LaserWriter Printers
Volume III

Service Guide

July 1995

Apple Computer, Inc.

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Introduction

The *Apple Service Guide for LaserWriter Printers*, Volume 3, is designed to help Apple-certified technicians troubleshoot and repair Apple laser printers at the customer's site. This guide includes service information for the LaserWriter 16/600 PS, LaserWriter Select 360, Personal LaserWriter 320, and LaserWriter 4/600 PS printers.

The *Apple Service Guide for LaserWriter Printers* presents information from the *Service Source CD* and other Service publications in a booklet format that is easy to use and easy to carry. The guide includes only information that experienced technicians need to service LaserWriter printers quickly and reliably at the customer's site.

The *Apple Service Guide for LaserWriter Printers* contains safety information and four chapters:

Chapter 1: General Information

Chapter 2: LaserWriter 16/600 PS

Chapter 3: LaserWriter Select 360

Chapter 4: Personal LaserWriter 320 and LaserWriter 4/600 PS

Safety: This section includes safety warnings, practices, and procedures. You should be completely familiar with all the safety information before using this guide. Please read this section.

Chapter 1 – General Information: This chapter contains general printer connection information, port pinouts, and generic troubleshooting tips that apply to more than one of the printer families covered in this guide.

Chapters 2–4: The four LaserWriter printer chapters contain information specific to particular LaserWriter printer models:

- Exploded-view drawings of the LaserWriter printers
- Alphabetical parts lists with part numbers
- System specifications
- Troubleshooting information, flowcharts, and tables

Important When ordering a replacement module or spare part, be sure to check the part number given in this guide against the current information in the AppleOrder system, on the AppleLink network, or in the Apple Service Price Pages. Remember that this Apple Service Guide is not updated on a regular basis.

Safety

▲Warning 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.

▲Warning Never disconnect the beam-detect cabling or laser shutter when the printer is switched on. The reflected laser beam, although invisible, can permanently damage your eyes.

▲Warning 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.

▲Warning Electrostatic discharge (ESD) can cause severe damage to sensitive microcircuits. LaserWriter I/O boards contain CMOS components, among the most sensitive chips in use today. CMOS chips, ROMs, and SIMMs are very susceptible to ESD and skin acid damage. To prevent damage to these components, handle them only by the edges.

▲Warning Make sure that you are not grounded when

- You are working on plugged-in equipment
- You are performing live adjustments

▲Warning The LaserWriter printers are heavy. When lifting or moving the printers, be careful not to strain your back.

LaserWriter Safety Rules

1. **Remove all jewelry before performing repairs on a LaserWriter printer.** Removing these conductors reduces the possibility of electric shock.
2. **Before servicing a LaserWriter, turn off the power and disconnect the AC power cord.** Certain parts of the printer are hot (electrified) when the printer is under power. Never work on a LaserWriter printer under power except when making live adjustments.
3. **Do not touch the following modules when the LaserWriter is powered on and the covers are removed:**
   - High-voltage power supply
   - DC power supply
   - Power supply block
   - High-voltage contact assembly
   - Power supply unit

Toner Safety

Toner is a nontoxic substance composed of plastic, iron, and a small amount of pigment. Skin and clothing are best cleaned by removing as much toner as possible with a dry tissue, 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.

Laser Safety

When servicing the optical system of the LaserWriter printer, be careful not to place screwdrivers or other shiny objects in the path of the printer 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.

Because the laser beam is invisible, warning labels are attached to the insides of covers where there is danger of exposure to laser radiation.

Fuser Safety

The fuser assembly rollers become very hot during printer operation. Before servicing the fuser assembly, switch off the printer for at least five minutes to allow the fuser assembly roller to cool.

ESD Damage Prevention Rules

Follow these rules to reduce the risk of electrostatic discharge (ESD) damage to equipment:

1. Before working on any device containing a printed circuit, ground yourself and your equipment to an earth or building ground. Use a grounded conductive workbench mat and a grounding wriststrap, and ground your equipment to the mat.

▲Warning Make sure that you are not grounded when:

- You are working on plugged-in equipment
- You are performing live adjustments

2. Do not touch anybody who is working on integrated circuits. You could "zap" the equipment through the technician—even if the technician is grounded.
3. Use static-shielding bags for boards and chips during storage, transportation, and handling. Leave all Apple replacement modules in their ESD-safe packaging until you need them.
4. Handle all ICs by the body, not the leads. Also, do not touch the edge connectors or exposed circuitry on boards or cards.
5. Do not wear polyester clothing or bring plastic, vinyl, or styrofoam into the work environment. The electrostatic field around these nonconductors cannot be removed.
6. Never place components on any metal surface. Use antistatic, conductive, or foam rubber mats.
7. If possible, keep the humidity in the service area between 70% and 90%, and use an ion generator. Charge levels are reduced (but not eliminated) in high-humidity environments and in areas where an ion generator is routinely used.
8. If an ESD pad/workstation (see "Setting Up an ESD-Safe Workstation") is not available, touch bare metal on the power supply to discharge electrostatic charges.

Setting Up an ESD-Safe Workstation

You need the following materials to set up an ESD-safe workstation:

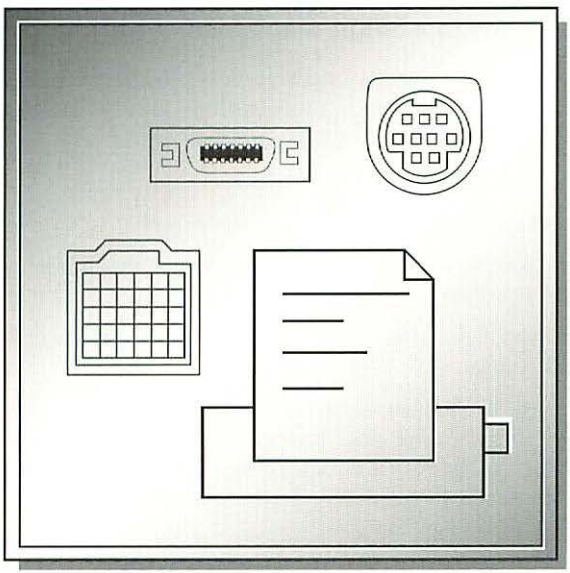
- Conductive workbench mat, with grounding cord
- Wriststrap, with built-in 1-megohm resistor and ground cord
- Equipment grounding cord, with alligator clips
- Ground/polarity tester

Setup Procedure

1. Remove all ESD hazards from the area. Nonconductive materials (see rule 5 under "ESD Damage Prevention Rules") cannot be grounded. Such materials retain charges for hours and even days.
2. Use a ground/polarity tester to verify proper grounding of the power outlet. If the outlet is wired incorrectly, most testers show a light pattern that matches a code given on the tester. If the tester does not verify proper grounding, move to another outlet that is safe.
3. Connect the grounding cord of the workbench mat to ground.
4. Use a wriststrap grounding cord. Fasten it to the workbench mat and to the wriststrap. The wriststrap should touch your skin. You need the continuous grounding provided by a grounding wriststrap.
5. Finally, ground the equipment you are working on. Use alligator clips and a grounding cord to attach any metal part of the device you are working on to the grounded workbench mat.

General Information

1



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Connecting the Printer to a Computer

Connect the printer to a computer in order to test the printer, especially the operation of the I/O board.

Following are instructions on how to connect the printer to a Macintosh computer using a peripheral-8 or LocalTalk cable and to an MS-DOS computer using a 36-pin parallel cable.

Note For information on how to install the appropriate printer software, refer to the printer user manual.

Connecting Directly to a Single Macintosh

You can connect LaserWriter 16/600 PS, LaserWriter Select 360, Personal LaserWriter, and LaserWriter 4/600 PS printers to a Macintosh computer by attaching a peripheral-8 cable to the mini DIN-8 (LocalTalk) port on the printer.

1. Switch off the printer and the Macintosh computer.
2. Plug one end of the cable into the computer's printer port.

Note LaserWriter 16/600 PS only: Make sure the configuration switch is in the down position. Otherwise, the printer will print a grid pattern.

3. Plug the other end of the cable into the printer's LocalTalk port and make sure AppleTalk is active.

Note LaserWriter Select 360: You can use two or even three ports on the LaserWriter Select 360 at the same time. For example, you can connect the printer directly to an IBM PC or compatible computer through the parallel port, and at the same time connect the printer to a Macintosh computer through the LocalTalk port.

Connecting LocalTalk Cables

The LaserWriter 16/600 PS and LaserWriter Select 360 printers can be connected to a Macintosh computer by attaching a LocalTalk cable to the LocalTalk port on the printer, as illustrated in Figure 1.

1. Switch off the printer and the Macintosh computer.
2. Obtain a LocalTalk connecting kit.
3. Plug a LocalTalk connector box into the printer's LocalTalk port.
4. Plug another LocalTalk connector box into the computer's LocalTalk port.
5. Connect the two connector boxes with a LocalTalk cable.

6. Switch on the printer and wait for the startup test page.
7. Install the printer software from the disks that came with the printer.
8. Open the Chooser and click the LaserWriter icon.
9. Click the name of your LaserWriter. Now you have selected the LaserWriter printer for printing.
10. Close the Chooser.

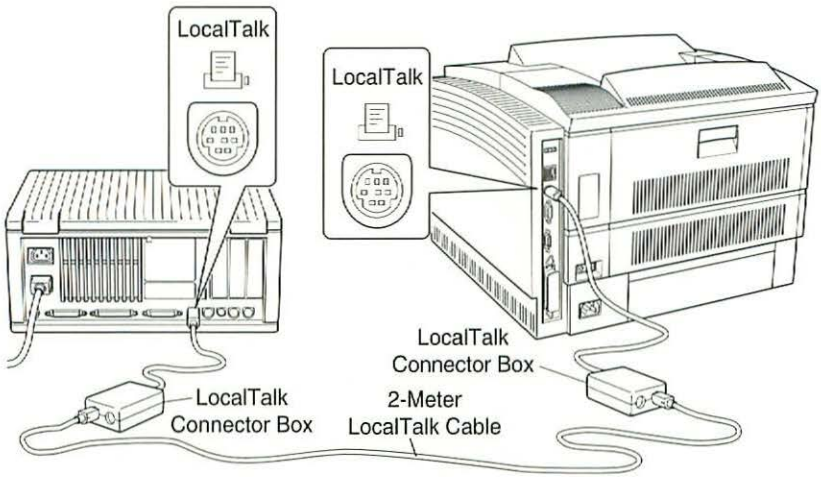


Figure 1. LocalTalk Connection

Connecting to an IBM PC or Compatible with a Parallel Cable

The LaserWriter 16/600 PS, LaserWriter Select 360, and LaserWriter 4/600 PS printers offer a Centronics-type parallel port for connection to IBM PC and compatible computers. This connection requires a cable with a 36-pin Centronics-type connector on one end and an appropriate connector on the other end for the specific computer. (Most IBM PC and compatible computers require a 25-pin connector.)

1. Attach the cable to the parallel port on the computer as shown in Figure 2.
2. Attach the 36-pin parallel connector to the parallel port on the printer.

Note Do not remove the plastic cover from the parallel port unless you need to attach a cable to the port. The cover protects the printer from possible damage by static electricity.

3. Secure the parallel connector to the printer with the spring clips.

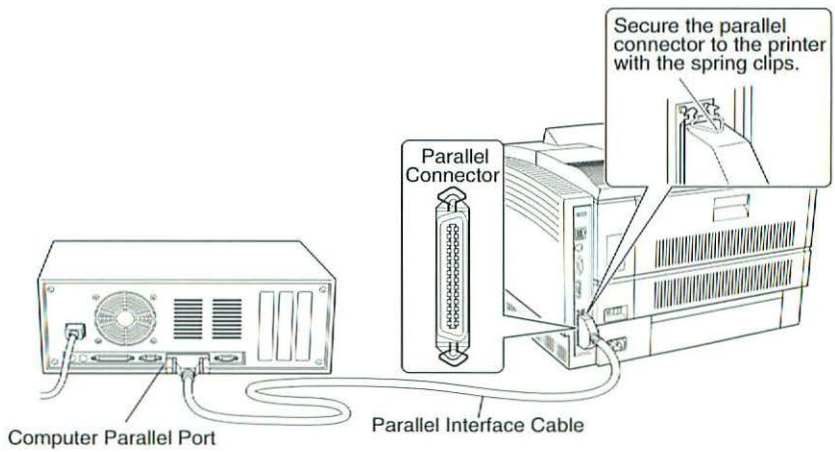


Figure 2. Parallel Port Connection

Connecting to an Ethernet Network

The LaserWriter 16/600 PS printer can be connected to an Ethernet network by attaching an Ethernet transceiver and a length of Ethernet cable to the Ethernet port on the printer.

