



PLW 300 & LW 4/600 PS

Personal LaserWriter 300, Personal LaserWriter 320,
LaserWriter 4/600 PS





Basics

PLW 300 & LW 4/600 PS



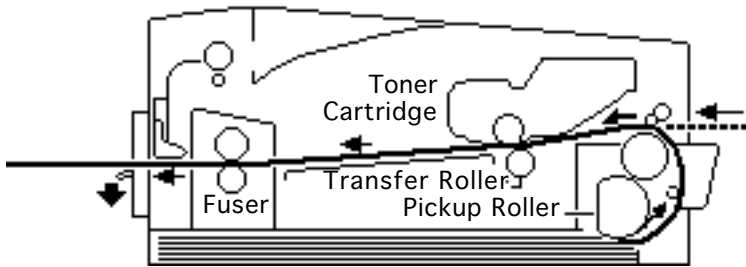
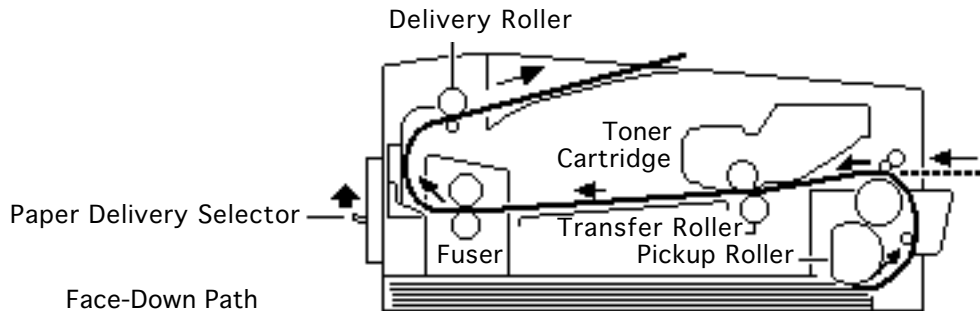


Paper Paths

There are two paper paths in this family of printers. Paper is fed from the paper cassette or manual-feed slot and delivered to the face-down tray or the face-up delivery slot.

When the paper delivery selector is in the up position, paper is delivered face-down. When the selector is in the down position, paper is delivered face-up. Default delivery is face-down at the top of the printer.

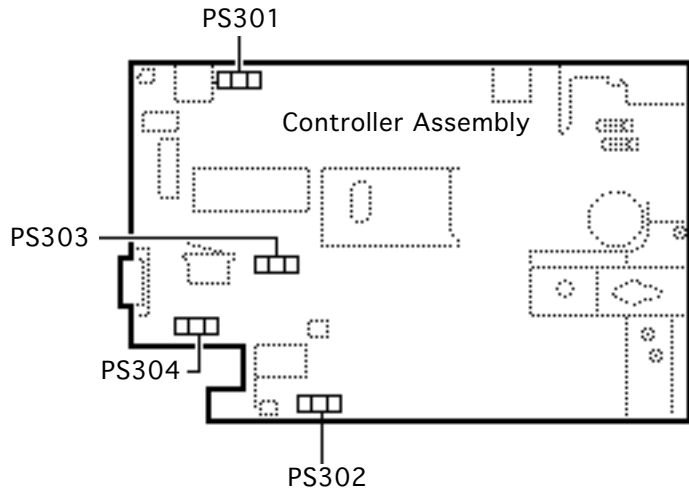






Sensing System Theory

There are four paper sensors in this family of printers:
PS304, PS303, PS302, and PS301.





Each consists of an actuator and a U-shaped photo interrupter that is soldered to the controller assembly. If the actuator is present inside the U, the circuit closes; if the actuator is absent, the circuit opens. In ready state the appropriate circuit is closed.

The paper sensors are actuated as an arm or lever swings against the paper as it moves through the printer.

Sensor Functions

The cassette empty sensor PS304 detects whether there is paper in the cassette tray. If the printer is set for cassette feed and the cassette is empty, sensor PS304 determines that a paper-out condition exists.

Registration paper sensor PS302 detects the presence of paper in the manual-feed slot and detects misfeeds of both





cassette-fed and manual-fed paper. If the paper does not reach the top position of this sensor in the required time, the printer determines that a pick-up delay jam has occurred.

Winding paper sensor PS303 detects the passage of paper from the photosensitive drum to the fuser. If the paper does not pass this sensor in time, the controller board determines that a jam condition exists.

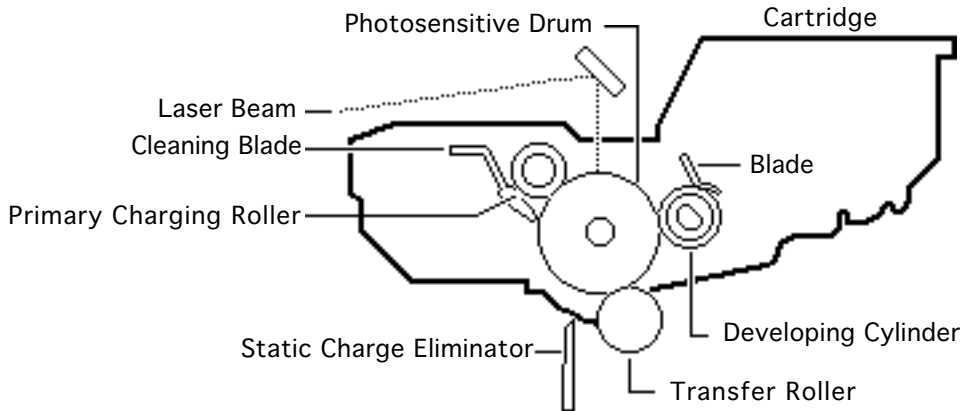
Paper delivery sensor PS301 detects the passage of paper through the fuser assembly. If the paper does not pass this sensor in time, the controller board determines that a jam condition exists.





Image Formation System

The nucleus of the printer is the image formation system, which includes the photosensitive drum, the developing unit, and the primary charging roller. These components are contained in the printer's toner cartridge.





The Printing Process

Upon receiving a print signal from the I/O board, the printer's controller assembly sends power to the main motor. The main motor, in turn, supplies the power that rotates the photosensitive drum, developing cylinder, primary charging roller, and transfer roller.

The primary charging roller applies a uniform negative charge on the photosensitive drum surface. At the same time, the laser/scanner assembly emits a laser beam that scans a latent image onto the surface of the photosensitive drum.

The latent image on the photosensitive drum becomes visible when the transfer roller transfers toner onto the developing cylinder.

Once the image is printed, the cleaner blade removes any





residual toner on the photosensitive drum surface. Then, as a final step, the primary charging roller lays a uniform charge on the photosensitive drum, readying the drum for the next latent image.





Status LEDs

The printer has three status LEDs: Ready/In Use, Paper-Out, and Paper-Jam.

While on standby, the printer's Ready/In Use status LED glows steadily. When a print command is received, the fan comes on and the Ready/In Use LED flashes.

If the cassette tray is empty and the printer is set for cassette feed, the Paper-Out LED glows steadily.

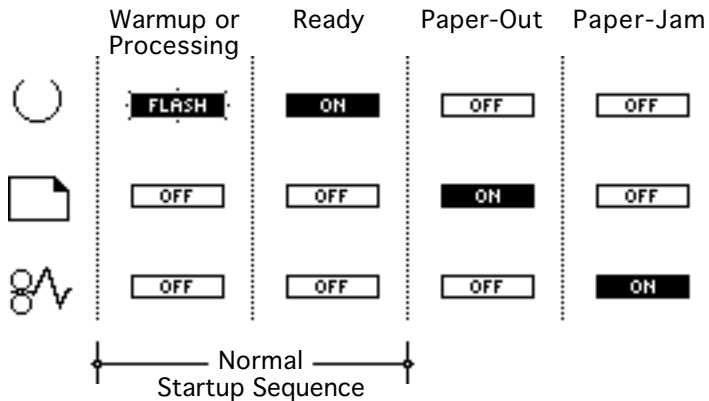
If paper is jammed in the printer, the Paper- Jam LED glows steadily.

Note: The Personal LaserWriter 320 and LaserWriter 4/600 PS also use LEDs to indicate errors during diagnostic mode. Refer to "Engine Diagnostic" in Troubleshooting Tips.





The four possible LED conditions for this printer are listed below:





Toner Cartridge

Caution: Avoid placing the toner cartridge near a CRT, disk drive unit, or floppy disk. Do not place the toner cartridge in an upright position or turn it upside down.

Before installing a new toner cartridge, hold the cartridge horizontally as shown and slowly rock it a 45° angle in both directions to evenly distribute the toner.

Print three or four pages after installing a new cartridge to remove any toner that might have leaked during installation.

Drum Exposure

Exposing the toner cartridge to light (even room light for more than 5 minutes) can damage the cartridge and may result in blank spots or black stripes on printed pages. To





avoid such exposure:

- Don't leave the rear access door open on the printer when the toner cartridge is installed.
- Always cover the toner cartridge when you remove it from the printer.
- Avoid storing opened toner packages in areas that are exposed to direct sunlight.

Note: If the cartridge has been irradiated by ordinary light, you may be able to repair the damage by placing the cartridge in a dark area, such as a drawer, for several hours. However, do not expose the cartridge to direct sunlight.





LaserWriter Safety

Unplug Printer

LaserWriter printers operate at high voltages. To prevent serious injury, always switch off the printer and unplug the AC power cord before servicing the printer.

Laser Beam Safety

Never disconnect the beam-detect cabling or laser shutter when the printer is switched on. Also be careful not to place screwdrivers or other shiny objects in the path of the laser beam. The reflected laser beam, though invisible, can permanently damage your eyes.

Never remove the cover of a laser/scanner assembly, whether the printer is powered on or not.





Fuser Heat

The fuser assembly becomes very hot during printer operation. Before servicing the fuser assembly, switch off the printer for at least 5 minutes to allow the fuser assembly to cool.

Toner Safety

Toner is a nontoxic substance composed of plastic, iron, and a small amount of pigment. Clean skin and clothing by removing as much toner as possible with a dry tissue and then washing with cold water. Hot water causes toner to jell and permanently fuse into clothing. Toner attacks vinyl materials, so avoid contact with vinyl.





Specifications

PLW 300 & LW 4/600 PS





General

Engine	Canon P90 engine
Printing Method	Electrophotography using single-component, dry-jumping development
Optical System	Semiconductor laser; scanning mirror
Resolution	300 dots per inch (dpi) (PLW 300 and 320) 600 dpi (LW 4/600 PS)
Imaging Language Supported	Quickdraw (PLW 300) PostScript Level 2 (PLW 320 and LW 4/600 PS)





**System
Requirements**

Macintosh computer with system 6.0.7 or later





Intro Date

**Personal
LaserWriter 300**

June 1993

**Personal
LaserWriter 320**

January 1994

**LaserWriter 4/600
PS**

June 1995





Logic Board

CPU	PLW 300: N/A PLW 320: AMD 29205 processor LW 4/600 PS: AMD 29200 RISC processor
RAM	PLW 300: 512 K PLW 320: 2 MB (expandable to 8 MB) LW 4/600 PS: 2 MB (expandable to 6 MB)
ROM	PLW 300: N/A PLW 320: 2.5 MB LW 4/600 PS: 2.5 MB





I/O

PLW 300: Serial, externally clocked

PLW 320: LocalTalk

LW 4/600PS: LocalTalk (EtherTalk and TokenTalk connectivity through LaserWriter Bridge 2.0 software.)





Performance

Printing Speed

Approximately 4 pages/min. (A4). Actual performance depends on the images printed and the computer used.

Duty Cycle

No limit in pages per month

Minimum Life Expectancy

150,000 pages

Printable Area

Maximum printable lines: 8 in. (203 mm)

Minimum top and bottom margins: 0.25 in. (6.35 mm)

Minimum left and right margins: 0.25 in. (6.35 mm)

The Personal LaserWriter 320 requires a total of 4 MB of RAM in order to print edge to edge on legal paper.





Paper

Paper Weights

Cassette feed: 17-20 lb., single-sheet, photocopy bond
Manual feed: 17-28 lb., letterhead and colored stock, standard-weight
transparency material, envelopes, and labels

Cassette Type

Universal (letter, legal, A4, executive)

Paper Delivery

Face-down/face-up

Capacity In

Cassette: 100 sheets
Manual: Single sheets, envelopes, transparency material, etc.

Capacity Out

25 plain sheets (face-down delivery only)





Transparency material, labels, and postcard paper are delivered face-up only and must be removed by hand.





Fonts

Serif Fonts

ITC Bookman, Courier, New Century Schoolbook, Palatino, Times, Chicago, and New York

Sans Serif Fonts

ITC Avant Garde, Helvetica, Helvetica Narrow, Geneva, and Monaco

Special-Purpose Fonts

Symbol, ITC Zapf Chancery, and ITC Zapf Dingbats





Electrical

Line Voltage

US/Japan: 100-120 V; 50-60 Hz

Europe/Australia: 220-240 V; 50 Hz

Power Consumption

Operating: 450 W maximum at 115 V or 220 V

Standby: 10 W or less





Physical

Dimensions

Width: 15.2 in. (38.5 cm)

Depth: 14.9 in. (37.9 cm)

Height: 6.3 in. (16.1 cm)

Weight

15.4 lb. (7 kg) without cartridge





Environmental

Temperature

Operating: 50-90.5° F (10-32.5° C)

Storage: 32-95° F (0-35° C)

Humidity

Operating: 20-80% relative humidity, noncondensing

Storage: 10-80% relative humidity, noncondensing

Ozone Emission

Less than 0.05 parts per million maximum, measured in accordance with ECMA 129 or UL114 standards for ozone





Troubleshooting

PLW 300 & LW 4/600 PS





General

The first part of this chapter contains quick-reference troubleshooting information for the Personal LaserWriter 300/320 and LaserWriter 4/600 PS. We encourage you to review and print out this chapter before troubleshooting a printer.

At the end of this chapter are troubleshooting flowcharts and tables. If a table name clearly addresses your problem, you can go directly to that table. If not, you should go to the flowchart associated with the version of the printer you are working on.





320 Power-On Self Test

The Personal LaserWriter 320 goes through a self diagnostic each time that you plug the printer in. This diagnostic is called the Power-On Self Test (POST). This test is not the same as the engine diagnostic (see next topic). Unlike the engine diagnostic test, POST does not require the placement of any loopback cable.

Note: POST does not occur on the Personal LaserWriter 300.

Observing how the LEDs extinguish from the time of startup can help isolate certain failure areas.

- When you plug in a functional printer, all LEDs will illuminate for a short time.
- The Ready LED extinguishes when no errors are found on the I/O controller board.
- The Paper-Out LED extinguishes when no errors are found on the RAM card.





- Finally the Jam LED extinguishes when no errors are found in the engine.

Note: In a functional printer, control will be passed on to the PostScript interpreter at the end of this sequence.





Engine Diagnostic

The Personal LaserWriter 320 and LaserWriter 4/600 PS have self-diagnostic capability built into the I/O board. When the printer is in diagnostic mode, the LEDs are displayed in special diagnostic sequences.

Note: The Personal LaserWriter 300 does not have self-diagnostic capability.

To enter the diagnostic mode, switch off the printer, place a serial loopback cable (P/N 922-1489) into the serial connector on the I/O board, and switch on the printer.

It may take up to 90 seconds for the diagnostic LEDs to display.

If the diagnostic detects an error, the LEDs will flash repeatedly through the following sequence until you switch off the printer.





1. All LEDs on for 1 second
2. All LEDs off for 1 second
3. <Error configuration> for 1 second
4. All LEDs off for 1 second

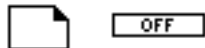
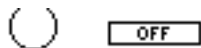
See next page for error configurations.



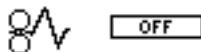
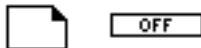


LED Error Configurations

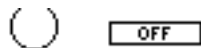
Controller Assembly



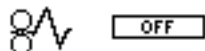
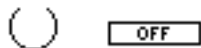
Fuser Assembly



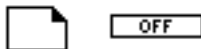
Fan Motor



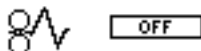
RAM Card



Laser Assembly



Misc. Engine





Troubleshooting Tips

Isolating Controller Board Problems

If you are unable to print a service test page (see "Service Test Page"), but the printer does cycle through its normal startup sequence (the fan comes on and the delivery rollers rotate), you most likely have a problem with the controller assembly or pickup solenoid.

Refer to the Take Apart chapter for instructions on how to replace the pickup solenoid and/or controller assembly.

Light Exposure Problems on Test Prints

When the printer cover is removed, the photosensitive drum inside the toner cartridge may be exposed to light. This exposure can affect the quality of your printouts.





Guard against light exposure when printing service test pages and other printouts by covering the toner cartridge with a piece of paper.

Interrupting a Print Cycle

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 imaging system.

If the image on the drum is OK, the fault is after the drum, probably in the fuser assembly or controller assembly.

To inspect the drum, initiate a printout. Wait approximately 12 seconds after you hear the paper being picked up from the cassette tray and then interrupt the printing process.





You should interrupt the printing process after the image has been transferred to the paper, but BEFORE the paper exits the fuser.

Remove the toner cartridge and turn it over. Pull back the shield that covers the photosensitive drum and inspect the drum surface.

Avoiding Paper Jams

The following tips will reduce your chances of a paper jam:

- Don't load already printed pages into the paper cassette—always use manual feed for printing the second side of two-sided copies.
- When printing multiple pages via manual feed, wait for the screen prompt before inserting a new sheet into the printer.
- Make sure that the paper cassette is properly loaded with one of the recommended paper types.



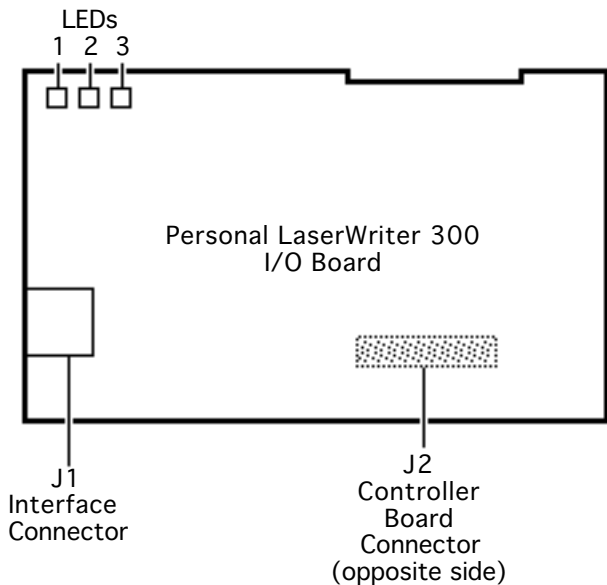


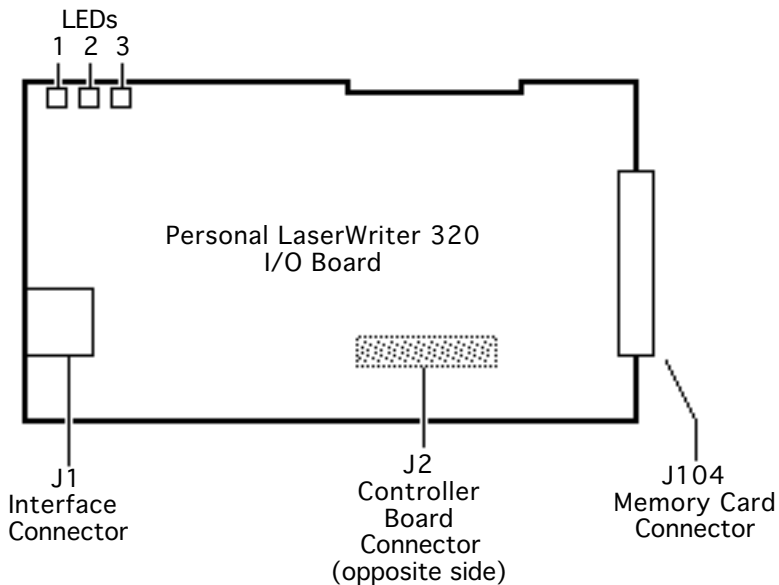
Circuit Board Diagrams

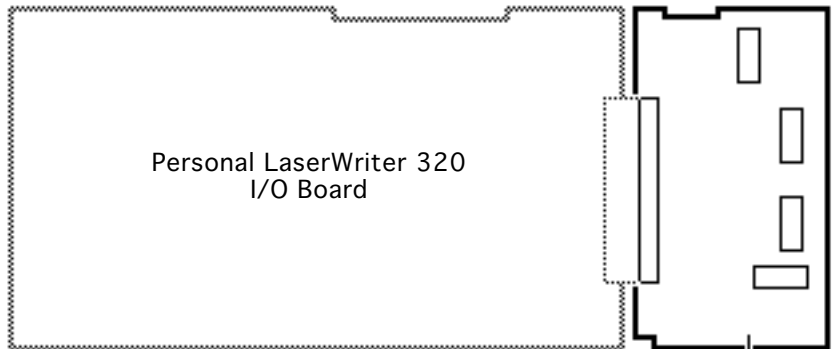
On the following pages are diagrams of the circuit boards and high-voltage contacts listed below:

- Personal LaserWriter 300 I/O Board
- Personal LaserWriter 320I/O Board
- Personal LaserWriter 320 2 MB RAM Expansion Card
- Personal LaserWriter 320 6 MB RAM Expansion Card
- Personal LaserWriter 300/320 Controller Assembly





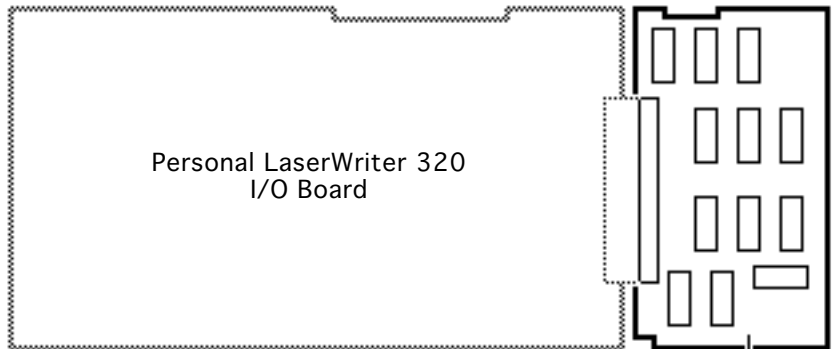




The 2 MB RAM Expansion Card mates into J104 on the Personal LaserWriter 320 I/O board to bring total RAM to 4 MB. 4 MB of RAM is required to print edge to edge on legal size paper.

2 MB RAM
Expansion Card

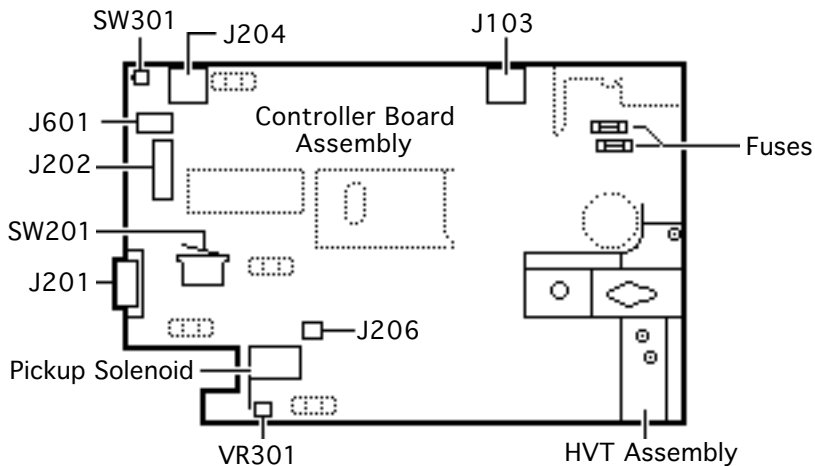




The 6 MB RAM Expansion Card mates into J104 on the Personal LaserWriter 320 I/O board to bring total RAM to 8 MB. 8 MB of RAM is required to print in PhotoGrade.

6 MB RAM
Expansion Card





The controller assembly controls the operation of the print engine. This assembly contains the high-voltage power supply, the four paper sensors, the printer fuses, the service test page button, and the pickup solenoid.

