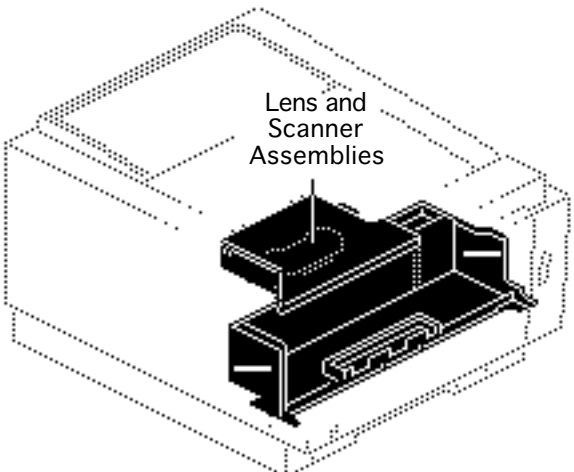


1 Remove the two screws that secure the motor to the chassis.

2 Remove the wires from the cable retainer.

Replacement Note: Make sure to thread the wires back into the cable retainer.

3 Lift the main motor straight up out of the printer.

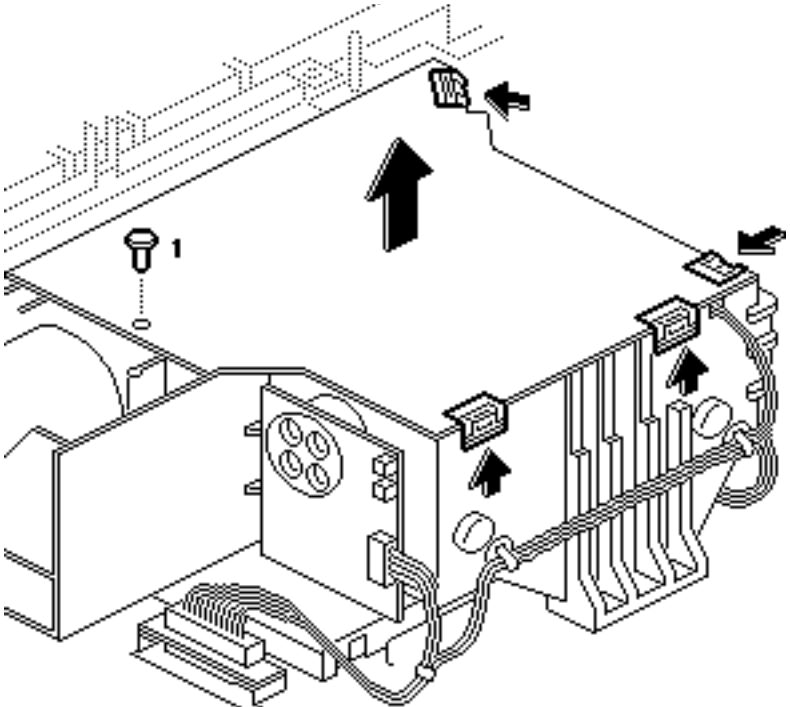


Lens and Scanner Assemblies

This topic applies to all models of the printer.

Before you begin, remove all following items present in the model:

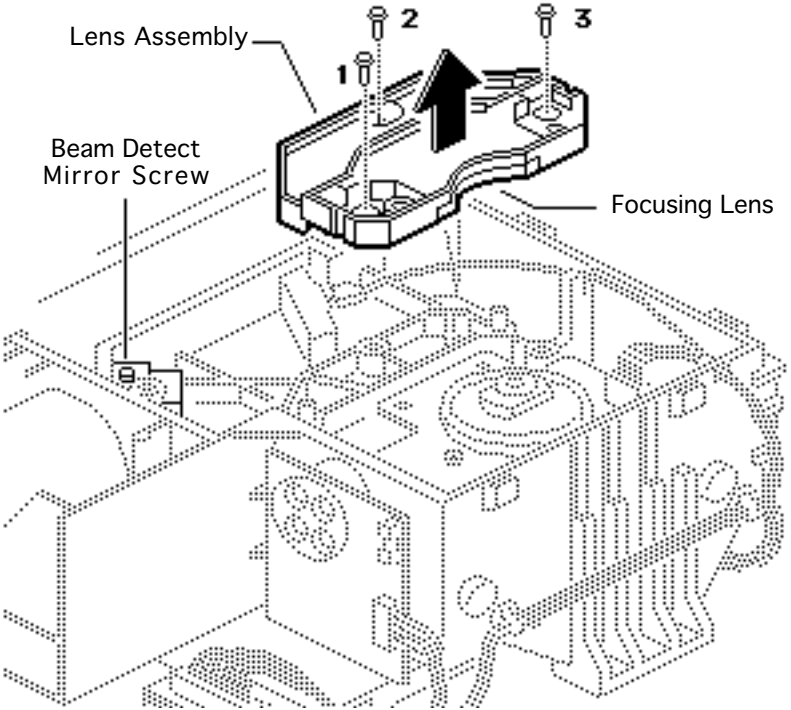
- Top cover
- I/O board
- I/O shield
- End plate
- DC controller mount plate
- PCB shield
- PCB mounting plate



Warning: Always replace the protective scanner assembly cover before you switch on the printer. The reflected laser beam can damage your eyes.

1 Remove the large cover retaining screw.

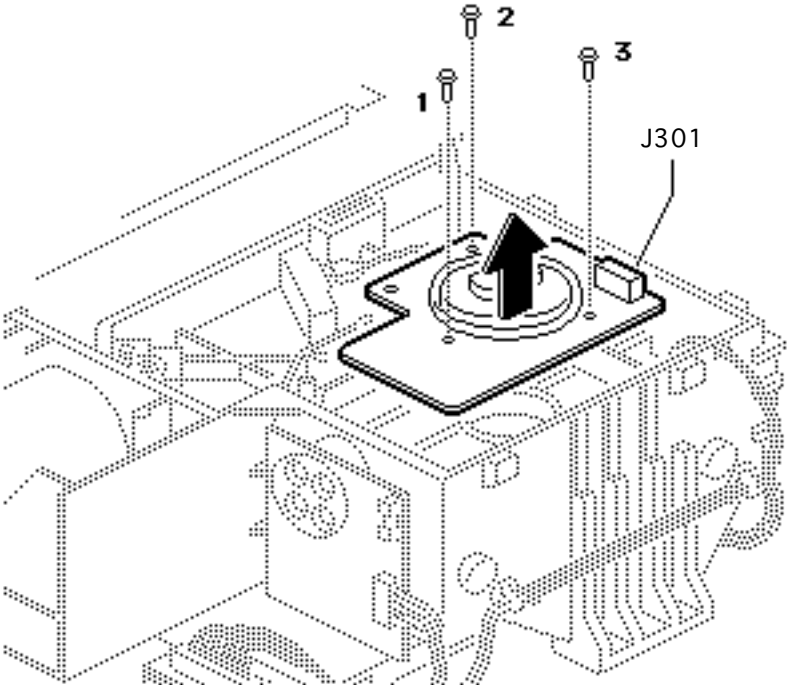
2 Release the four cover clamps and lift off the scanner assembly cover.



3 **Caution:** Do not touch the focusing lens on the lens assembly. If you touch the lens or the lens becomes dirty, it cannot be cleaned and must be replaced.

Caution: Do not loosen the beam detect mirror screw. The beam detect mirror requires factory alignment. If the screw is loosened, the printer must be replaced.

Remove the three black screws and lift out the lens assembly.



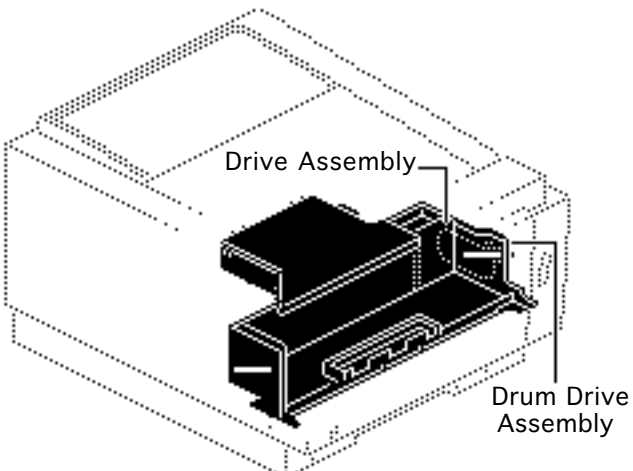
4 **Caution:** Do not touch the scanner assembly mirror. If it gets dirty, it must be replaced.

Disconnect connector J301.

5 Remove the three long black mounting screws and lift out the scanner assembly.

Replacement Note: Perform the “Registration Adjustment” procedure after installing a scanner assembly (see the Adjustments chapter).

Drive Assemblies

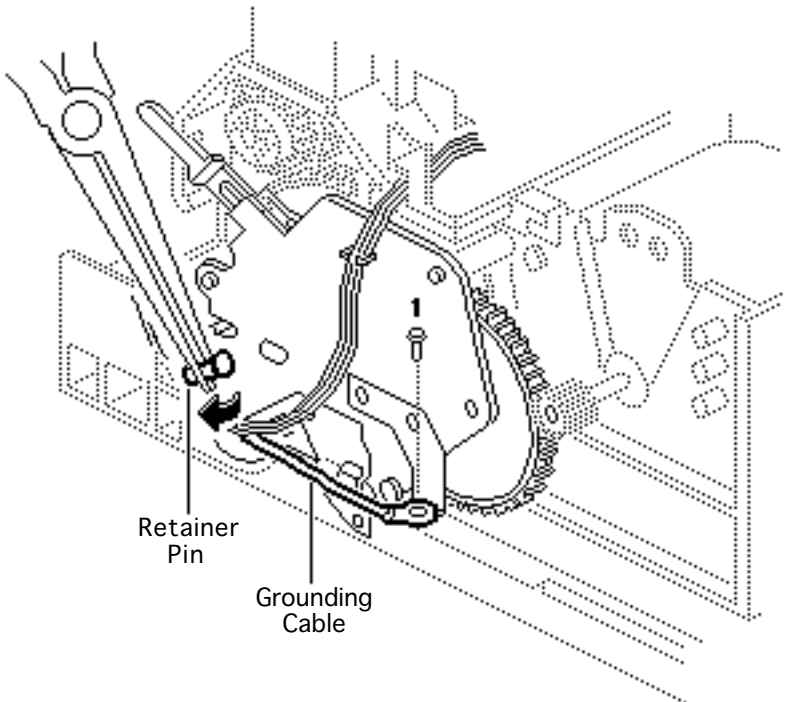


This topic applies to all models of the printer.

Before you begin, remove all following items present in the model:

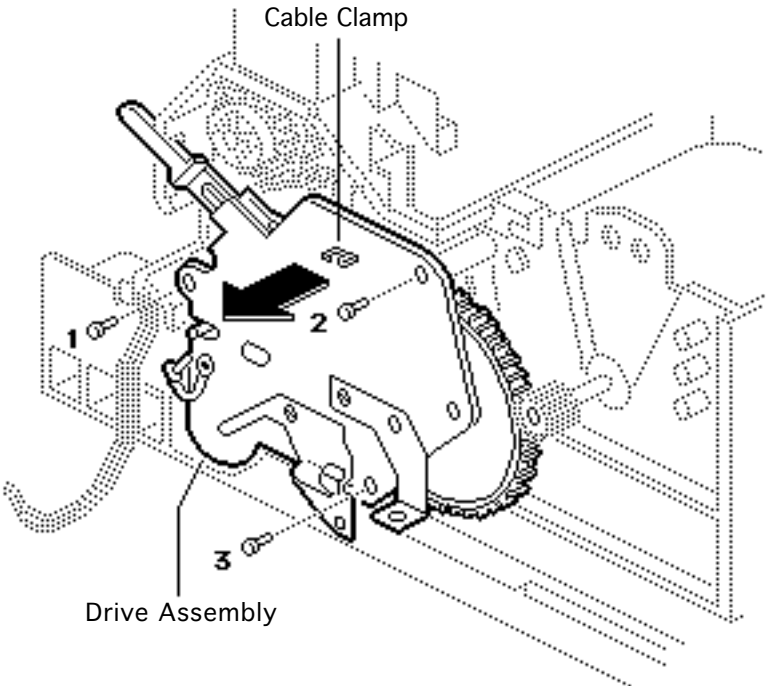
- Top cover
- Cassette feeder tray

Note: This procedure covers the take apart of the drive assembly and the drum drive assembly.



1 Using needlenose pliers, pull out the black cable retainer pin that holds the connector cables.

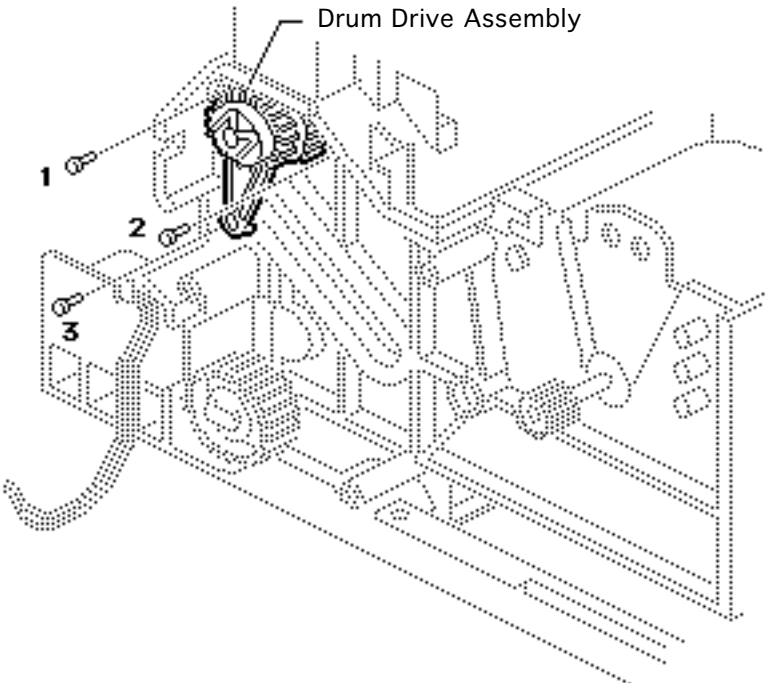
2 Remove the screw that secures the grounding cable.



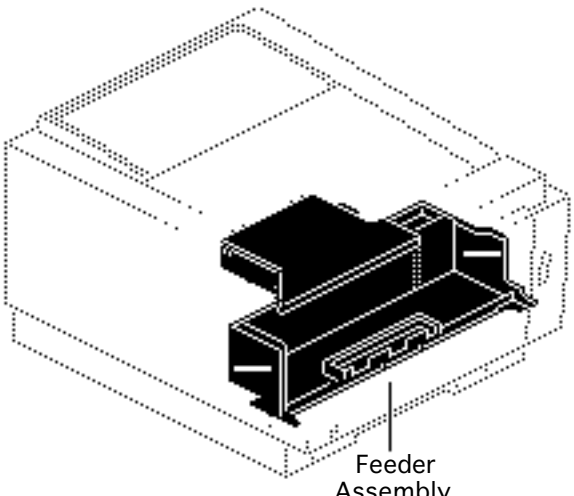
3 Remove the cables from the cable clamp.

4 Remove the three mounting screws and pull out the drive assembly.

Replacement Note: Be careful not to over-tighten the three drive assembly mounting screws.



5 Remove the three mounting screws and pull off the drum drive assembly.

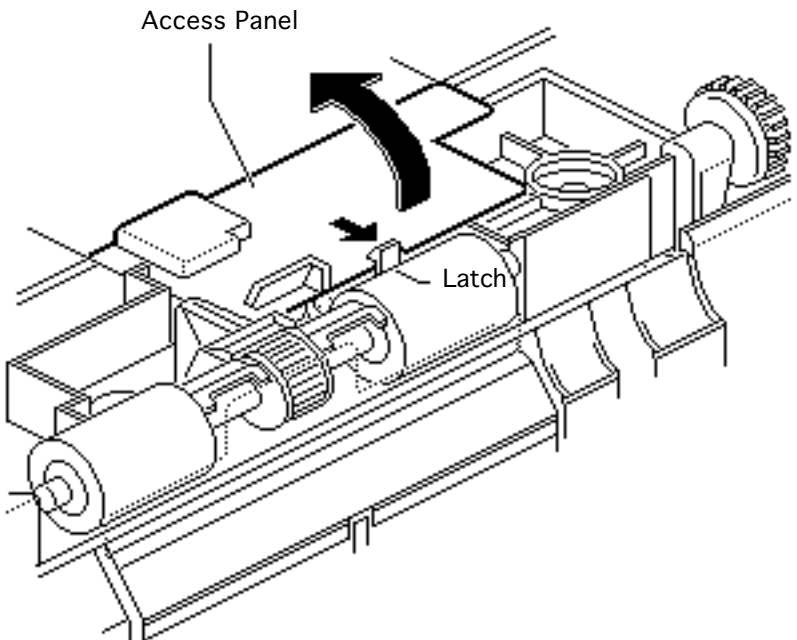


Feeder Assembly

This topic applies to all models of the printer.