1. Obtain an Ethernet transceiver and an Ethernet cable appropriate for the network's media type—thin, thick (AUI), or twisted pair (see Figure 3).

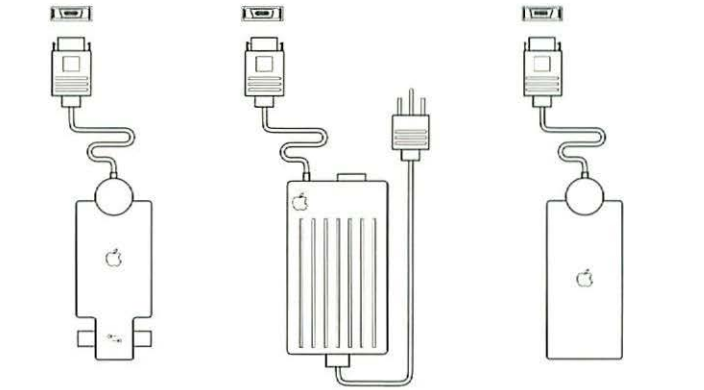


Figure 3. Ethernet Connection

2. Plug the short cable from the transceiver into the Ethernet port on the printer.
3. Connect the printer to the Ethernet network in one of these ways:
   a. To connect the printer to the end of an Ethernet network, connect one end of the Ethernet cable to the empty socket of the nearest device's transceiver and the other end to the printer's transceiver.
   b. To connect the printer between two devices, disconnect one Ethernet cable from the transceiver of the device immediately to the left or right of the printer and plug it into the printer's transceiver. Then connect the new Ethernet cable to the free socket on the printer's transceiver, and to the socket on the other device's transceiver.
   c. To connect to an Ethernet hub, see the documentation that came with the Ethernet hub.

Cable Connectors

Figure 4 shows the pin numbers for LaserWriter peripheral cable connectors as viewed from the front of the connector.

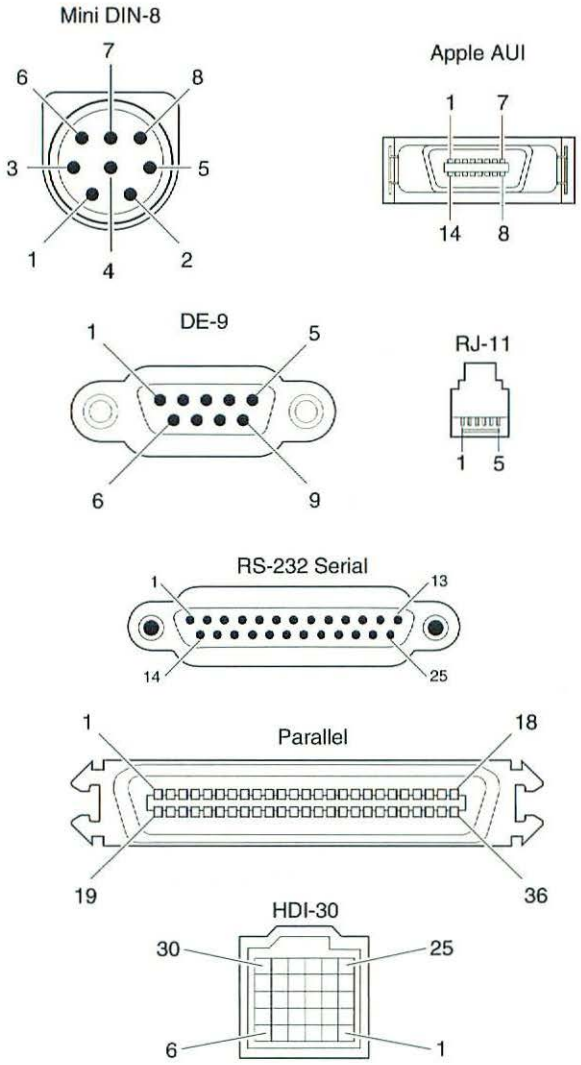


Figure 4. Cable Connectors

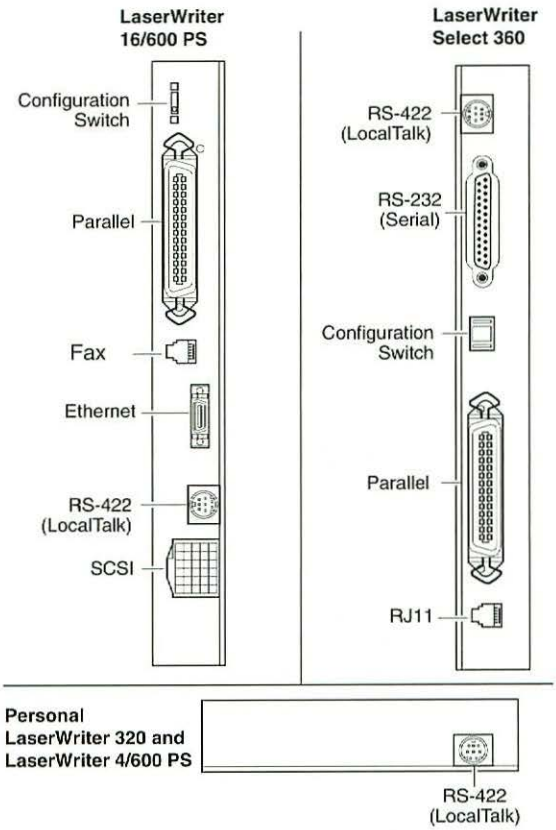


Figure 5. Printer Ports

Table 1. LaserWriter 16/600 PS Pinouts – RS-422*		
Pin	**Signal Name**	**Signal Description**
1	HSKo	Handshake out
2	HSKi	Handshake in
3	TxD-	Trasmit data -
4	GND	Signal ground
5	RxD-	Receive data -
6	TxD+	Transmit data +
7	GPI	General-purpose input
8	RxD+	Receive data +
*Connector type: mini DIN-8 male		

Table 2. LaserWriter 16/600 PS Pinouts – HDI-30 SCSI Connector*		
Pin	**Signal Name**	**Signal Description**
1	SCSI-Mode	SCSI disk mode enable signal
2	Data0/	Data bit 0
3	GND	Signal ground
4	Data1/	Data bit 1
5	Tempwr	+5 volts termination power (Termination power is not provided on the PowerBook 100.)
6	Data2/	Data bit 2
7	Data3/	Data bit 3
8	GND	Signal ground
9	ACK/	Acknowledge
10	GND	Signal ground
11	Data4/	Data bit 4

Table 2. LaserWriter 16/600 PS Pinouts – HDI-30 SCSI Connector* (Continued)		
Pin	**Signal Name**	**Signal Description**
12	GND	Signal ground
13	GND	Signal ground
14	Data5/	Data bit 5
15	GND	Signal ground
16	Data6/	Data bit 6
17	GND	Signal ground
18	Data7/	Data bit 7
19	PARITY/	Data parity
20	GND	Signal ground
21	REQ/	Request
22	GND	Signal ground
23	BUSY/	Busy
24	GND	Signal ground
25	ATN/	Attention
26	C/D/	Control/data
27	RST/	Reset
28	MSG/	Message
29	SEL/	Select
30	I/O/	Input/output
*Connector type: 30-pin high-density interconnect (HDI-30)		

Table 3. LaserWriter 16/600 PS Pinouts – Ethernet*		
Pin	**Signal Name**	**Signal Description**
1	FN Pwr	+12 volts @ 175mA or +5 volts @ 420 mA
2	DI-A	Data in circuit A
3	DI-B	Data in circuit B
4	VCC	Voltage common
5	CI-A	Control in circuit A
6	CI-B	Control in circuit B
7	+5 V	+5 volts (from host)
8	+5 V	Secondary +5 volts (from host)
9	DO-A	Data out circuit A
10	DO-B	Data out circuit B
11	VCC	Secondary voltage common
12	NC	Reserved
13	NC	Reserved
14	FN Pwr	Secondary +12 volts or +5 volts
Shell	Protective Gnd	Protective ground
*Connector type: Custom 14-pin .05-inch spaced ribbon (AAUI)		

Table 4. LaserWriter 16/600 PS and Select 360 Pinouts – Parallel Port*	
Pin	**Signal Description**
1	Data strobe
2	Data 1
3	Data bit 7
4	Data parity
5	Signal ground
6	Request
7	Signal ground
8	Busy
9	Signal ground
10	Attention
11	Control/data
12	Reset
13	Message
14	Select
15	Input/output
16	Signal ground
17	Chassis ground
18	No connection
19-30	Signal ground
31	Prime
32	Fault
33-36	No connection
*Connector type: TRW CINCH 57-30360 or equivalent	

Table 5. LaserWriter Select 360 Pinouts – RS-232*		
Pin	**Signal Name**	**Signal Description**
1	FG	Frame/protective ground
2	TxD	Transmitted data (from printer to computer)
3	RxD	Received data (from computer to printer)
4	RTS	Request to send.
5	CTS	Clear to send. (These signals are not used when XON/XOFF hand-shaking is enabled.)
7	SG	Signal ground
20	DTR	Data terminal ready.
*Connector type: 25-pin serial		

Figure 6 illustrates the overall approach to troubleshooting a LaserWriter printer. The rest of this section describes some specific actions you can take.

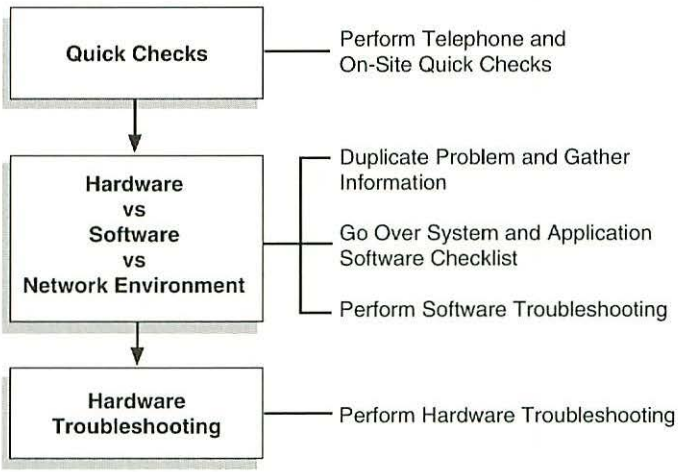


Figure 6. Overall Approach to Troubleshooting LaserWriter Printers

Telephone and On-Site Quick Checklist

- ✓ Check the power source and power connection.
- ✓ Check all cables and cable connections.
- ✓ Confirm that the toner cartridge is installed and has toner.
- ✓ Confirm that the paper cassette is installed and has paper.
- ✓ Confirm that the LaserWriter access door is closed.
- ✓ Check the status lights.
- ✓ Check the print density adjustment.
- ✓ Check the switch settings, if applicable.
- ✓ Confirm whether the printer produces a user test page.

Information Gathering

If quick checks do not identify the problem, try duplicating the problem and gather as much information as possible, including the following:

- A specific description of the problem (no power, unable to print from the computer, print quality bad, paper jam).
- The operating condition and environment under which the problem occurs (model of computer and LaserWriter; whether printer is networked; LaserWriter Driver version; system software and version; application software and version).
- Exactly what the customer is doing when the problem occurs.
- What has been changed or added to the system if the problem only appeared recently.
- What the customer has done to fix the problem, and the results.
- Whether the problem is continuous or intermittent.
- Whether the LaserWriter can print a user test page (if applicable).

Problem Identification

Using the information obtained from the customer or from on-site observation, determine whether the problem resides in one of the following functional areas—hardware, software, or network environment.

Hardware Environment

The problem is most likely a hardware problem if any of the following conditions exists:

- The printer is unable to print a user or service test page (if applicable).
- The printer shows obvious, physical signs of damage.
- The printer emits unusual noises or smells.
- The printer indicates a paper jam or paper-out condition.
- The print quality of the test print is not acceptable.
- The printer has no power.

Software Environment

The problem is most likely a software problem if any of the following conditions exists:

- The printer successfully prints both a user test page and a service test page, but does not print when connected to a computer (provided the computer and network hardware components are known-good).
- The user is attempting to print using pre-release, public-domain, or untested software (applications, fonts, or drivers).
- The same problem occurs when the software is used with other known-good LaserWriter printers.

Network Environment

The problem is most likely a network problem if any of the following conditions exists:

- Two or more users on the network experience the same printing problems.
- The printer successfully prints both a user test page and a service test page (if applicable), and the computer and software are known-good.
- The printer exhibits "poor performance" symptoms (for example, the printer takes longer to print than before).
- The printer or other network devices have been moved from one location to another.