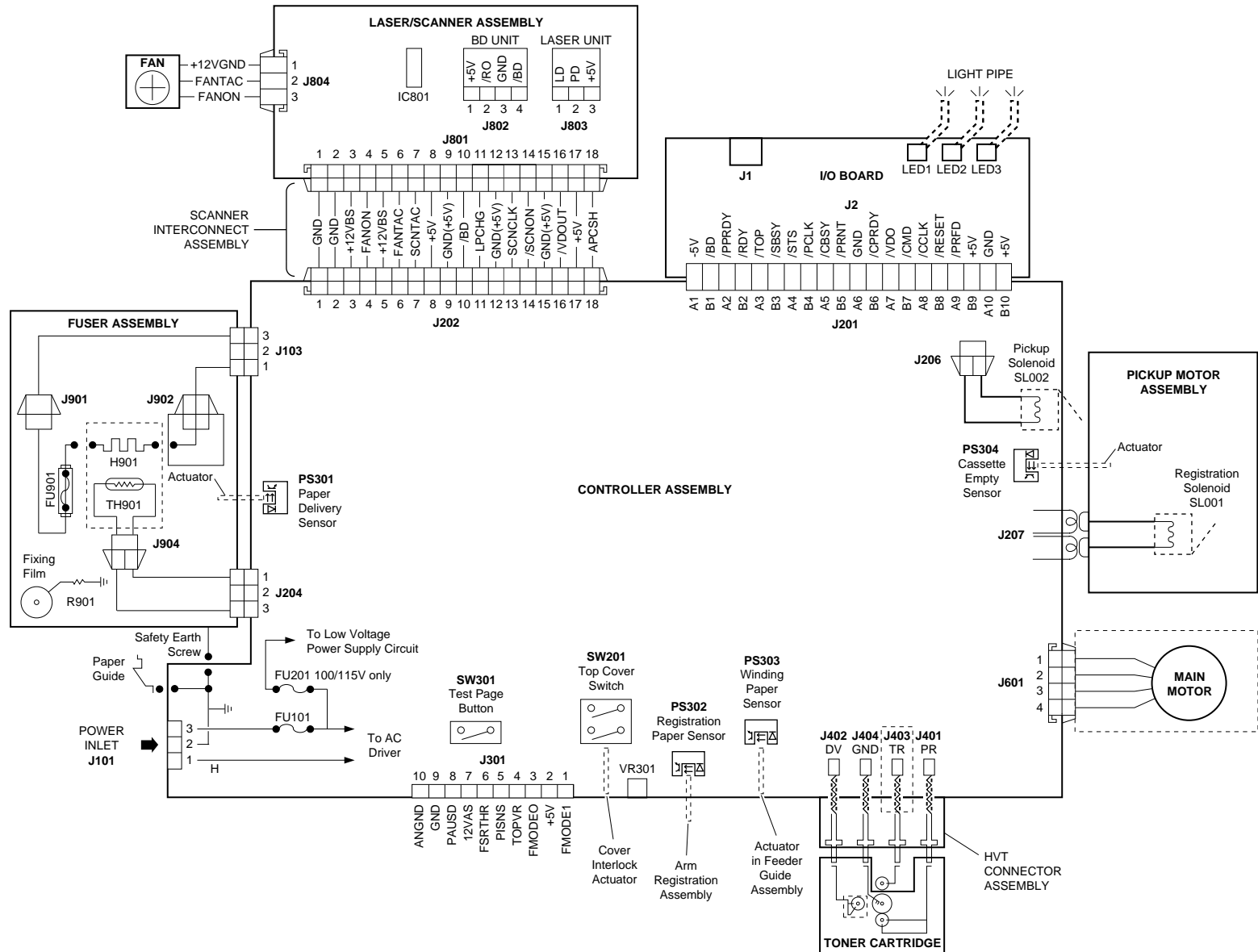




Wiring Diagram

The wiring diagram for this printer can be found on the next page. The detail in this document is too small to read easily at 100% view. You should either zoom into the diagram using the zoom tool above, or print the diagram on a laser printer with a resolution of 300 dpi (600 dpi preferred).







Service Test Page

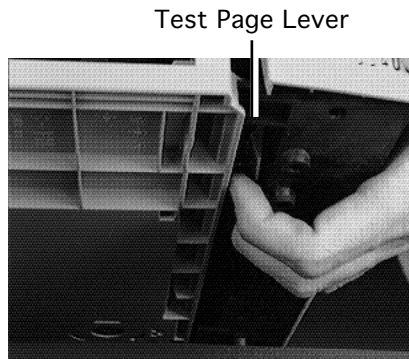
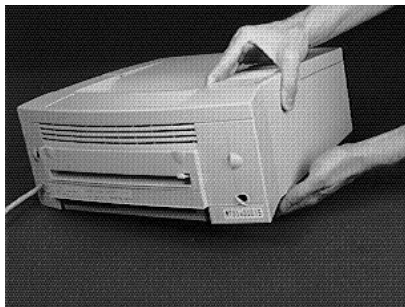
The service test page is generated by the controller assembly. It serves to confirm print engine operation.

There are two methods for generating the service test page, depending on the model of the printer that you are servicing.





LaserWriter 4/600 PS



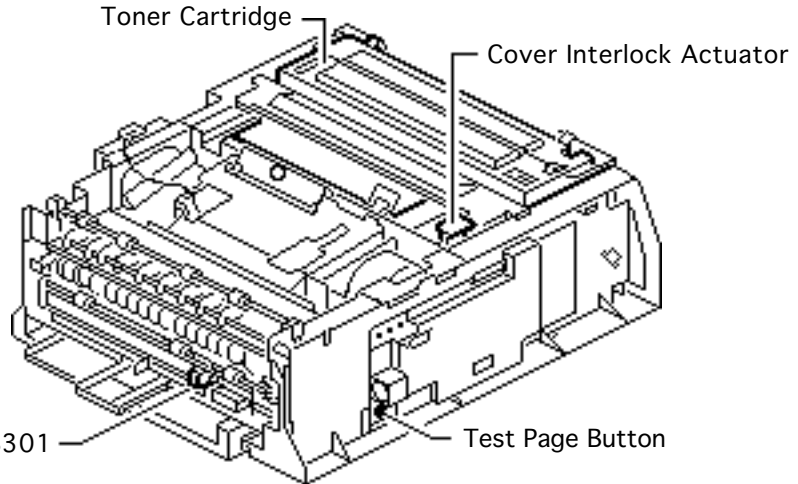
To generate a service test page on the LaserWriter 4/600 PS, raise the edge of the printer and press the plastic service test page lever underneath the printer. The photos above are taken from the “Service Test Page LW 4/600” movie that is included on this CD.





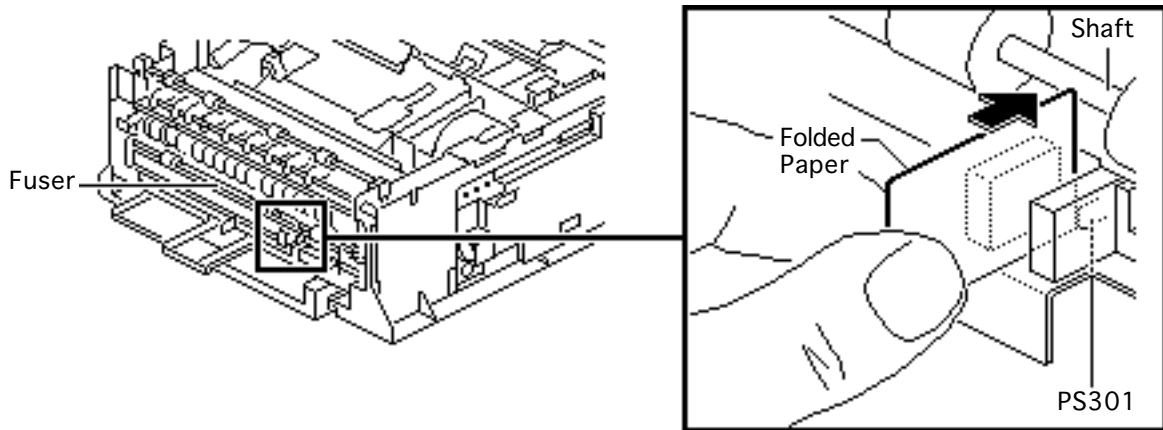
Personal LaserWriter 300/320

To generate a service test page on the Personal LaserWriter 300 or 320, perform the steps on the next page.





Remove the printer cover (refer to "Cover" in Take-Apart) and plug in the printer. Defeat the paper delivery sensor PS301 with a piece of folded paper. Insert the paper only until it touches the metal shaft on the fuser. If you insert the paper too far, the sensor will remain open and the printer will determine that a paper jam exists.





Cover the toner cartridge with a piece of paper to prevent exposure of the drum.

Press down on the toner cartridge and the cover interlock actuator while you press the service test page button with a screwdriver (or similar dowel-shaped tool).

Note: When you press down the cover interlock actuator, the fan should come on and the paper delivery rollers should rotate. If you don't hear the fan, verify that you have properly defeated the paper delivery sensor PS301, that you are holding down the cover interlock actuator all the way, and that the paper cassette is installed. If you do not press down firmly on the toner cartridge during the printing process, the test page may be blank.





Power Failure

AC power failure

- 1 Verify correct voltage at power outlet.
- 2 Check power cord connections at printer and outlet.
- 3 Replace fuse FU101 on controller assembly.
- 4 Replace controller assembly.

DC power failure

- 1 Examine cause of tripping of overcurrent detection circuit in controller assembly.
- 2 Replace fuse FU201 on controller assembly.
- 3 Replace controller assembly.





No Paper Pickup

No pickup (manual feed)

- 1 Check arm registration assembly and replace if broken.
- 2 Replace pickup motor assembly.
- 3 Replace controller assembly.

No pickup (cassette feed)

- 1 Check cassette-empty sensor lever and replace if broken.
- 2 Replace pickup solenoid on controller assembly.
- 3 Inspect pickup roller on pickup motor assembly and replace if damaged.
- 4 Replace pickup motor assembly.
- 5 Replace controller assembly.





Printer Jams

Paper jam LED lights
when there's no
paperjam

- 1 Check arm registration assembly and replace if broken.
- 2 Check paper delivery sensor and replace if broken.
- 3 Replace controller assembly.





Motor Failure

Motor doesn't rotate

- 1 Verify motor is making good contact with controller assembly at connector J601.
- 2 Replace main motor.
- 3 Replace controller assembly.





Fan Failure

Fan doesn't come on

- 1 Verify fan is making good contact with laser/scanner assembly at connector J804.
- 2 Replace fan.
- 3 Replace controller assembly.





Fuser Assembly Failure

No power to fuser assembly

- 1 Verify fuser assembly is properly seated and making good contact with controller assembly at connectors J103 and J204.
- 2 Replace fuser assembly.
Note: After replacing the fuser assembly, wait at least 10 minutes before plugging in the printer to allow the capacitor to discharge.
- 3 Replace controller assembly.





Printer Drops After 3 Pages

The printer drops connections to the Macintosh after printing three pages.

Replace the fan.





Environmental Problems

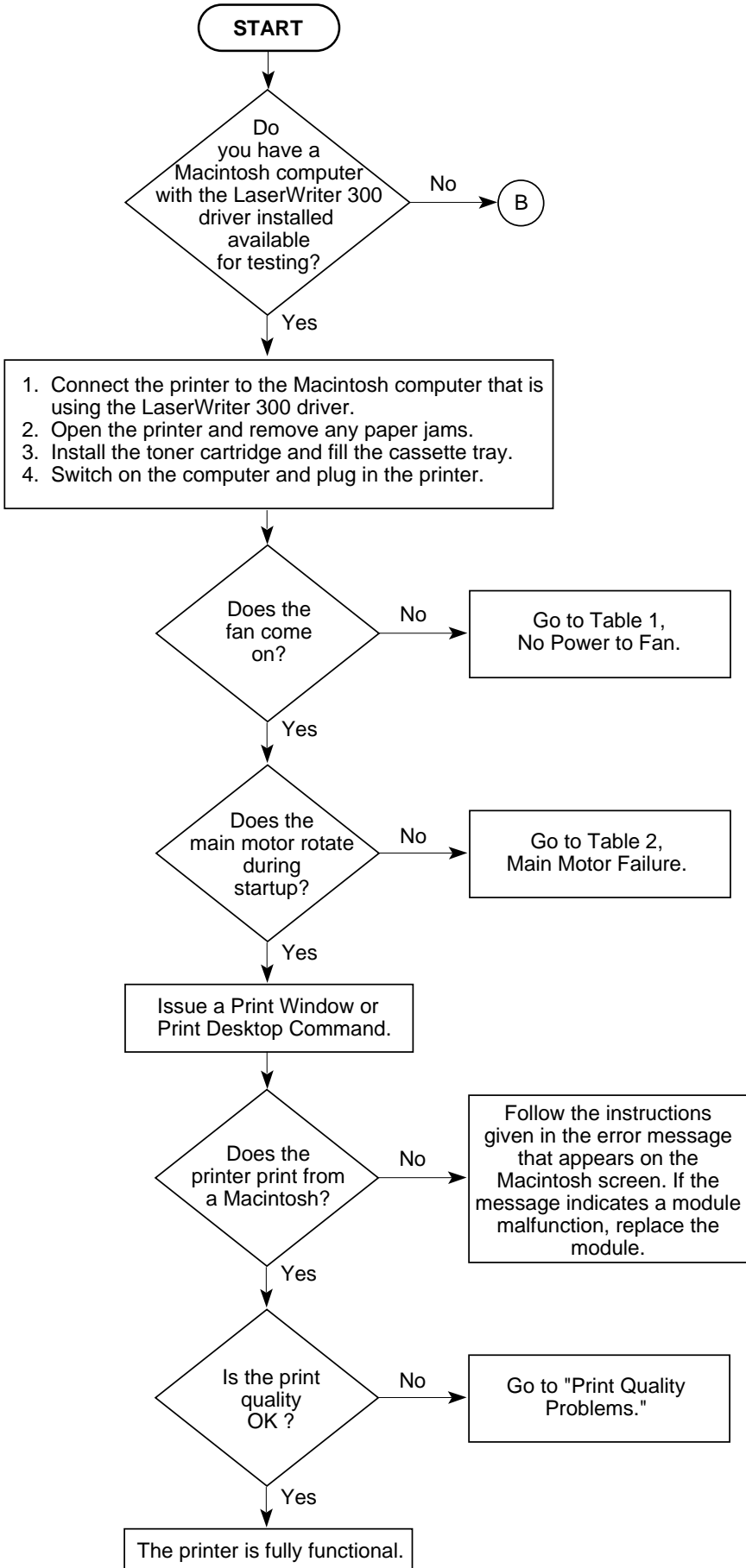
Room lights flicker when printer cycles to print.

There have been reports of the Personal LaserWriter 300/320 causing sporadic flickering in some incandescent lights when the printer cycles to print. Replacing the controller assembly has cured this problem in the cases that have been reported.



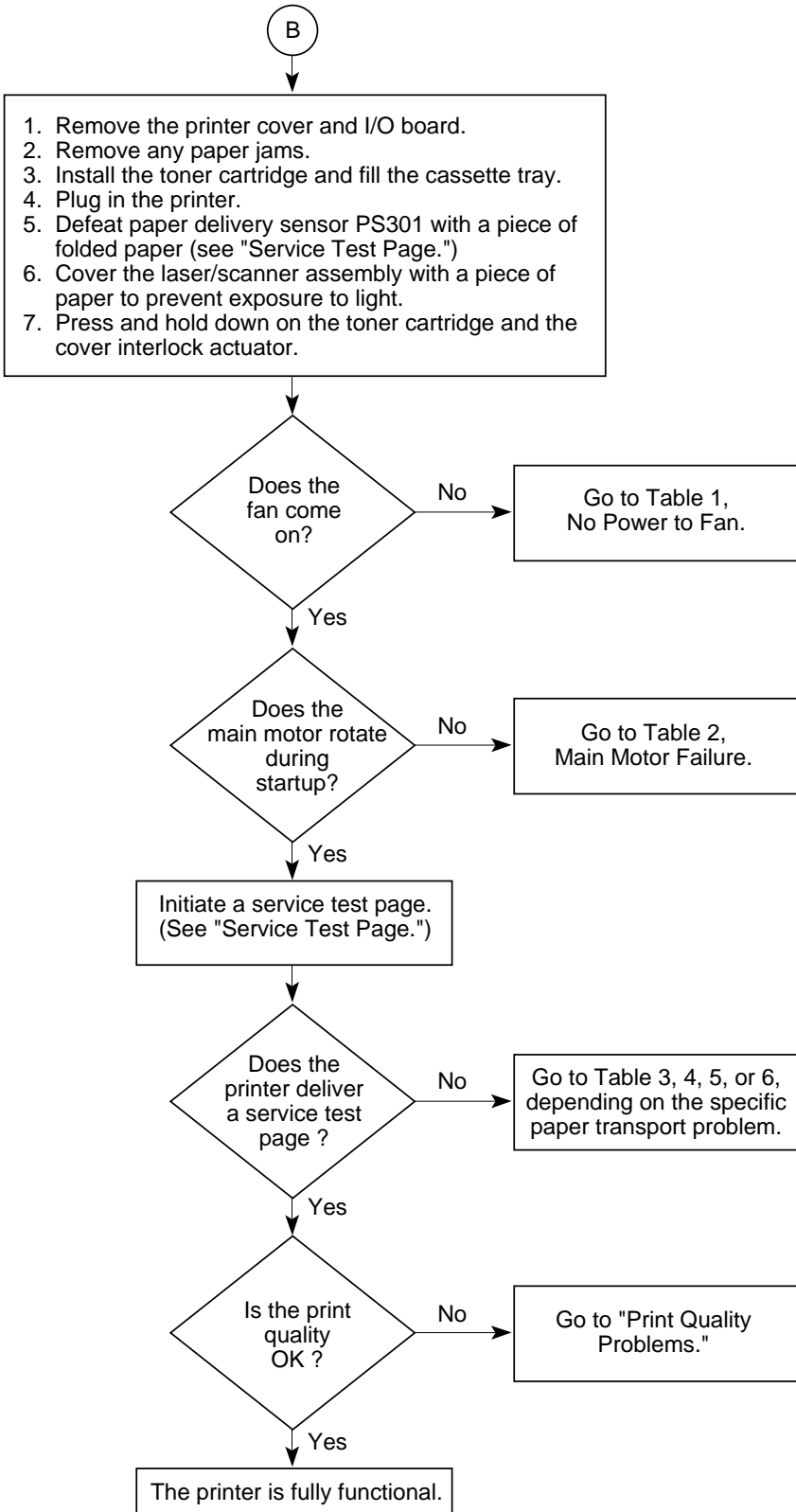


PLW 300 Flowchart 1



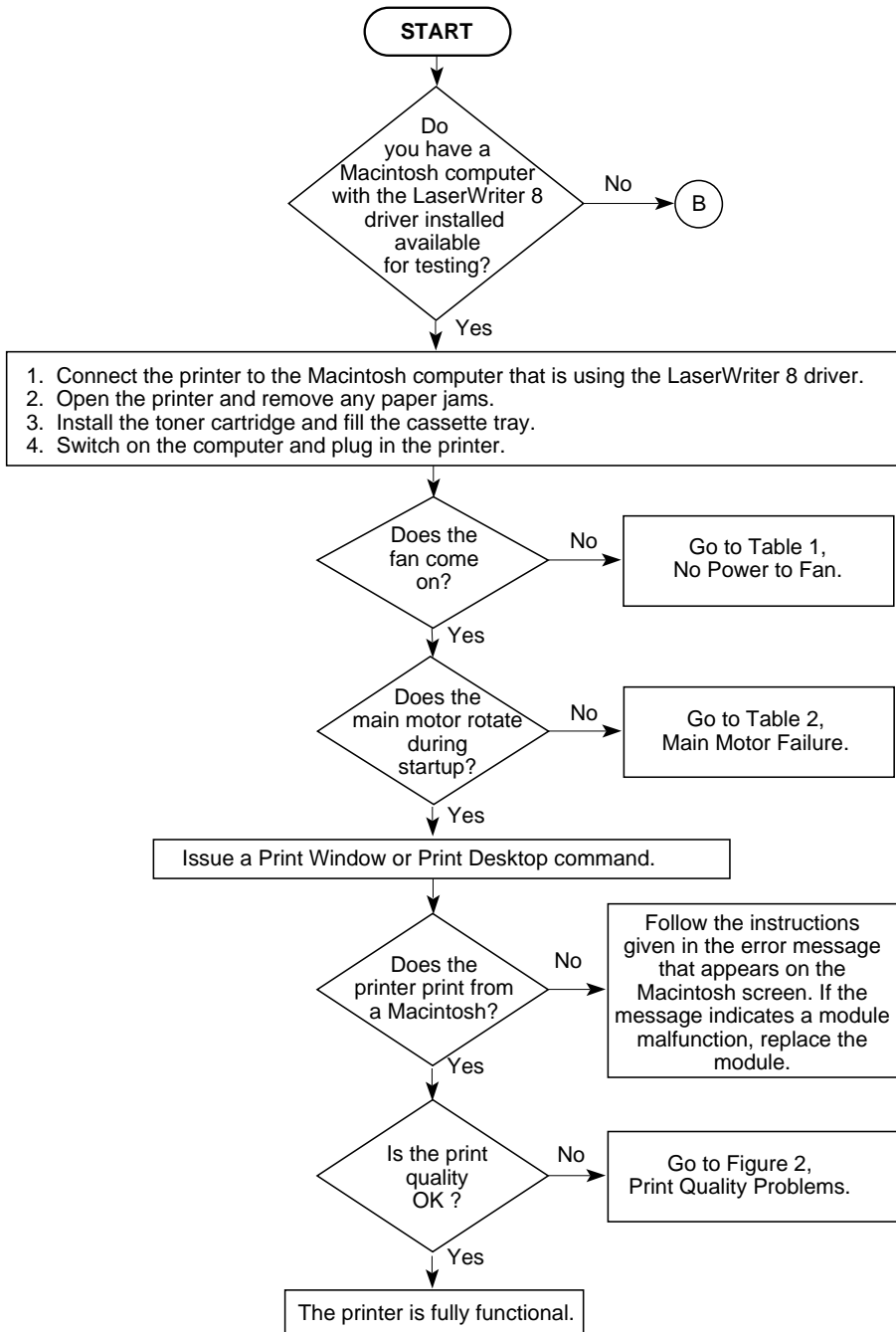


PLW 300 Flowchart 1 (Continued)



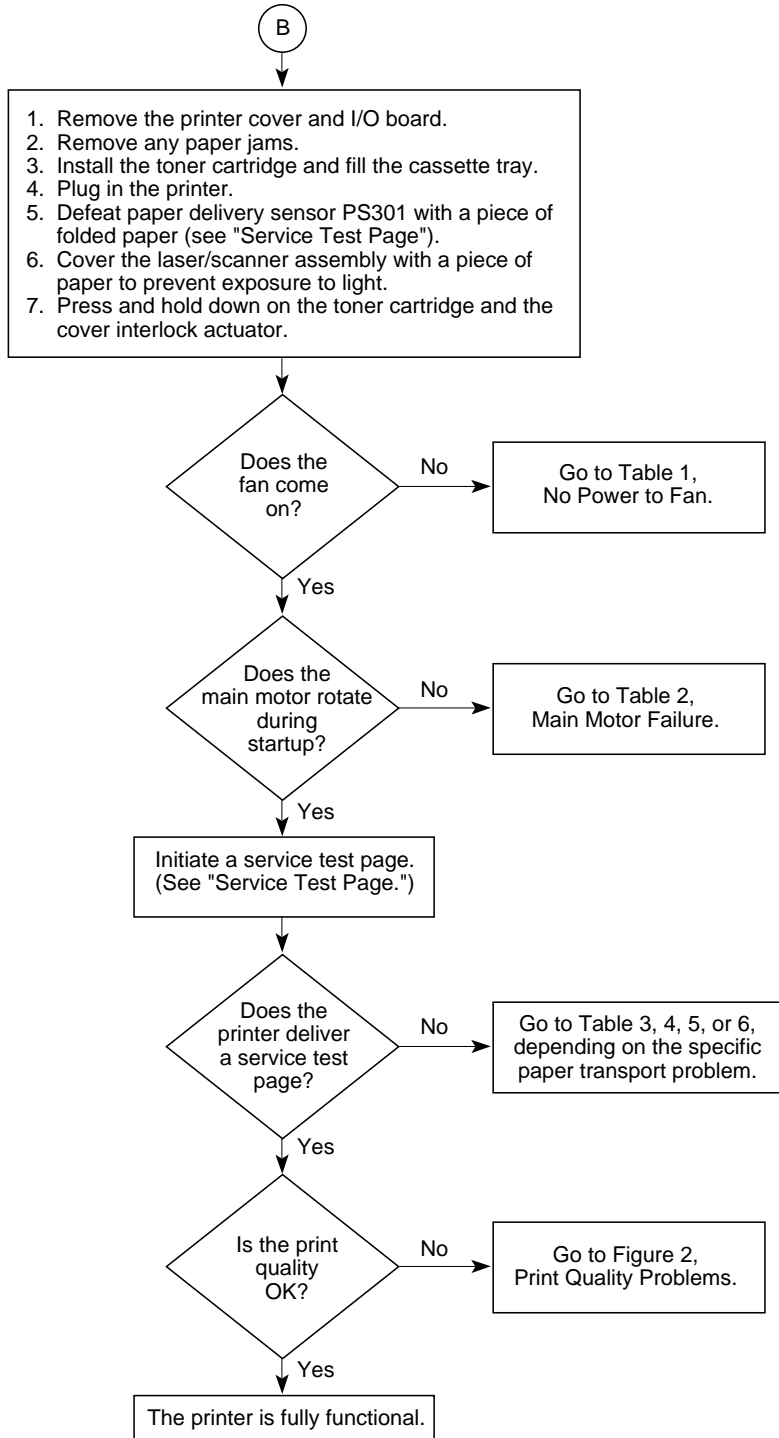


PLW 320 and LW 4/600 Flowchart 1





PLW 320 and LW 4/600 Flowchart 1 (Continued)





Troubleshooting Tables

Important As you proceed through the steps in a table, remember to retry the printer each time you change its physical state—for example, when you replace a module. If the problem remains, reinstall the original module before proceeding to the next step in the table. Refer as necessary to the wiring diagram that follows the tables.