Before you begin, remove all following items present in the model:

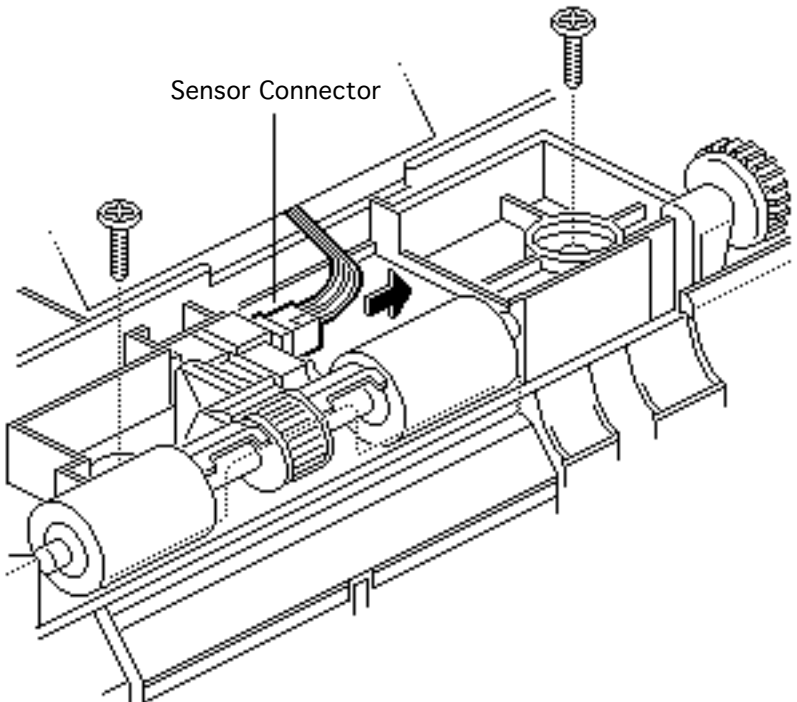
- Top cover
- Cassette feeder tray
- Drive assembly



1 Open the front access door.

2 **Note:** The access panel mentioned below is behind the right roller of the feeder assembly and has a very small latch. The latch is hard to see, but you can feel it with your finger.

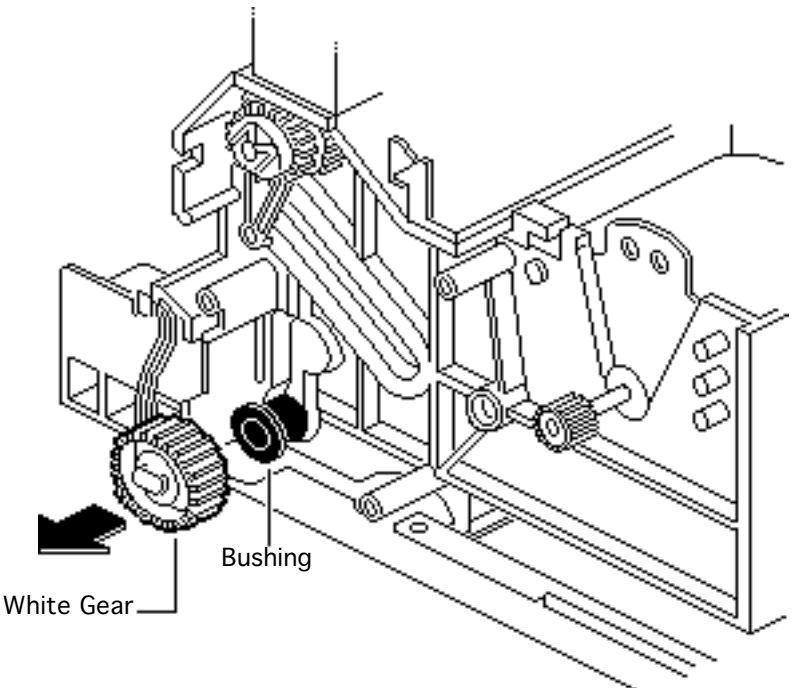
Pull the latch forward and lift up the access panel.



3 Disconnect the sensor connector.

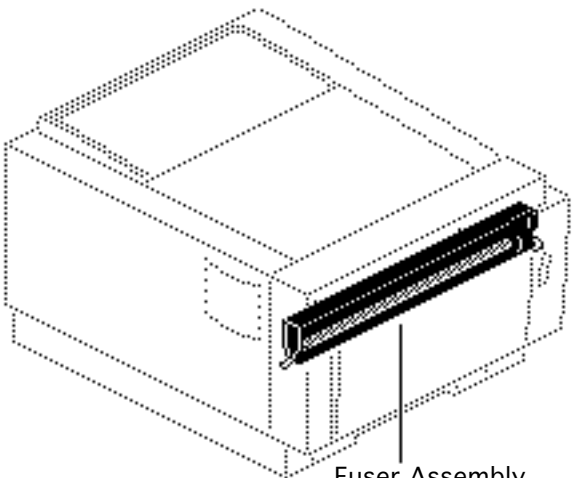
4 **Note:** There are holes cut through the main body block to facilitate the screwdriver access needed in the step below.

Remove the two feeder assembly mounting screws.



5 Remove the white gear and black plastic bushing from the end of the feeder assembly shaft.

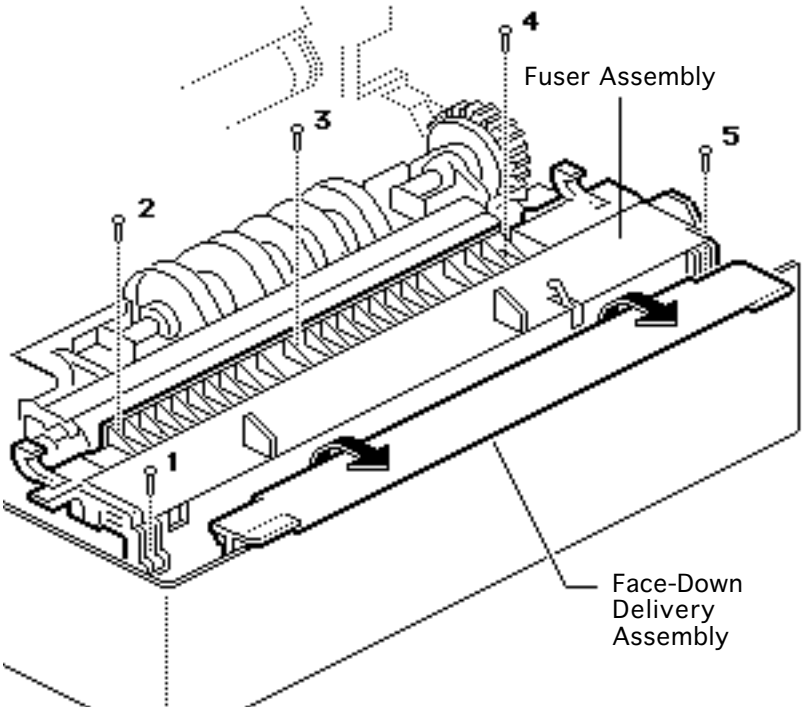
6 Lift up the feeder assembly, pull it to the left, and remove it.



Fuser Assembly

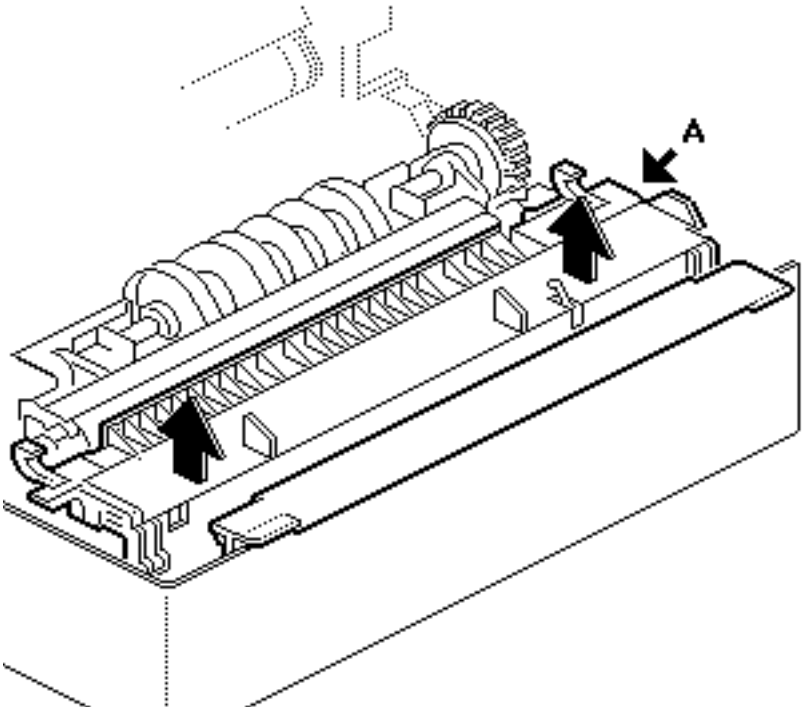
This topic applies to all models of the printer.

No preliminary steps are required before you begin this procedure.



1 Open the front access door.

2 Lift up the face-down delivery assembly and remove the five gold-colored screws that secure the fuser assembly to the front access door.



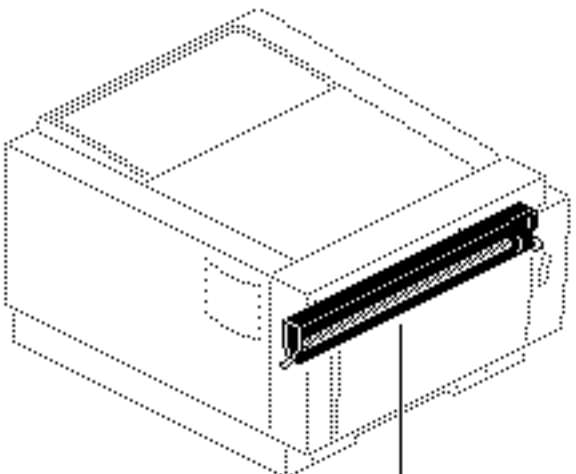
3 Using a flatblade screwdriver, carefully pry between the fuser assembly and the front cover at the right edge (A) while you pull out the fuser assembly.

Replacement Note: Make sure that the connector pins at each end of the front access door make proper contact with the connectors on the fuser assembly. Improper contact could cause the fuser not to heat up.

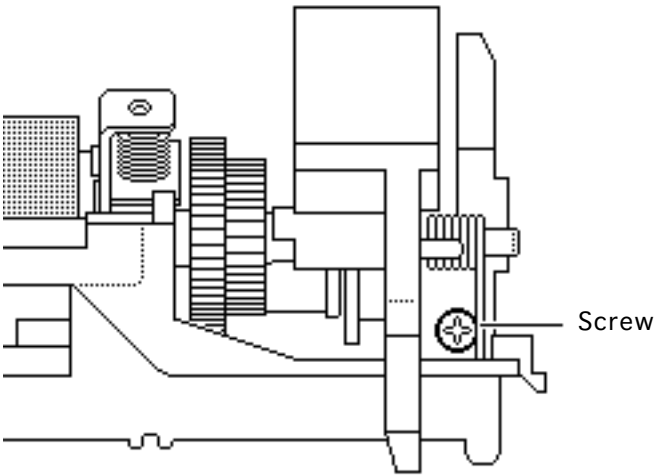
Fuser Heater Bulb

This topic applies to all models of the printer.

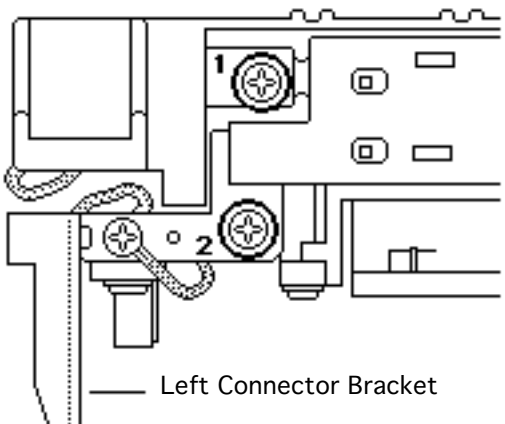
Before you begin, remove the fuser assembly.



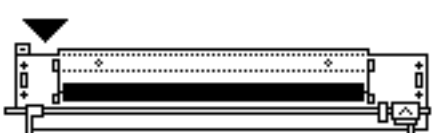
Fuser Heater Bulb
(inside Fuser Assembly)

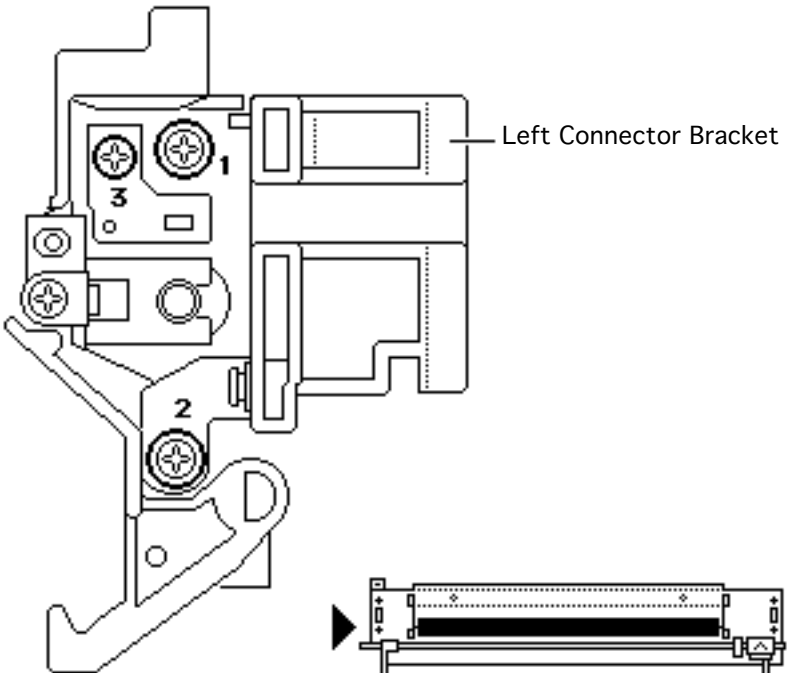


1 Remove the gold-colored screw and the washer that secure the right side of the heater bulb.



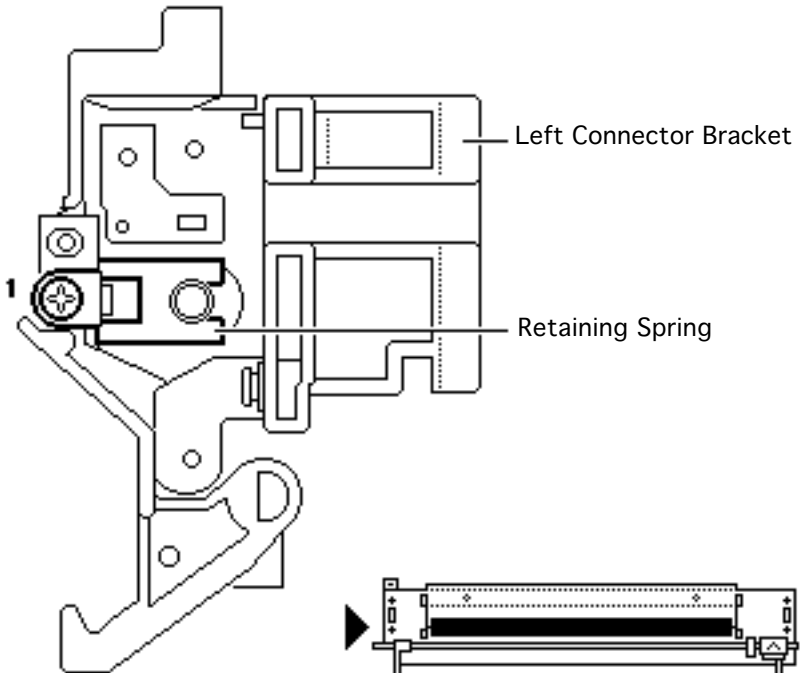
2 Remove the two gold-colored screws on the left end that secure the left connector bracket to the fuser assembly.