To troubleshoot and repair network problems, refer to the *Networking and Communications Apple Service Guide*.

Software Troubleshooting

If you suspect a software problem, follow these steps:

1. Check the LaserWriter switch settings (if applicable).
2. Check the cables and cable connections.
3. Verify that the LaserWriter driver software is installed in the System Folder, and that the version number is current.
4. Open the Apple menu and select the Chooser.
5. Click the appropriate LaserWriter icon and verify that the printer is selected.

6. Open the File menu and choose Print Directory or Print Window.
7. If a printout of the directory or window is produced, the printer and network are functioning properly. Perform software checks as directed in the "System and Application Software Checklist" section.
8. If a printout of the directory or window is not produced, perform software checks as directed in the "System and Application Software Checklist" section.
9. If this approach does not fix the problem, your customer probably has a hardware problem. Refer to the appropriate troubleshooting flowcharts and tables for the specific printer.

System and Application Software Checklist

When troubleshooting system and application software, perform the checks listed in Table 6.

Table 6. System and Application Software Checklist

Check	Problem	Solutions
Is the problem particular to one application (try replicating the problem using another application)?	The message "Application is busy or missing" appears	1. Make sure the application is installed on the drive. 2. Launch the application rather than open the document. If application launches, it is not corrupt.
	Program incompatible with system	1. Contact vendor about program update. 2. Remove program from system.
	Program corrupted	1. System crashes can corrupt the program and the system software. Trash the program. 2. Reinstall the program and system software from original, locked disks.

Table 6. System and Application Software Checklist (Continued)

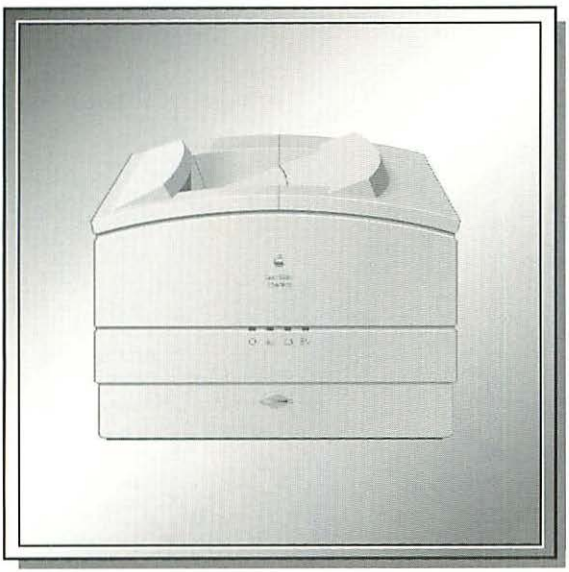
Check	Problem	Solutions
Is the problem with corrupted system software (try booting from a floppy) or with Multiple System folders (use Find File under the Apple Menu)?	Corrupted system software	Trash the old system software. Use Installer on original, locked system software disks to install new system software.
	Multiple System folders	Remove all system folders except folder with the Macintosh icon on it.

Important When replacing corrupted system software, avoid introducing new problems—always use the Installer on the original system software disks. If you remove the System folder before running the Installer, you will need to replace any custom enhancements, such as fonts, sounds, etc., from the previous system folder on your customer's system. Make copies of your customer's fonts and desk accessories before running the Installer.

Hardware Troubleshooting

If you suspect you have a printer hardware problem, refer to the troubleshooting flowcharts and tables in the appropriate printer chapter in this manual.

LaserWriter 16/600 PS



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Exploded View—Main Printer

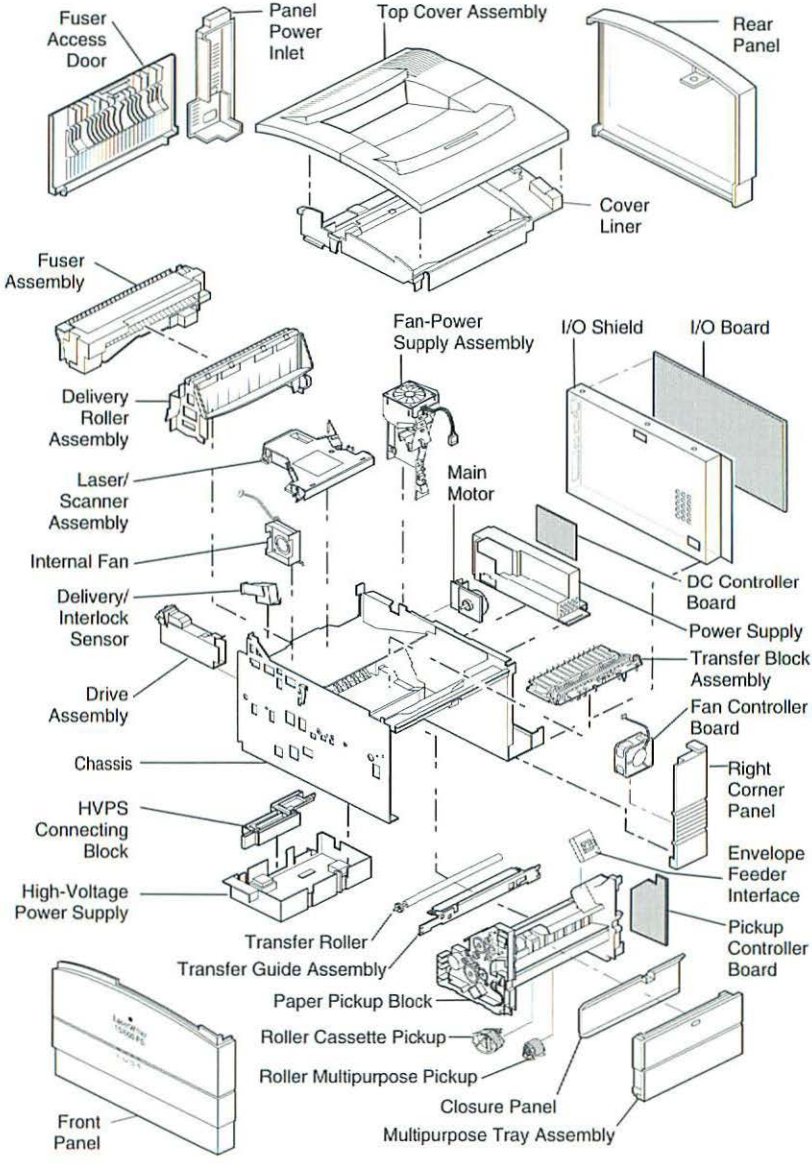


Figure 7. LaserWriter 16/600 PS Exploded View

Cables
- Cable Assembly, RJ-11 076-8075
- Cable, DC Controller–I/O Controller 922-0945
- Cable, Envelope Feeder Interface 922-0285
- Cable, Hard Drive 922-1204
- Cable, HVPS–DC Controller 922-0217
- Cable, International Fax–Modem 922-1208
- Cable, Laser–DC Controller 922-0960
- Cable, LED Display 922-0210
- Cable, Main Motor 922-0214
- Cable, Pickup Controller–DC Controller 922-1131
- Cable, Power Supply–DC Controller 922-0215
- Cable, Power Supply–I/O Controller 922-0216
- Cable, Scanner–DC Controller 922-0943
- Cable, Sheet Feeder Interface 922-0219
- Cable, Cover-Sheet Feeder 922-0273

Cartridge Guides
- Coupler (Pkg. of 5) 922-0534
- Engine Spring Kit 076-0678
- Laser Shutter Arm 922-0246
- Toner Cartridge Guide, Left 922-0242
- Toner Cartridge Guide, Right 922-0243
- Toner Cartridge Support 922-0244
- Toner Pressure Arm, Left 922-0250
- Toner Pressure Arm, Right 922-0251

Cassettes
- A4 Cassette 922-0384
- Letter Cassette 922-0382
- Universal Cassette 922-0383

DC Controller Board 661-0094
Delivery/Interlock Sensor 922-0299
Delivery Roller Assembly 922-0292
- Delivery Assembly Piece Parts Kit 076-0675
- Delivery Frame 922-0293
- Roller, Lower Delivery 922-0296
- Roller, Upper Delivery 922-0297
- Roller, Upper Passive Delivery 922-0295
- Upper Delivery Guide 922-0298

Drive Belt 922-0209
- Drive Belt End Plate 922-0294

External Plastics/Top

- Cleaning Brush 922-0240
- Cover Interlock Arm 922-0236
- Cover Liner 922-0229
- Cover, Paper Output 922-0239
- Cover, Toner Access 922-0235
- Holder, Output Tray Extension 922-0238
- Output Tray Extension 922-0237
- Top Cover Assembly 922-0234

External Plastics/Side & Bottom

- Cassette Guide, Left 922-0245
- Cassette Guide, Right 922-0249
- Cover, Cassette Stop 922-0222
- Door, Fuser Access 922-0233
- Foot 922-0247
- Panel, Front 922-1126
- Panel, Right Corner 922-0940
- Panel, Power Inlet 922-0941
- Panel, Rear 922-0942
- Strap Hinge 922-0258

Fans

- Fan, Power Supply 922-0944
- Fan Duct A 922-1134
- Fan Duct B 922-1130
- Fan, Controller Board 922-0948
- Fan, Internal 922-0947

Fuser Assembly

- Fuser Assembly (110/115 V) 661-0091
- Fuser Assembly (220/240 V) 661-0092
- Pressure Roller 922-0955
- Fuser Roller 922-0954
- Fuser Heating Bulb (110/115 V) 922-0956
- Fuser Heating Bulb (220/240 V) 922-0957
- Fuser Roller/Bushing/Gear Kit 076-0479
- Fuser Spring Kit 076-0481

Hard Drive, 240 MB, 2.5" SCSI 661-0895

High-Voltage Connecting Block 922-0268

- Power Supply–HVPS Interface PCB 922-0204

High-Voltage Power Components

- HVPS Cover 922-0269
- Power Supply, High Voltage (HVPS) 661-0096
- Paper Weight A 922-0270
- Paper Weight B 922-0271

I/O Controller Board and Fax Cards
I/O Controller Board 661-0090
Fax Card, U.S. 661-0095
Fax Card, International 661-0130
Kits
Delivery Assembly Piece Parts Kit 076-0675
Engine Spring Kit 076-0678
Fuser Roller/Bushing/Gear Kit 076-0479
Fuser Spring Kit 076-0481
Hard Drive Bracket Kit 076-0474
Main Engine Screw Kit 076-0453
Pickup Block Gear Kit 076-0478
Pickup Block Piece Parts Kit 076-0674
Pickup Block Ring/Spring Kit 076-0672
Pickup Block Roller/Shaft Kit 076-0480
Secondary Engine Screw Kit 076-0454
Top Cover Hinge Kit 076-0670
Laser/Scanner Assembly 661-0093
Laser Shutter 922-0241
LED Display 922-0232
LED Shield 922-0230
Main Motor & Drive Assembly
Drive Assembly 922-0950
Main Motor 922-0946
Modem, Data/Fax, 2400 Baud, External 661-1692
Multipurpose Tray & Components
Closure Panel 922-0253
Cover, Multipurpose Tray 922-0221
Lateral Brace 922-0248
Multipurpose Tray 922-0227
Multipurpose Tray Extension 922-0228
Pickup Block
Cassette Pickup Solenoid 922-0275
Cassette Pickup Roller 922-0951
Guide, Opening 922-0284
Guide 922-0288
Inner Left Frame Gear Mount 922-0277
Lever, Sensor 922-0287
Paper Guide 922-0283
Pickup Controller Board 922-0952
Pickup Frame, Left 922-0276
Pickup Motor 922-0953

- Pickup Roller, Multipurpose Tray 922-0281
- Pickup Sensor Board 922-0208
- Multipurpose Guide Plate 922-0290
- Multipurpose Pickup Solenoid 922-0278
- Multipurpose Tray Guide Assembly 922-0286
- Sensor Holder Assembly 922-0289

Power Supply, 110 V 661-0097
Power Supply, 220 V 661-0098
Sheet Feeder Connecting Block 922-0272
SIMM, 8 MB, 80 ns, 72-pin 661-0809
Transfer Block Assembly

- Feeder Guide 922-0265
- Passive Transfer Roller 922-0266
- Transfer Block Assembly 922-0267
- Transfer Roller 922-0949

Exploded View—Envelope Feeder

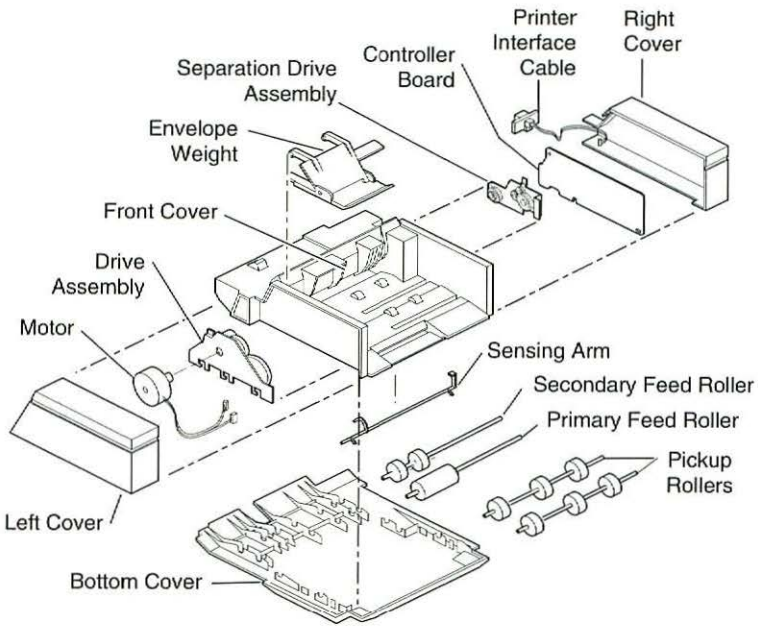


Figure 8. LaserWriter 16/600 PS Envelope Feeder Exploded View

The LaserWriter 16/600 PS envelope feeder is nearly identical to the LaserWriter Pro 600/630 envelope feeder. However, the two feeders are not cross-compatible. You must use each feeder in the printer for which it is specifically designed.