Table 1. No Power to Fan

Step	Check	Result	Action
1	Make sure the toner cartridge is installed and then unplug the printer. Because of the possibility of a capacitor error, wait 4 minutes and then plug in the printer. Does the problem persist?	No	Problem solved.
2	Is the printer cover securely seated and the rear door assembly installed and securely closed? Or, if the cover is removed, do you have the cover interlock actuator depressed and the paper delivery sensor defeated?	No	Reseat the printer cover and/or install and close the rear door assembly. Or, depress the cover interlock actuator and defeat the paper delivery sensor.
3	Is there correct voltage at the outlet?	No	Plug in the printer at an outlet that is supplying the correct voltage.
4	Is the power cord securely connected at the outlet and at the printer end?	No	Secure the power cord.
5	Is the fan cable securely connected to the laser/scanner assembly?	No	Secure the fan cable.



Table 1. No Power to Fan (Continued)			
Step	Check	Result	Action
6	Is the fan cable pinched under the top tab that secures the fan to the chassis?	Yes	Make sure the fan cable runs under the side of the tab.
7	Does the voltage between connector J804-3 (FANON) and J804-1 (+12VGND) on the laser/scanner assembly change from 0 V to about 12 VDC when you plug in the printer?	Yes	Replace the fan.
8	Is fuse FU101 on the controller assembly blown?	Yes No	Replace the fuse. Replace the controller assembly.

Table 2. Main Motor Failure			
Step	Check	Result	Action
1	Is the motor properly seated and making good contact with the controller assembly?	No Yes	Reseat the motor so that it makes good contact with the controller assembly. Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: <ul style="list-style-type: none"> • Replace the motor. • Replace the controller assembly.

Table 3. No Paper Pickup from Cassette Tray			
Step	Check	Result	Action
1	Have you set the printer for cassette-feed in the Print dialog box?	No	Select the Cassette option in the Print dialog box.



Table 3. No Paper Pickup from Cassette Tray (Continued)

Step	Check	Result	Action
2	Was the toner cartridge installed before you plugged in the printer?	No	With the toner cartridge installed, unplug the printer and plug it back in again.
3	Try printing with known-good paper. Does the problem persist?	No	Problem solved.
4	Remove excess paper from the cassette tray. Does the problem persist?	No	Problem solved.
5	Is the paper pickup roller worn or deformed?	Yes	Replace the paper pickup roller.
6	Replace the pickup solenoid on the controller assembly. Does the problem persist?	No	Problem solved.
7	Is the fuser assembly properly seated and making good contact with the controller assembly?	No	Reseat the fuser assembly so that it makes good contact with the controller assembly.
8	Remove the fuser assembly and measure the resistance between connectors J204-1 and J204-2. Does the resistance measure approximately 440 kΩ?	No	Replace the fuser assembly.
9	Is there continuity between connectors J103-1 and J103-2?	No Yes	Replace the fuser assembly. Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: <ul style="list-style-type: none"> • Replace the controller assembly • Replace the pickup motor.



Table 4. No Paper Pickup From Manual-Feed Slot

Step	Check	Result	Action
1	Is the printer set up for manual feed?	No	Select the Manual Feed option in the Print dialog box.
2	Try printing with known-good paper. Does the problem persist?	No	Problem solved.
3	Remove excess paper from the manual-feed slot. Does the problem persist?	No	Problem solved.
4	Is the arm registration assembly broken?	Yes	Replace the arm registration assembly.
		No	Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: <ul style="list-style-type: none"> • Replace the pickup motor. • Replace the controller assembly. • Replace the fuser assembly.

Table 5. Paper Jams in Pickup/Transfer Area

Step	Check	Result	Action
1	Try printing with known-good paper. Does the problem persist?	No	Problem solved.
2	Was the toner cartridge installed before you plugged in the printer?	No	With the toner cartridge installed, unplug the printer and plug it back in again.
3	Is the paper wrinkled or damaged?	Yes	Check the inside of the printer for physical obstructions and make sure that all paper feed assemblies are installed correctly.

**Table 5. Paper Jams in Pickup/Transfer Area (Continued)**

Step	Check	Result	Action
4	Inspect the arm registration assembly. Is it jammed or broken?	Yes	Replace the arm registration assembly.
5	Inspect the winding paper sensor on the feeder guide assembly. Is it jammed or broken?	Yes	Replace the feeder guide assembly.
6	Does the paper jam when you print a service test page?	Yes No	Replace the fuser assembly. Replace the pickup motor. If the problem persists, replace the controller assembly.

Table 6. Paper Jams in Fuser/Delivery Area

Step	Check	Result	Action
1	Try printing with known-good paper. Does the problem persist?	No	Problem solved.
2	Is the paper wrinkled or damaged?	Yes	Check the inside of the printer for physical obstructions.
3	Inspect the winding paper sensor on the feeder guide assembly. Is it jammed or broken?	Yes	Replace the feeder guide assembly.
4	Inspect the delivery roller assembly and passive delivery rollers. Are they installed correctly and in good working order?	No	Replace or reseal the delivery roller assembly and/or passive delivery rollers.

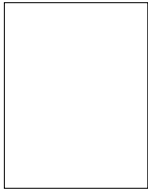
**Table 6. Paper Jams in Fuser/Delivery Area (Continued)**

Step	Check	Result	Action
5	Remove the rear door assembly and inspect the operation of the paper delivery selector. Does the assembly move freely?	No	Replace the rear door assembly.
6	Test the paper delivery sensor in the fuser assembly. Does it appear to be jammed or broken?	Yes No	Replace the fuser assembly. Replace the controller assembly. If the problem persists, replace the fuser assembly.



Print Quality Problems

The following graphic shows examples of image quality defects. Refer to the appropriate troubleshooting table to correct the quality of the image.



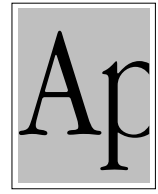
All-Blank Page
See Table 7



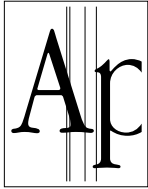
All-Black Page
See Table 8



Light/Faded Image
See Table 9



Dark Image
See Table 10



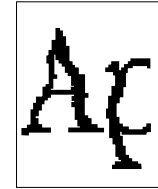
Black Vertical Line(s)
See Table 11



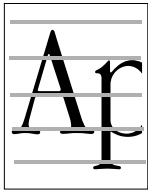
White Vertical Line(s)
See Table 12



Irregular Black Line
See Table 13



Stairstepping
See Table 14



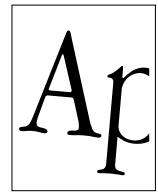
Horizontal Banding
See Table 15



Black Horizontal Lines
See Table 16



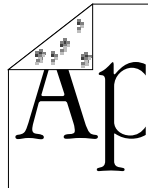
Bad Registration
See Table 17



Skewed Print
See Table 18



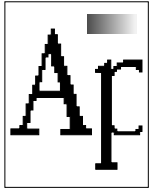
Bad Fusing
See Table 19



Toner on Back
See Table 20



Blank Spots
See Table 21



No PhotoGrade Resolution
See Table 22



Legal Size Print Area
See Table 23



Table 7. All-Blank Page

Step	Check	Result	Action
1	Has the sealing tape been removed from the toner cartridge, and is the cartridge free from any other obstructions?	No	Remove the sealing tape or other obstructions from the toner cartridge.
2	If the printer cover is removed, make sure you are pressing down on the toner cartridge during the printing process so that the toner cartridge is making solid contact with the HVT connector. Does the problem persist?	No	Problem solved.
3	Are the metal contact points on the toner cartridge or HVT connector assembly dirty?	Yes	Clean the contact points with a soft, dry cloth.
		No	Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: <ul style="list-style-type: none"> • Replace the controller assembly. • Replace the laser/scanner assembly.

Table 8. All-Black Page

Step	Check	Result	Action
1	Replace the controller assembly with a known-good controller assembly. Does the problem persist?	No	Problem solved.
		Yes	Replace the laser/scanner assembly.

**Table 9. Uniformly Light/Faded Image Over Entire Page**

Step	Check	Result	Action
1	Remove the toner cartridge and rock it back and forth to distribute the toner evenly. Does the problem persist?	No	Problem solved.
2	Adjust the print density, using the Options button in the Print dialog box, and print about a dozen test pages with known-good paper. Does the problem persist?	No	Problem solved.
3	Replace the toner cartridge with a known-good cartridge. Does the problem persist?	No	Problem solved.
4	Are the metal contact points on the toner cartridge or HVT connector assembly dirty?	Yes No	Clean the contact points with a soft, dry cloth. Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: <ul style="list-style-type: none">• Replace the transfer roller assembly.• Replace the HVT connector assembly.• Replace the controller assembly.• Replace the laser/scanner assembly.



Table 10. Uniformly Dark Image Over Entire Page

Step	Check	Result	Action
1	Adjust the print density, using the Options button in the Print dialog box, and print about a dozen test pages with known-good paper. Does the problem persist?	No	Problem solved.
2	Are the metal contact points on the toner cartridge or HVT connector assembly dirty?	Yes	Clean the contact points with a soft, dry cloth.
		No	Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: <ul style="list-style-type: none"> • Replace the controller assembly. • Replace the laser/scanner assembly.

Table 11. Black Vertical Lines, Sharp and Well-Defined

Step	Check	Result	Action
1	Try printing with a known-good toner cartridge. Does the problem persist?	No	Problem solved.
2	Does the problem occur only when you print from the Macintosh, not when you print a service test page?	Yes	Replace I/O board.
		No	Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: <ul style="list-style-type: none"> • Replace the fuser assembly. • Replace the laser/scanner assembly.

**Table 12. White Vertical Lines, Sharp and Well-Defined**

Step	Check	Result	Action
1	Is there any type of physical obstruction near the laser opening that could be casting a shadow on the photosensitive drum?	Yes	Remove the obstruction.
2	Does the problem occur only when you print from the Macintosh, not when you print a service test page?	Yes No	Replace the I/O board. Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: <ul style="list-style-type: none">• Replace the pickup motor.• Replace the laser/scanner assembly.• Replace the mirror assembly.

Table 13. Irregular Black Lines

Step	Check	Result	Action
1	Replace the toner cartridge. Does the problem persist?	No	Problem solved.



Table 14. Stairstepping/Vertical Lines Jagged or Shaky			
Step	Check	Result	Action
1	Is the laser/scanner assembly properly seated and making good contact with the scanner interconnect assembly?	No	Reseat the laser/scanner assembly.
2	Is the scanner interconnect assembly properly seated and making good contact with the controller assembly?	No	Reseat the scanner interconnect assembly.
3	Does the problem appear when you print a service test page?	No Yes	Replace the I/O board. Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: <ul style="list-style-type: none"> • Replace the laser/scanner assembly. • Replace the controller assembly.

Table 15. Horizontal Banding, Evenly Spaced Smudged Black Lines Over Image			
Step	Check	Result	Action
1	Interrupt a print cycle and inspect the photosensitive drum. Does the fault appear on the drum?	Yes No	Replace the toner cartridge. Replace the fuser assembly.



Table 16. Black Horizontal Lines, Sharp and Well-Defined

Step	Check	Result	Action
1	Does the problem appear on normal prints, but definitely not on a service test page?	Yes	Replace the I/O board.
		No	Replace the fuser assembly. Replace the laser/scanner assembly.

Table 17. Bad Registration

Step	Check	Result	Action
1	Try printing with known-good paper. Does the problem persist?	No	Problem solved.
2	Remove the excess paper from the cassette tray or manual-feed slot. Does the problem persist?	No	Problem solved.
3	Perform the registration adjustment (see "Registration Adjustment"). Does the problem persist?	No	Problem solved.
		Yes	Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: <ul style="list-style-type: none"> • Clean or replace the pickup roller as needed. • Replace the pickup motor. • Replace the arm registration assembly if broken. • Replace the controller assembly.

**Table 18. Skewed Print**

Step	Check	Result	Action
1	Adjust the mirror assembly (see “Mirror Adjustment”). Does the problem persist?	No	Problem solved.

Table 19. Bad Fusing

Step	Check	Result	Action
1	Try printing with known-good paper. Does the problem persist?	No	Problem solved.
2	Remove the excess paper from the cassette tray or manual-feed slot. Does the problem persist?	No	Problem solved.
3	Perform the registration adjustment (see “Registration Adjustment”). Does the problem persist?	No Yes	Problem solved. Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: <ul style="list-style-type: none">• Clean the transfer roller.• Replace the transfer roller.• Replace the fuser assembly.

**Table 20. Toner on Back of Page**

Step	Check	Result	Action
1	Clean the transfer roller using a dry, lint-free cloth only. If the roller cannot be cleaned, replace it. Does the problem persist?	No	Problem solved.
2	Clean the transfer guide assembly. Does the problem persist?	No	Problem solved.
3	Clean the feeder guide assembly. Does the problem persist?	No Yes	Problem solved. Replace the fuser assembly.

Table 21. Blank Spots, Random Pattern or Location

Step	Check	Result	Action
1	Try printing with dry, known-good paper. Does the problem persist?	No	Problem solved.
2	Clean the transfer roller using a dry, lint-free cloth only. Does the problem persist?	No Yes	Problem solved. Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: <ul style="list-style-type: none">• Replace the fuser assembly.• Replace the transfer roller.

**Table 22. No PhotoGrade on Personal LaserWriter 320**

Step	Check	Result	Action
1	Have you installed the 6 MB RAM expansion card?	No	Install the 6 MB RAM expansion card on the I/O board. This will bring the total RAM to 8 MB. Eight MB of RAM is required to print in Offgrade.

Table 23. Personal LaserWriter 320 Legal Size Print Area Not Edge-to-Edge

Step	Check	Result	Action
1	Have you installed the 2 MB RAM expansion card?	No	Install the 2 MB RAM expansion card on the I/O board. This will bring the total RAM to 4 MB. Four MB of RAM is required to print edge-to-edge on legal size paper.



Take Apart

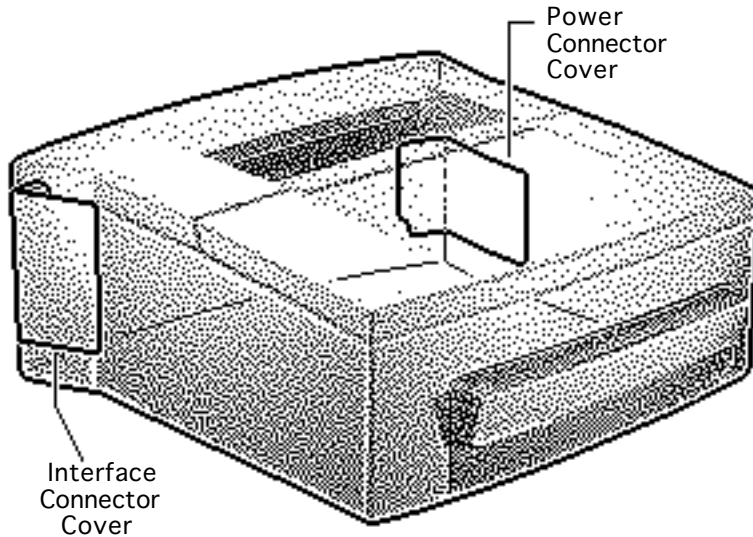
PLW 300 & LW 4/600 PS

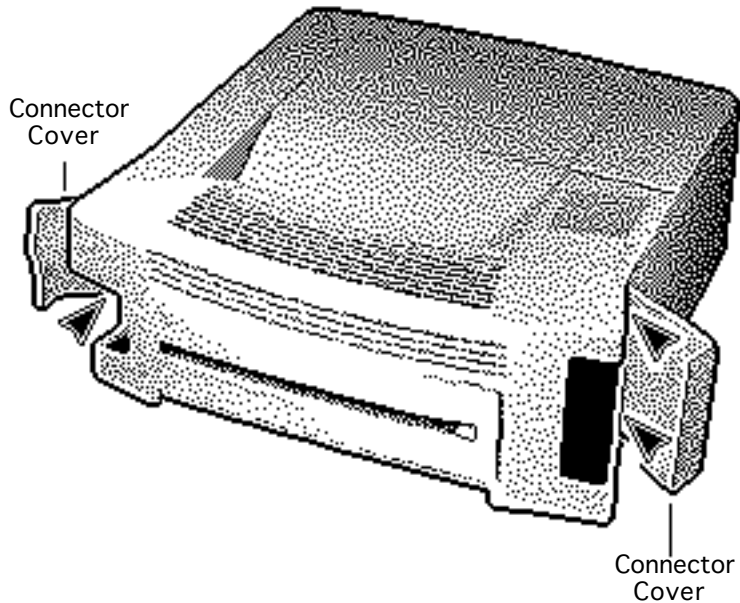




Connector Covers

No preliminary steps are required before you begin this procedure.





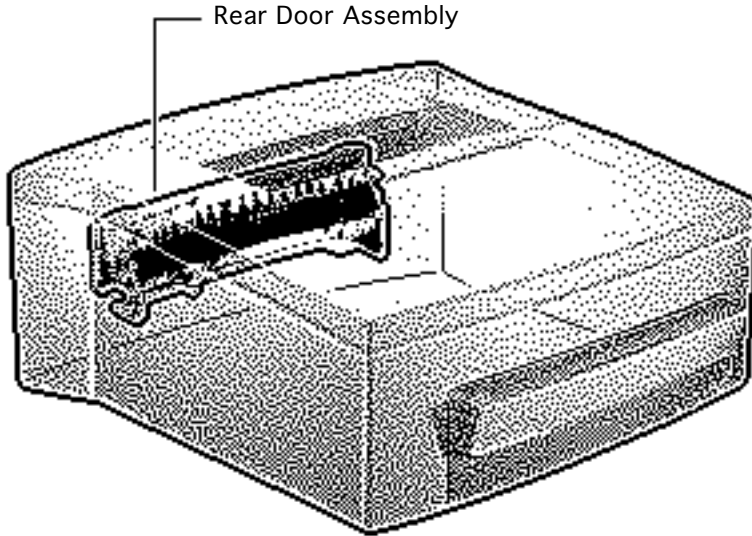
- 1 Open the connector covers.
- 2 Release the tabs at the top and bottom of each connector cover, and remove the connector covers from the main cover.

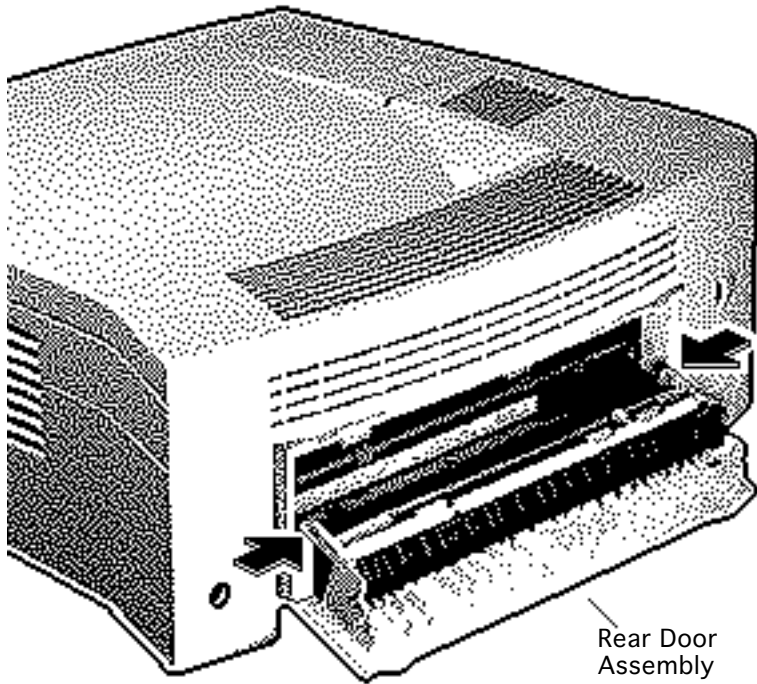




Rear Door Assembly

No preliminary steps are required before you begin this procedure.





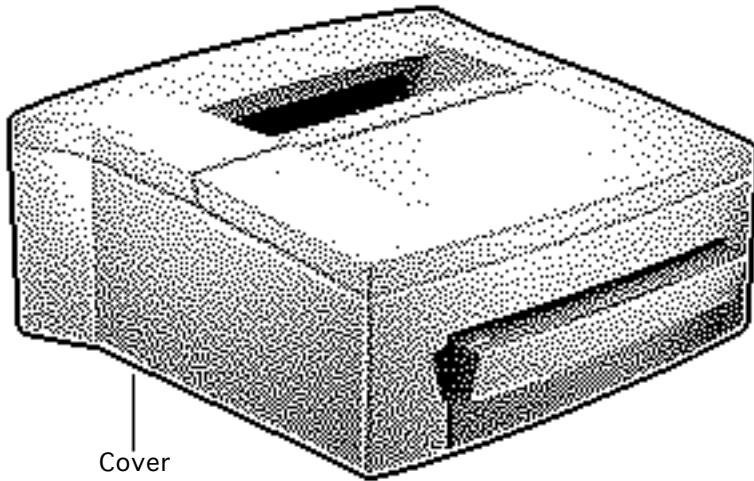
- 1 Open the rear door assembly.
- 2 Push the assembly to the right to free the left hinge and to the left to free the right hinge.
- 3 Lift the rear door assembly out of the printer.





Cover

No preliminary steps are required before you begin this procedure.