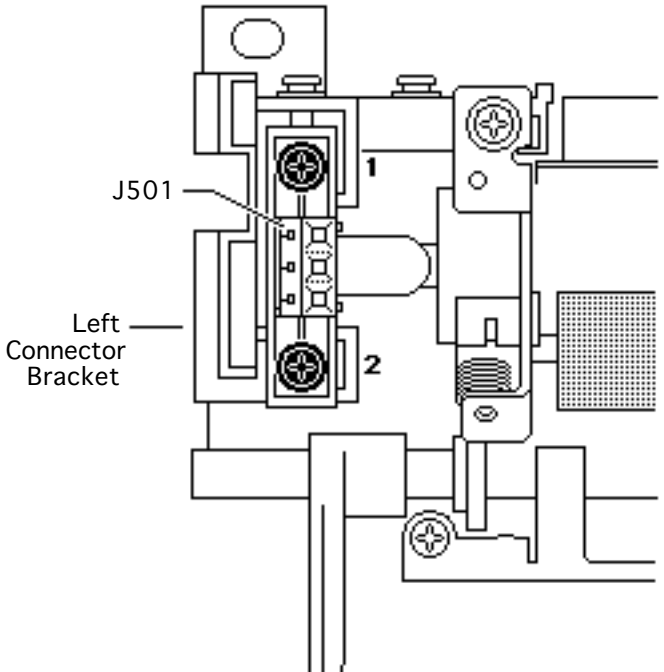
3 Remove the two gold-colored screws on the left rear face that secure the left connector bracket to the fuser assembly (1 and 2).

4 Remove the screw and washer that secure the heater bulb cable to the left connector bracket (3).

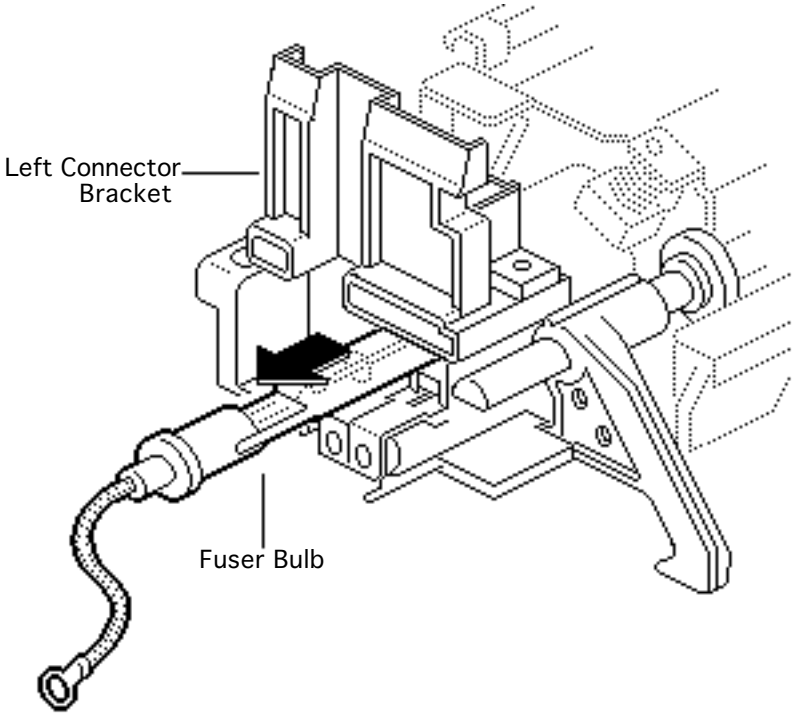


5 Remove the small silver-colored screw that secures the heater bulb retaining spring to the left connector bracket.

6 Set aside the retaining spring.



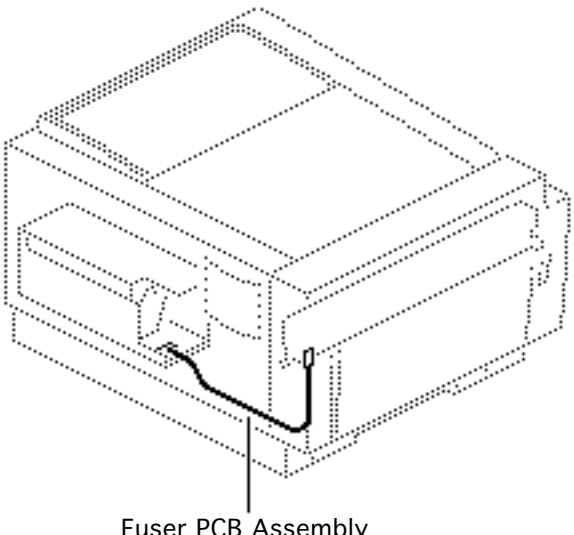
7 Remove the two black screws that fasten connector J501 to the left connector bracket.



8 **Caution:** Be careful not to touch the surface of the heater bulb when removing it from the fuser assembly. If you accidentally touch the bulb, clean it with isopropyl alcohol.

Carefully pull the left connector bracket and heater bulb out of the fuser assembly.

9 Remove the heater bulb from the left connector holder.

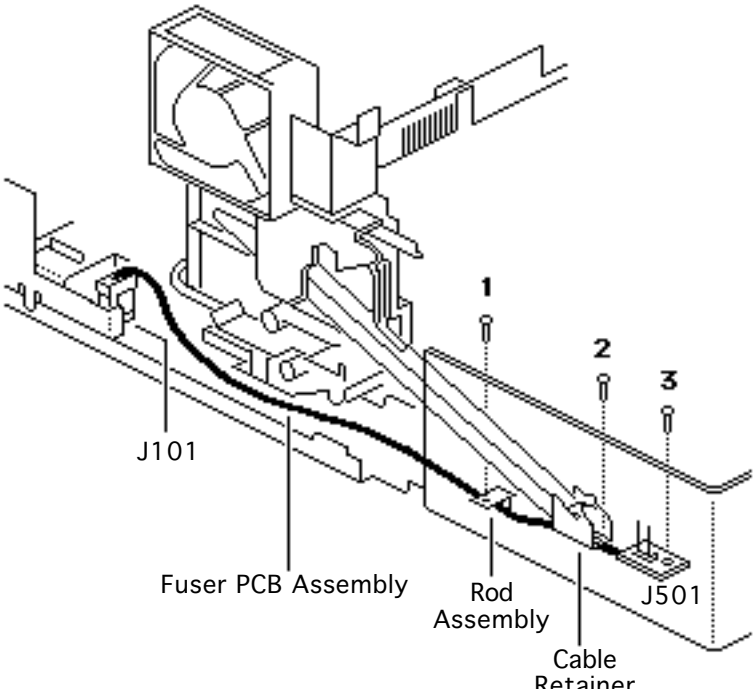


Fuser PCB Assembly

This topic applies to all models of the printer.

Before you begin, remove the following:

- Top cover
- Fuser assembly
- Face-down delivery assembly



1 Remove the screw that fastens the rod assembly to the front access door.

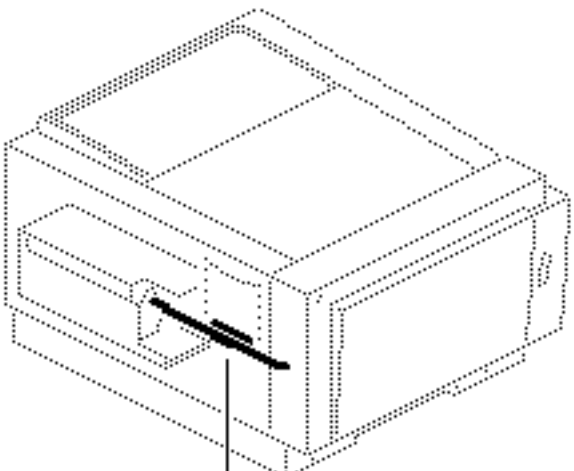
2 Remove the black screw that secures connector J501 to the front access door.

3 Remove the black screw that secures the cable retainer to the front access door. Lift out the cable retainer.

4 Disconnect connector J101.

5 Lift out the fuser PCB assembly.

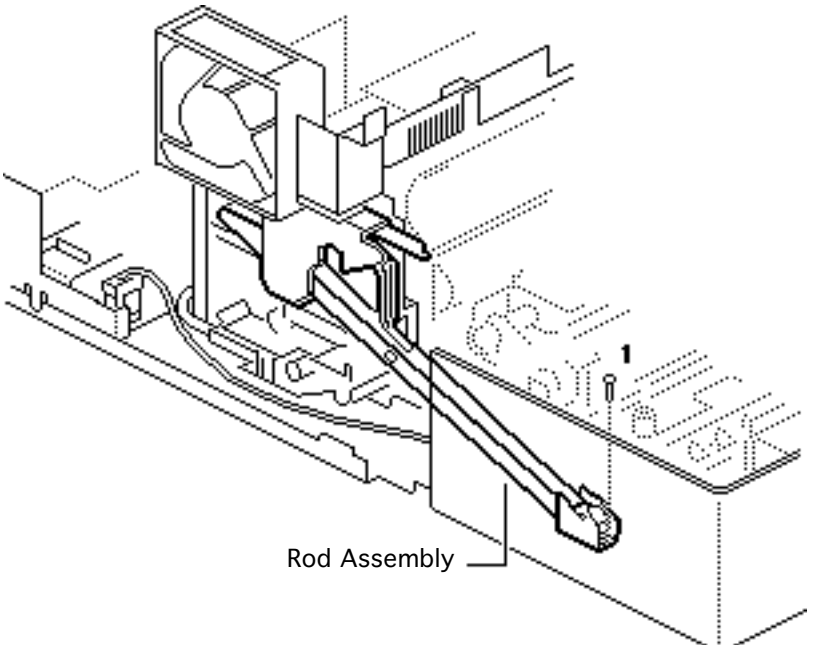
Rod Assembly



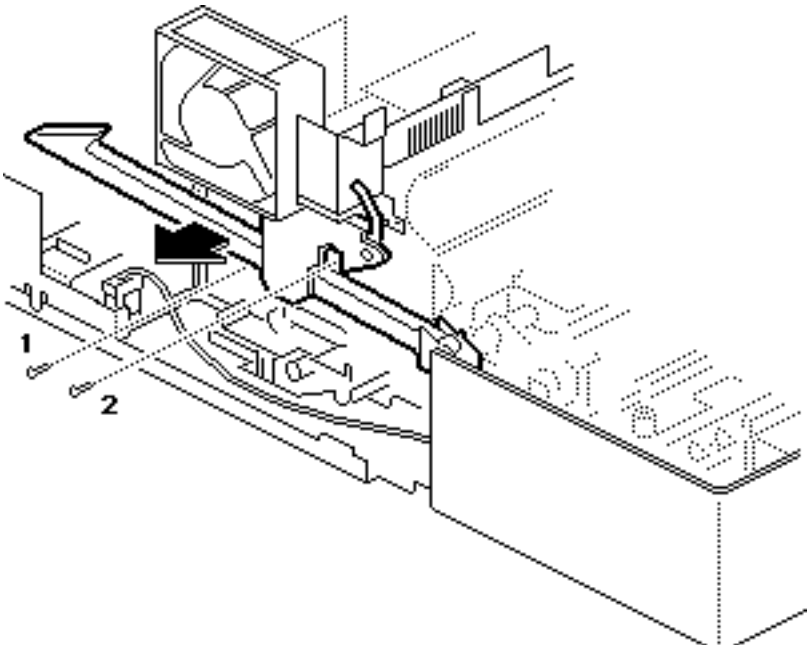
This topic applies to all models of the printer.

Before you begin, remove the following:

- Top cover
- Fuser assembly

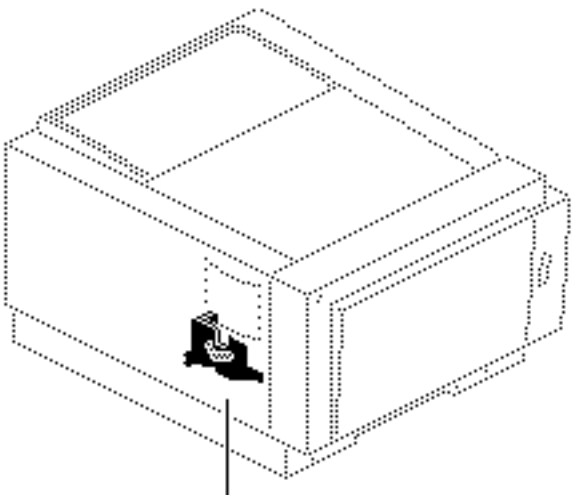


1 Remove the screw that fastens the metal end of the rod assembly to the front access door.



2 Remove the two screws that secure the rod assembly to the printer chassis.

3 Lift out the rod assembly.

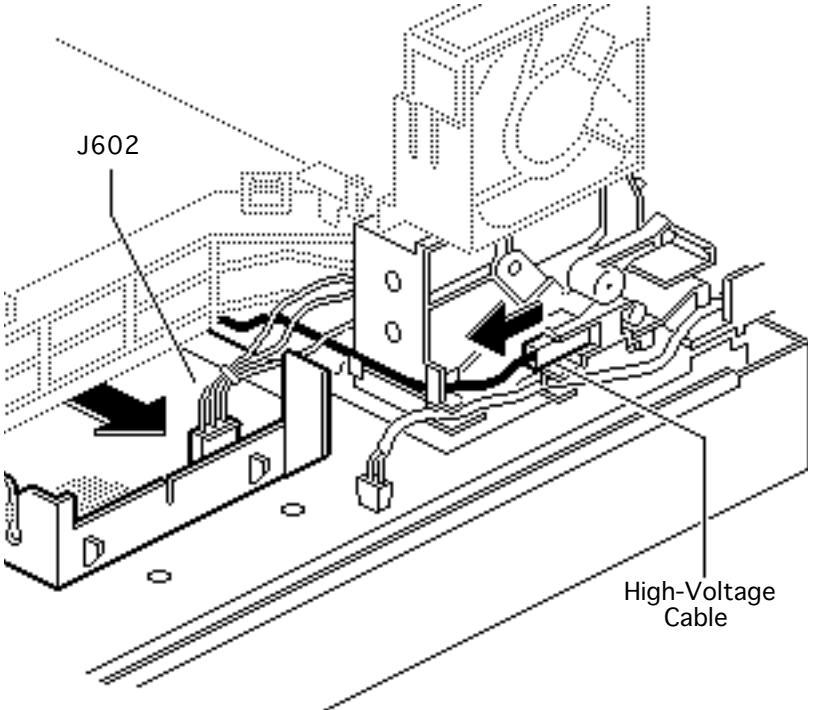


High-Voltage Contact Assy

This topic applies to all models of the printer.

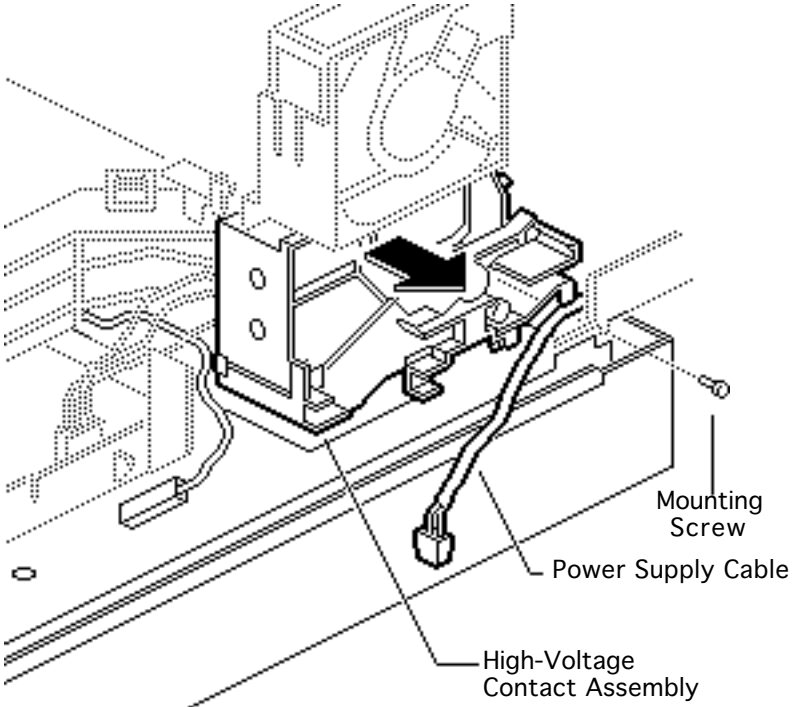
Before you begin, remove all following items present in the model:

- Top cover
- I/O board
- I/O shield
- PCB shield
- End plate
- Power supply
- Fuser assembly
- Rod assembly



1 Pull out the plastic tray from beneath the scanner assembly and disconnect connector J602 from the high-voltage power supply.