You can distinguish the two feeders externally by carefully inspecting the pickup rollers and shafts. The LaserWriter 16/600 PS model has a one-piece roller/shaft construction. The LaserWriter Pro 600/630 model has a two-piece roller/shaft construction. You can also confirm model type by taking the feeder apart and inspecting the controller board. The LaserWriter 16/600 PS envelope feeder controller board bears the number "RG1-3437." The LaserWriter Pro 600/630 envelope feeder controller board has the vendor number "RG5-0576" imprinted at the end of the board.

Envelope Feeder Parts List

Controller Board Components
- Cable Clamp 922-0142
- Cable, Printer Interface 922-0139
- Controller Board 661-0123
- Ferrite Core 922-0148
- Sensing Arm 922-0137

Drive Components
- Feed Roller, Secondary 922-1129
- Gear Kit 076-0662
- Passive Roller Shaft 922-0138
- Pickup Roller Shaft, Forward 922-0146
- Pickup Roller Shaft, Rear 922-1045
- Primary Feed Shaft 922-0138
- Roller/Pin Kit 076-0664
- Separation Assembly 922-0144
- Separation Assembly Coupling 922-0135
- Separation Assembly Shaft 922-0140

External Parts
- Cable, Guide Plate Grounding 922-0133
- Cover, Bottom 922-0123
- Cover, Front 922-0130
- Cover, Left 922-0129
- Cover, Right 922-0124
- Envelope Weight 922-0127
- Envelope Weight Arm 922-0128
- Feeder Frame 922-0122
- Guide Plate 922-0131
- Guide Plate Ground 922-0132
- Pressure Block 922-0136
- Sizing Guide 922-0125
- Tray, Extension 922-0126

Index of Kits
- Bushing/Ring/Spring Kit 076-0663
- Gear Kit 076-0662
- Roller/Pin Kit 076-0664
- Screw Kit 076-0665

Motor and Main Drive Assembly
- Drive Assembly 922-1127
- Motor 922-0958

Separation Drive Plate 922-0143

Exploded View—Sheet Feeder

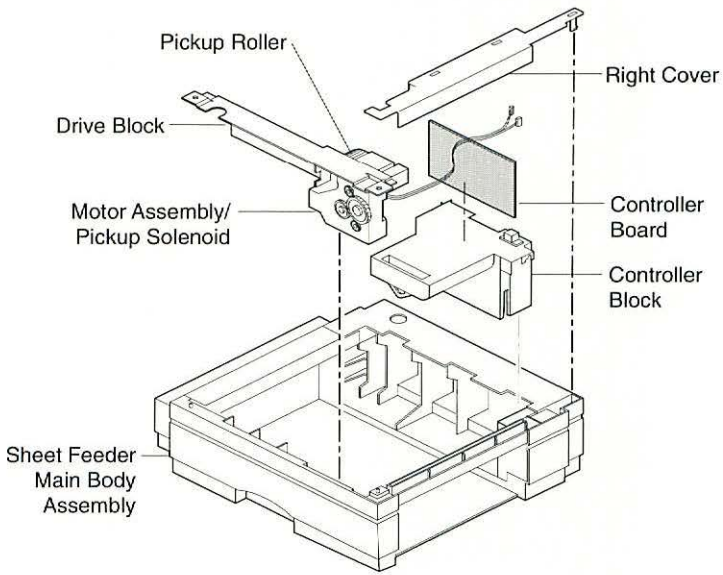


Figure 9. LaserWriter 16/600 PS Sheet Feeder Exploded View

The LaserWriter 16/600 PS sheet feeder is nearly identical to the LaserWriter Pro 600/630 sheet feeder. However, the two feeders are not cross-compatible. You must use each feeder in the printer for which it is specifically designed.

You can distinguish the two feeders by taking the feeder apart and inspecting the controller board. The LaserWriter 16/600 PS sheet feeder controller board bears the number "RG5-1086." The LaserWriter Pro 600/630 sheet feeder controller board has the vendor number "RG5-0541" imprinted on it.

Sheet Feeder Parts List

- Controller Block 922-0161
  - Controller Block Cover 922-0155
- Controller Board 661-0124
  - Cassette Size Actuator 922-0163
- Drive Block
  - Bushing/Spring/Washer Kit 076-0668
  - Drive Block Mount 922-0169
  - Feeder Roller Housing 922-0165
  - Feeder Shaft 922-0172
  - Motor Assembly 922-1128
  - Optional Feeder Drive Assembly 922-0483
  - Paper Weight 922-0177
  - Passive Roller Housing 922-0166
  - Passive Roller Mount 922-0175
  - Pendulum 922-0176
  - Pickup Cam 922-0171
  - Pickup Roller 922-0959
  - Pickup Shaft 922-0173
  - Pickup Solenoid 922-0174
  - Roller Feeder 922-0170
- Kits
  - Bushing/Spring/Washer Kit 076-0668
  - Gear Kit 076-0666
  - Screw/Ring Kit 076-0667
- Main Body
  - Base Pan 922-0159
  - Base Pan Foot 922-0160
  - Cassette Size Actuator Cover 922-0162
  - Drive Block Plate 922-0168
  - Front Panel 922-0157
  - Front Panel Support Rod 922-0158
  - Guide Rail 922-0167
  - Left Frame 922-0153
  - Left Panel 922-0164
  - Rear Panel 922-0151
  - Rear Panel Grounding Plate 922-0156
  - Right Cover 922-0154
  - Right Frame 922-0152

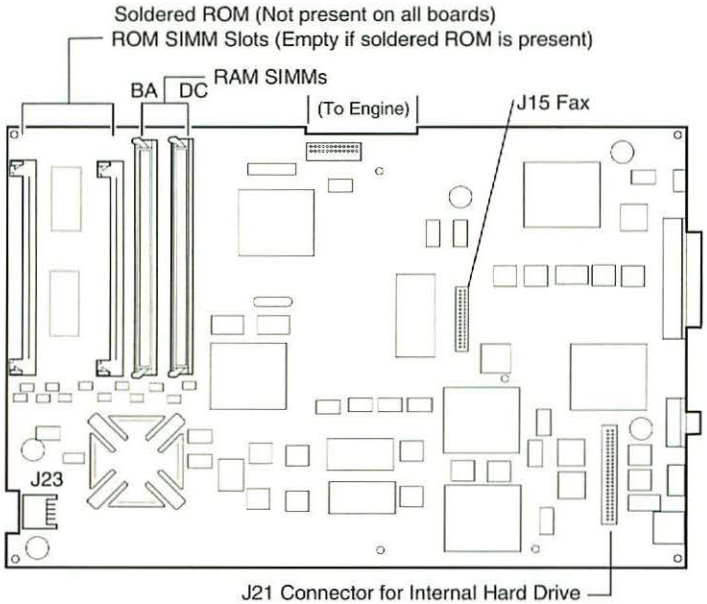


Figure 10. LaserWriter 16/600 PS I/O Controller Board

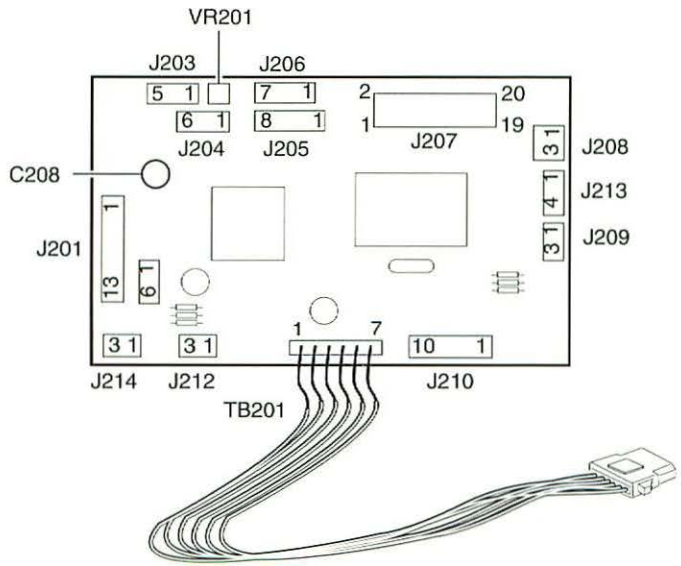


Figure 11. LaserWriter 16/600 PS DC Controller Board

Specifications

Table 7. Print Engine Specifications	
Engine	Canon LBP-P430 engine
Printing Method	Electrophotography using single-component microfine toner
Optical System	Semiconductor laser and a rotating six-faced prism scanning mirror
Resolution	600 dpi standard with FinePrint; PhotoGrade requires minimum 12MB of RAM.
Printing Speed	17.1 pages per minute (letter) 16.2 pages per minute (A4)
Dimensions	Height: 12.08 in. (307 mm) Width: 16.73 in. (425 mm) Depth: 16.89 in. (429 mm) Weight: Printer with cassette: 42.02 lb. (19.1 kg) Toner cartridge: 3.3 lb. (1.5 kg)
Operating Environment	50-90.5° F (10-32.5° C) 20-80% relative humidity
Power Consumption	Approximately 0.79 kW at 71° F (20° C)
Macintosh Requirement	System Software 7.0 or later
Print Capacities and Material	Standard cassette (250 sheets) A4, B5, legal, letter, or executive plain paper (16-24 lb.) Cassettes available: letter, A4, or universal Multipurpose tray (100 sheets) Plain paper from 7.16 in. by 10.1 in. to 8.5 in. by 14 in. (16-32 lb.), envelopes, and fuser-compatible labels and film Lower cassette (500 sheets) A4, B5, legal, letter, or executive plain paper (16-24 lb.) Cassette available: universal Envelope feeder (75 sheets) COM-10, DC, Monarch, C5, B5 (recommended envelope); from 3.54 in. by 7.44 in. to 7.0 in. by 10.0 in. Do not use envelopes with clasps, snaps, windows, or synthetic materials. Envelopes with peel-off adhesive strips or double sealable flaps must use fuser-compatible adhesive.

Table 8. I/O Board Specifications	
Processor	AMD 29030 (RISC) running at 25 MHz
RAM	8 MB, expandable to 32 MB. Refer to "RAM Upgrades" in "Upgrades" for more information.
ROM	4 MB standard
Pinouts	LocalTalk, Ethernet, and parallel connections
Imaging Languages Supported	QuickDraw, Postscript Level 2, and HP PCL5
Settings	The LaserWriter 16/600 PS features automatic traffic control. The printer can accept jobs simultaneously from AppleTalk, TCP/IP, and NetWare networks and from the parallel port, automatically switching between PostScript and PCL5 languages. No manual intervention is required if the standard communication settings are adequate. See "Configuation Switch" in this chapter for information about customizing these settings.

Printer Diagnostics

The LaserWriter 16/600 PS printer features diagnostics built into the I/O controller board: the Power-On Self Test (POST), and the Extended Power-On Self Test (EPOST).