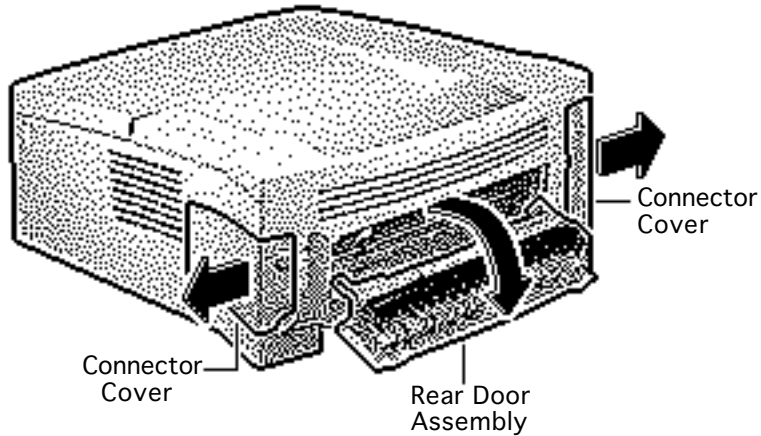


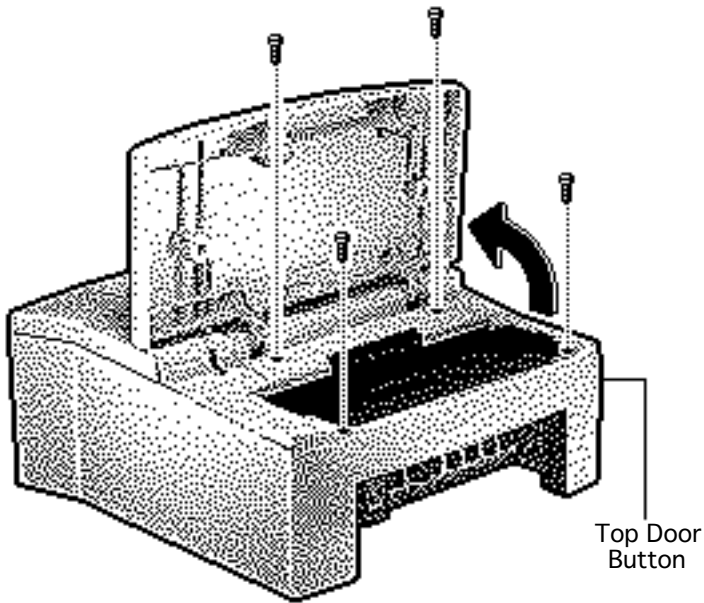
Cover





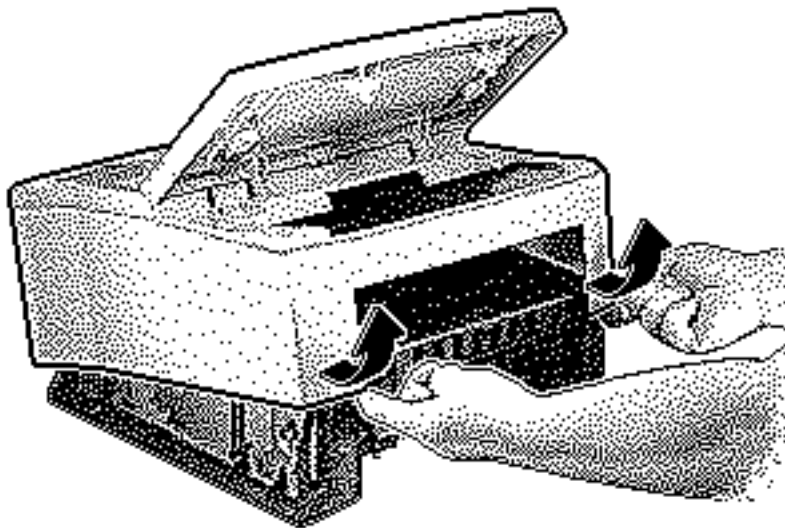
- 1 Open the rear door assembly and side connector doors.





- 2 Push the button on the right side of the printer and open the top door of the cover.
- 3 Remove the four screws that secure the cover to the chassis.





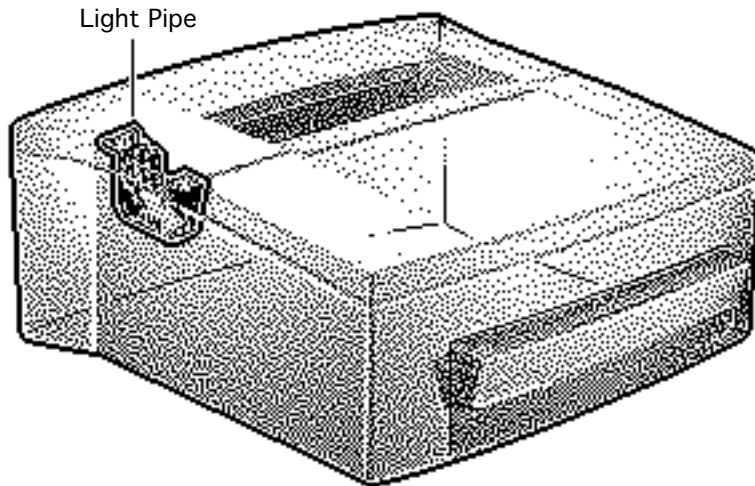
- 4 Grip the two back corners of the cover and pull out to release the back tabs.
- 5 Grip the two front corners of the cover and pull out to release the front tabs.
- 6 Lift the cover and remove it from the printer.

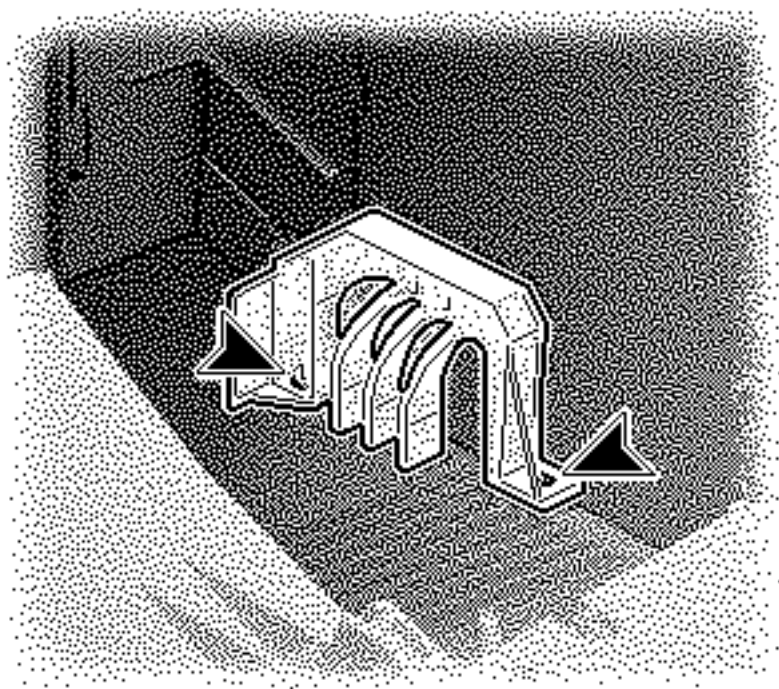




Light Pipe

Before you begin, remove the cover.





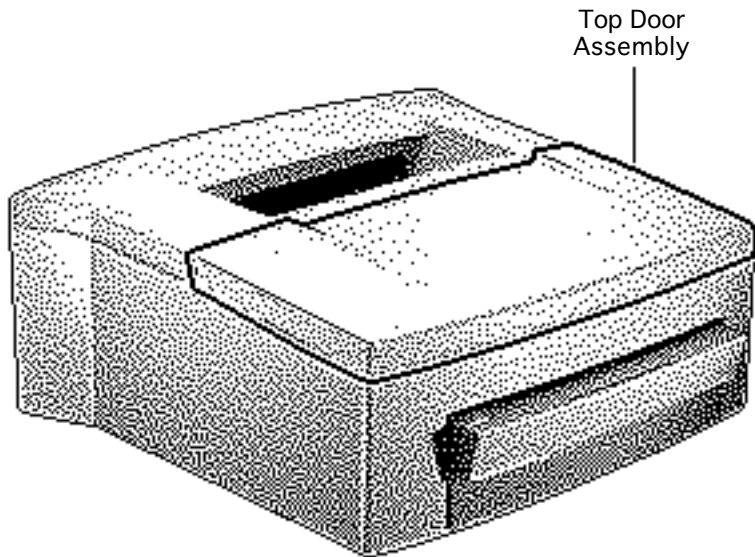
- 1 Turn the cover upside down.
- 2 Using a flat-blade screwdriver, pry up the small lockwashers that secure the light pipe to the cover.
- 3 Lift the light pipe and remove it from the cover.

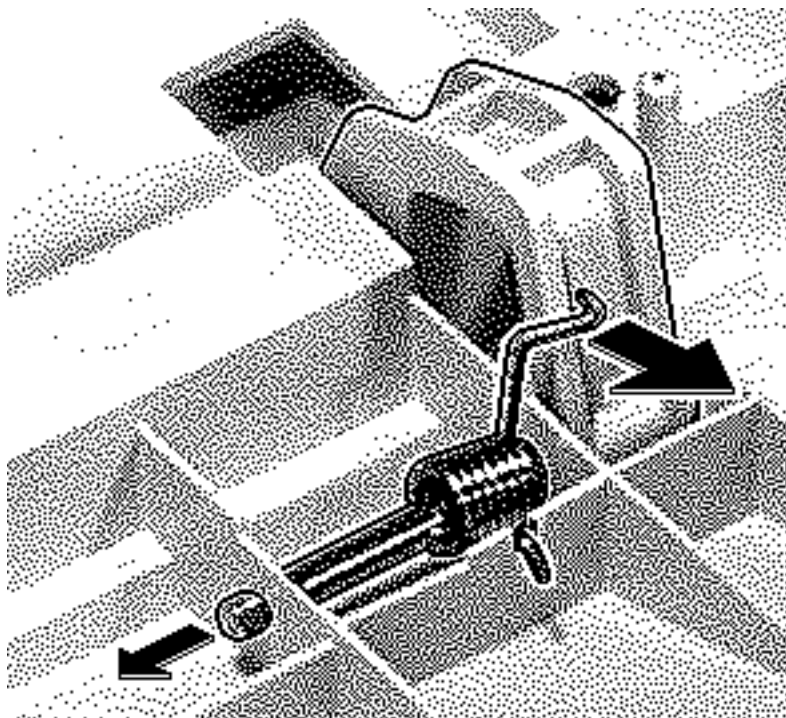




Top Door Assembly

Before you begin, remove the cover.





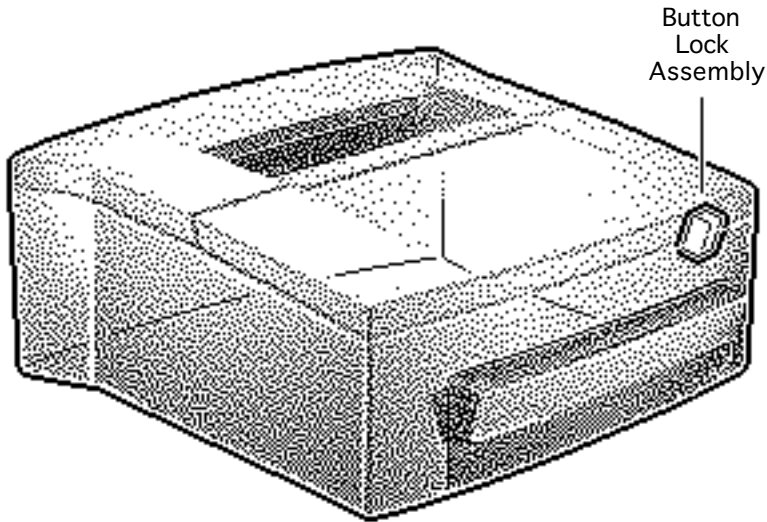
- 1 Turn the cover upside down.
- 2 Using needle-nose pliers, lift up the end of each spring and release the spring.
- 3 Grip the metal bar that holds each spring. Slide the bar toward the middle of the cover until the bar clears the plastic hinges.
- 4 Pull down on the top door assembly to free the hinges and remove the top door assembly from the cover.

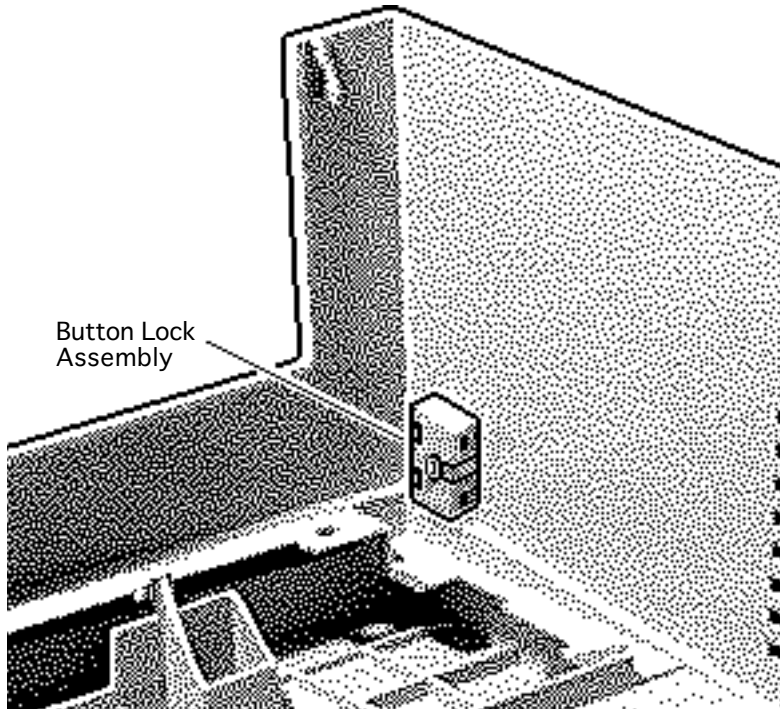




Button Lock Assembly

Before you begin, remove the cover.





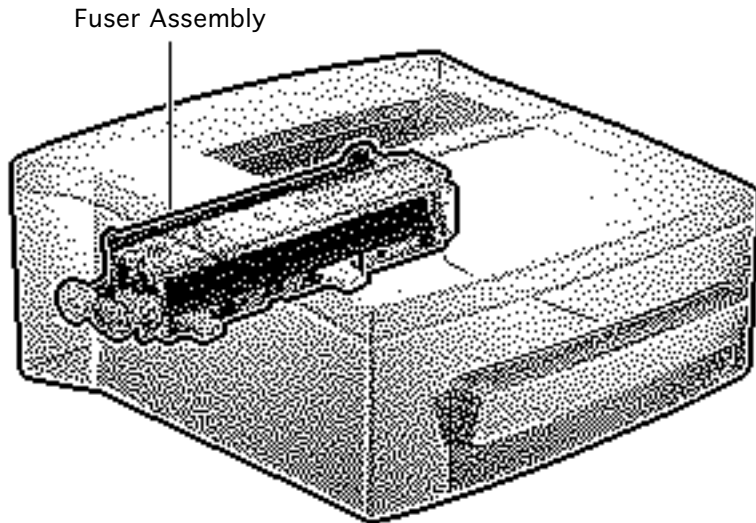
- 1 Turn the cover upside down.
- 2 Using a flat-blade screwdriver, release the tabs on either side of the button lock assembly.
- 3 Push out the button assembly and remove it from the cover.

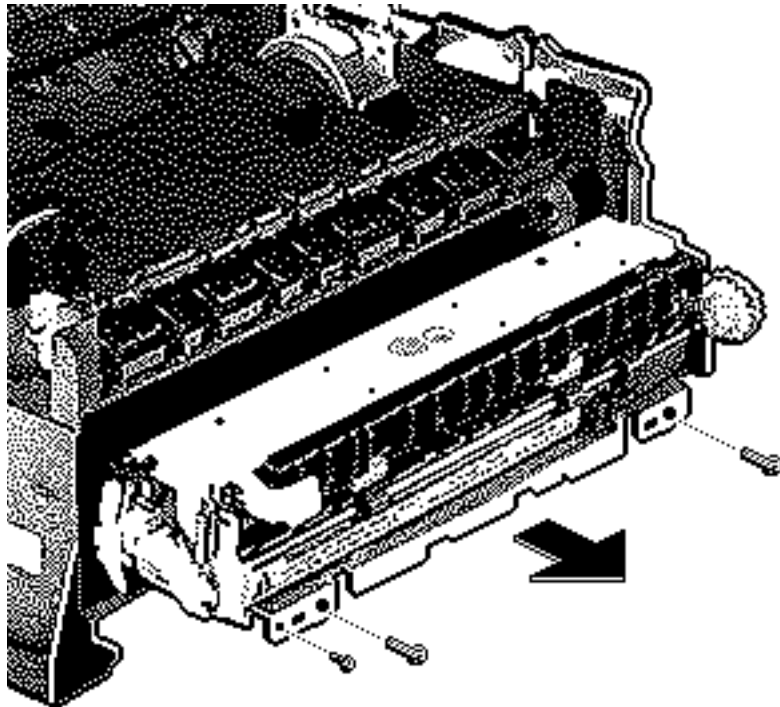




Fuser Assembly

Before you begin, remove the cover.





- 1 Remove the three screws that secure the fuser assembly to the chassis.
- 2 Grip the metal edges of the fuser assembly and pull the assembly out of the printer.

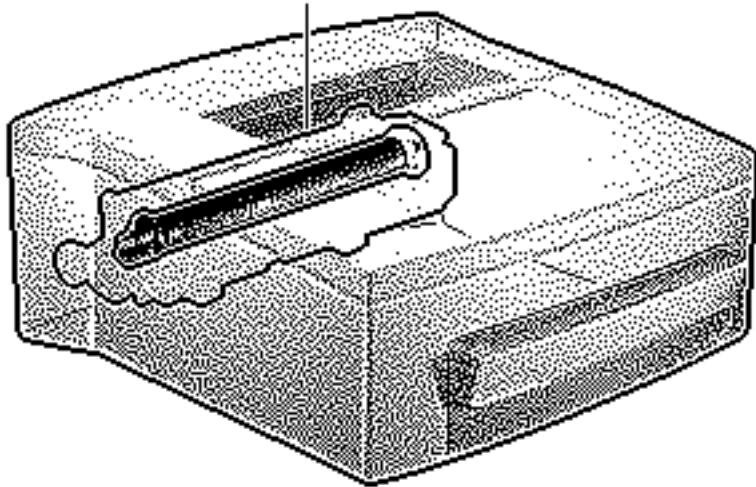


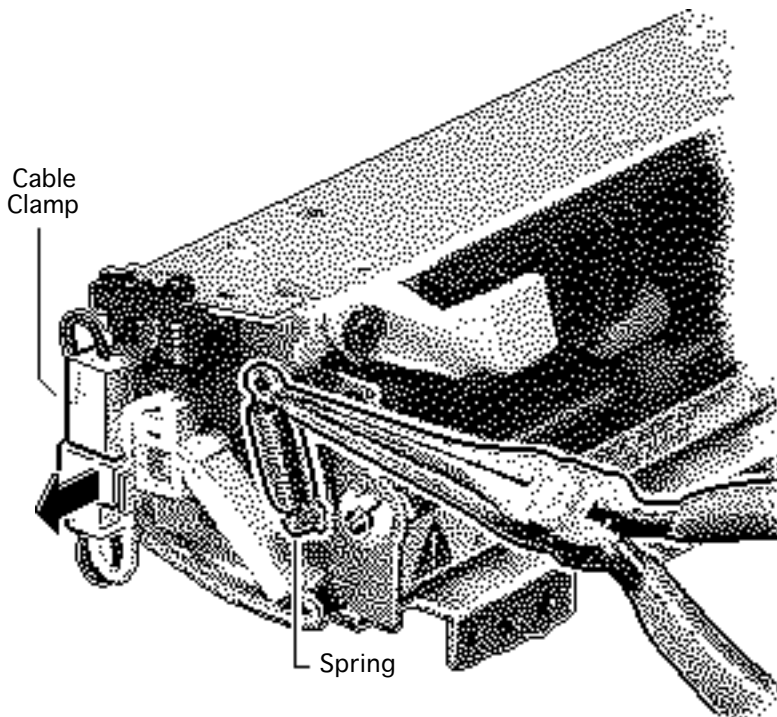


Fixing Film Assembly

Before you begin, remove the following:

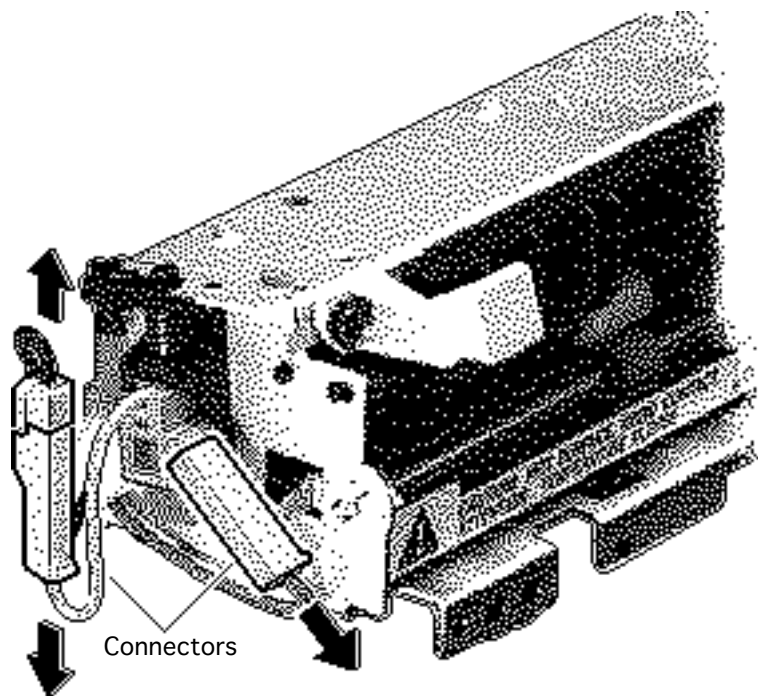
- Cover
- Fuser assembly





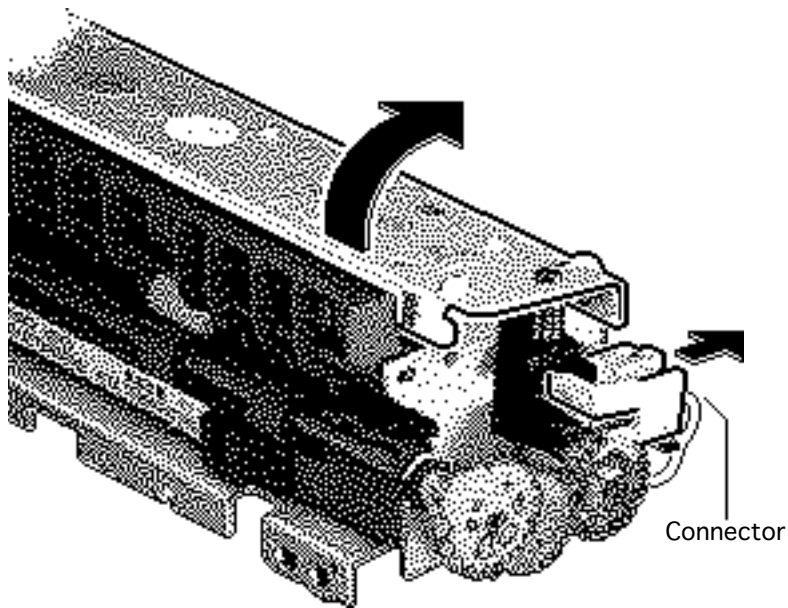
- 1 Using needlenose pliers, release the springs on the left and right sides of the fuser (left side shown).
- 2 Open the cable clamp on the left side of the fuser.





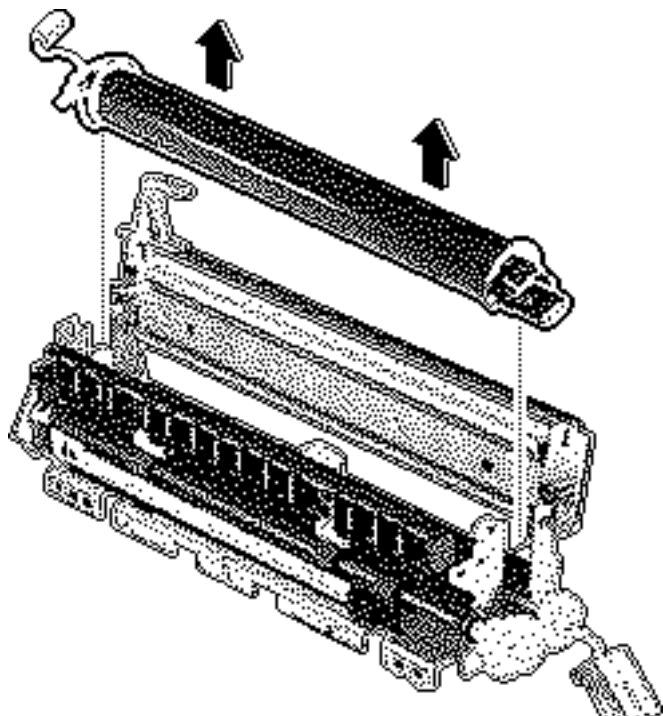
- 3 Disconnect the two connectors on the left side of the fuser.





- 4 Disconnect the connector on the right side of the fuser.
- 5 Open the the top of the fuser.





- 6 Hold both ends of the fixing film assembly and carefully lift it out of the fuser.