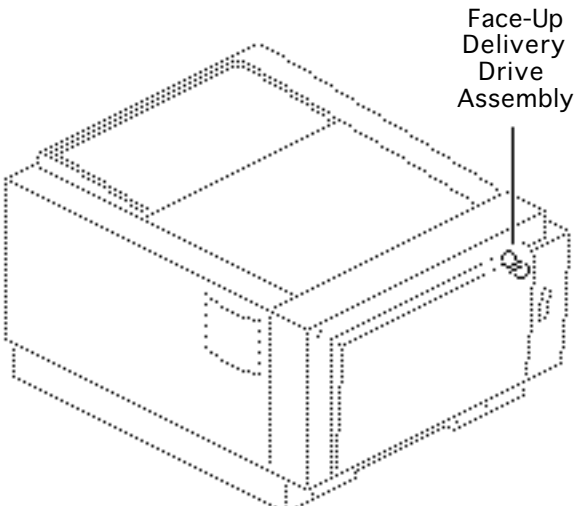
2 Disconnect the high-voltage cable.



3 Remove the contact assembly mounting screw.

4 Remove the power supply cable from the cable guide on the high-voltage contact assembly.

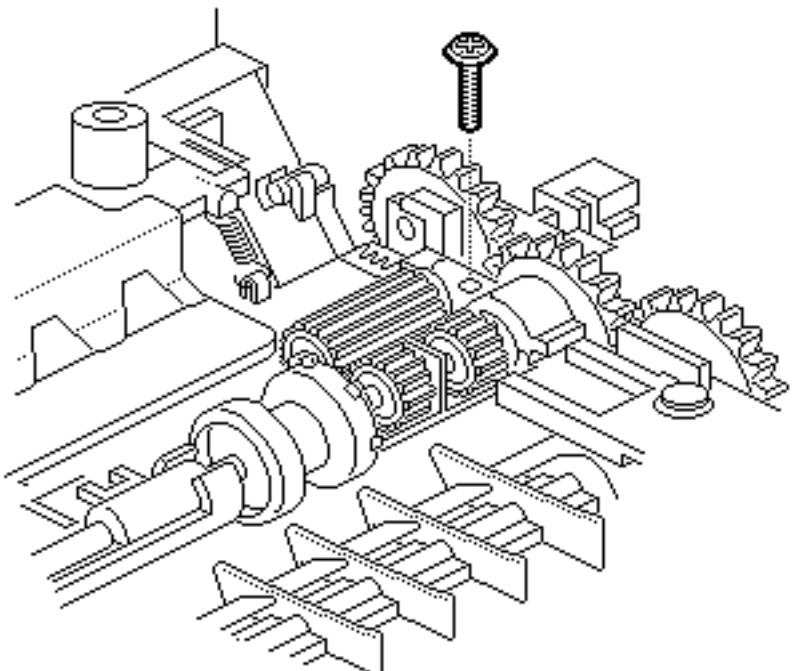
5 Lift out the high-voltage contact assembly.



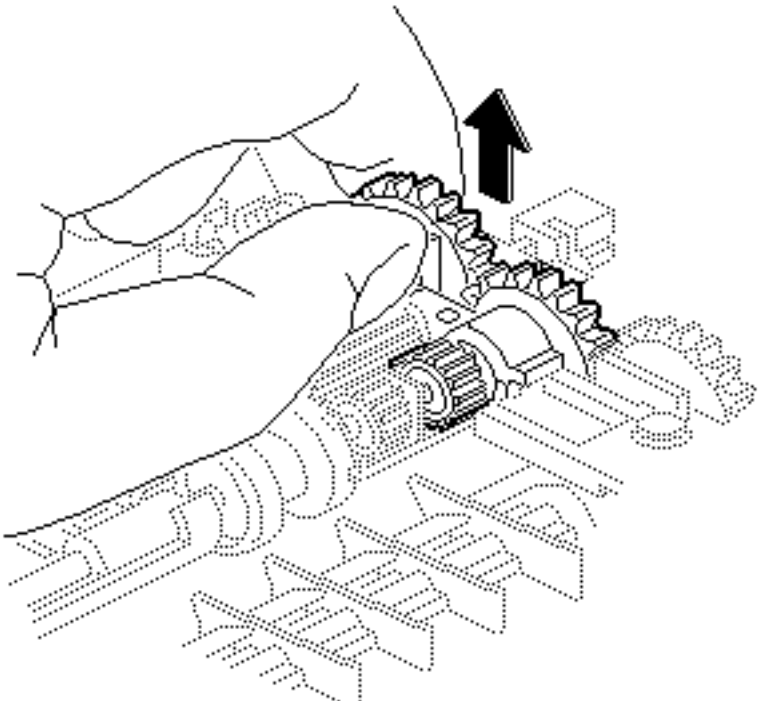
Face-Up Delivery Drive

This topic applies to all models of the printer.

Before you begin, remove the fuser assembly.

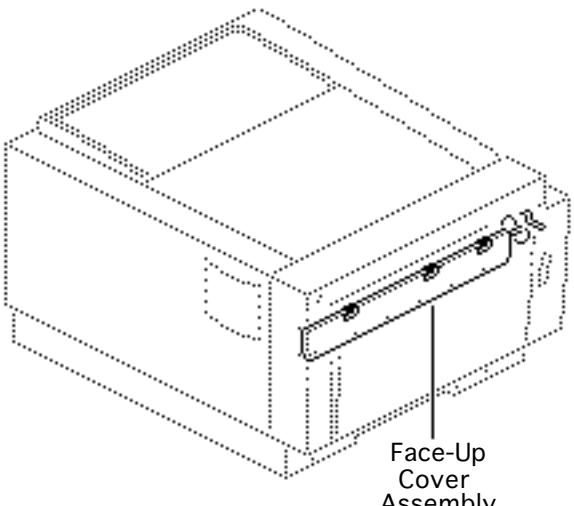


1 Remove the screw that secures the face-up delivery drive assembly to the front access door.



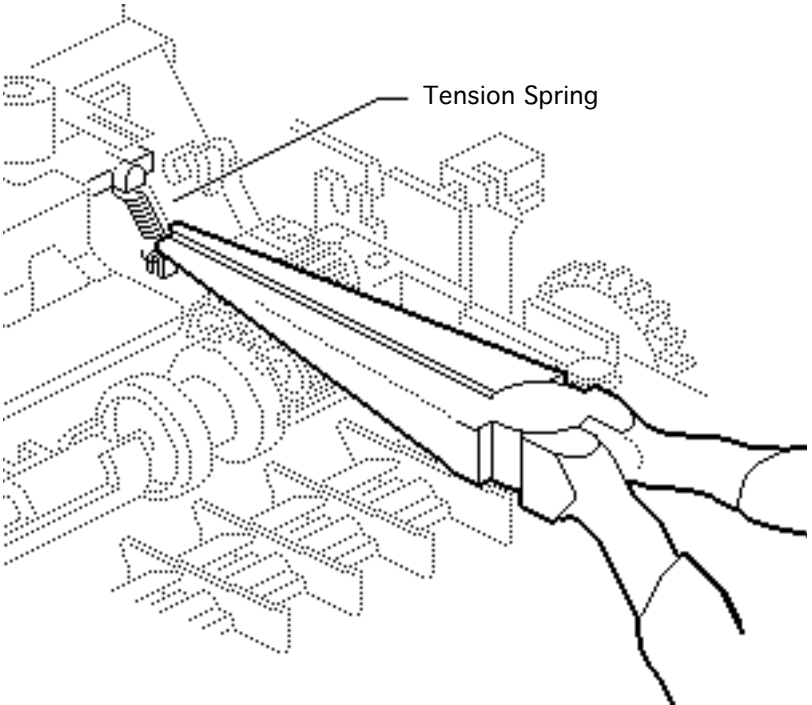
2 Lift out the face-up delivery drive assembly and the white, 20-tooth gear.

Face-Up Cover Assembly



This topic applies to all models of the printer.

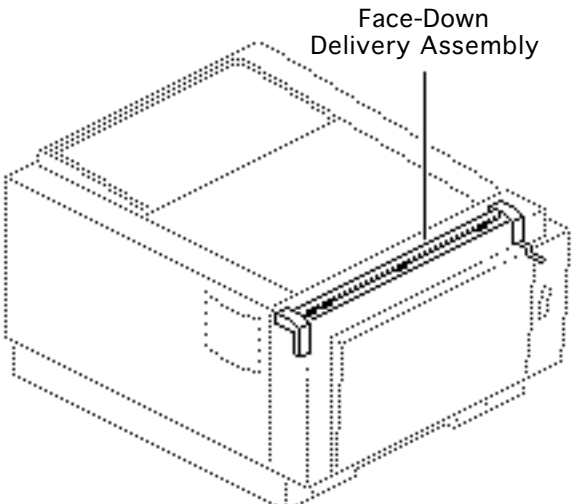
Before you begin, detach the face-up tray and remove the fuser assembly.



1 Using needlenose pliers, unhook the tension spring that connects the face-up cover to the front access door.

2 Open the face-up tray by pulling up on the green latch on the outside of the front access door.

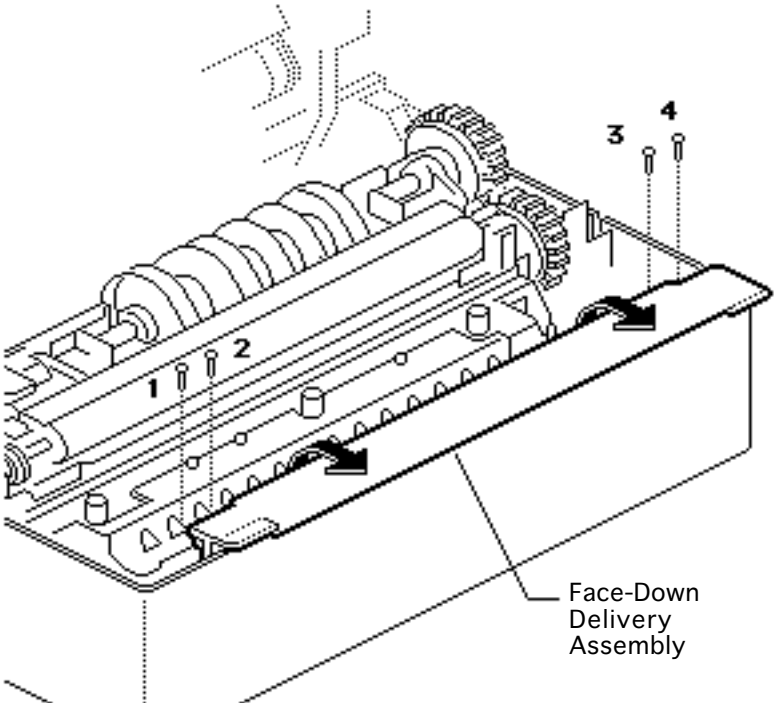
3 Grip the bottom edge of the face-up cover with your fingertips and bend it slightly to release the holding pins at each end. The face-up cover should fall into your palms.



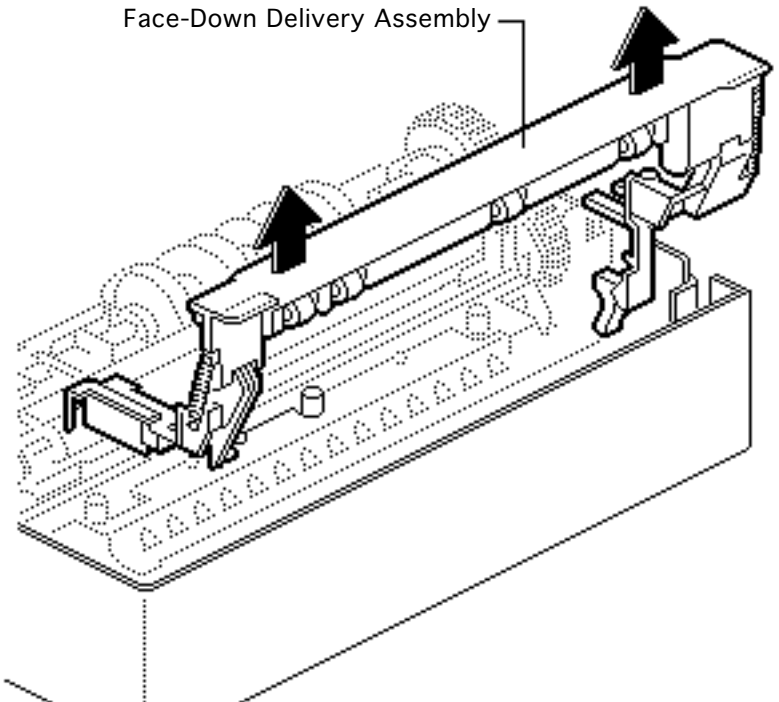
Face-Down Delivery Assembly

This topic applies to all models of the printer.

Before you begin, remove the fuser assembly.



1 Swing the face-down delivery assembly cover open and remove the four mounting screws.



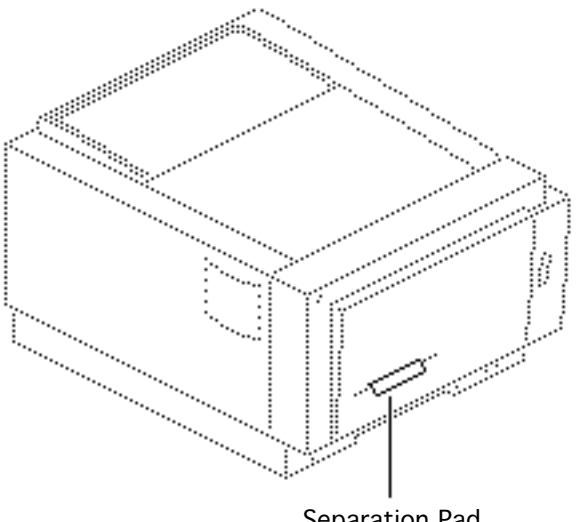
2 Lift out the face-down delivery assembly.

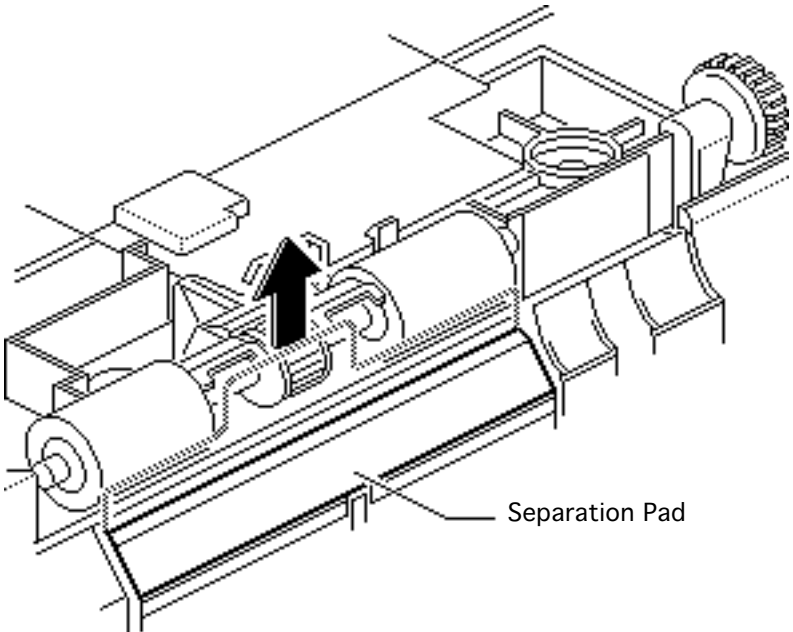
Note: The deflector below the face-down delivery assembly is not mechanically connected to anything. You can lift out the deflector if it needs to be replaced.

Separation Pad

This topic applies to all models of the printer.