Power-On Self Test (POST)

When you switch on power, the LEDs are designed to illuminate in a specific sequence as the printer comes ready. In a functioning printer, all LEDs briefly illuminate about a second after you turn on the printer to confirm power distribution. They then extinguish and pulse as the fans power up and main motor rotation takes place. About 5–6 seconds into printer startup, all LEDs will again illuminate for one second. This marks the beginning of the Power-On Self Test (POST).

POST is a diagnostic procedure built into the I/O controller board that tests four areas: the SIMM/CPU, the I/O controller, the engine, and a fax card or hard drive, if present. As each check passes, the leftmost LED extinguishes. When all four checks have passed, all LEDs remain extinguished for one second. The ready LED will then flash once. At this point the Power-On Self Test ends, and control passes over to the PostScript interpreter.

When POST detects an error, it exits the LED-extinguishing sequence and alternately flashes the toner and jam LEDs until you turn off the printer. Observing which LEDs have extinguished prior to the error array can help isolate the fault to one of the four areas indicated.

Note The LED array that POST uses has no correlation to jam, low-toner, or paper-out conditions. POST simply uses those LEDs to relay coded feedback. Once control passes over to the PostScript interpreter, the engine sensing system engages and LEDs do correlate to their labels.

Extended Power-On Self Test (EPOST)

Whereas the Power-On Self Test (POST) occurs during every printer startup, the Extended Power-On Self Test (EPOST) occurs only with intervention of the service technician. EPOST is a diagnostic built into the I/O controller board and designed to run when the printer is in a modified state of operation.

To enable EPOST, turn off the printer, install a serial loopback connector (see Figure 12A) into the I/O controller serial port, and set the configuration switch to the "up" position. Turn the printer back on. EPOST engages about 10–15 seconds after the printer starts up.

EPOST startup behavior is identical to that of POST up to the point where an error is detected. In POST, startup is terminated and a general error display is

reported to the LED panel. In EPOST, error reporting is extended to display about a dozen more specific error codes. See Figure 12B for a chart of EPOST failure codes.

If EPOST detects an error, the LEDs cycle through the following sequence until you turn off the printer.

1. All LEDs are on for one second
2. All LEDs are off for one second
3. Failure error code for two seconds
4. All LEDs are off for one second

▲Caution When you are finished with the test, remember to remove the serial loopback cable and set the configuration switch in its original position.

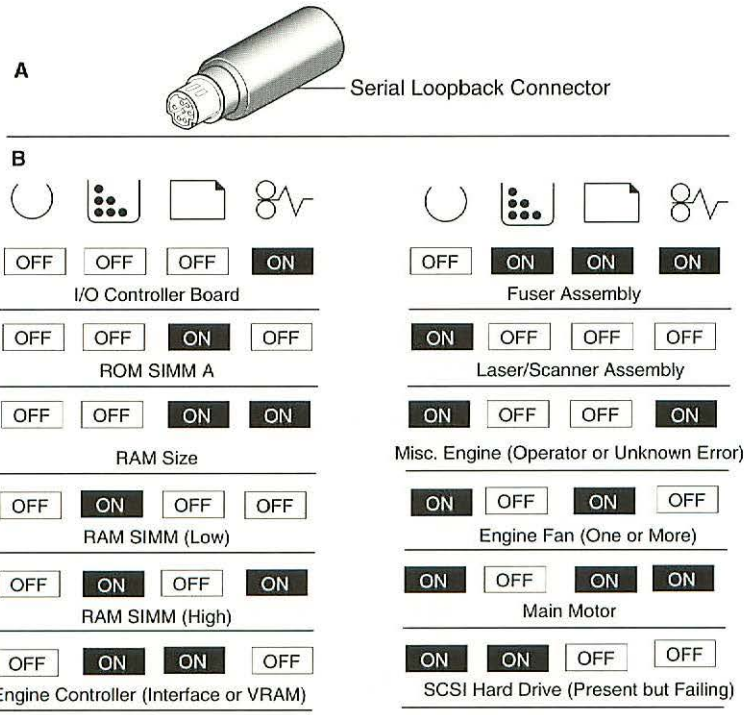


Figure 12. Extended Power-On Self Test (EPOST) Failure Codes

Test and Configuration Pages

There are three special pages that an operational LaserWriter 16/600 PS can print. Each indicates information that can isolate problems and/or identify the configuration of the printer. These pages are:

- Startup test page
- Service test page
- Configuration page

Startup Test Page

The printer generates a startup test page (see Figure 13) two to three minutes after you switch on the printer. Successful printing of this page indicates that the I/O board is operational.

Note Printing of the startup test page may be turned off by software. If it does not print, use the Apple Printer Utility to enable the startup page.

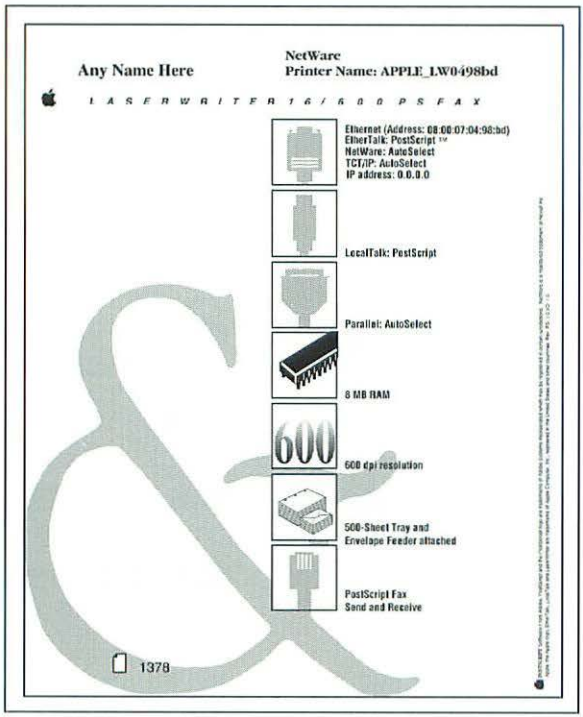


Figure 13. Startup Test Page

Service Test Page

The printer generates a service test page (see Figure 14) when you press the service test page button. Successful printing of this page indicates that the printer engine is operational.

To access the service test page button, open the multipurpose tray. The button is located in the upper right corner of the opening. The button is small and difficult to see against the black plastic. Use a paper clip or similar tool to press the button.

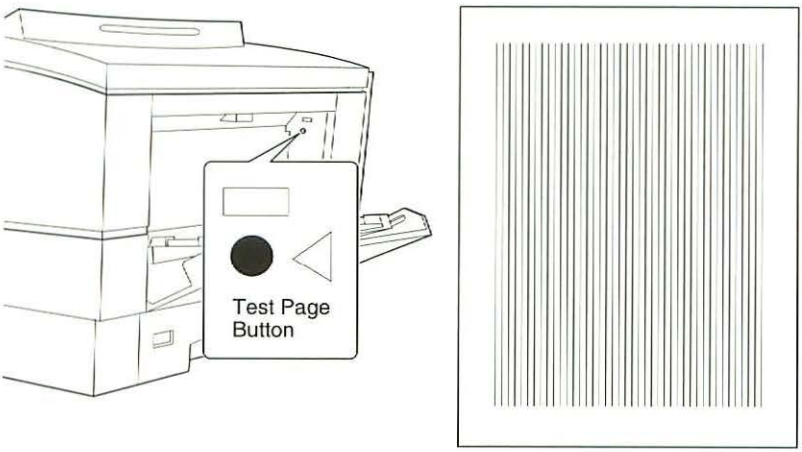


Figure 14. Service Test Page

Configuration Page

The printer generates a configuration page (see Figure 15) when you issue the Print Configuration Page command with the printer utility.

Note The Print Configuration Page command in the Apple Printer Utility is located in the File menu.

The numbered sections of the configuration page provide the following information:

1. Network address settings
2. Amount and allocation of RAM memory and readout of EEROM integrity.
3. Switch configurations
4. HP LaserJet emulator version
5. Startup page setting (on or off)
6. LaserWriter serial number
7. Halftone screen settings
8. System administrator password
9. Timeout settings
10. SCSI ID of printer and attached drives
11. LaserWriter fax configuration
12. Default paper tray and margin offsets

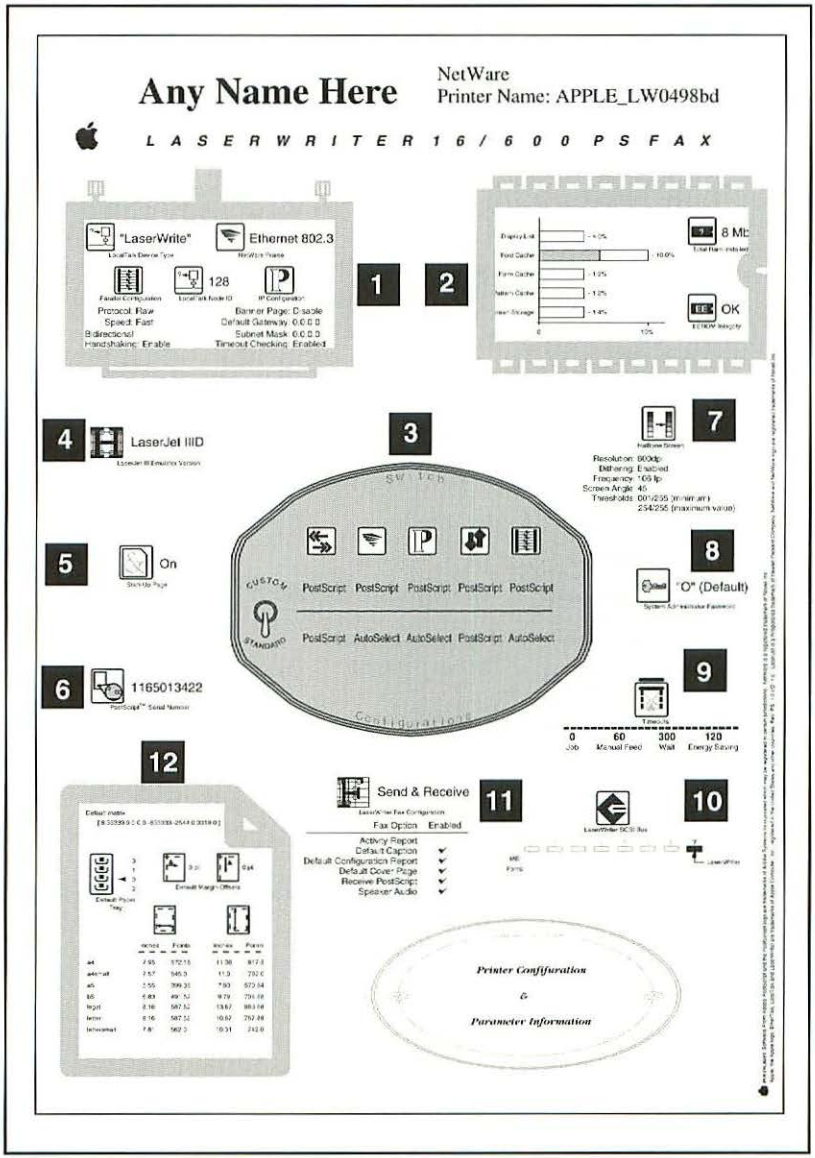


Figure 15. Configuration Page

Configuration Switch

The LaserWriter 16/600 PS configuration switch is located at the top of the I/O controller board end bracket. Configuration refers to the communication protocols that you assign to each of the three ports.

When you set communication protocols on other LaserWriter printers, you typically set a configuration switch that has numerical settings similar to a SCSI ID switch. With the LaserWriter 16/600 PS, the configuration switch is a toggle between standard (down) and custom (up) values. You define custom settings through software. To change or view the current communication settings, run the Apple Printer Utility on the Macintosh computer or the LaserWriter Utility for Windows on an IBM PC or compatible computer.

Note The LaserWriter Utility for Macintosh computers does not work with the LaserWriter 16/600 PS. If you are working from a Macintosh computer, you must use the Apple Printer Utility.

Table 9 lists the standard and custom switch settings.

Table 9. Configuration Switch Settings

Port	Interface	Standard Mode (Down Switch)	Custom Mode (Up Switch)
LocalTalk	LocalTalk	PostScript	PostScript
Ethernet	EtherTalk	Postscript	Postscript
	NetWare	AutoSelect	Postscript
	TCP/IP	AutoSelect	Postscript
Parallel	Parallel	AutoSelect (raw protocol)	Postscript (normal protocol)

Settings made with any of the printer utilities discussed in this section become default parameters and affect all printed documents, regardless of the computer that originated the print request.