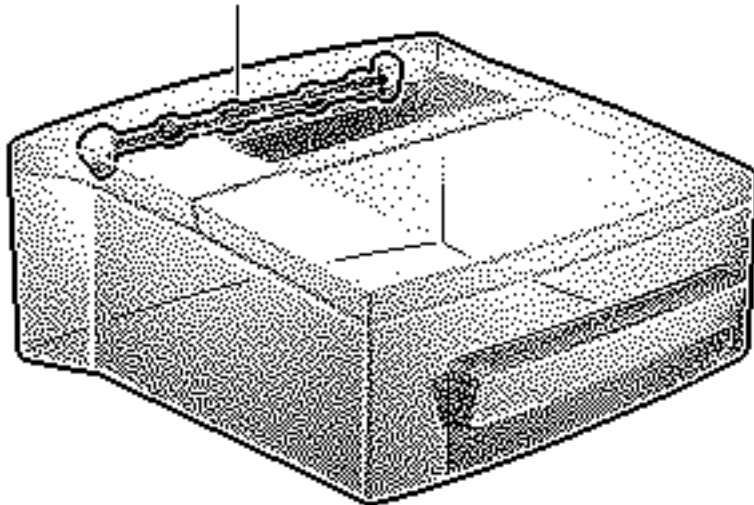


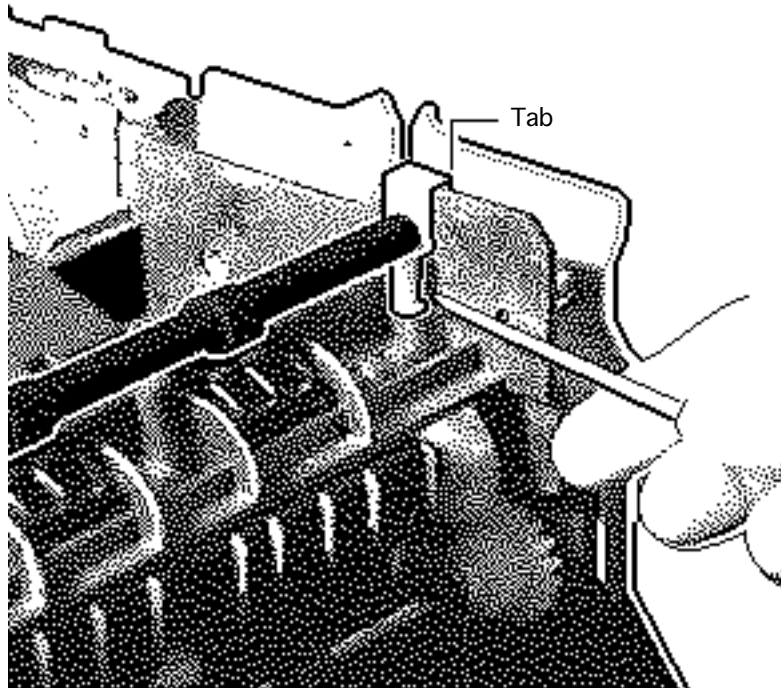


Delivery Roller Assembly

Before you begin, remove the cover.

Delivery Roller Assembly





- 1 Using a flat-blade screwdriver, release the white plastic tab that holds one side of the delivery roller assembly.
- 2 Pull up on the roller to free that side from the chassis.
- 3 Repeat this procedure on the other side of the roller.
- 4 Remove the roller assembly from the chassis.

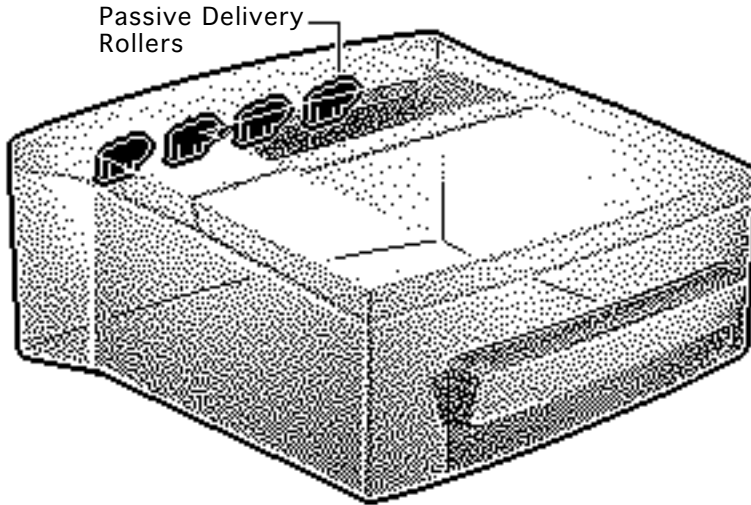


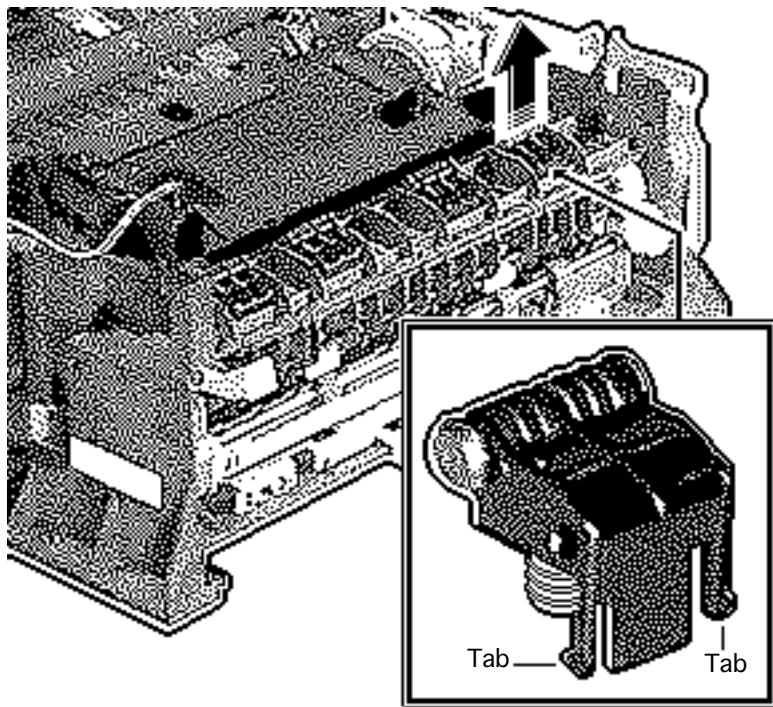


Passive Delivery Rollers

Before you begin, remove the following:

- Cover
- Delivery roller assembly





- 1 Push in the tabs on each side of the passive delivery roller from the underneath side.
- 2 Pull up the roller and remove it from the chassis.

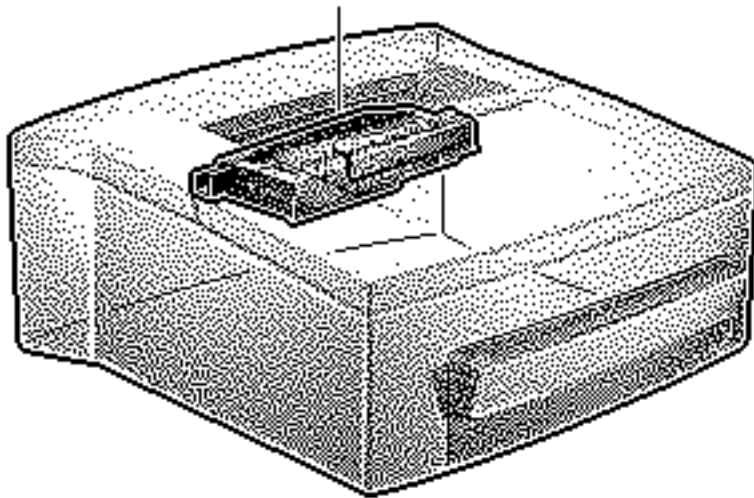


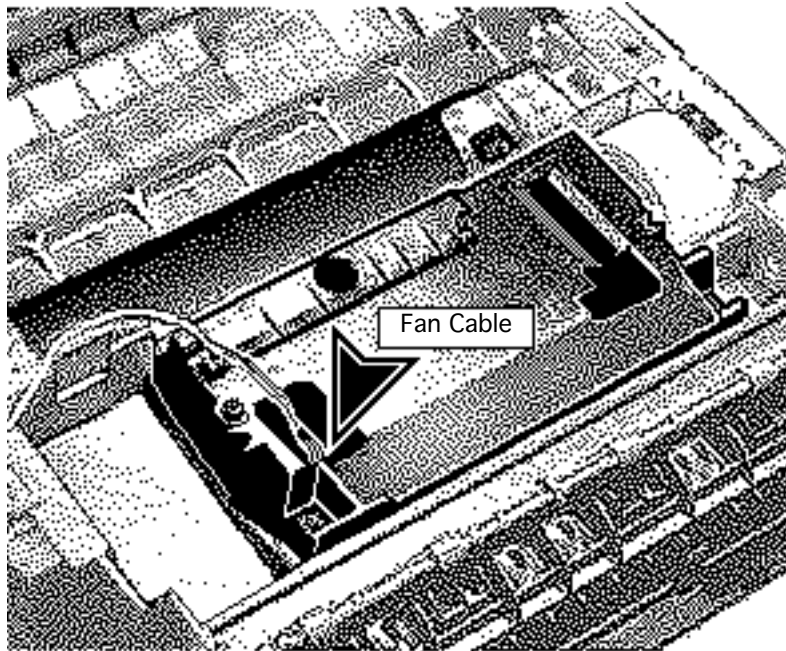


Laser/Scanner Assembly

Before you begin, remove the cover.

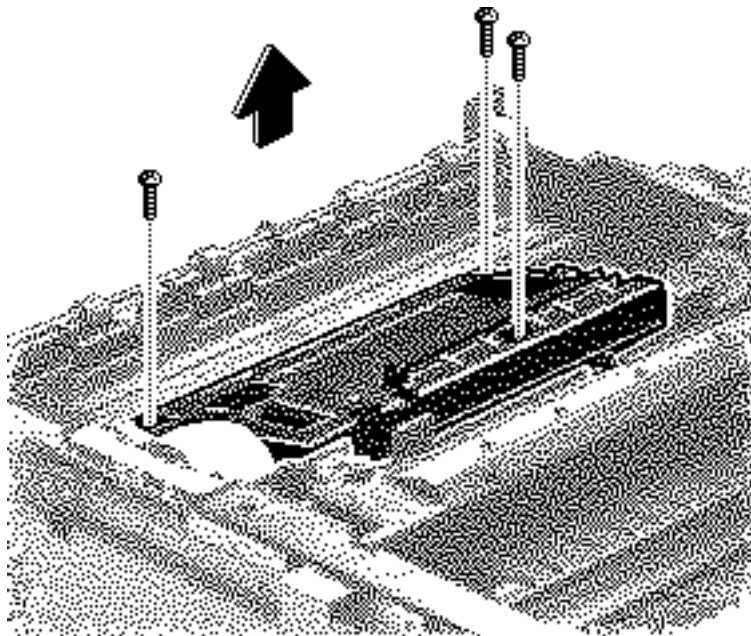
Laser/Scanner Assembly





- 1 Disconnect the fan cable from the laser/scanner assembly.





- Note:** Do not remove the fourth black screw that secures the plastic cover to the body of the laser/scanner assembly.

Remove the three black screws that secure the laser/scanner assembly to the chassis.

- Lift the laser/scanner assembly out of the printer.

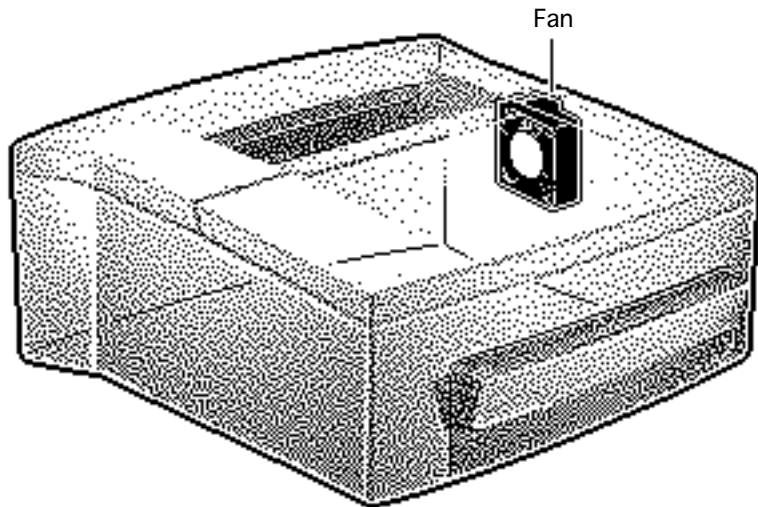
Caution: Never disassemble the laser/scanner assembly since it cannot be adjusted.

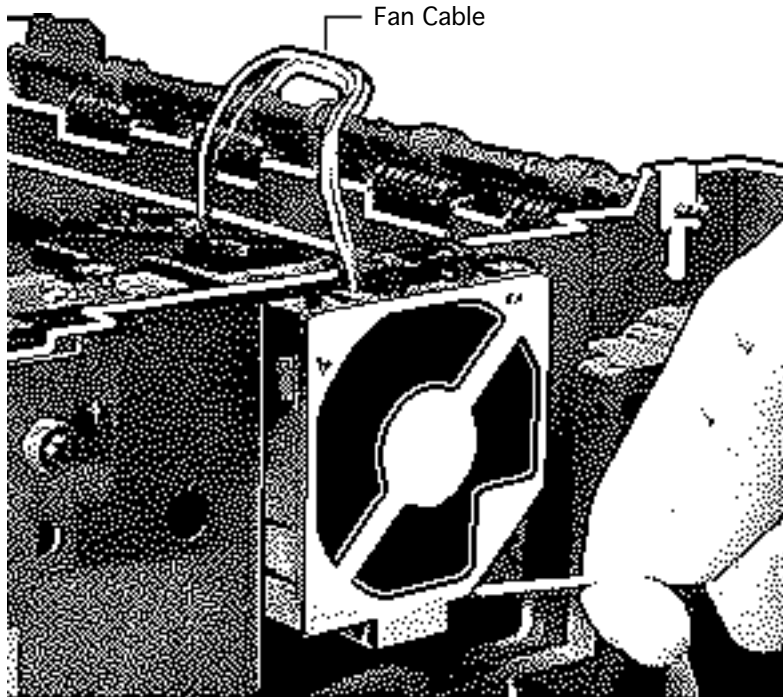




Fan

Before you begin, remove the cover.





- 1 Disconnect the fan cable.
- 2 Using a flat-blade screwdriver, push down and release the bottom tab that secures the fan to the chassis.
- 3 Pull out on the top of the fan and release the top tabs.
- 4 Remove the fan.

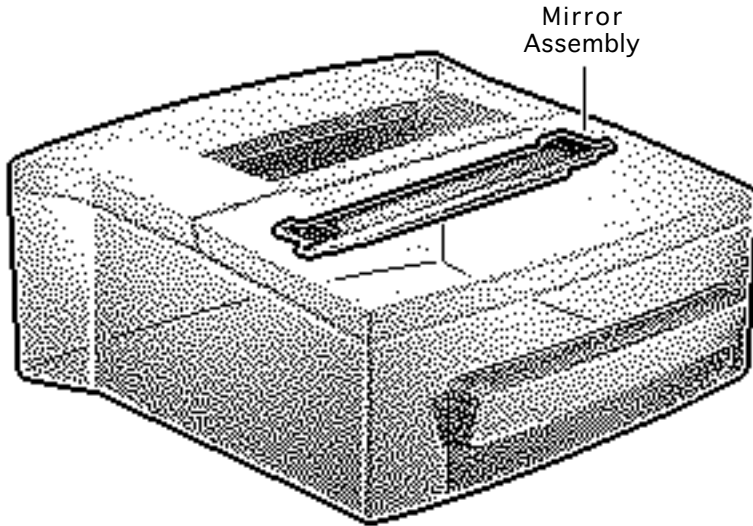
Replacement Note: Be careful not to pinch the cable underneath the top tab on the fan. Be sure to run the cable underneath the right side of the tab.

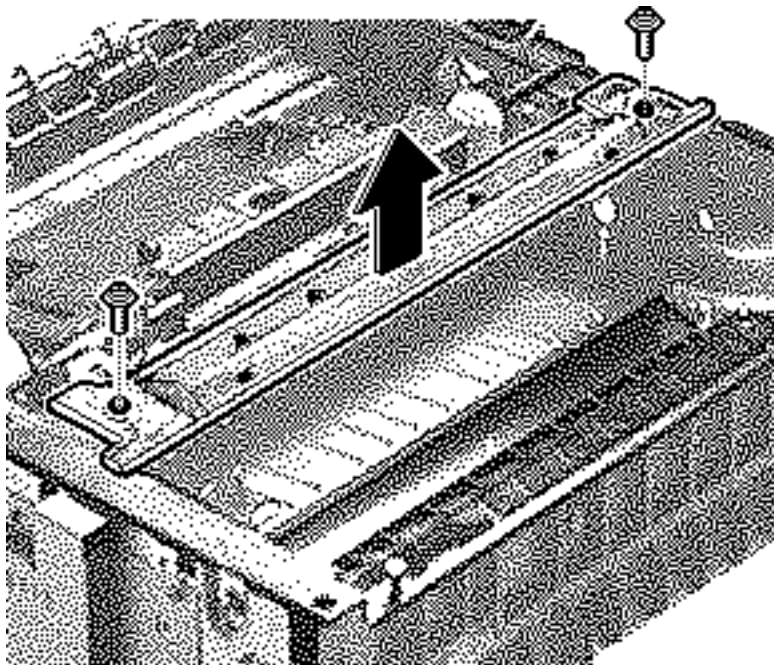




Mirror Assembly

Before you begin, remove the cover.





- 1 Remove the two screws that hold the mirror assembly to the chassis.
- 2 Lift the mirror out of the printer.

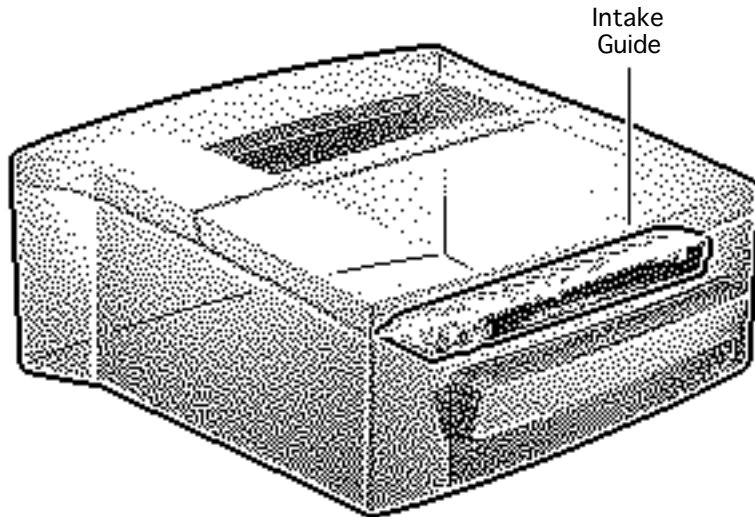
Note: You must readjust the mirror after replacing it. Refer to "Mirror Assembly" in Adjustments.

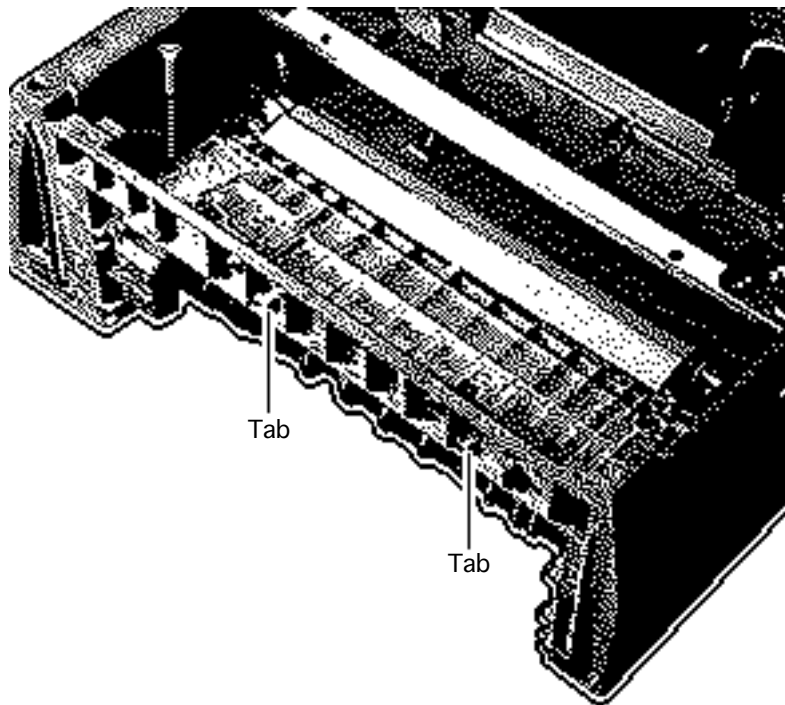




Intake Guide

Before you begin, remove the cover.





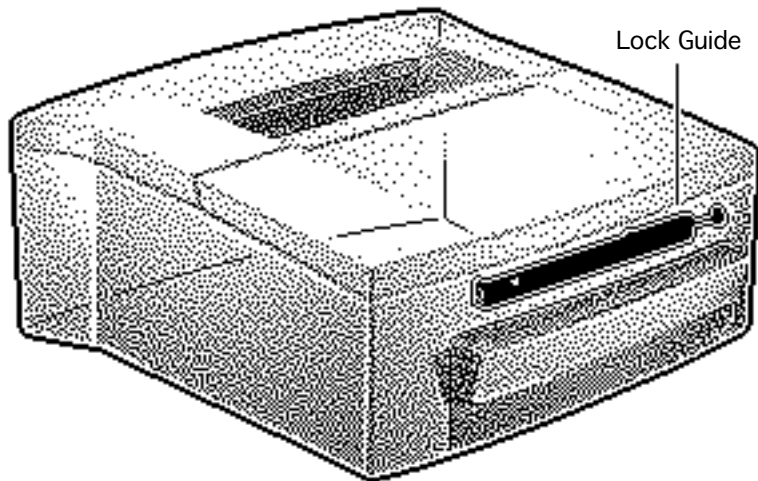
- 1 Remove the self-tapping screw that secures the intake guide to the chassis.
- 2 Release the two tabs that secure the front edge of the intake guide to the chassis.
- 3 Remove the intake guide from the printer.

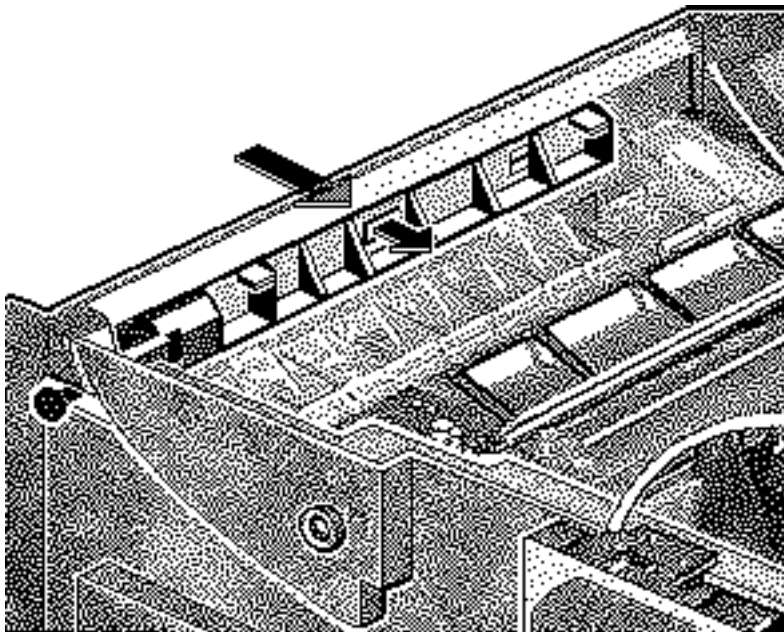




Lock Guide

Before you begin, remove the cover.





- 1 Push in the center tab and release the lock guide.
- 2 Lift the guide out of the printer.