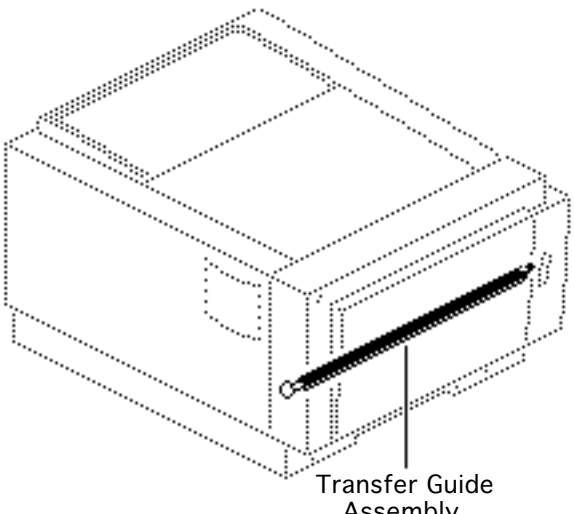
No preliminary steps are required before you begin this procedure.





1 Open the front access door.

2 Grasp the clear plastic tab and pull the separation pad straight up and out of the printer.

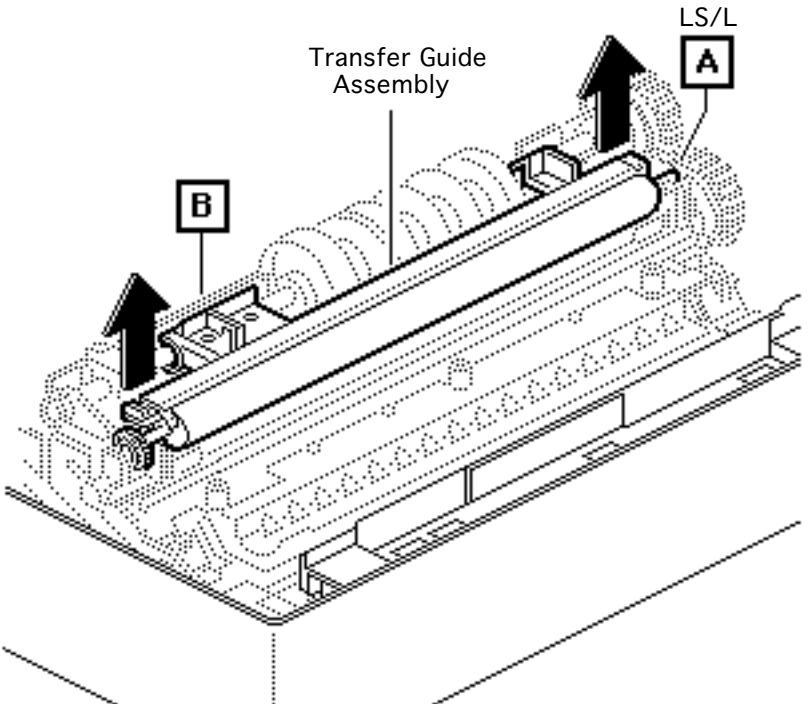


Transfer Guide Assembly

This topic applies to all models of the printer.

No preliminary steps are required before you begin this procedure.

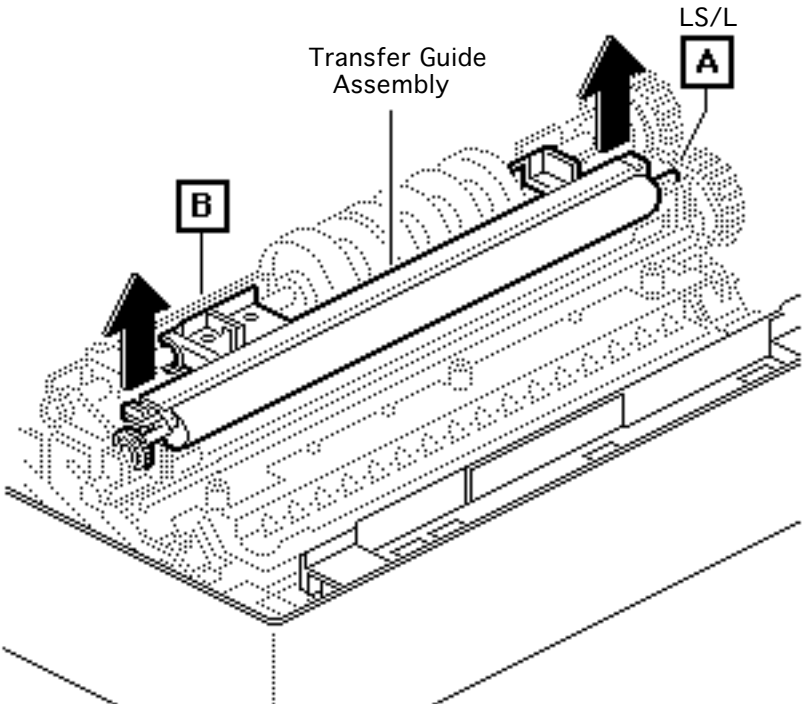
Note: This procedure also covers the removal of the left and right transfer roller mount assemblies and the transfer roller.



1 Open the front access door.

2 **Note:** On the LS/L the grip on the right side (A) has been closed into a ring. In the following step, you must first lift the left end of the assembly, then slide it out and to the left.

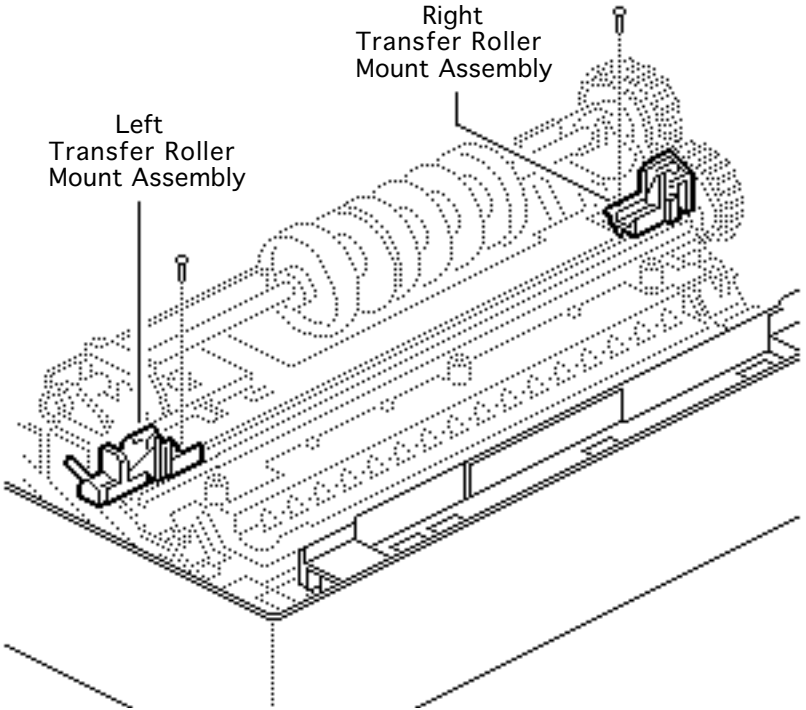
Grasp each end of the transfer guide assembly and lift it out of the printer.



Replacement Note: When replacing the transfer guide assembly, be sure that you snap the black plastic grip into the pickup roller shaft (B).

Transfer Roller

1 If you want to remove the transfer roller, pull each end of the transfer roller shaft from the transfer guide assembly.



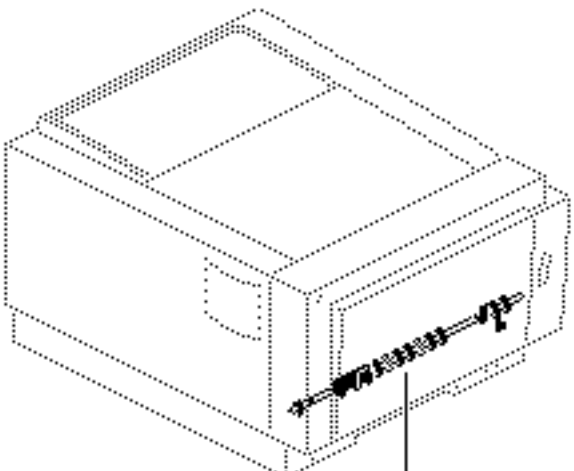
Transfer Roller Mount Assembly

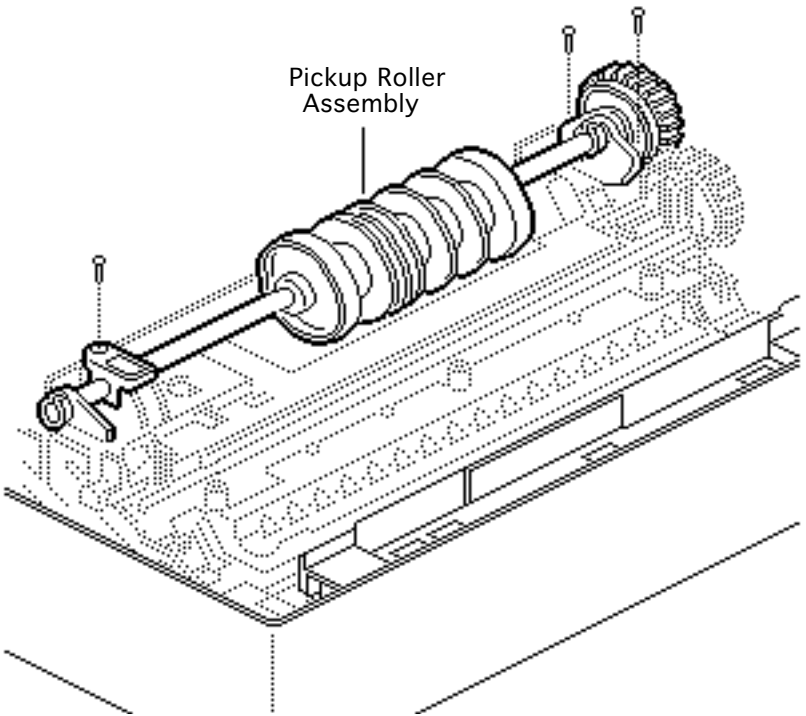
1 If you want to remove a transfer roller mount assembly, remove the single screw that secures it to the access door and lift the assembly out of the printer.

Pickup Roller Assembly

This topic applies to all models of the printer.

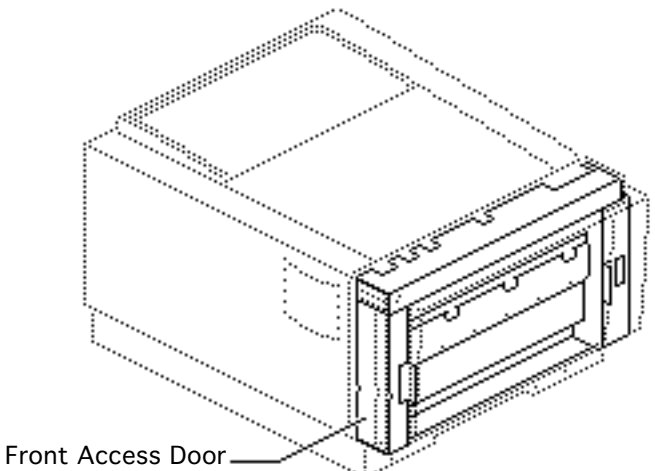
Before you begin, remove the transfer guide assembly.





1 Remove the three black mounting screws and lift out the pickup roller assembly.

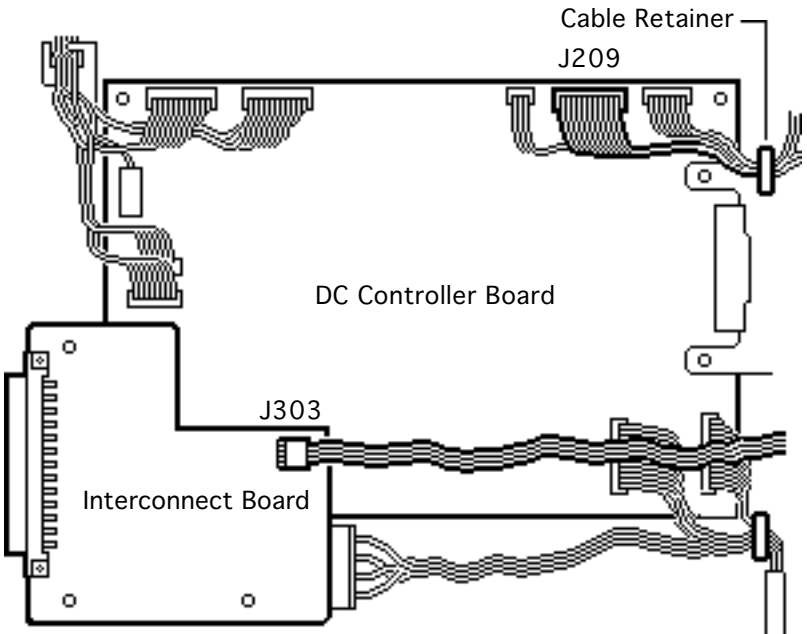
Front Access Door



This topic applies to all models of the printer.

Before you begin, remove all following items present in the model:

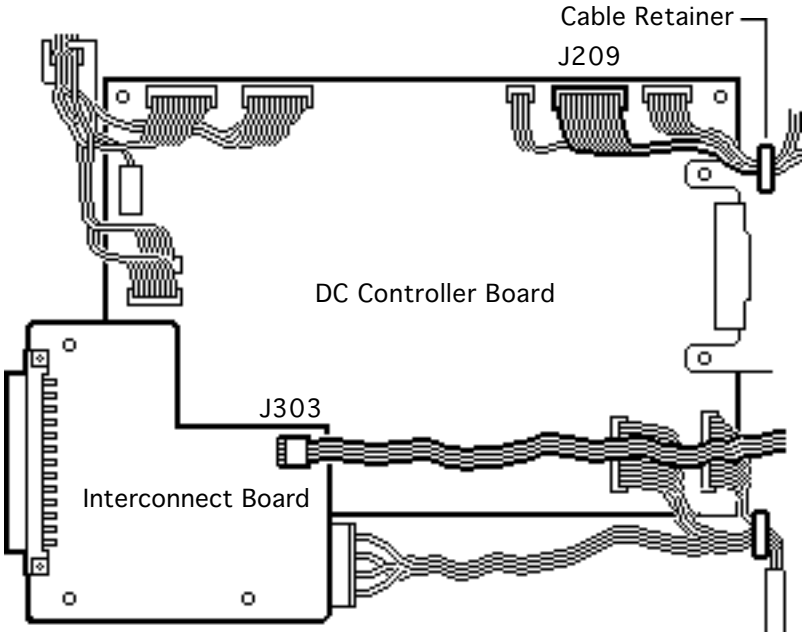
- Top cover
- I/O board
- I/O shield
- PCB shield
- Fuser assembly
- Front cover
- LED cover



Note: Perform this procedure only if you are replacing the front access door itself.

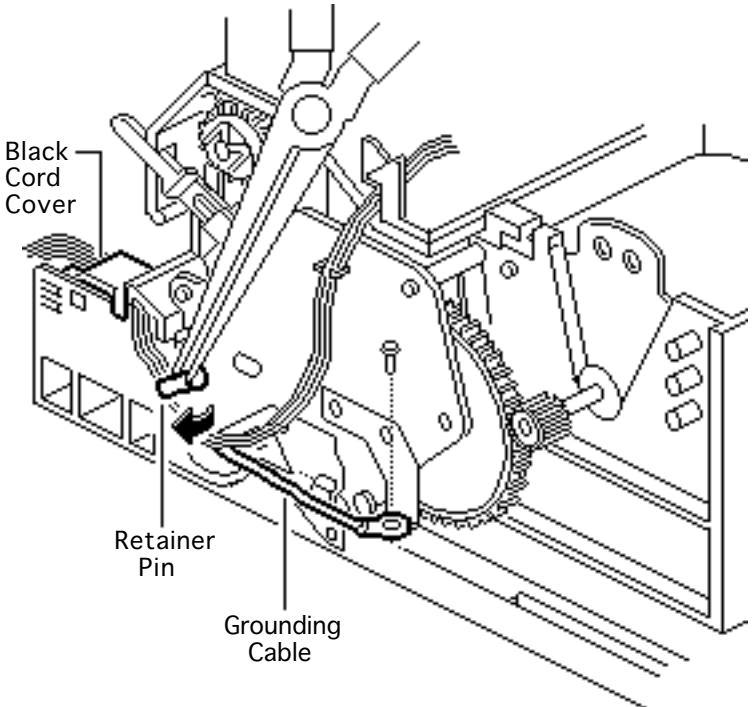
1 Disconnect connector J209 from the DC controller board, or from the serial controller in the case of the LS/L (not shown).

2 Disconnect the status panel cable as described below:
- SC, NT, NTR: Disconnect connector J303 on the interconnect board.



- LS: Disconnect connector J803 on the I/O board (not shown).
- LS/L: Disconnect connector J215 from the serial controller (not shown).