Apple Printer Utility for Macintosh Computers

The Apple Printer Utility for Macintosh computers works only with the LaserWriter 16/600 PS. This utility sets parameters on the printer's I/O controller board, such as the following:

- Naming the printer
- Initializing SCSI hard drives
- Downloading fonts
- Setting default printer resolution
- Setting default paper-handling options
- Setting default print density
- Printing configuration page
- Turning off the startup test page
- Setting communication protocols

LaserWriter Utility for Windows

The LaserWriter Utility for Windows has the same functions as the Apple Printer Utility for Macintosh computers, except for certain hard drive and font functions that are absent from the Windows printer drive interface.

Note The LaserWriter Utility for Macintosh computers does not work with the LaserWriter 16/600 PS. If you are working from a Macintosh computer, you must use the Apple Printer Utility.

NetWare Utilities

Two DOS utilities, LWPMAN and LWFORM, perform a subset of Apple Printer Utility functions in a NetWare environment.

TCP/IP Printer Configuration Utility for UNIX

To configure the printer from a UNIX environment, run the TCP/IP Printer Configuration Utility by using the Telnet program.

Upgrades

The LaserWriter 16/600 PS has several user-installable upgrades. This section provides instructions for installing RAM, adding a fax card, and adding internal or external hard drives.

RAM Upgrade

There are two RAM SIMM sockets on the LaserWriter 16/600 PS I/O controller board, socket BA on the left and socket DC on the right.

The printer comes with 8 MB of RAM installed in slot BA. You can increase the printer memory to a total of 32 MB by installing RAM SIMMs in one of the configurations shown in Table 10. No other configuration is supported. If you try to install a (16 + 0 = 16) or (16 + 4 = 20) configuration, for example, you are likely to receive an engine error when you start up the printer.

Table 10. LaserWriter 16/600 PS RAM Configurations

Total	Slot BA (left slot)	Slot DC (right slot)	Note
8 MB	8 MB	(empty)	Standard installed.
12 MB	8 MB	4 MB	Minimum configuration to enable PhotoGrade.
16 MB	8 MB	8 MB	
24 MB	16 MB	8 MB	This configuration requires moving the base 8 MB SIMM from the left (BA) to the right (DC) SIMM socket. Always install the SIMM in the left socket before installing the SIMM in the right socket.
32 MB	16 MB	16 MB	Remove the base 8 MB SIMM and return it to the customer. Always install the SIMM in the left socket first.

Installing SIMMS

▲Caution Put on the grounding wrist strap before handling the SIMM.

1. Insert the SIMM (see Figure 16) straight into the socket (begin with socket BA).
2. Press the SIMM down at an angle until the retaining clips on each end of the connector snap and fasten the SIMM in place.
3. Repeat step 1 to install the second SIMM if necessary.
4. Remove the grounding wrist strap.

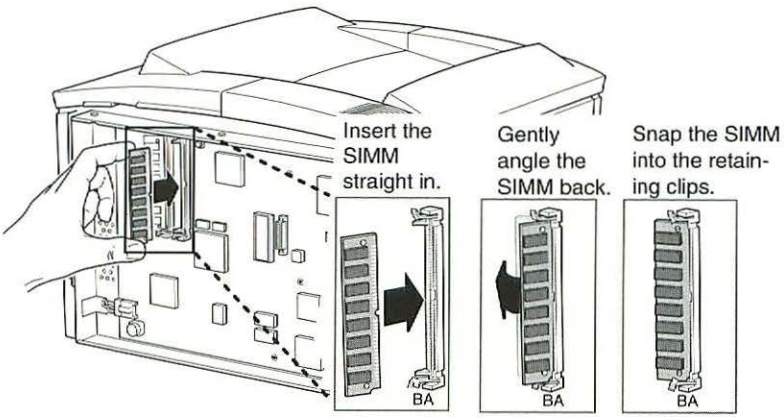


Figure 16. Installing SIMMs

Adding a Fax Card

There are two fax cards (see Figure 17) available from Apple, one for use in the United States and one for international use.

Install the fax card into connector J15 on the I/O board. One screw connects the fax card to a sheet metal flange on the I/O shield. The fax port aligns with a pinout opening in the I/O shield.

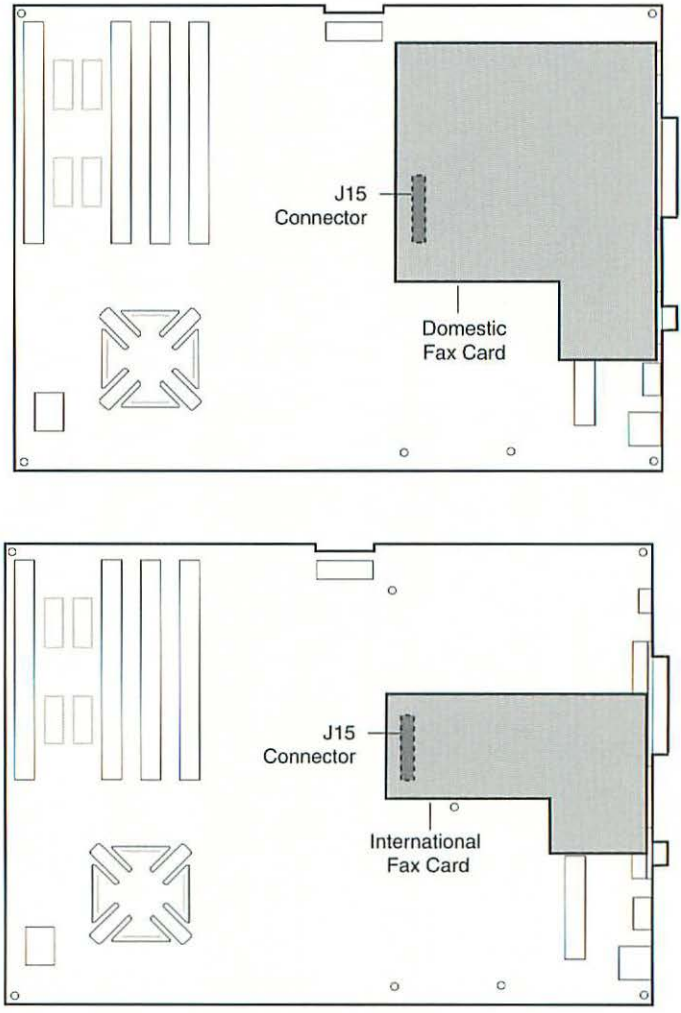


Figure 17. LaserWriter 16/600 PS Fax Cards

Adding an Internal Hard Drive

You can install one internal hard drive in the LaserWriter 16/600 PS.

The drive mounts directly onto the printer's I/O board (see Figure 18) with the three captive screws attached to the carrier. Follow these steps to install an internal hard drive:

1. Turn the printer off.
2. Remove the rear cover.
3. Put on the grounding strap.
4. Check the I/O serial number on the yellow barcode label in the upper right-hand corner of the I/O controller board. If the last four characters of the number are "34AA," do not install the hard drive. Return the I/O controller board to Apple.
5. If the last four characters are not 34AA," continue installing the hard drive. Attach the hard drive cable to the I/O board and secure the hard drive to the board with the three screws on the retaining brackets.

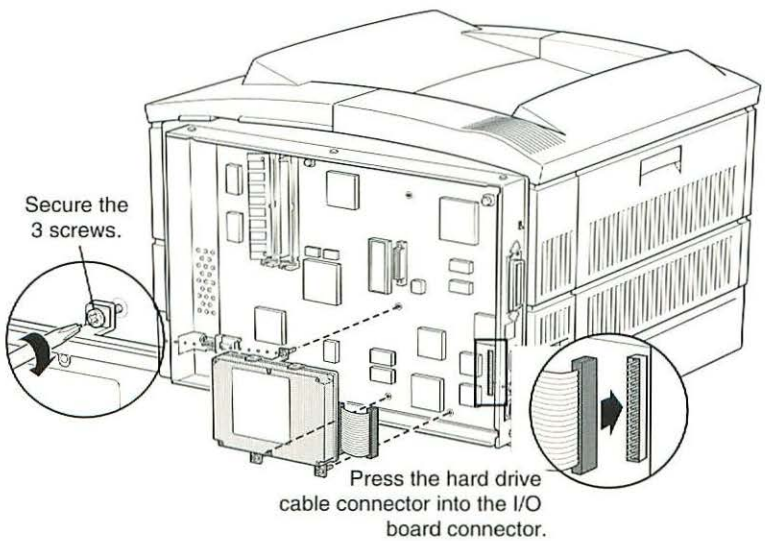


Figure 18. Installing the Internal Hard Drive

Adding An External Hard Drive

You must use an HDI-30 SCSI System cable and SCSI terminator to connect an external hard drive to the printer. The terminator can be either black or gray. Each SCSI device connected to the printer must have a different number. Do not use SCSI ID #7 (it's a reserved ID number) or ID #0 (used by an internal hard drive, if one is installed).

Important External hard drives must supply 5 volts DC to the SCSI bus to work properly. Check the documentation that came with the hard drive for information about SCSI voltage.

The printer does not recognize an attached drive unless you turn on the drive before or at the same time that you start up the printer. If a hard drive is not turned on, the printer detects an error and will not start up.

Previously Used Hard Drives

The LaserWriter 16/600 PS does not recognize disks that have been formatted for use with a different model of LaserWriter or Macintosh. If you attach a previously used hard drive to the printer, you must reinitialize the drive and then reload fonts from your computer.

Note Initialize hard drives with the Apple Printer Utility (for Macintosh) or the Font Downloader in the Printer Setup dialog box (for Windows). If your computer communicates with the printer via DOS or a UNIX network, refer to the LaserWriter 16/600 PS user manual for initialization instructions.

Registration Adjustment

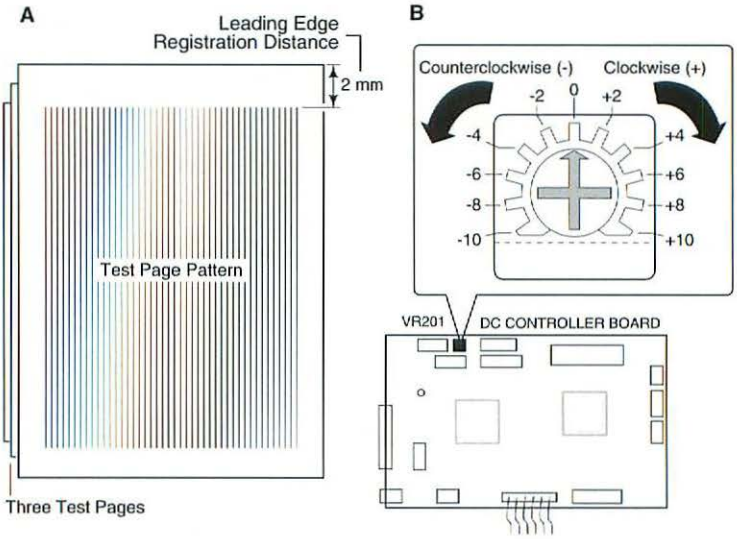
You must adjust the printer registration whenever you replace the DC controller board, paper pickup block, or laser/scanner assembly.

The DC controller board calculates registration based on input from registration paper sensor PS602 and adjustments made to varistor VR201 on the DC controller board.

Optimum leading edge registration distance is 2 mm (see Figure 19A).

Adjust the printer registration as follows:

1. Using a jeweler's screwdriver, reset VR201 on the DC controller board to "0" (see Figure 19B).
2. Switch on the printer and wait for the printer to warm up.
3. Print three service test pages (see Figure 19A).
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.
6. Adjust VR201 so that the average value becomes 2.0 mm (see Figure 19C). For example, if your average distance is 2.6 mm, the difference is 0.60 mm and you should set VR201 to a setting of +2 .
7. Print three more test pages. If the average registration distance is not 2.0 mm, repeat this procedure.



C

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

Difference (mm)	VR201 Setting
+3.02	+10
+2.71	+9
+2.41	+8
+2.11	+7
+1.81	+6
+1.51	+5
+1.21	+4
+0.90	+3
+0.60	+2
+0.30	+1

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

Difference (mm)	VR201 Setting
-0.30	-1
-0.60	-2
-0.90	-3
-1.21	-4
-1.51	-5
-1.81	-6
-2.11	-7
-2.41	-8
-2.71	-9
-3.02	-10

Figure 19. Registration Adjustment

Before you begin troubleshooting, check the printer setup and operating conditions described in the following section, "Pre-Power-On Checklist." If the problem persists, refer to the troubleshooting flowchart (Figure 27).