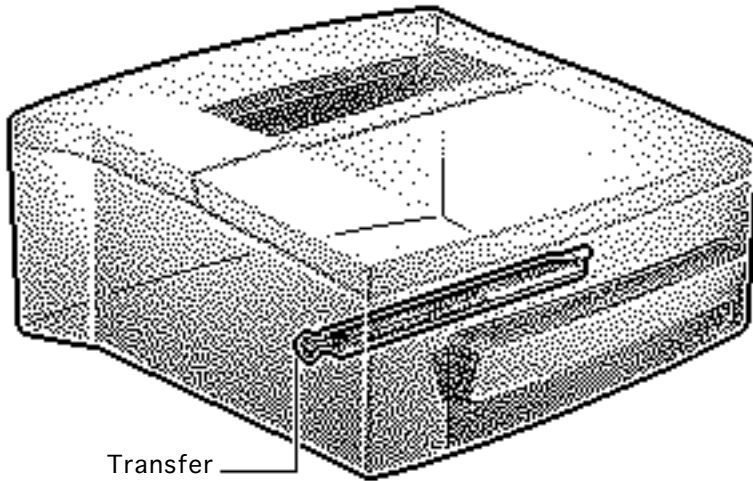




Transfer Roller Assembly

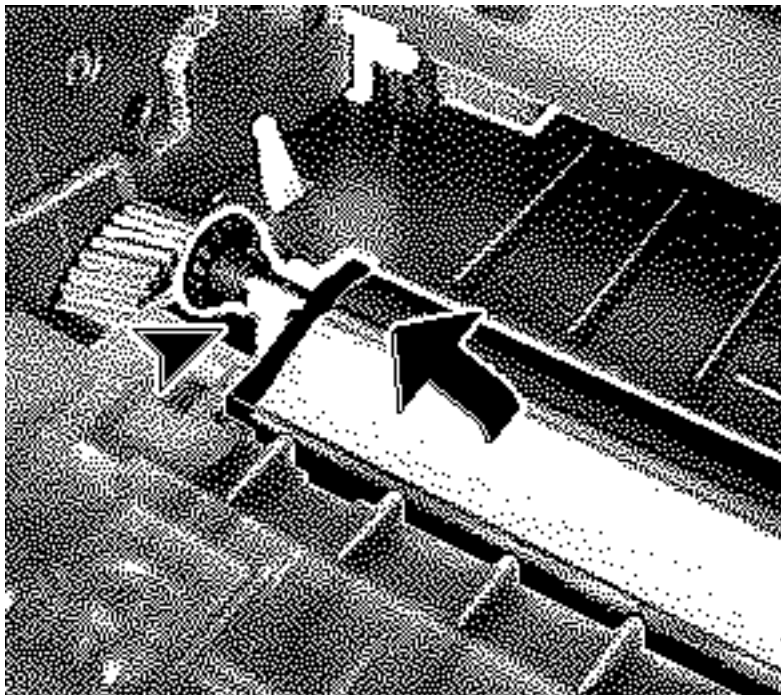
No preliminary steps are required before you begin this procedure.

Note: You may want to remove the mirror assembly first to make the transfer roller assembly more accessible.



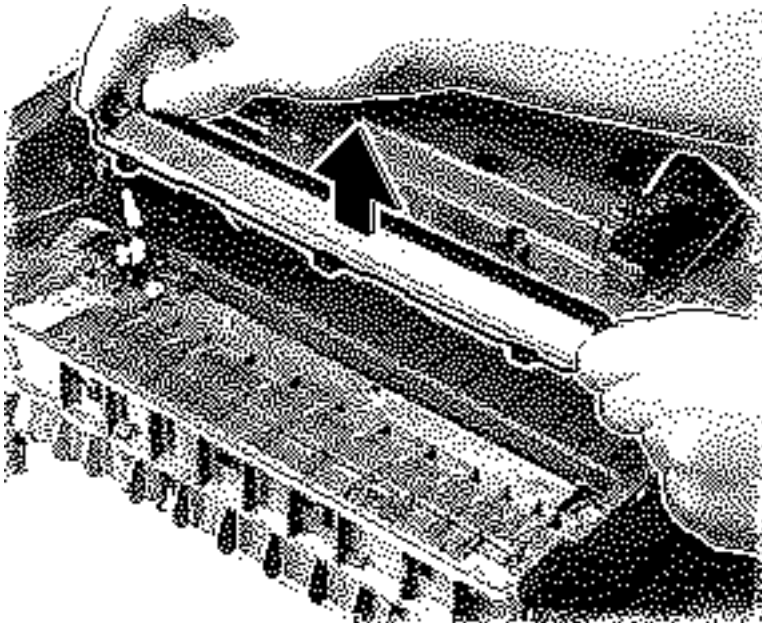
Transfer
Roller
Assembly





- 1 Using a flat-blade screwdriver, pry up the left end of the transfer roller assembly (the end with the gear on it).
- 2 Slide the assembly to the left to free it from the bushing on the right side.





- Note:** When removing the transfer roller assembly, be careful not to lift out the bushing. Hold the transfer roller assembly by the shaft, not the sponge area.

Lift the transfer roller assembly out of the printer.

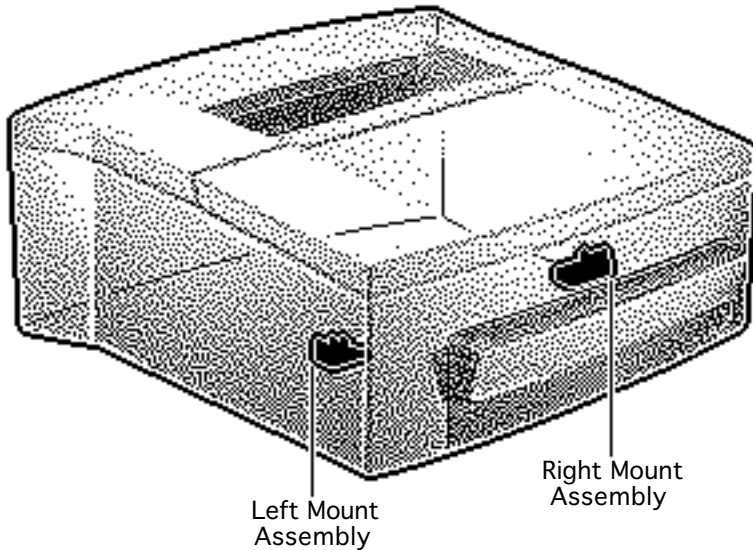
Replacement Caution: There are three positioning tabs along the front edge of the transfer roller assembly. These tabs must be fully seated, otherwise paper jams will occur.

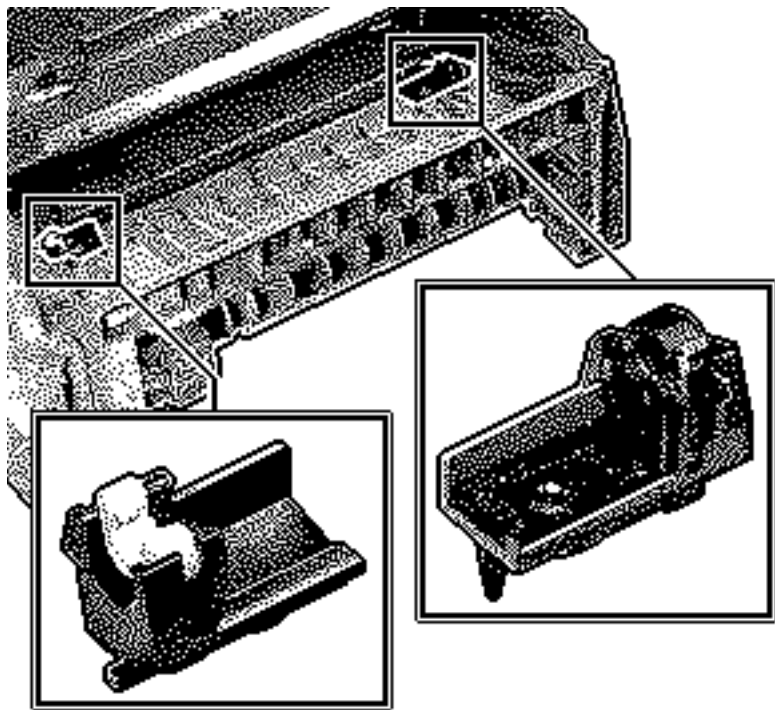




Transfer Mount Assemblies

Before you begin, remove the transfer roller assembly.





- 1 Remove the screws that secure the transfer mount assemblies to the chassis.
- 2 Lift the mount assemblies out of the printer.

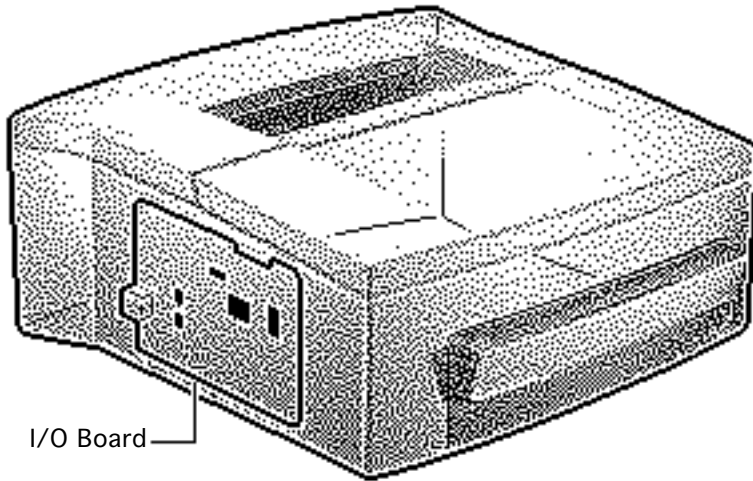


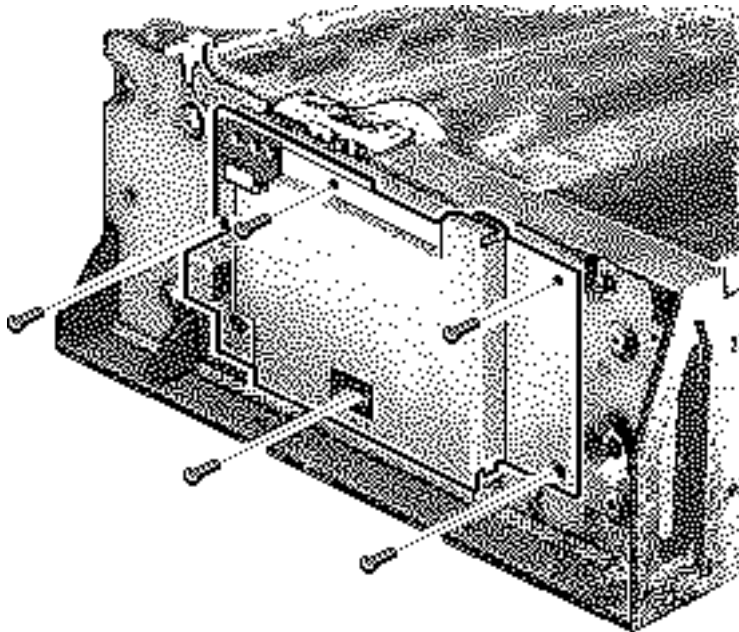


I/O Board

Before you begin, remove the cover.

Note: Before returning an I/O board to Apple, remove the metal cover. Keep the metal cover and install it on the replacement I/O board.





- 1 Remove the five screws that secure the I/O board to the chassis.
- 2 Pull the I/O board straight out and remove it from the drive assembly.

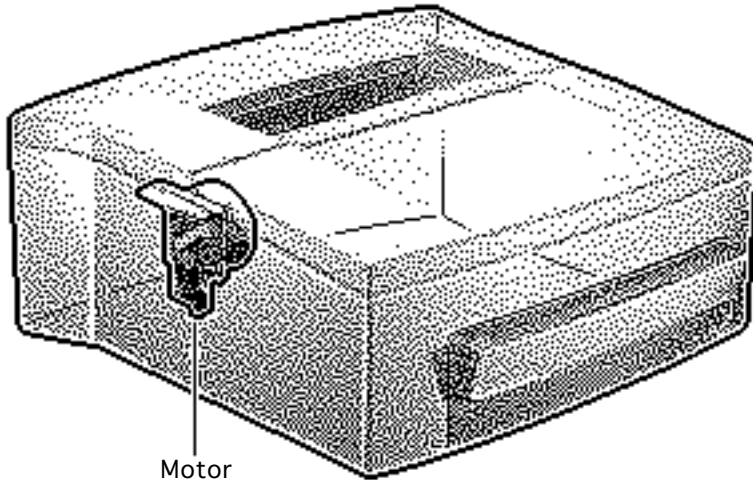




Motor Assembly

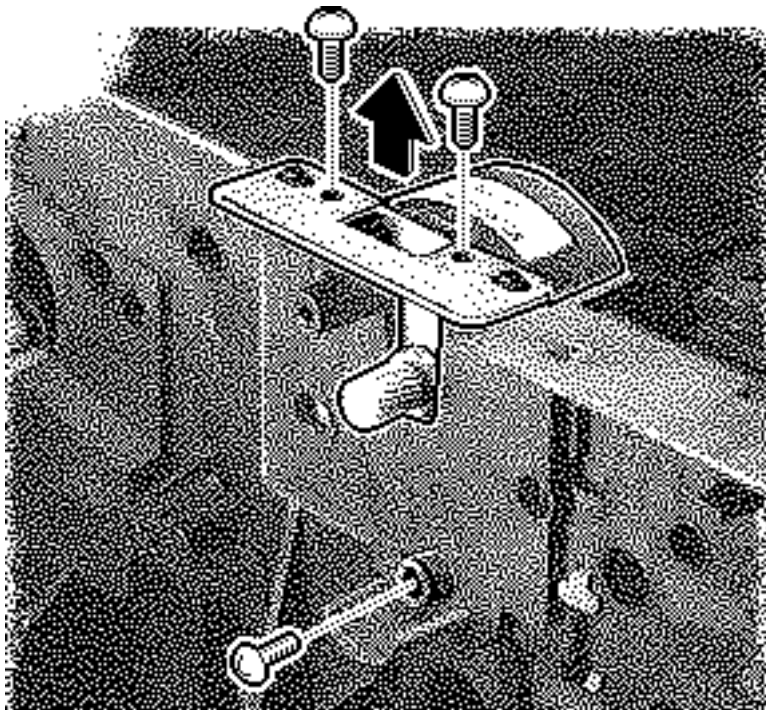
Before you begin, remove the following:

- Cover
- I/O board



Motor
Assembly





- 1 Remove the three screws that secure the motor assembly to the chassis.
- 2 Lift out the motor assembly.

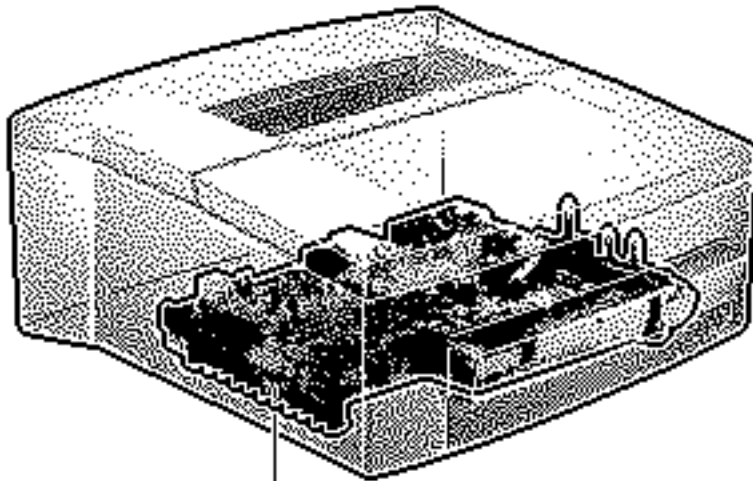




Controller Assembly

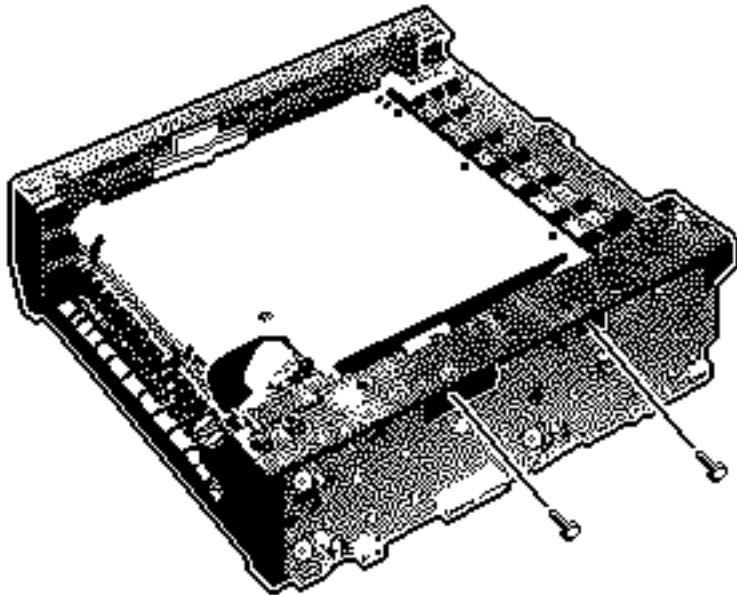
Before you begin, remove the following:

- Cover
- I/O board
- Fuser assembly



Controller Assembly

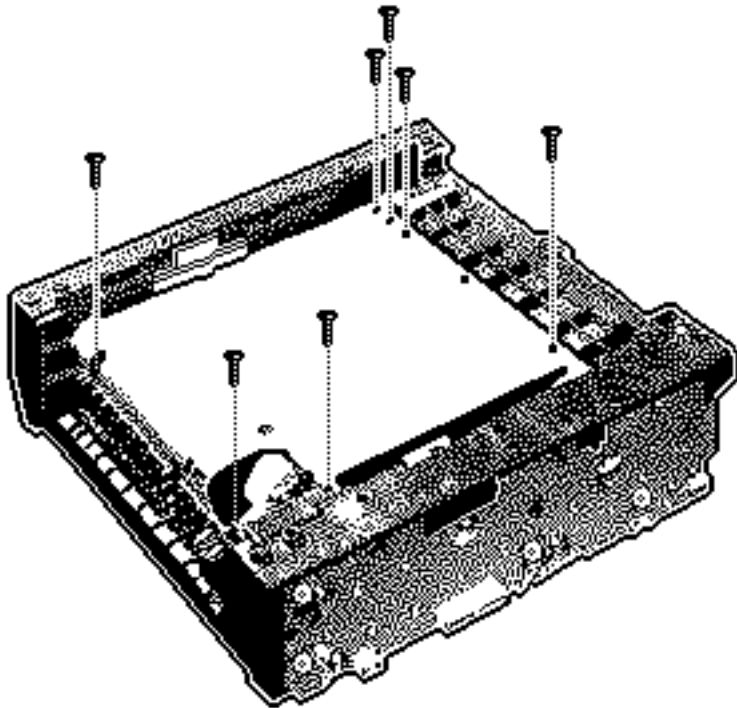




Note: Because the mirror assembly protrudes above the printer chassis, you must protect the mirror when you turn the printer over. Insert a book under the printer to prevent undue stress on the mirror assembly.

- 1 Turn the printer upside down.
- 2 Remove the two screws that secure the drive assembly grounds to the controller assembly.

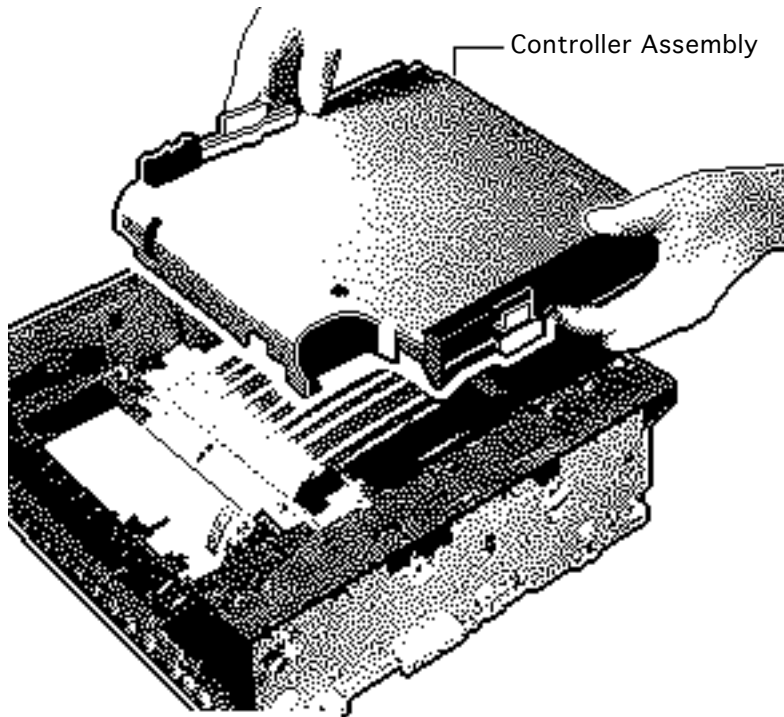




- Note:** Be careful not to remove the center screw that secures the solenoid to the controller board.

Remove the seven screws that secure the controller assembly to the chassis.





- 4 Hold the controller assembly by the cassette guides and lift the controller assembly out of the printer.

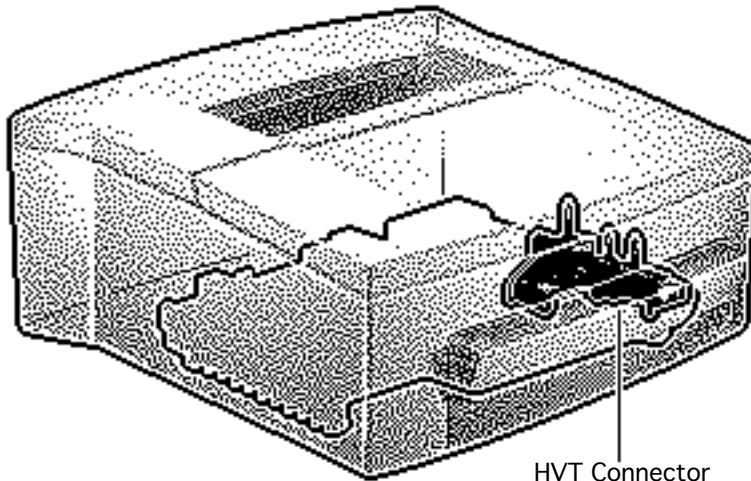




HVT Connector Assembly

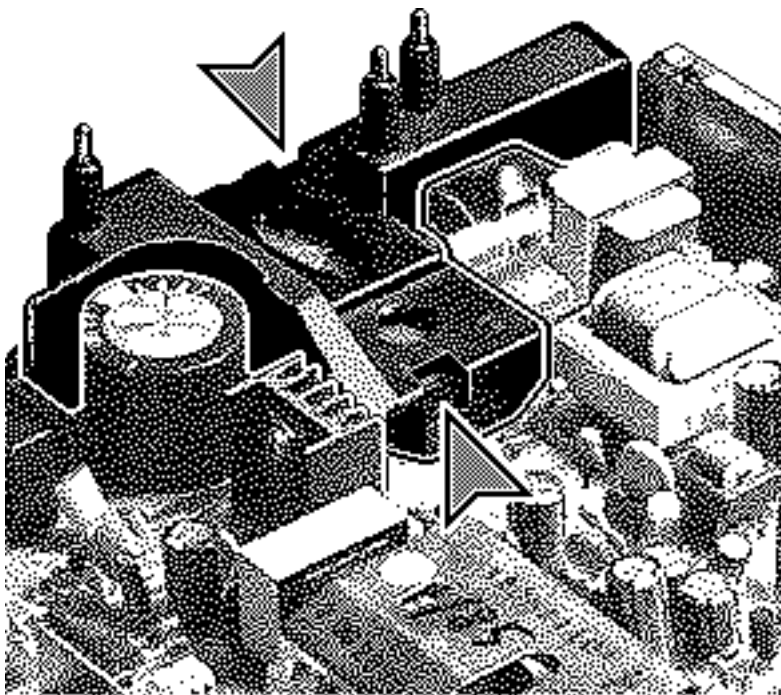
Before you begin, remove the following:

- Cover
- I/O board
- Fuser assembly
- Controller assembly



HVT Connector Assembly





- 1 Push in the tabs on each side of the HVT connector assembly and release the assembly.
- 2 Lift the HVT connector assembly from the controller assembly.

Replacement Note: You should hear a distinctive click when you replace the HVT connector assembly.