3 Open the two cable retainers and remove the cables.

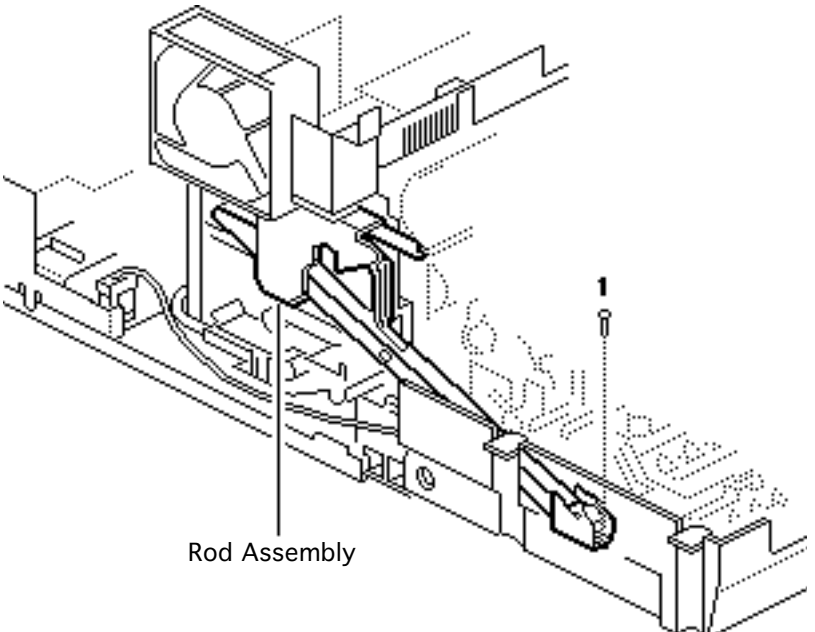


4 Using needlenose pliers, pull out the black cable retainer pin that holds the connector cables.

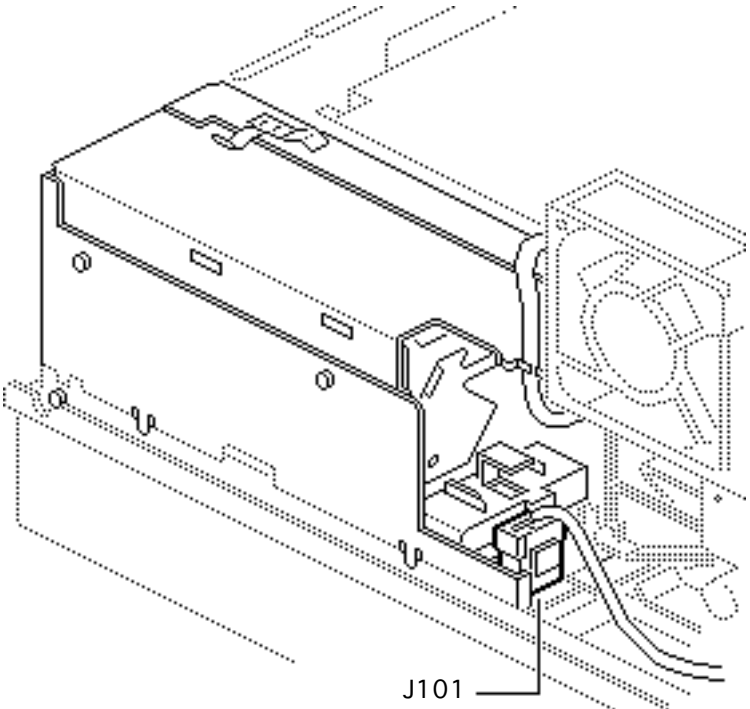
5 Remove the cables from the cable clamp.

6 Remove the screw that secures the grounding cable to the chassis.

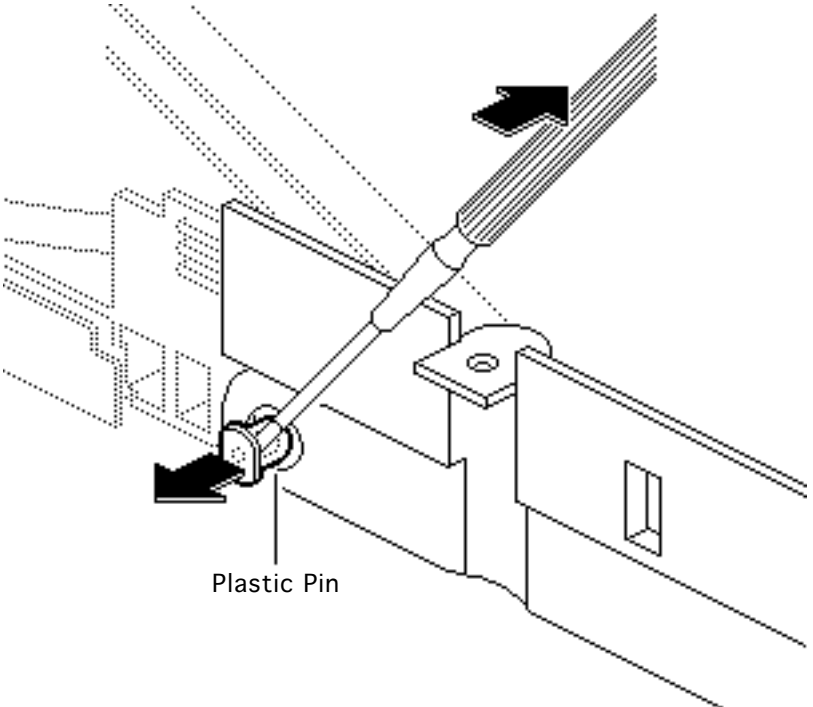
7 Using a small flat-blade screwdriver, remove the small black cord cover.



8 Remove the screw that fastens the metal end of the rod assembly to the front access door.



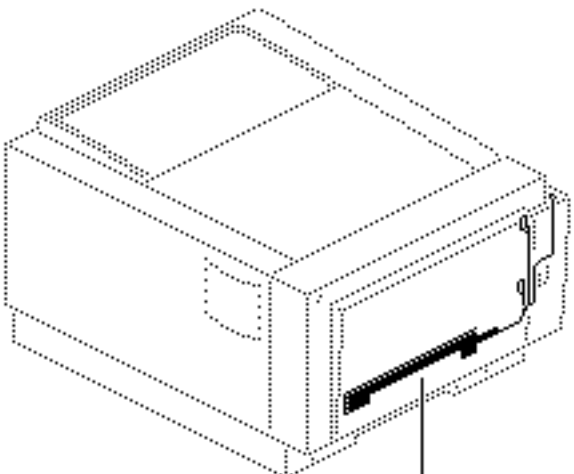
9 Disconnect connector J101 from the power supply.



10 Locate the two plastic pins at the hinge points on either end of the front access door (left pin is illustrated here).

11 Using a jeweler's screwdriver, carefully remove the plastic pins.

12 Lift away the front access door.



Multipurpose Cable Assembly

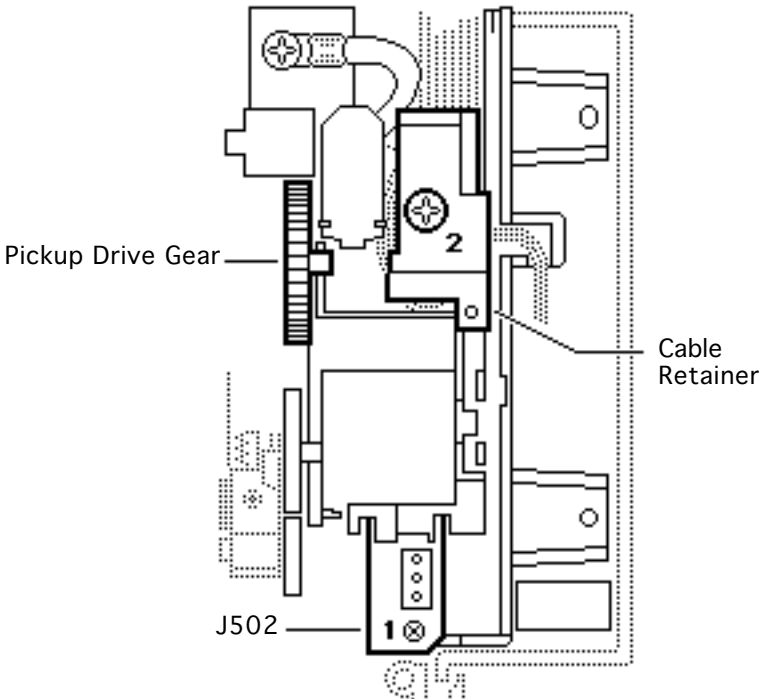
This topic applies to all models of the printer.

Before you begin, remove all following items present in the model:

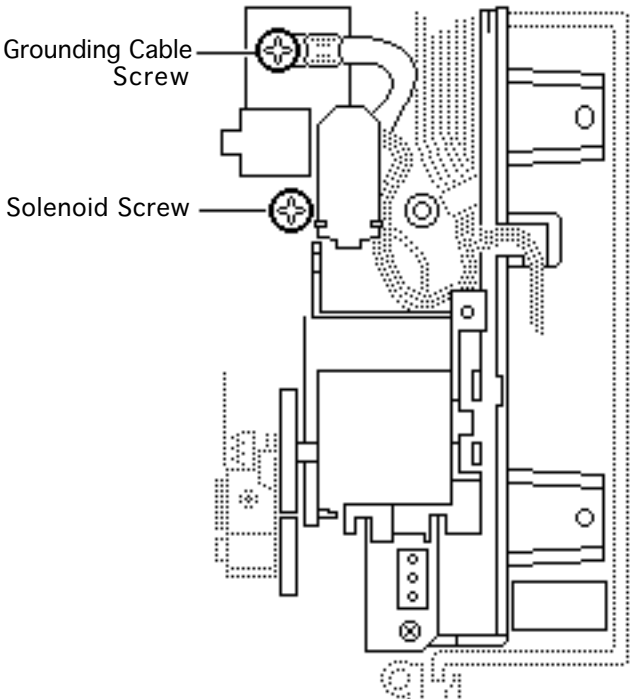
- Top cover
- I/O board and shield
- PCB shield
- Fuser assembly
- Front cover
- LED cover
- Transfer guide assembly
- Pickup roller assembly
- Right transfer roller

mount

Note: The multipurpose cable assembly is the primary conduit of DC power to the front access door.

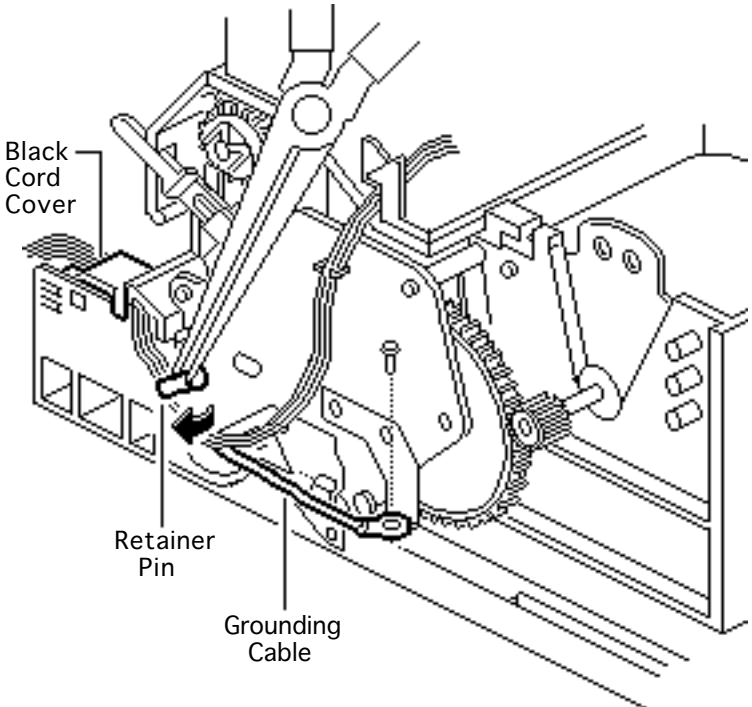


1. Remove the screw that secures connector J502 and the small circuit board to the front access door.
2. Remove the large black screw that secures the black plastic cable retainer. Pry loose and lift out the cable retainer.
3. Lift out the white pickup drive gear.



4 Remove the screw that secures the pickup roller clutch solenoid.

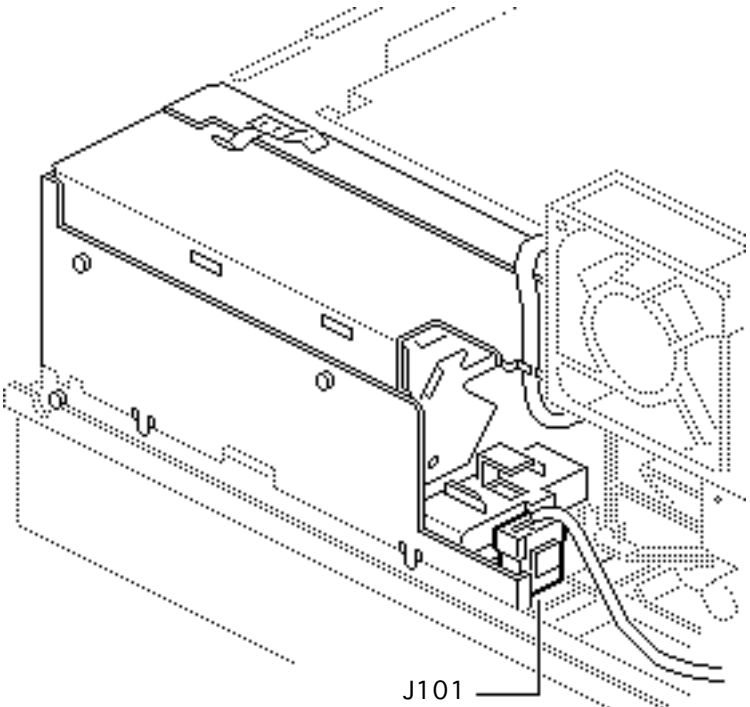
5 Remove the screw that secures the grounding cable to the front door.



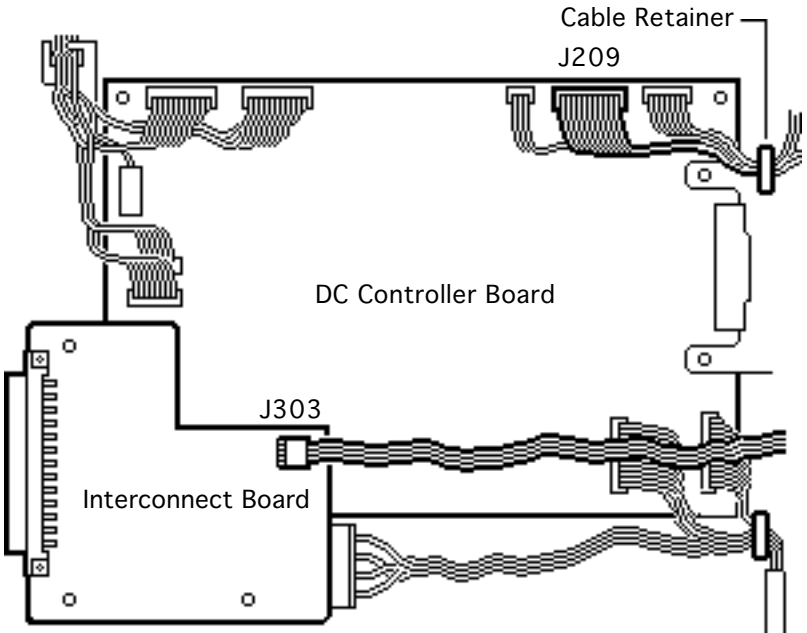
6 Using needlenose pliers, pull out the black cable retainer pin that holds the connector cables.