The flowchart directs you to perform various tasks and refers you to specific troubleshooting tables. Perform each step in the troubleshooting tables in order, and refer as necessary to the wiring diagram that follows the tables.

Retry the printer each time you change its physical state–for example, when you replace a component–until the problem is resolved. If you replace a module and find that the problem remains, reinstall the original module before proceeding.

When the printer is repaired, perform the necessary preventive maintenance before returning it to the customer. Make sure you are familiar with all procedures described in the "Safety" section in the front of this guide before performing any live electrical checks.

Pre-Power-On Checklist

Check the following items before proceeding with the troubleshooting flowchart or tables.

- Line voltage is OK (U.S.: 115 VAC ± 10%; Int'l.: 220 VAC ± 10%).
- Printer is installed on a solid, level surface.
- Room temperature is 50–90° F (10–32.5° C).
- Humidity is 20–80%.
- Printer is not located in a hot or humid area, near open flames, or in a dusty location.
- Printer is not exposed to ammonia gas.
- Printer is not in direct sunlight.
- Printer is installed in a well-ventilated area.
- Cables and connectors are OK.
- Toner cartridge is installed and has toner.
- Paper cassette is properly loaded with paper.
- Paper is within specifications.
- Top cover and fuser door are closed.
- Fuser roller levers are in a down position.

Troubleshooting Tips

This section contains additional troubleshooting information for the LaserWriter 16/600 PS printer. Review these repair procedures before proceeding; the troubleshooting tables that follow refer to these procedures.

Multimeter Probes

The connectors within the LaserWriter 16/600 PS are very small and require sharp needle-point probes to make good contact. Do not use probes that do not make proper contact.

To see whether a set of probes works properly, test resistance at connector J210 on the DC controller board in the following manner (the cable must connected to the board):

Set your multimeter to resistance and insert the probes at pins 1 and 10. If the reading indicates continuity, then the probes are making good contact. If the reading indicates infinite resistance, then the probes do not make contact and should not be used with this printer.

Forcing a Feed Cycle

If you want to print from anything other than the standard 250-sheet cassette tray, you must be connected to a CPU and select the feed option that you want. It is not possible to print a service test page from any source other than the standard cassette.

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 lies at some point before the drum, probably in the imaging system.

If the image on the drum is OK, the fault lies at some point after the drum, probably in the fuser assembly, transfer block, or high-voltage power supply.

To inspect the drum in this way, run a print and wait until the paper clears the synchronization pause at the registration paper sensor. Open the toner access door, remove the toner cartridge, and pull back the shield to inspect the drum.

Drum Exposure

Make sure you cover the toner cartridge during servicing. Prolonged exposure to light can result in print quality problems. If damage has occurred, store the toner cartridge in a dark place. The drum returns to its normal condition after about 24 hours.

Setting Fuser Rollers

The LaserWriter 16/600 PS fuser rollers ship in a jam-release state, but the levers and packing material are designed so that you automatically engage the fuser rollers when you first set up the printer.

However, the LaserWriter 16/600 PS has two additional gray envelope levers situated directly above the jam-release levers. When placed in an up position, these levers release just enough fuser roller pressure to permit wrinkle-free fusing of thicker envelopes. The levers should be up for envelopes (see Figure 20A) and down for everything else (see Figure 20B). If you encounter fusing problems on normal paper, be sure to check that the envelope levers are in a down position .

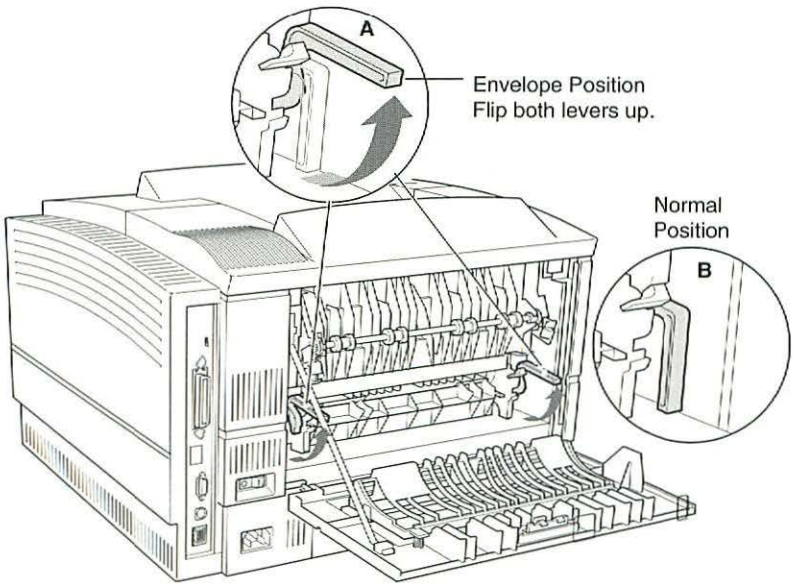


Figure 20. Setting Fuser Rollers

Maintaining I/O Connectivity

If you want to troubleshoot the printer while maintaining connectivity to a host computer, you must temporarily reposition the printer's I/O controller board. In this reconfigured state, you will be able to print from a paper source other than the standard cassette, observe the behavior of LEDs during startup, or run the printer diagnostic, while still having the engine open for troubleshooting. You must remove the printer interface cable from the I/O controller board and temporarily substitute a Quadra 900/950 floppy drive 20-pin cable between connectors A and B, as shown in Figure 21. This cable has the extra length needed for the I/O shield to rest flat on the work surface. Do not disconnect power supply cable J15, the I/O-CPU cabling, or the AC power cable.

Maintaining Pickup Connectivity

To troubleshoot the paper pickup block, you must temporarily reconfigure the printer's paper path so that the pickup block is exposed. In this reconfigured state, you will be able to take voltage readings from the pickup controller board and observe paper feeding from the cassette.

▲Caution When performing this procedure do not let the pickup controller board brush up against the metal chassis.

To reconfigure the paper path:

1. Disable the startup test page using the Apple Printer Utility.
2. Remove the pickup block and set it at an angle to the printer.
3. Reconnect cables J601 and J603 at the leading edge of the pickup controller board (C in Figure 21).
4. Load paper into the cassette tray and insert the cassette tray into the pickup block.
5. Press down the top cover interlock actuator and force the interlock switch closed by wedging in the hooked end of the green cleaning brush (D in Figure 21).
6. Reinstall the top cover and cover liner and close the lid.
7. Install the envelope feeder or sheet feeder if you need to test feed from those sources. You must maintain I/O connectivity in order to complete this testing.

Note Make sure to enable the startup test page before returning the printer to the customer.

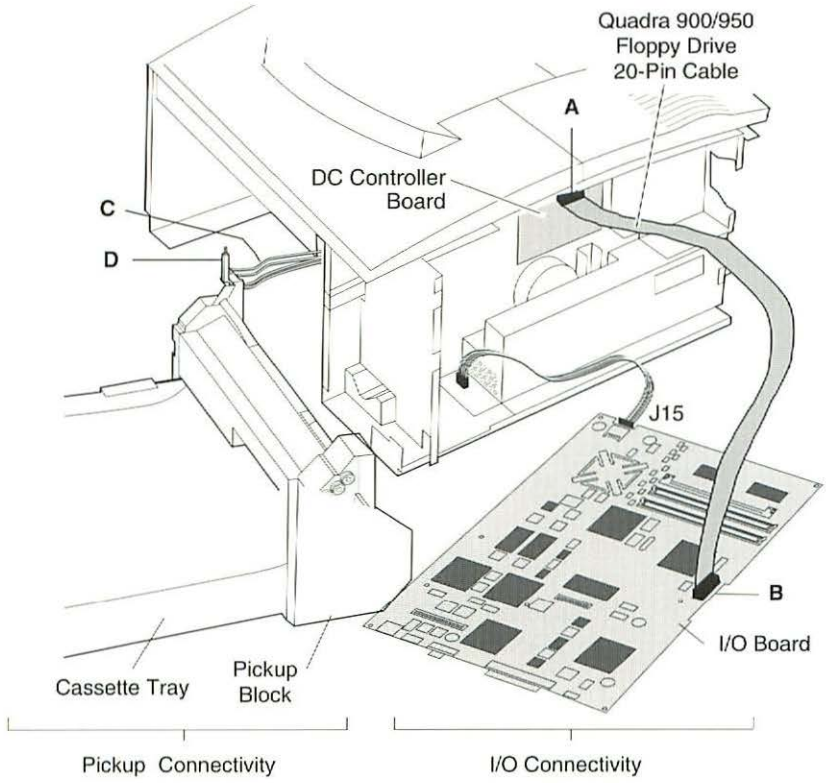


Figure 21. Maintaining I/O and Pickup Connectivity

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 C208 to prevent overheating. If there is a failure of the fusing system, you must turn the power off and leave it off for about 10 minutes, or manually discharge the capacitor before switching the power back on.

▲Caution Be sure to switch off power and unplug the printer before performing this procedure.

To discharge capacitor C208 (see Figure 22), switch off the printer and remove the rear panel, I/O controller board, and I/O shield. Carefully jumper the two wires at the base of the capacitor using some kind of conductor.

Note There are many different tools that can be used to discharge the capacitor: a flat-blade screwdriver, a paper clip, or aluminum foil doubled over. The tool illustrated in Figure 22 is a length of lead solder. It has the advantage of being ductile and less apt to damage the controller board.

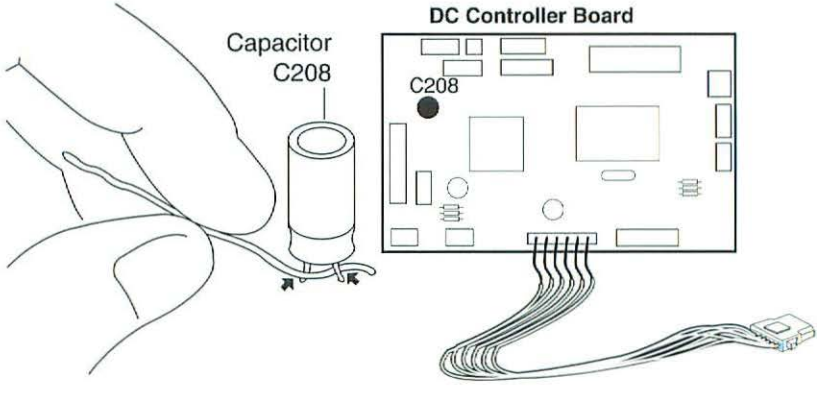


Figure 22. Discharging the Capacitor

Toner Cartridge Modification

LaserWriter toner cartridge part number M2473G/A is the **only** cartridge from Apple specifically designed for the LaserWriter 16/600 PS.

However, you may also use Revision B LaserWriter Pro 600/630 toner cartridges in the LaserWriter 16/600 PS. You can distinguish the revision B toner cartridge by the 1" x 3.5" molded ridge on the top surface (see Figure 23). You must not use the original version of the LaserWriter Pro 600/630 toner cartridge; if the ridge is not present, do not use the toner cartridge in a LaserWriter 16/600 PS.