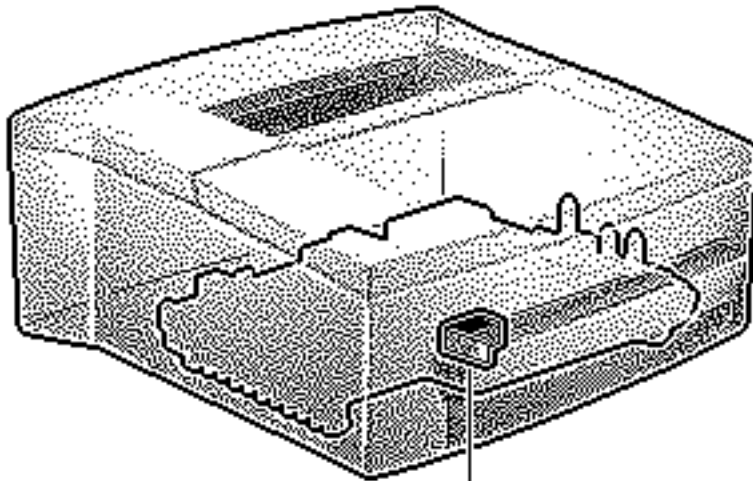




Pickup Solenoid

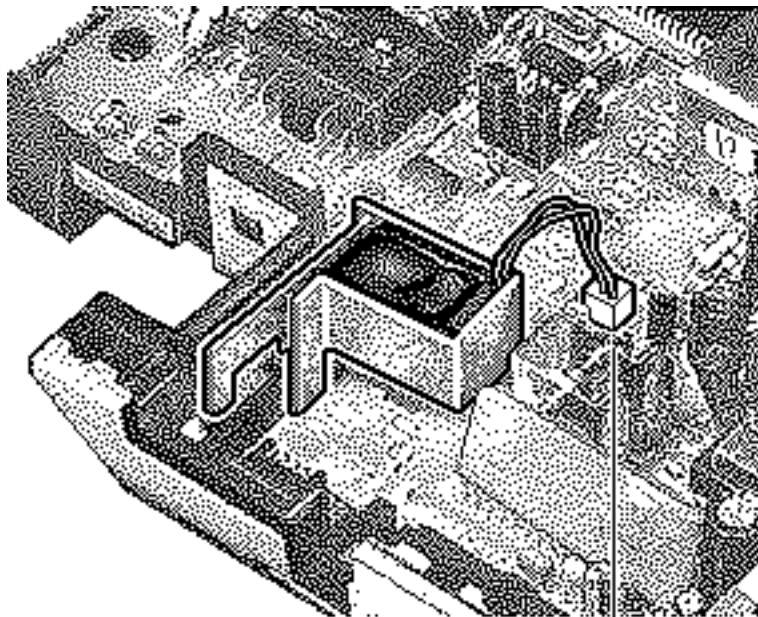
Before you begin, remove the following:

- Cover
- I/O board
- Fuser assembly
- Controller assembly



Pickup
Solenoid





Solenoid Cable

- 1 Remove the screw that secures the solenoid to the controller assembly.
- 2 Disconnect the solenoid cable from connector J206.
- 3 Lift the solenoid from the controller assembly.

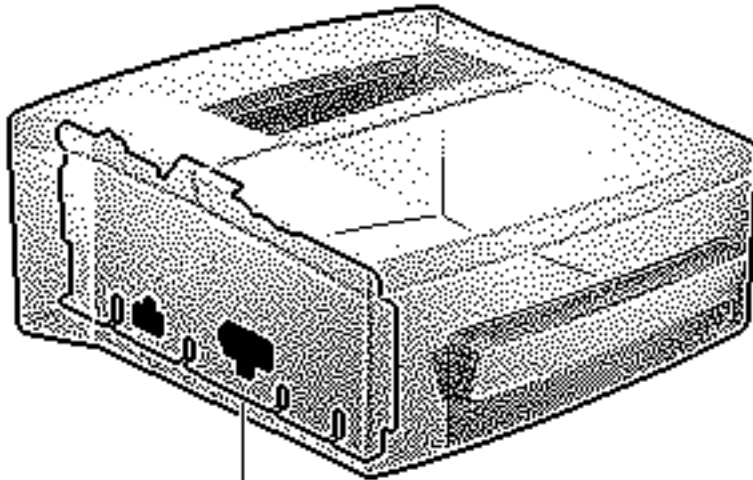




Drive Assembly

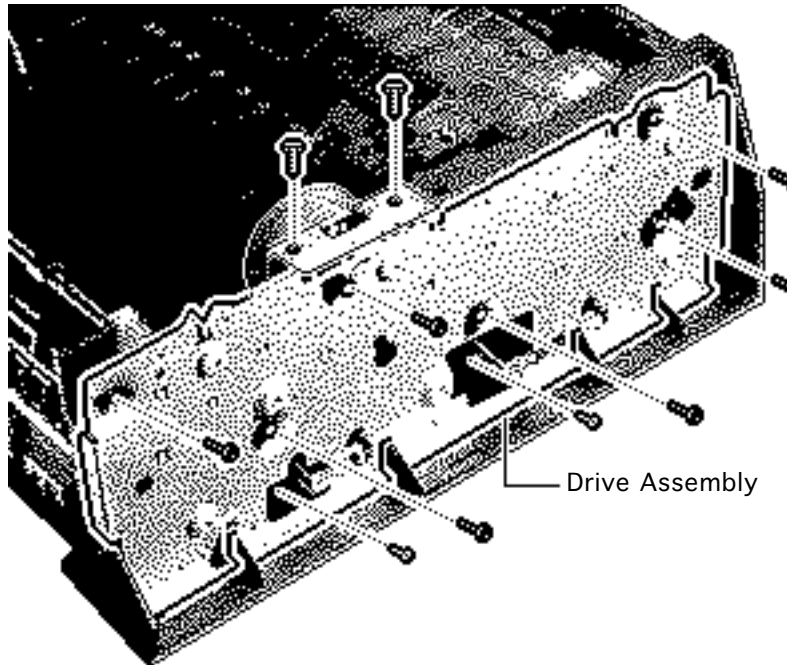
Before you begin, remove the following:

- Cover
- I/O board



Drive
Assembly





- 1 Loosen the two self-tapping screws on the top of the motor assembly.
- 2 Remove the six self-tapping screws that secure the body of the drive assembly to the chassis.
- 3 Remove the two sheet metal screws that attach the drive assembly to the controller board.
- 4 Lift the drive assembly from the chassis.

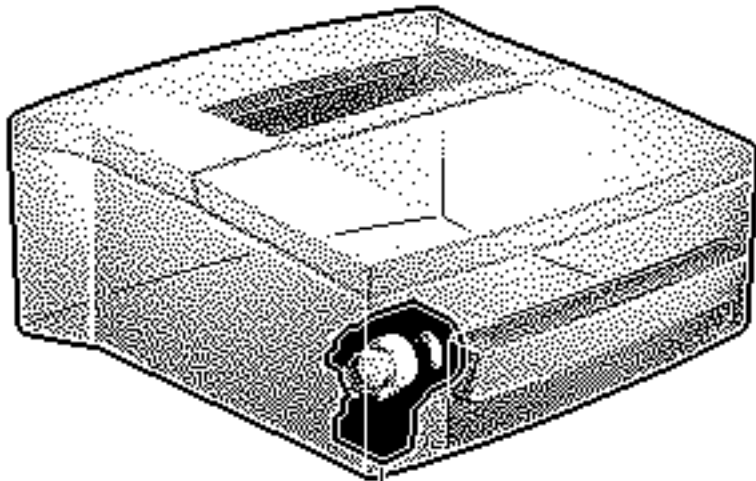




Pickup Motor Assembly

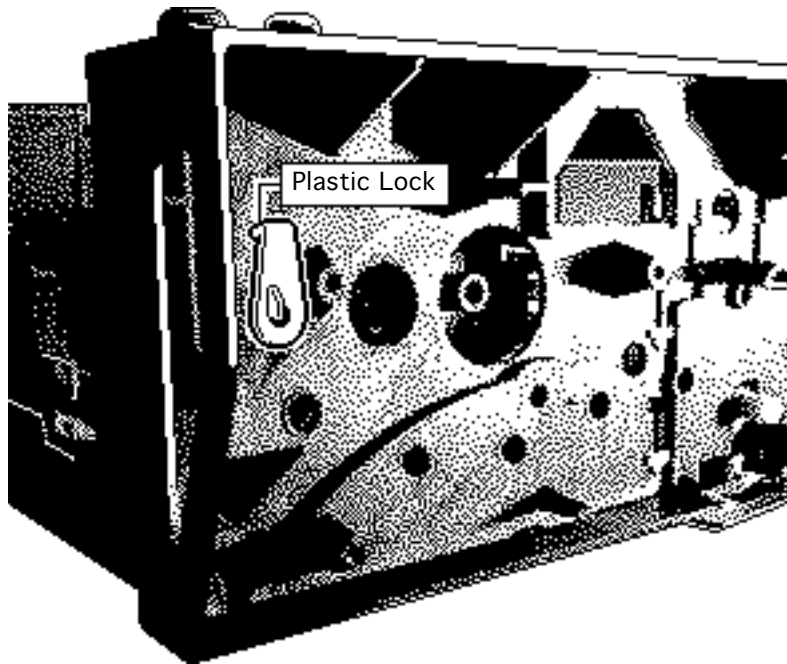
Before you begin, remove the following:

- Cover
- I/O board
- Drive assembly
- Fuser assembly
- Controller assembly



Pickup Motor Assembly

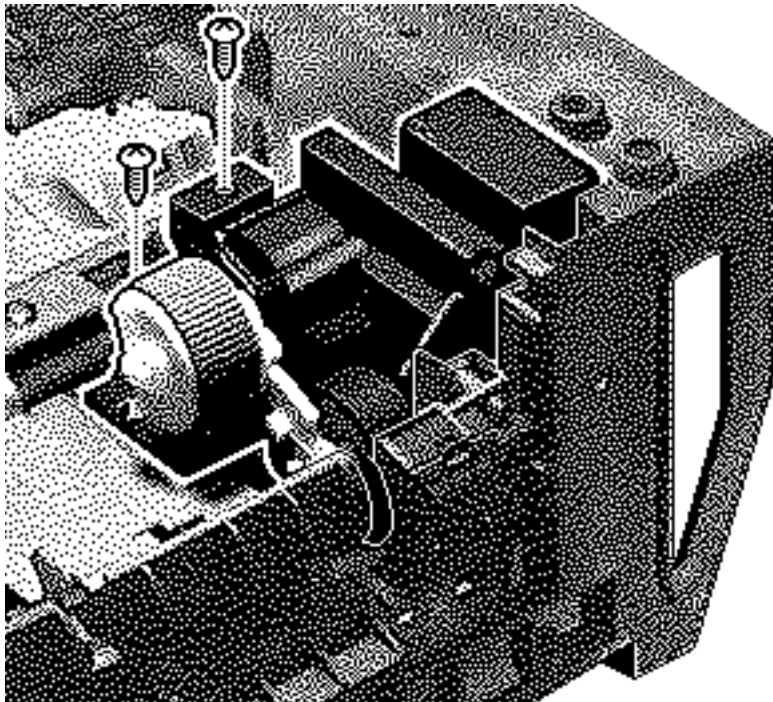




Note: You must support the top of the printer while it is upside down to protect the mirror assembly. Place a book underneath the printer to eliminate stress on the mirror assembly.

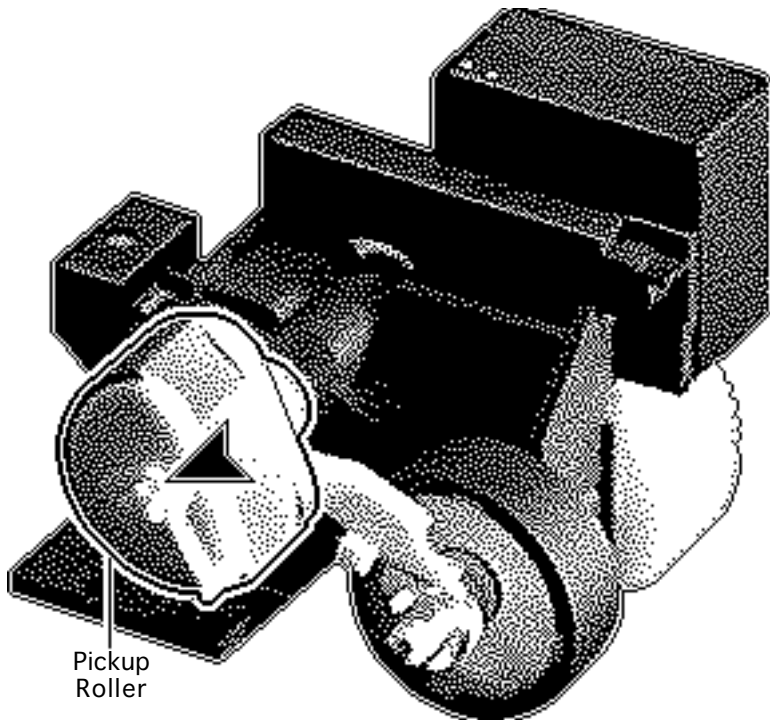
- 1 Turn the printer over.
- 2 Slide the white plastic lock counterclockwise and pull it out of the chassis.





- 3 Remove the two screws that secure the pickup motor assembly to the chassis.
- 4 Lift the pickup motor assembly out of the printer.





- 5 Push up the white plastic tab that secures the pickup roller to the pickup motor assembly.
- 6 Pull out on the roller and remove it.

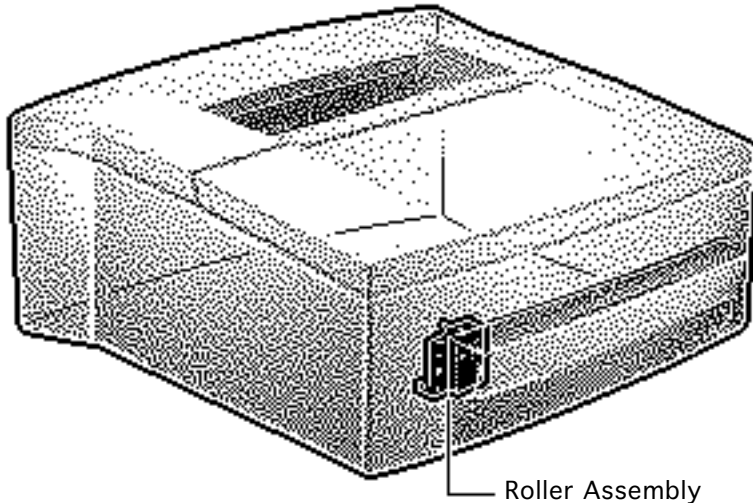
Replacement Note:
When replacing the pickup roller, install it with the flat side facing down.





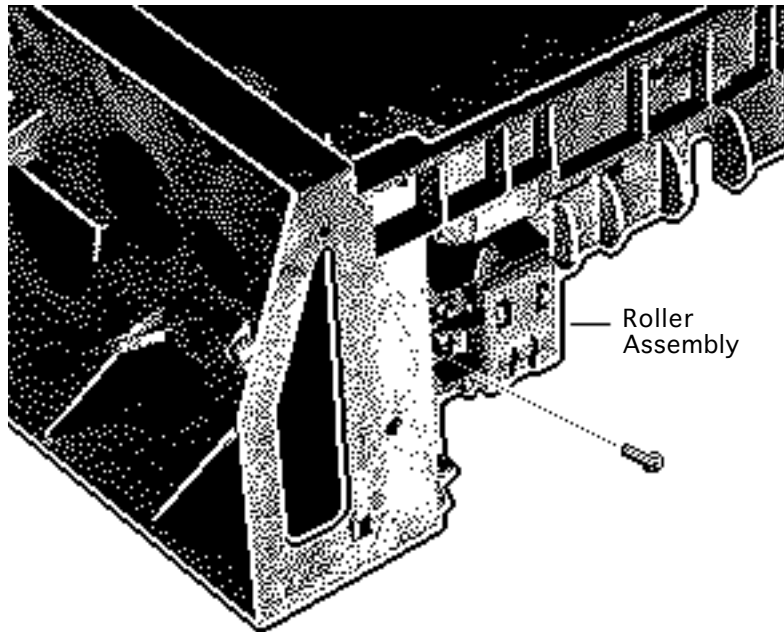
Roller Assembly

Before you begin, remove the cover.



Roller Assembly





- 1 Remove the screw that secures the roller assembly to the chassis.
- 2 Lift the roller assembly from the printer.

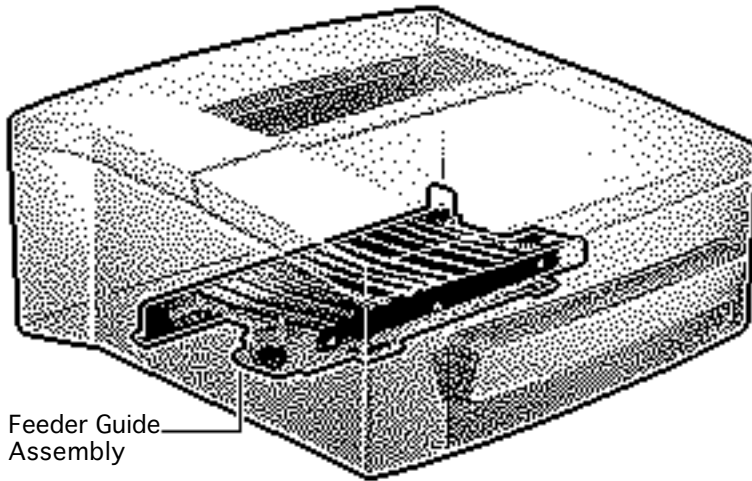




Feeder Guide Assembly

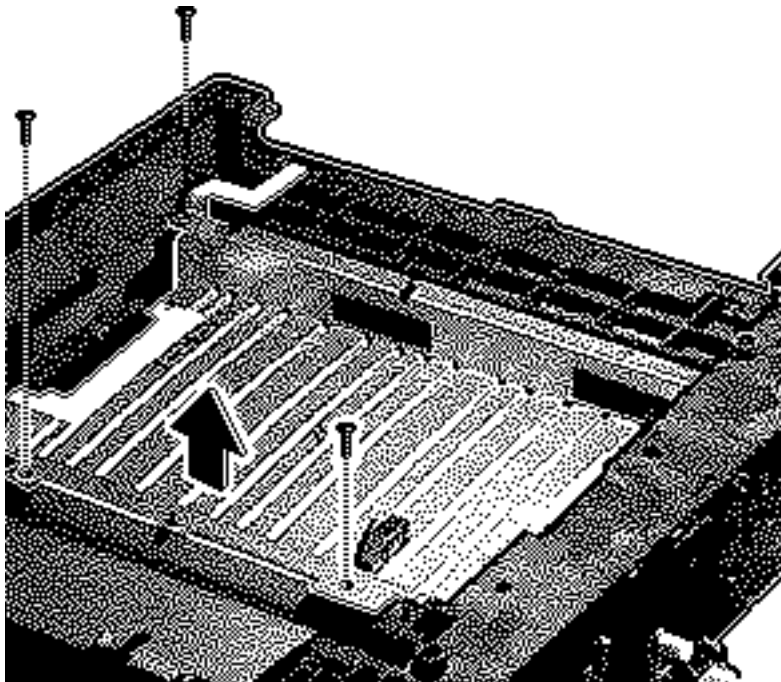
Before you begin, remove the following:

- Cover
- I/O board
- Fuser assembly
- Controller assembly



Feeder Guide Assembly





- 1 Remove the three screws that secure the feeder guide assembly to the chassis.
- 2 Lift the feeder guide assembly from the printer.

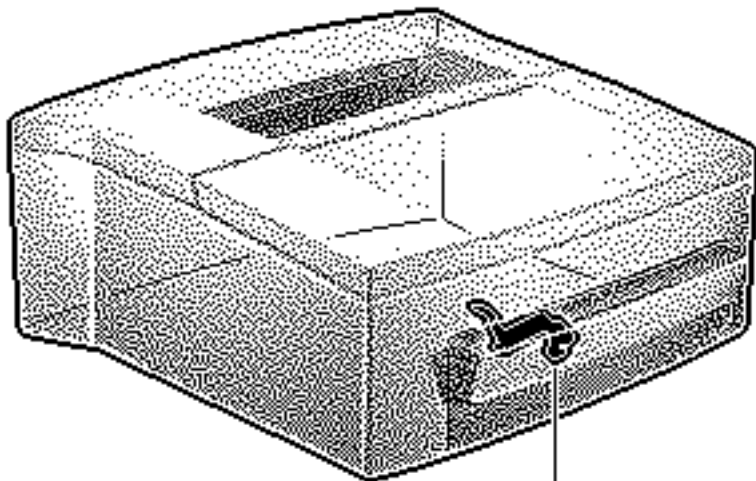




Arm Registration Assembly

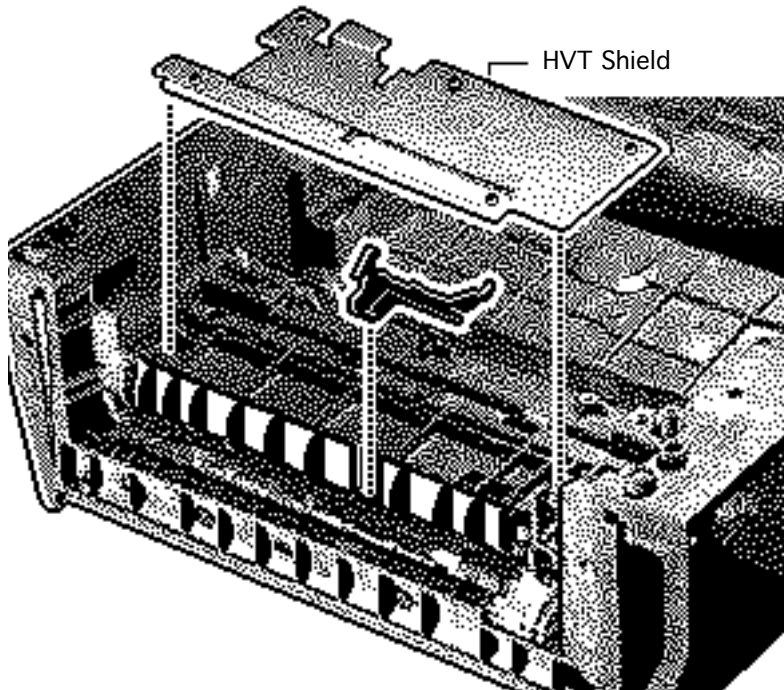
Before you begin, remove the following:

- Cover
- I/O board
- Fuser assembly
- Controller assembly
- Feeder guide assembly



Arm Registration Assembly





- 1 Remove the HVT shield and lift the arm registration assembly out of the printer.

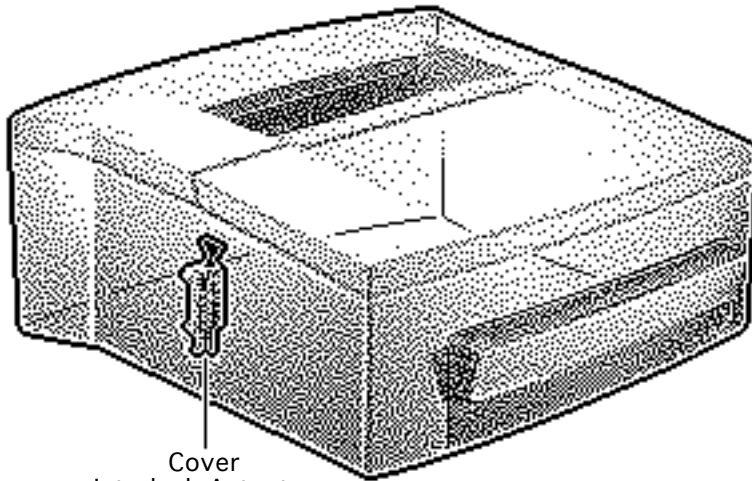




Cover Interlock Actuator

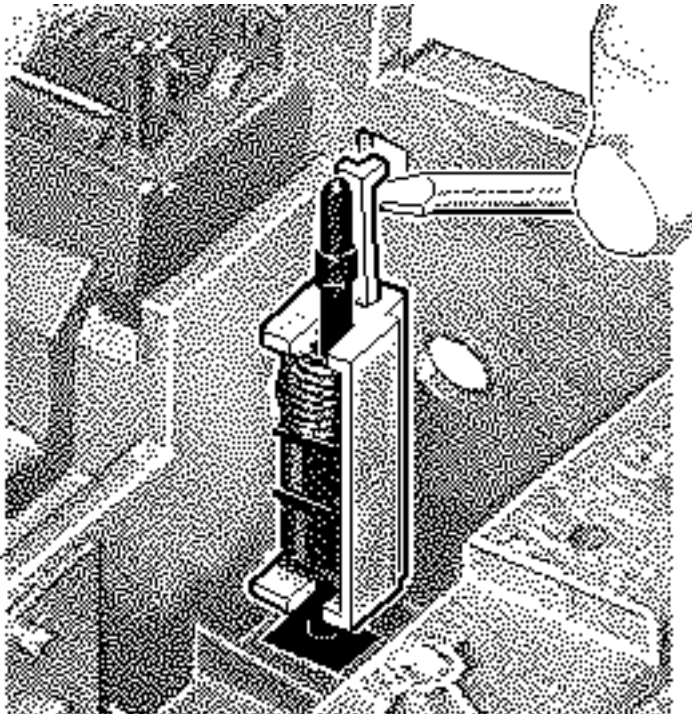
Before you begin, remove the following:

- Cover
- I/O board
- Fuser assembly
- Controller assembly
- Feeder guide assembly



Cover
Interlock Actuator





- 1 Push in the top tab and slide up the cover interlock actuator.
- 2 Remove the cover interlock actuator from the chassis.