7 Remove the screw that secures the grounding cable to the printer chassis.

8 Using a small flat-blade screwdriver, remove the small black cord cover.



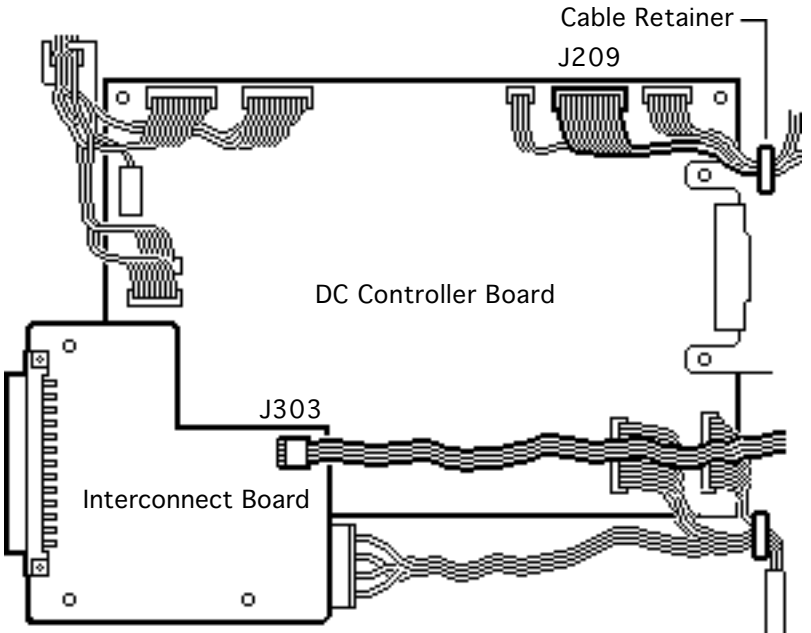
9 Disconnect connector J101 from the power supply.



10 Disconnect connector J209 from the DC controller board, or from the serial controller in the case of the LS/L (not shown).

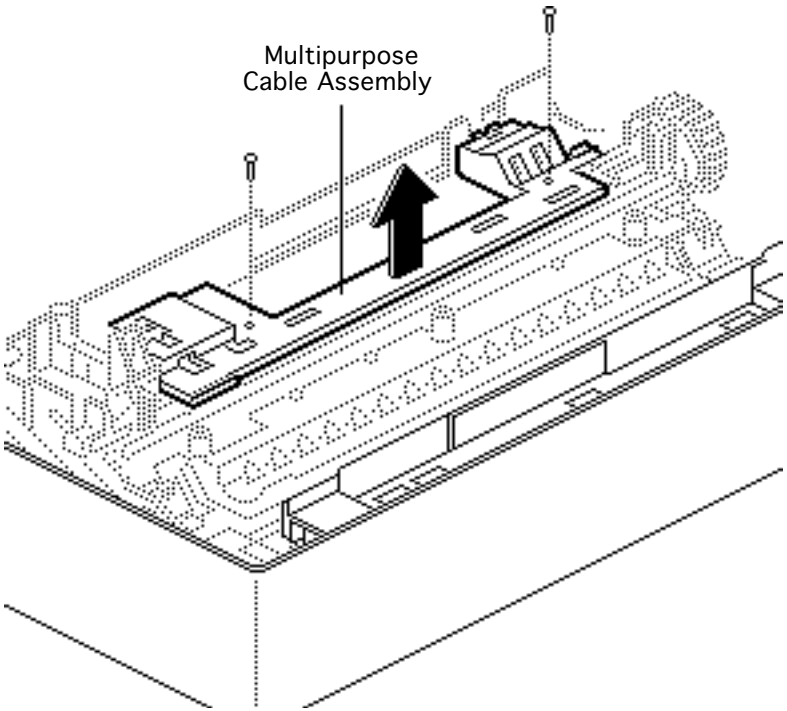
11 Disconnect the status panel cable as described below:

- SC, NT, NTR: Disconnect connector J303 on the inter-connect board.
- LS: Disconnect connector J803 on the I/O board (not shown).



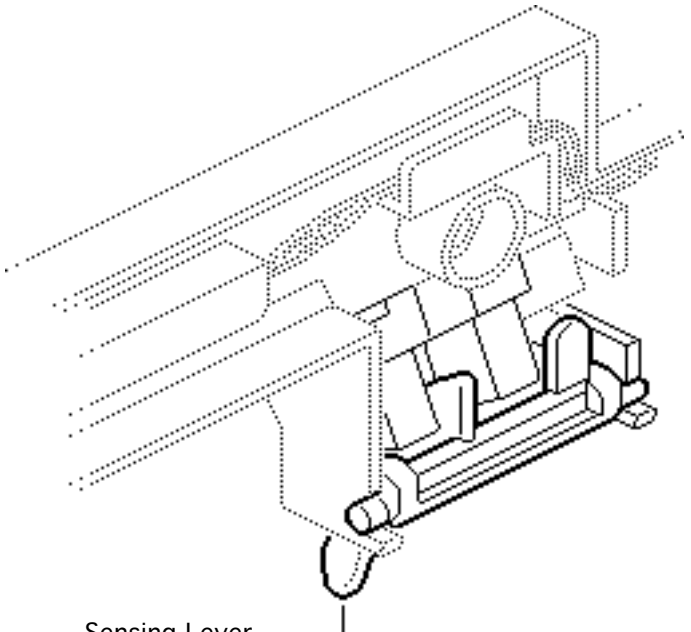
- LS/L: Disconnect connector J215 from the serial controller (not shown).

12 Open the two cable retainers and remove the cables.



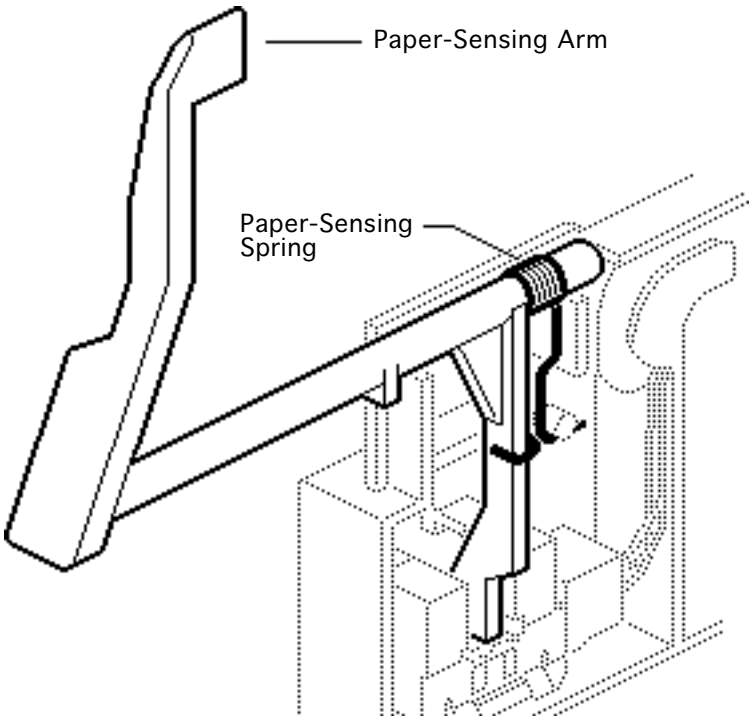
13 Remove the two black screws that secure the plastic sensor mount. Lift up slightly on the sensor mount.

14 Lift out the multipurpose cable assembly and sensor mount.



15 **Note:** You will need to install the old paper sensing lever into the replacement cable assembly.

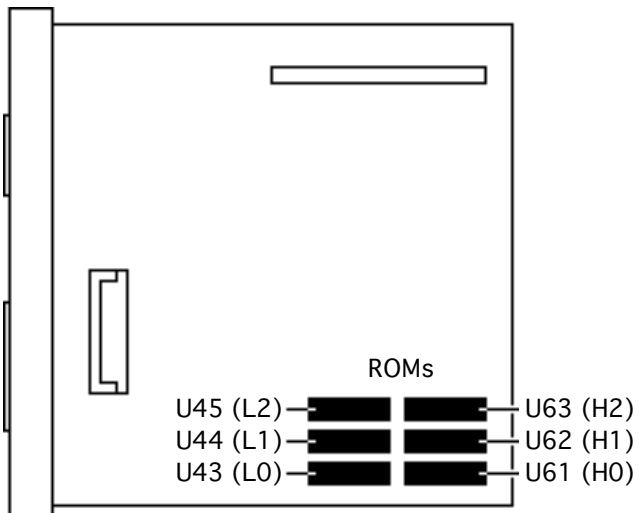
Remove the paper sensing lever at sensor PS501 from the multipurpose cable assembly and set it aside.



Replacement Note: If you removed the left transfer roller mount assembly prior to this procedure, the paper-sensing arm may have flipped loose when you lifted off the sensor mount. Replace the sensing arm and spring as shown. The illustration shows the arm and spring as they would look in a functional print-ready state.

Upgrades

PLW SC/NT/NTR/LS

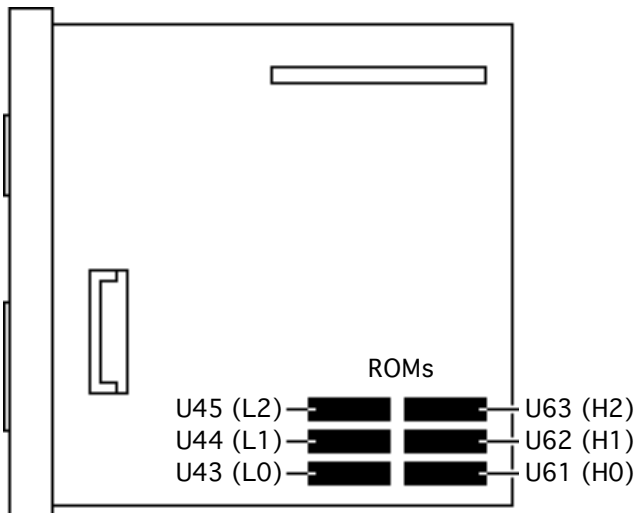


NTR ROM Upgrade

The NTR ROM Upgrade Kit consists of six ROMs. The following numbers are imprinted on the six Rev. 4.0 ROMs:

- 341-0950
- 341-0951
- 341-0952
- 341-0953
- 341-0954
- 341-0955

If you are replacing a customer's NTR board, check the ROMs. If they are

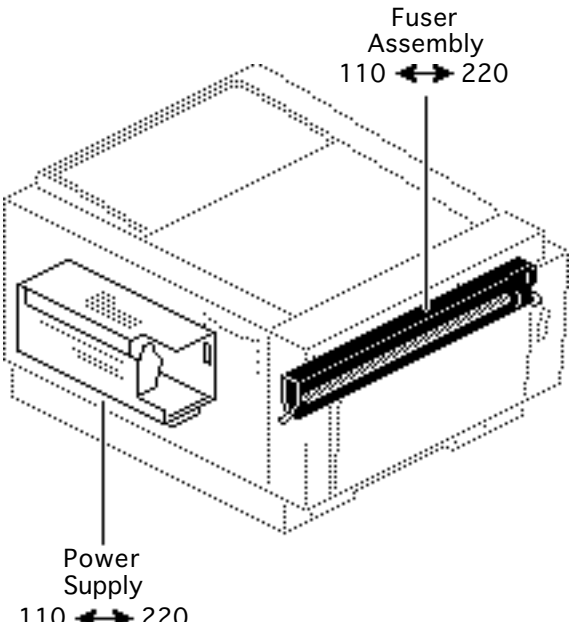


Rev. 4.0 ROMs, you must remove the ROMs and install them on the replacement board. Replacement NTR boards do not have Rev. 4.0 ROMs.

Caution: Old ROMs must be returned to Apple. Refer to August 1993 Service Notices for complete information on the Personal LaserWriter NTR ROM Repair Extension Program.

Additional Procedures

PLW SC/NT/NTR/LS



Voltage Conversions

Before you begin, remove the following:

- Top cover
- I/O board and shield
- End plate

Note: Personal LaserWriter printers manufactured for the USA and Japan operate at line voltages of 110-115 volts. Those manufactured for Europe or Australia operate at line voltages of 220-240 volts.

1 Replace each of the components shown with a corresponding one of the new voltage.

Nip Width Measurement

Before you begin, remove the following:

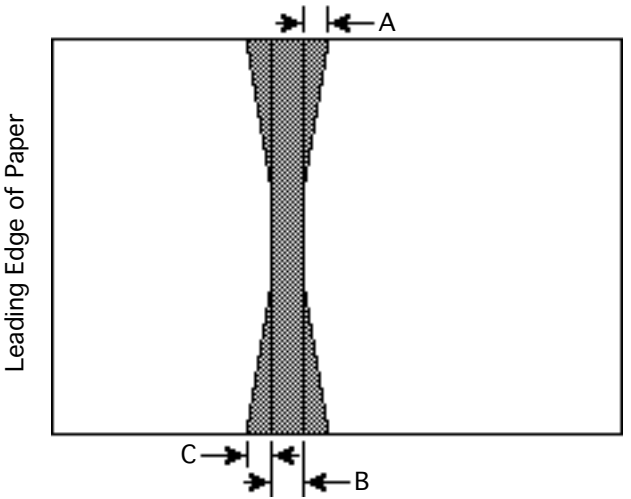
- Top cover
- I/O board and I/O shield

You should perform the nip width measurement whenever poor or irregular fusing occurs. This measurement shows whether the fuser assembly rollers exert uniform pressure on each page. If they don't, replace the lower fuser roller. If the problem persists, replace the fuser assembly. Perform the procedure as described below.

1 Using a copy machine, make several copies of letter-size, all-black paper. Place the black sheets on the multipurpose tray.

2 Switch on the printer and run a service test page (see Basics).

Width	Measure when upper and lower rollers are hot
B	2-3 mm
A	Under 0.5 mm
C	Under 0.5 mm

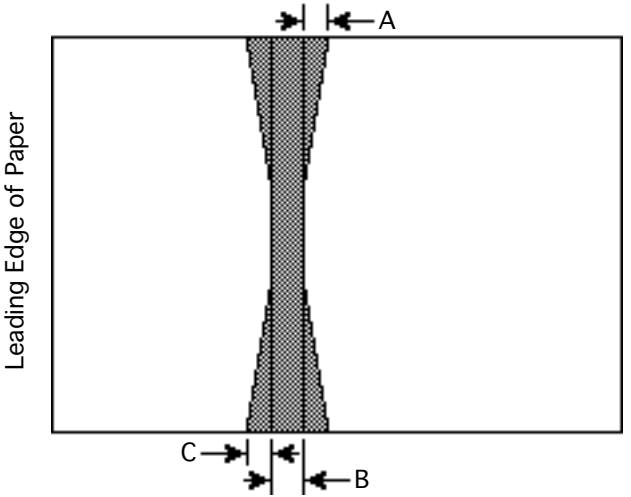


3 When the leading edge of the paper appears at the face-down delivery rollers, switch off the printer, wait 10 seconds, then switch on the printer.

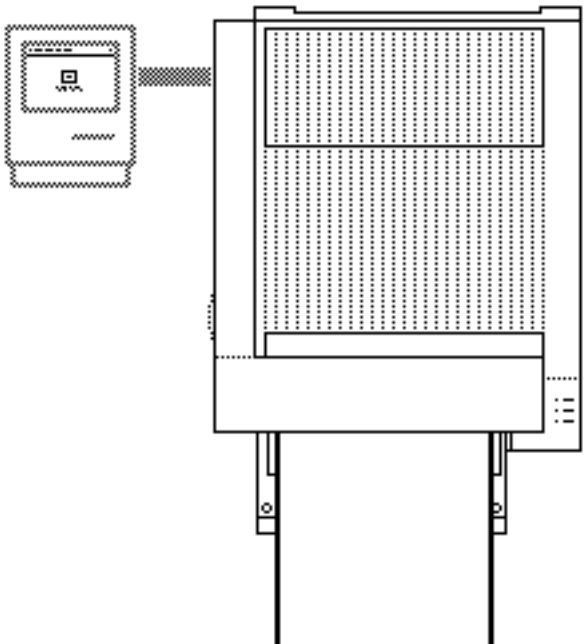
4 Measure the width of the glossy band on the paper. The band should be 2 – 3 mm wide at its center and should extend no more that .5 mm at the top or bottom edge.

Note: If the measurement fails to meet specifications,

Width	Measure when upper and lower rollers are hot
B	2-3 mm
A	Under 0.5 mm
C	Under 0.5 mm



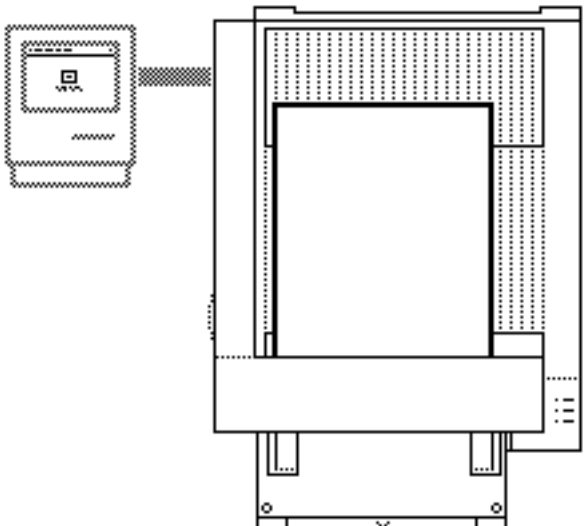
replace the lower fuser roller and perform the test again. If the measurement still does not meet specifications, replace the fuser assembly.



Cleaning Page

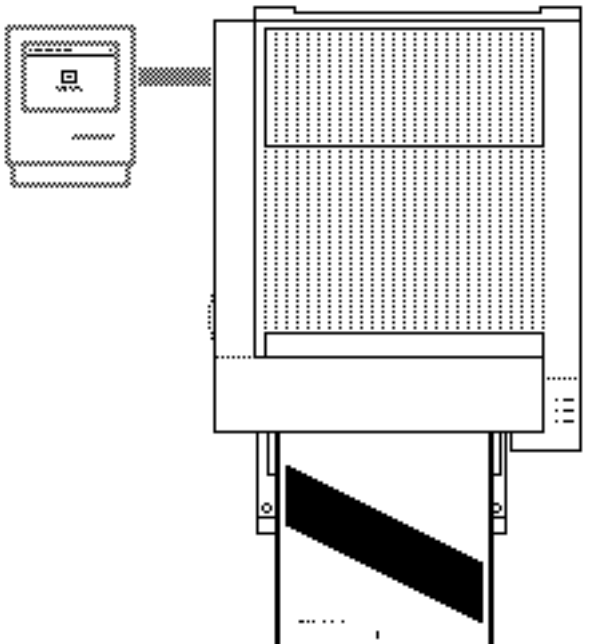
Use the cleaning page if frequent paper jams occur in the fuser area or after replacement of the toner cartridge. The cleaning page removes excess toner from the fuser rollers and other rollers inside the printer.

1 Place several sheets of paper on the multipurpose tray.



2 Open the “Cleaning page” file located on the Personal LaserWriter Installation Disk.

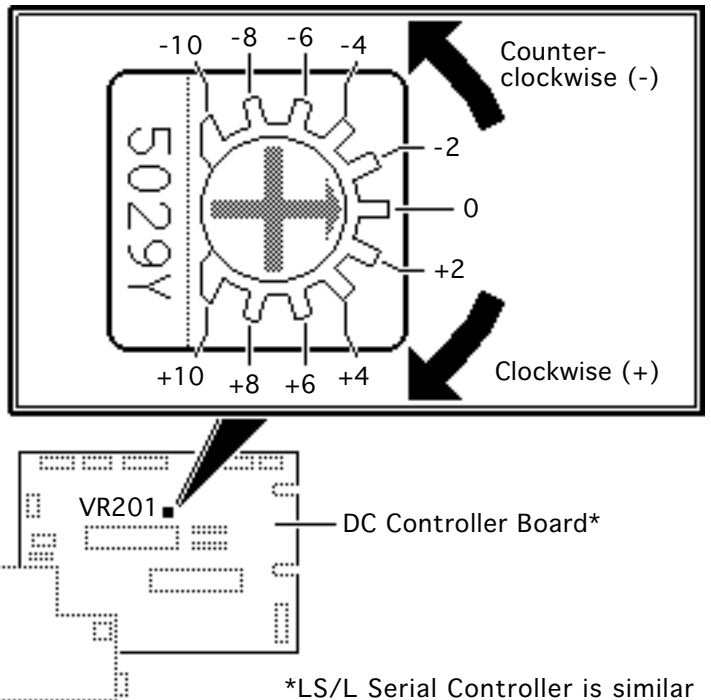
3 Select “Print” from the File menu and “Manual Feed” in the subsequent dialog box and click OK. The printer will print a cleaning page.



4 Place the cleaning page face-up on the multipurpose tray and repeat the printing procedure described on the previous page.

Adjustments

PLW SC/NT/NTR/LS



*LS/L Serial Controller is similar

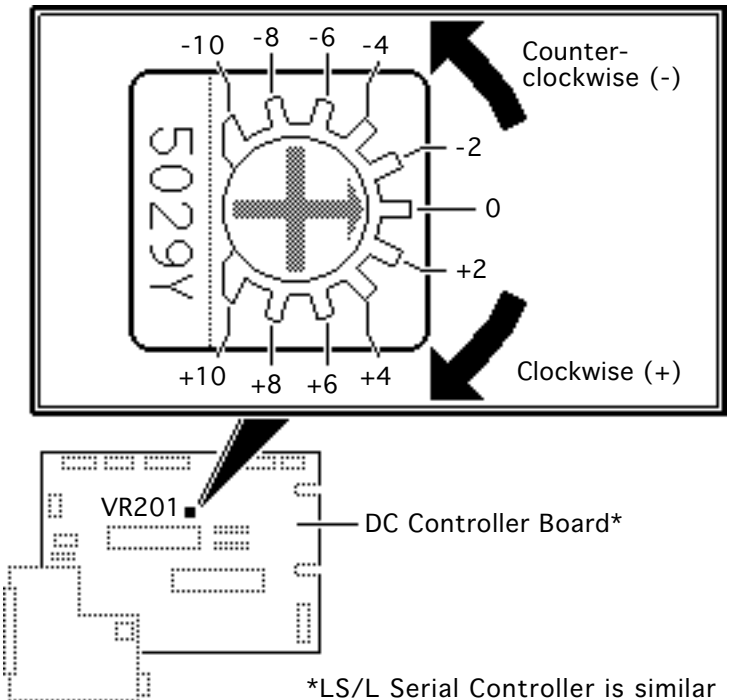
Registration Adjustment

Before you begin, remove the following:

- Top cover
- I/O board and I/O shield

Perform the registration adjustment whenever you replace the DC controller board (serial controller on the LS/L) or the scanner assembly motor.

1 Using a jeweler's screwdriver, reset VR201 on the DC

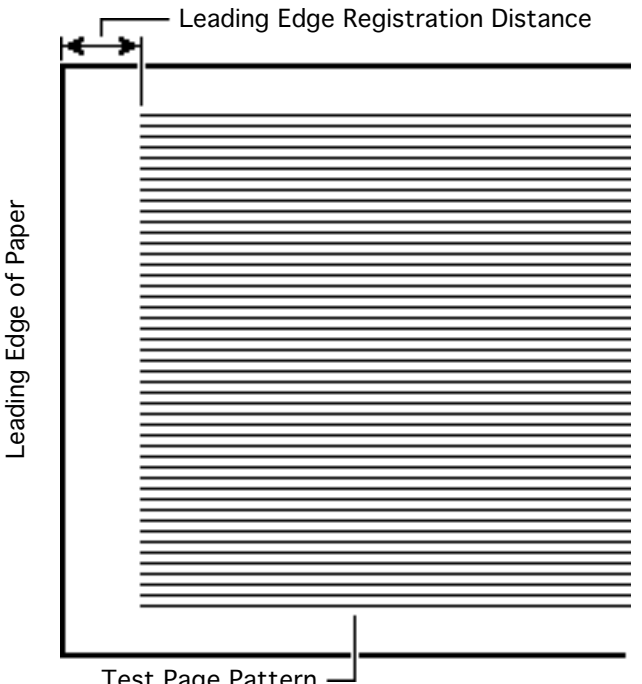


*LS/L Serial Controller is similar

controller board to “0”

2 Connect an AC power cord to the printer and switch on the printer.

3 Press the service test page button three times to make three service test pages.



4 Using a metric ruler, measure the distance from the leading edge of the paper to the test pattern for each print.

5 Calculate the average by adding the measurements and dividing by three. Subtract the average distance from 3.6 mm to determine the correct adjustment distance. For example, if your average distance is 2.4 mm, the adjustment required is 1.2 mm (3.6 mm minus 2.4 mm).

(-) Counterclockwise
(Avg. distance > 3.6 mm)

Correction Distance (mm)	VR201 Setting
-0.24	-1
-0.48	-2
-0.72	-3
-0.96	-4
-1.20	-5
-1.44	-6
-1.68	-7
-1.92	-8
-2.16	-9
-2.40	-10

(+) Clockwise
(Avg. distance < 3.6 mm)

Correction Distance (mm)	VR201 Setting
+2.40	+10
+2.16	+9
+1.92	+8
+1.68	+7
+1.44	+6
+1.20	+5
+0.96	+4
+0.72	+3
+0.48	+2
+0.24	+1

6 Using the table to the left, identify the adjustment required to return the registration adjustment to 3.6 mm. For example, with a required adjustment of 1.2 mm, you would set VR201 at +5 clockwise.

7 Adjust VR201 to the value indicated.

8 Print three more test pages. If the average registration adjustment is not 3.6 mm, repeat this procedure.

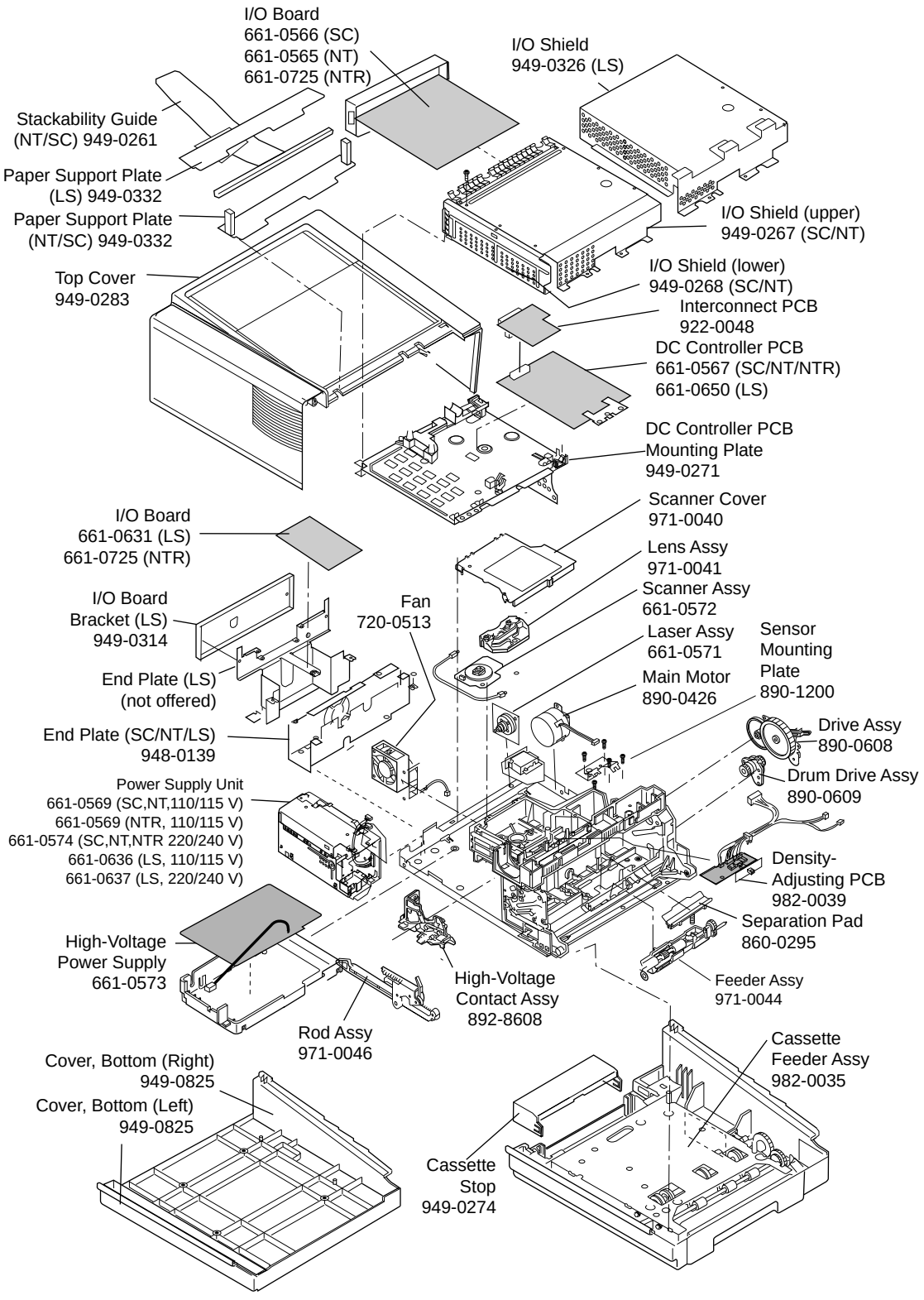
Refurbishment Kit

Since all major parts of the Personal LaserWriter are rated to last the life of the printer itself, no refurbishment kit exists for this family of printers.

Exploded View

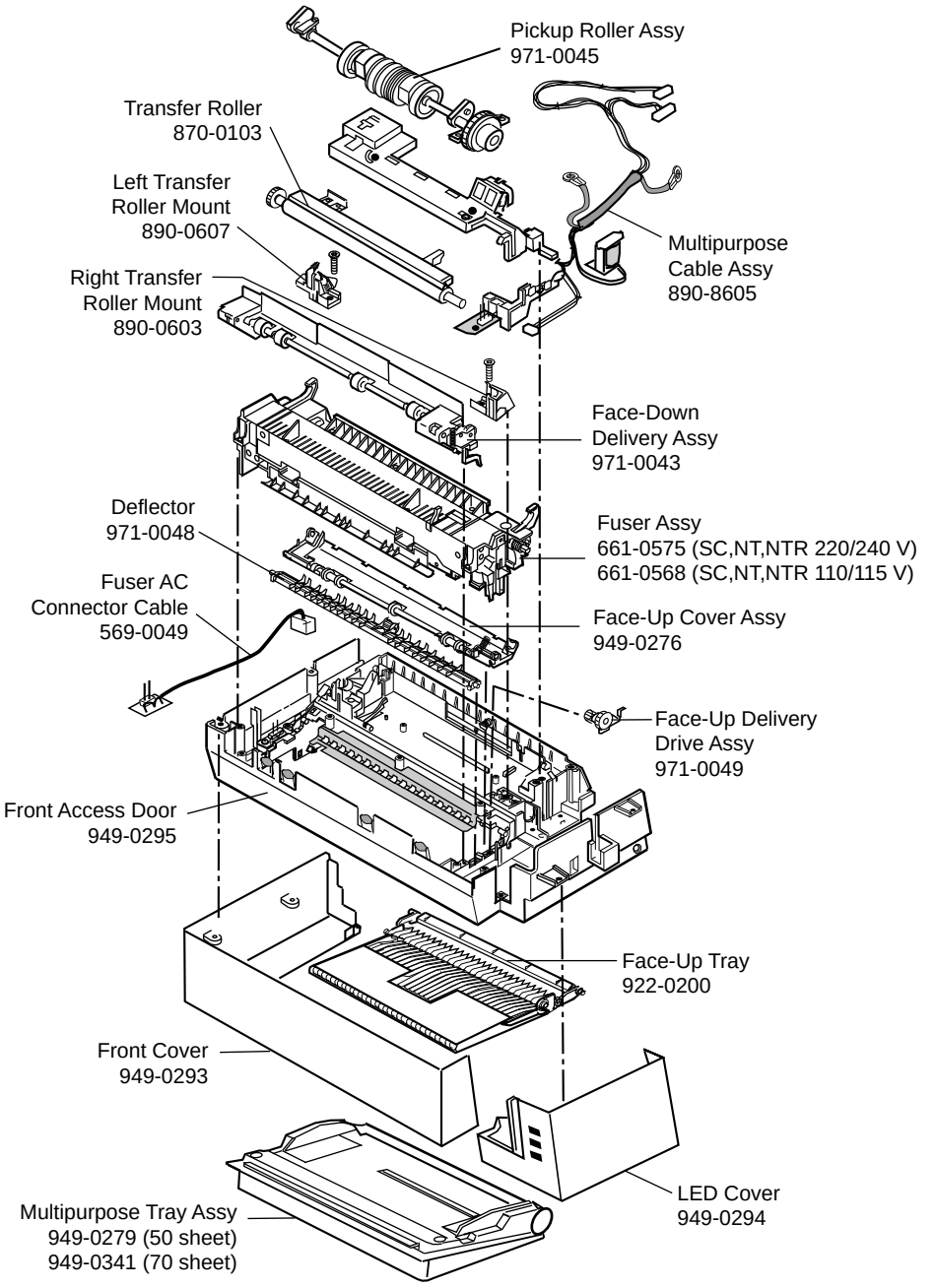
PLW SC/NT/NTR/LS

Personal LaserWriter SC/NT/NTR/LS Exploded View



Personal LaserWriter SC/NT/NTR/LS Exploded View

Personal LaserWriter Door Exploded View



Personal LaserWriter Door Exploded View