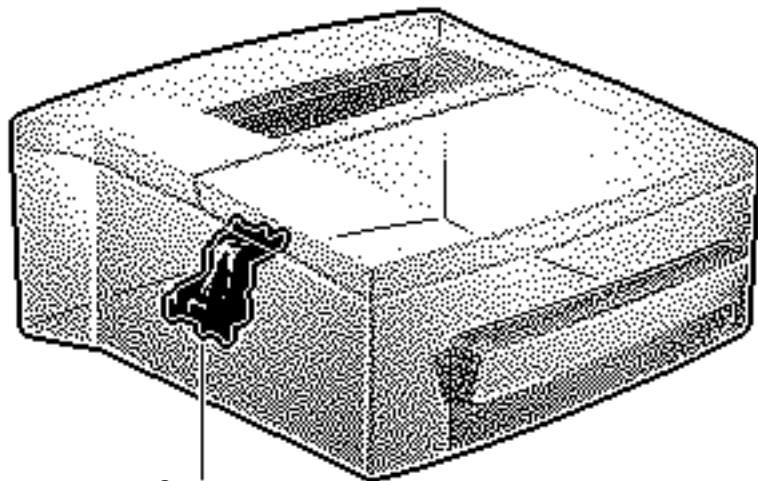




Scanner Interconnect Assembly

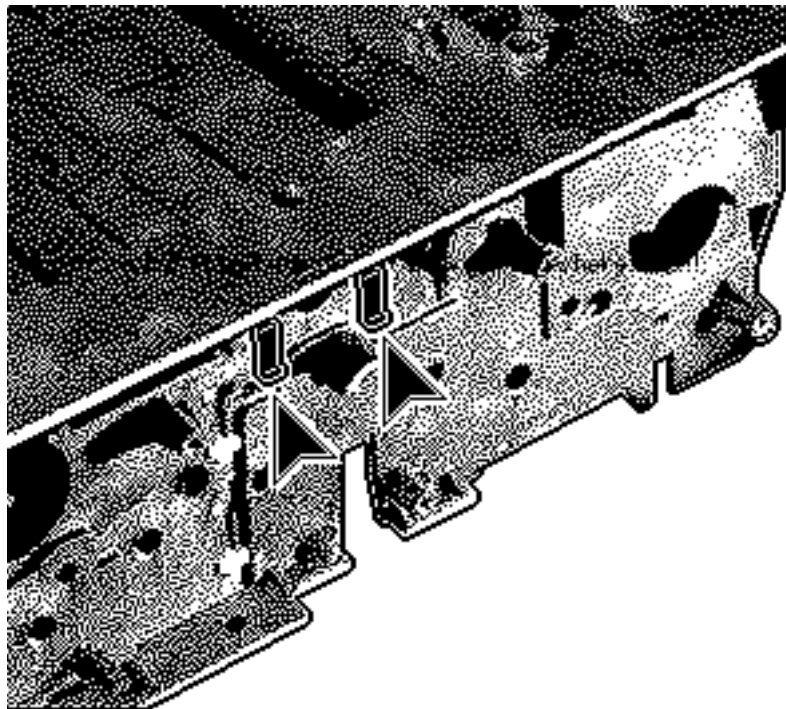
Before you begin, remove the following:

- Cover
- Laser/Scanner assembly
- I/O board
- Drive assembly
- Fuser assembly
- Controller assembly
- Feeder guide assembly



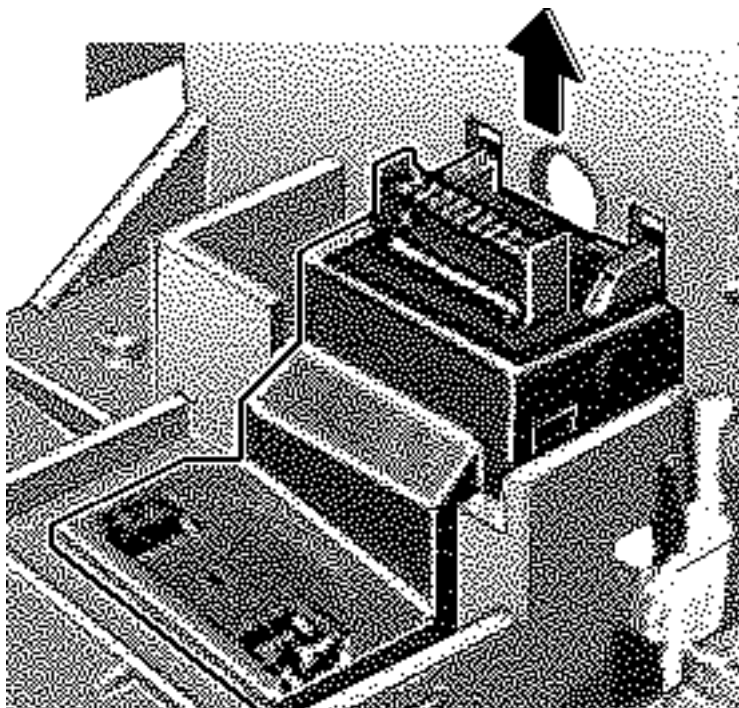
Scanner Interconnect Assembly





- 1 Release the two tabs that secure the scanner interconnect assembly to the chassis.





- 2 Lift the assembly out of the chassis.

Replacement Note: You should hear a distinctive click when you replace the scanner interconnect assembly.

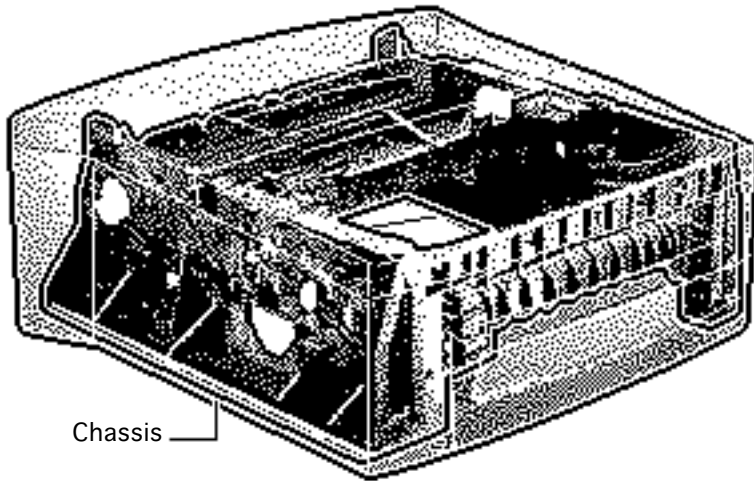




Chassis

The chassis is what remains after removing the following:

- Cover
- All assemblies



Chassis

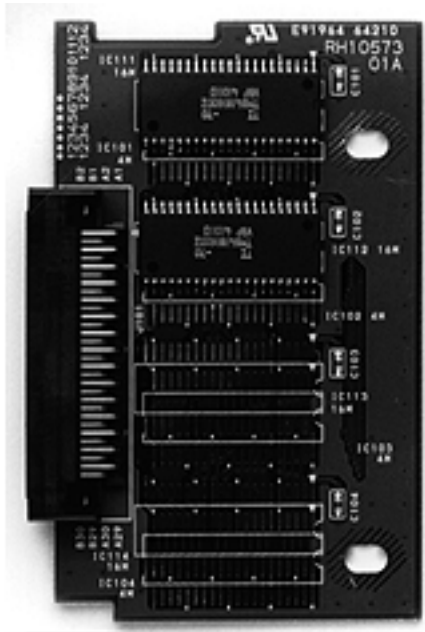




Upgrades

PLW 300 & LW4/600 PS





LW 4/600 Memory Upgrade

To increase this printer's ability to image highly complex pages you may install the 4MB memory board (P/N 661-0247) into the I/O controller board.





Additional Procedures

PLW 300 & LW 4/600 PS



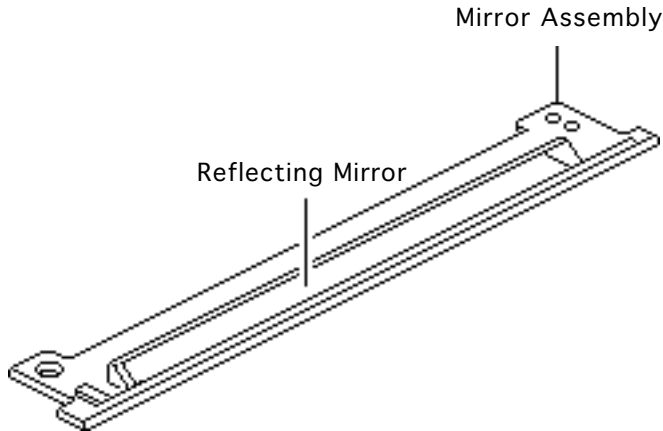


Mirror Assembly Maintenance

Using a blower brush, clean the mirror assembly while it is still mounted in the printer chassis.

Caution: Wipe in one direction only when cleaning the mirror.

If the mirror is still dirty, remove the mirror assembly. Using lint-free paper soaked with alcohol, lightly wipe the reflecting mirror clean.





Refer to the Adjustments chapter for information on how to adjust the mirror after reinstalling it.





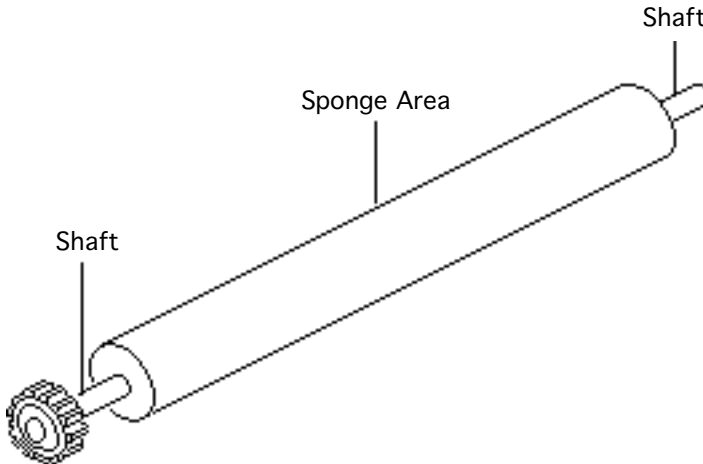
Transfer Roller Maintenance

Before you begin, remove the following:

- Cover
- Transfer roller assembly

You must replace the transfer roller when it has been soiled by paper dust, when the toner cannot be removed, or when the roller is damaged.

When handling the transfer roller, hold it only by the shaft, not the sponge area.





If the transfer roller becomes dirty, clean it using dry, lint-free paper, which should produce virtually no paper dust.

Caution: Use dry paper only to clean the transfer roller. Never use solvents.

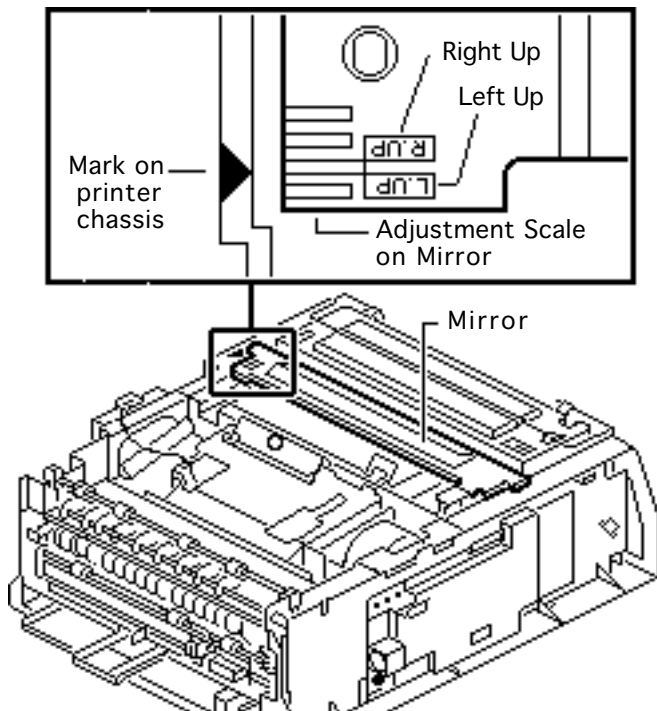




Adjustments

PLW 300 & LW 4/600 PS





Mirror Assembly

No preliminary steps are required before you begin this procedure.

The reflecting mirror is factory-adjusted to ensure the correct angle. If you replace the mirror or the laser/scanner assembly, you must readjust the mirror.

- 1 Align the adjustment scale on the mirror assembly with the mark on the printer chassis.

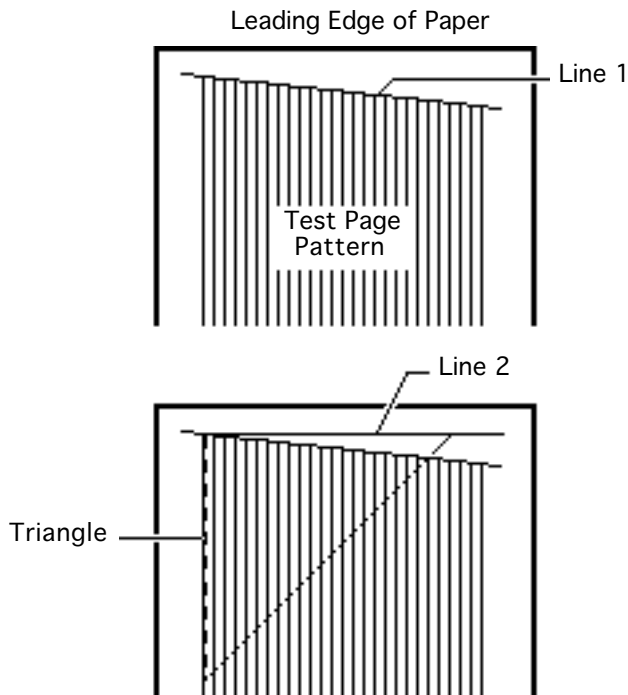




- 2 Place letter-size paper in the cassette tray and initiate a service test page.

Note: Always use letter-size or A4 paper for this adjustment.



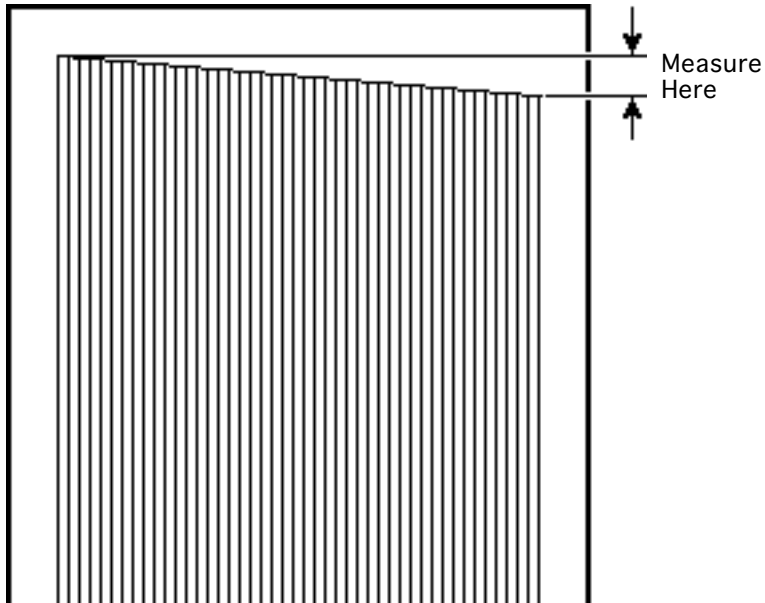


- 3 Using a straight edge, draw a line across the top of the test page pattern (line 1).

Note: The skew in the graphic is exaggerated for clarity.

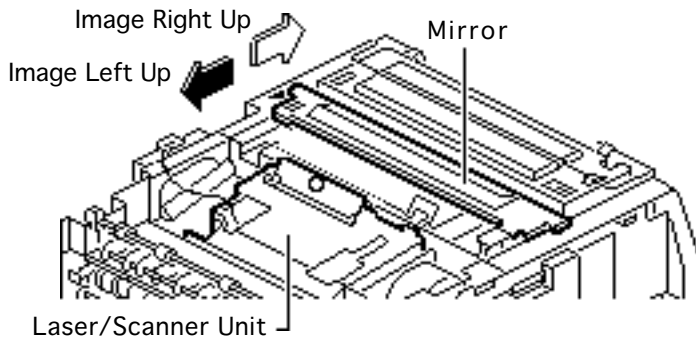
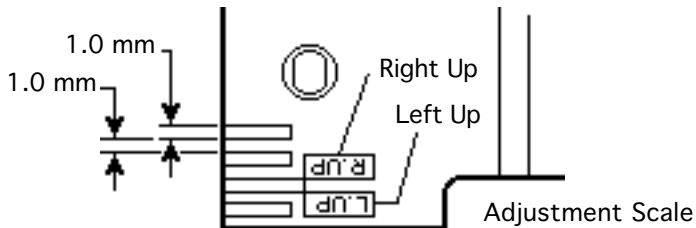
- 4 Place a triangle against the first vertical test pattern line on the and trace a line along the top of the rectangle (line 2).





- 5 Measure the error between the first and second horizontal lines as shown.





If the error is more than 1.5 mm, shift the scale in 1 mm increments to correct the error.

Shift the mirror towards the laser/scanner assembly to move the left side of the image up; shift the mirror assembly away from the laser/scanner assembly to move the right side of the image up.

Initiate another service test page to verify the adjustment.

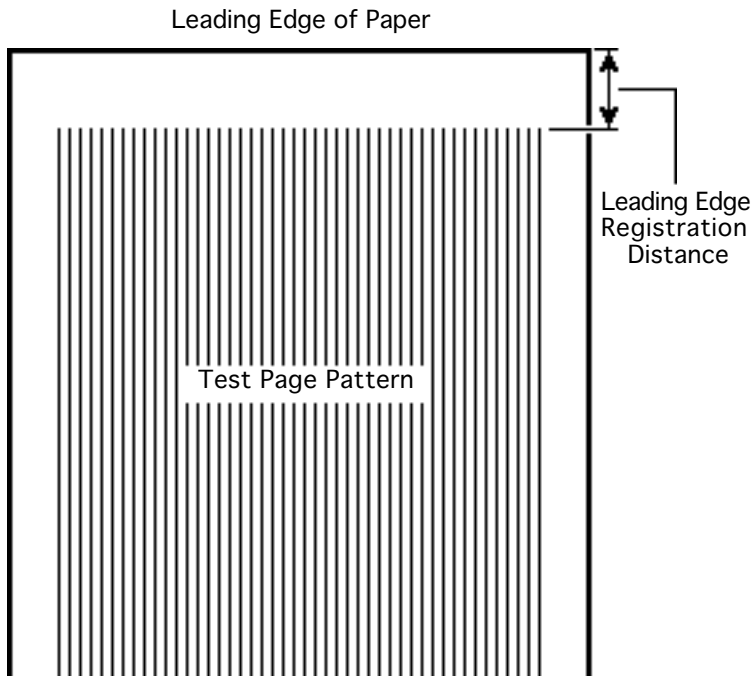
If the adjusted value is still





incorrect, repeat the adjustment procedure until the error is less than 1.5 mm.



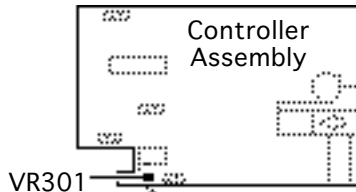


Registration Adjustment

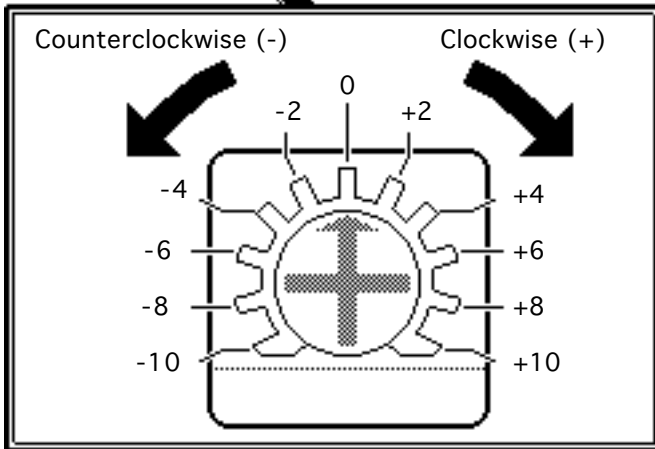
You must perform the registration adjustment procedure whenever you replace the controller assembly.

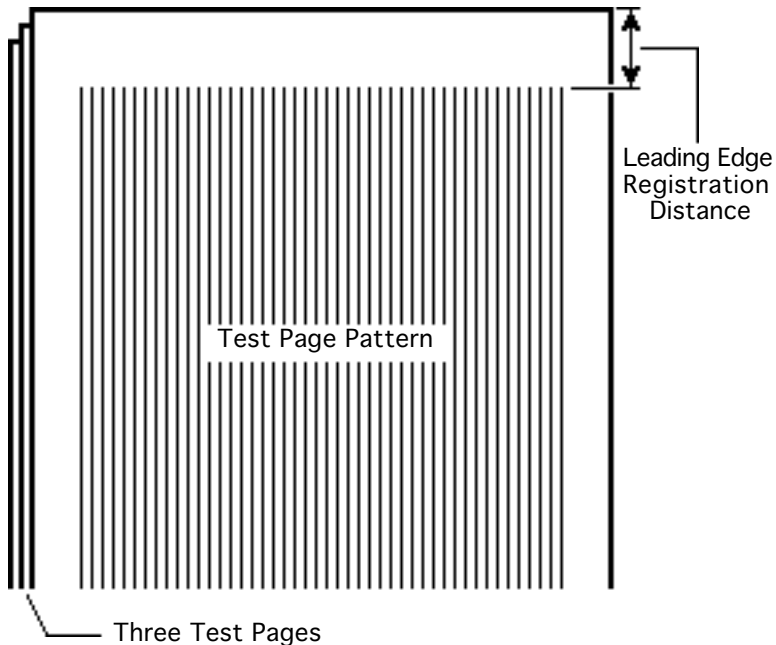
Note: Optimum leading edge registration distance is 2 mm.





- 1 Using a jeweler's screwdriver, reset VR301 on the controller assembly to "0."
- 2 Switch on the printer and wait for the printer to warm up.
- 3 Print three service test pages.





- 4 Measure the distance from the top of each page to the edge of the printed test page pattern.
- 5 Calculate the average distance by adding the three measurements and dividing by three.





(+) Clockwise
(Avg. distance < 2.0 mm)

Difference (mm)	VR301 Setting
+3.04	-10
+2.74	-9
+2.44	-8
+2.10	-7
+1.83	-6
+1.50	-5
+1.22	-4
+0.90	-3
+0.61	-2
+0.30	-1

(-) Counterclockwise
(Avg. distance > 2.0 mm)

Difference (mm)	VR301 Setting
-0.30	+1
-0.61	+2
-0.90	+3
-1.22	+4
-1.50	+5
-1.83	+6
-2.10	+7
-2.44	+8
-2.74	+9
-3.04	+10

- 6 Adjust VR301 so that the average value becomes 2.0 mm (see the table to the left).

Note: For example, if your average distance is 2.6 mm, the difference is 0.6 mm and you should set VR301 to a setting of -2.

- 7 Print three more test pages. If the average registration distance is not 2.0 mm, repeat this procedure.





Exploded View

PLW 300 & LW 4/600 PS





PLW 320 & LW 4/600 PS