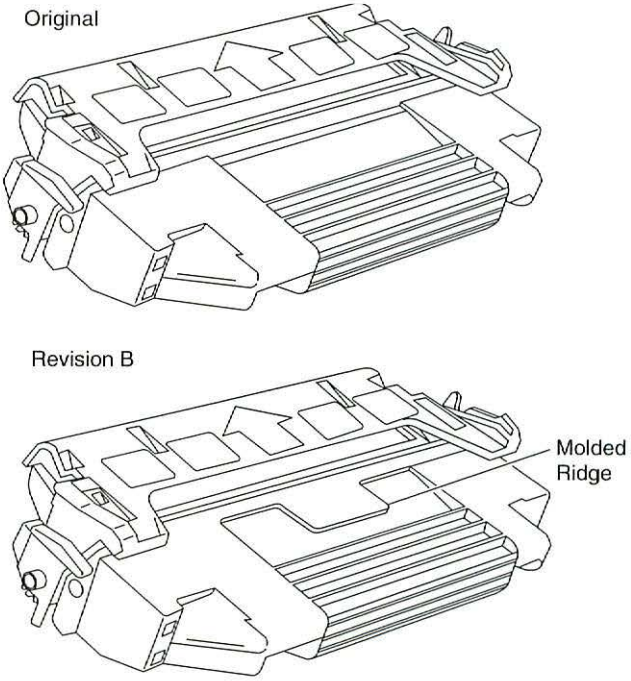


Figure 23. Comparison of LaserWriter Pro 600/630 Toner Cartridges

Paper Sensors

Paper sensors consist of an actuator, a U-shaped photo interrupter, and circuitry. Sensors are tripped as the actuator swings against movement of paper and blocks the gap of the "U". An actuator can be passive (governed by gravity) or spring-loaded. There are six paper sensors, and one dual-action sensor. Five of these sensors are shown in Figure 24:

PS601 Cassette Paper Sensor

PS602 Registration Paper Sensor

PS701 Multipurpose Paper-End Sensor

PS702 Multipurpose Paper-Present Sensor

PS851 Sheet Feeder Paper-Present Sensor (located in the optional sheet feeder not shown in Figure 24)

PS931 Envelope Paper-Present Sensor (located in the optional envelope feeder not shown in Figure 24)

PS201 Delivery/Interlock Sensor (dual-action sensor)

Sensing Switches

Sensing switches attach to the pickup controller board and do not use photo interrupters. Switches are actuated by leaf springs that press inward as you insert a cassette tray or close the top cover. There are seven sensing switches (see Figure 25):

SW601 Top Cover Interlock Switch

SW603 Upper Cassette Size Sensing Switch

SW604 Upper Cassette Size Sensing Switch

SW605 Upper Cassette Size Sensing Switch

SW851 Lower Cassette Size Sensing Switch

SW852 Lower Cassette Size Sensing Switch

SW853 Lower Cassette Size Sensing Switch

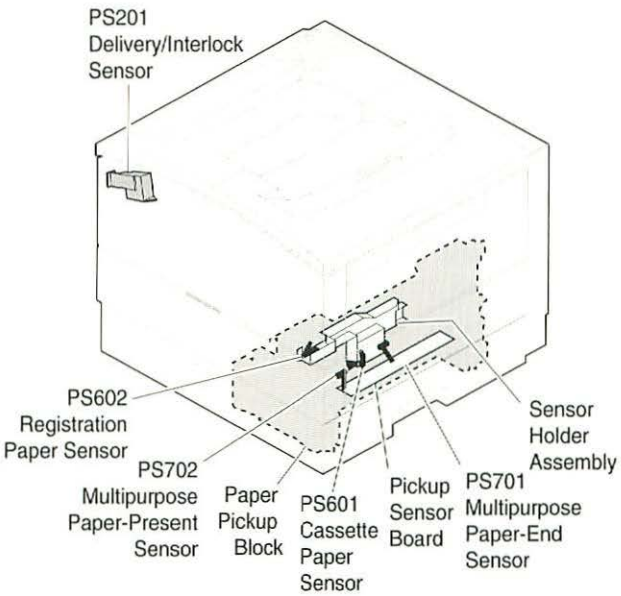


Figure 24. Paper Sensors

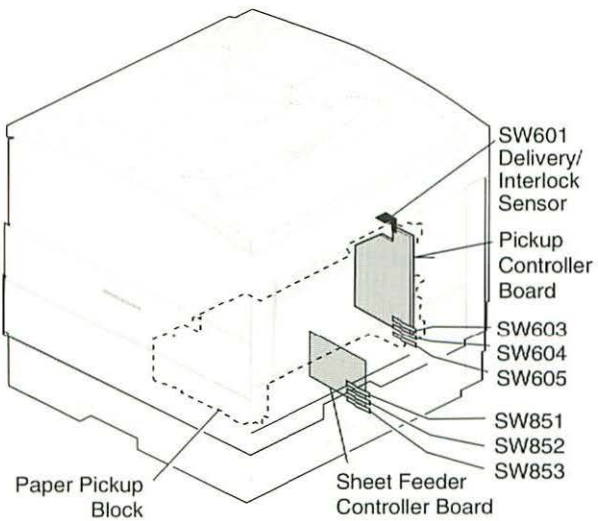


Figure 25. Sensing Switches

Paper Path

The LaserWriter 16/600 PS has four paper sources and one output tray in a complete system (see Figure 26).

Motor Locations and Functions

There are four motors (see Figure 26) and four separate drive trains in a complete system. Two motors are in the printer engine and one is in each of the optional feeders (sheet and envelope):

- Main motor (M1) powers the system that transports paper from the toner cartridge to the delivery tray on top of the printer.
- Pickup block motor (M2) powers the system that transports paper into the engine, through the pickup block, and up to the toner cartridge.
- Sheet feeder motor (M3) powers the system that transports paper from the 500-sheet cassette upward into the printer engine.
- Envelope feeder motor (M4) powers the system that separates envelopes and feeds them into the printer engine.

Fans

The LaserWriter 16/600 PS has three fans (see Figure 26).

- Power supply fan (FM1) is situated above the laser/scanner assembly and directly below the vent opening on the top cover.
- Controller board fan (FM2) is situated behind and to the left of the I/O controller board.
- Internal fan (FM3) is situated forward of the laser/scanner assembly and is ventless.

Note See Table 19, "Fan error," for further technical information on these fans.

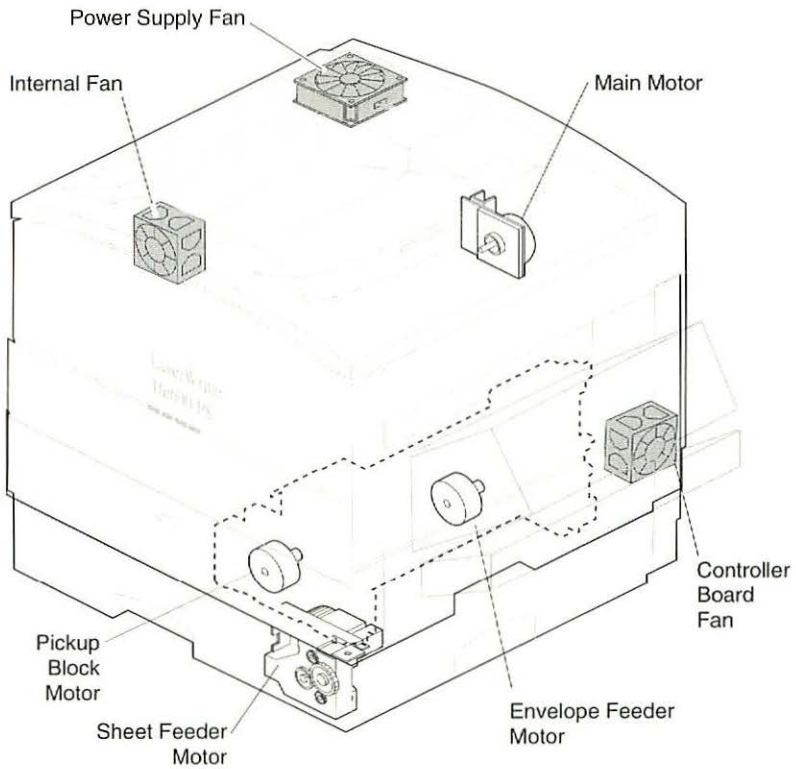


Figure 26. Paper Path, Motors, and Fan Locations

LaserWriter 16/600 PS Troubleshooting Flowchart

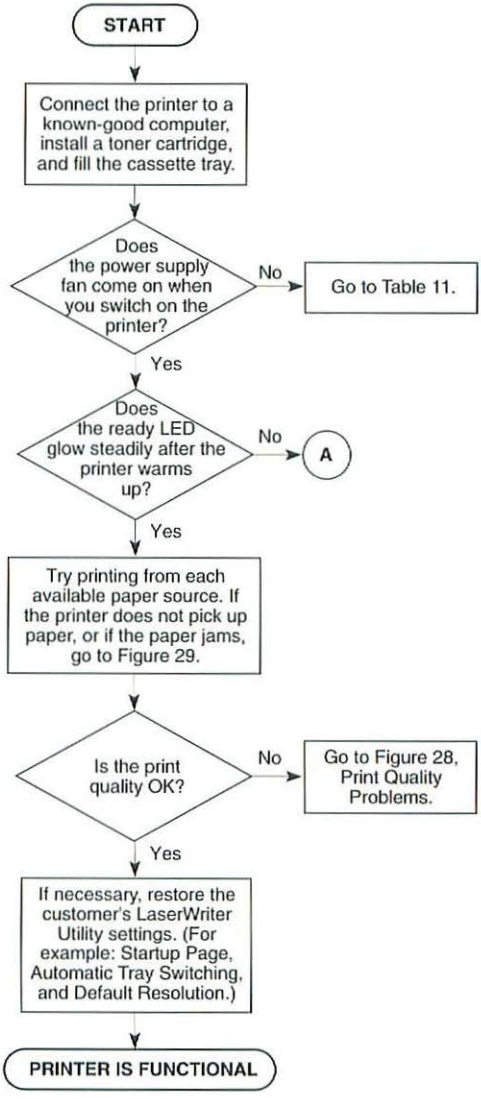


Figure 27. LaserWriter 16/600 PS Print Engine Check (1 of 2)

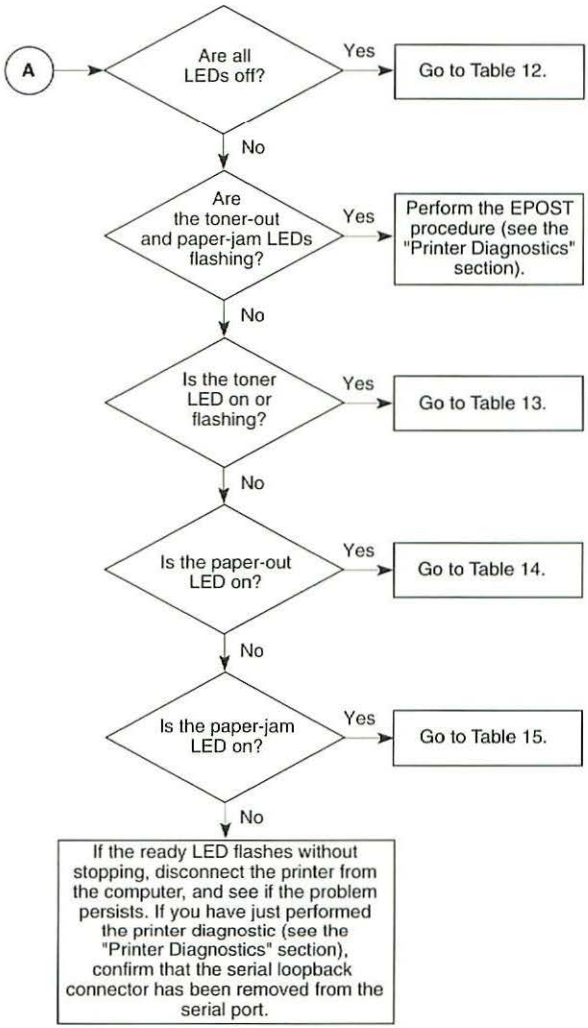


Figure 27. LaserWriter 16/600 PS Print Engine Check (2 of 2)

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 11. The Power Supply Fan Does Not Come On When You Switch On the Printer

Step	Check	Result	Action
1	Does the power supply fan come on when you turn on the printer?	No	Remove the rear panel, I/O board, and I/O shield, and restart the printer.
		Yes	The problem is probably with the power supply fan or its connection to the DC controller board. Run the printer diagnostic. If the diagnostic suggests a fan problem, see Table 19.
2	Do any of the motors rotate after the printer starts up?	Yes	Check the connections at J213 and J214 on the DC controller board, and check that nothing physical is blocking the fan blades. If the problem persists, replace the DC controller board.
		No	Make sure J103 is connected at the power supply. If TB201 is detached from the DC controller, replace the DC controller board; otherwise, replace the power supply. If the problem persists, replace the DC controller board.

Table 12. All LEDs Are Off After Printer Warmup			
Step	**Check**	**Result**	**Action**
1	Are the top cover and fuser door closed?	No	Close them completely, and confirm that the plastic tab actuators on the doors are intact. No LEDs illuminate if either door is open.
2	Remove the rear panel and I/O shield. Is the status panel cable securely connected to J204 on the DC controller board?	No	Secure the cable.
3	Can you print despite the fact no LEDs illuminate?	Yes	Check connection between the status panel and the DC controller board. If the connections are secure, replace the status panel.
4	Place probes between J208-2 (GND) and J208-3 (PSNS) on the DC controller board. Does the voltage rise to 5 V as you open the fuser door?	No	Replace the delivery/interlock assembly.
5	Place probes between J201-7 (+5 V) and J201-1 (GND) on the DC controller board. Switch on the printer. Does the voltage measure 5 V?	No	Replace the DC controller board.
6	Press the top cover interlock leaf spring. Do you hear the clicking sound of a microswitch when you press the spring?	No	Confirm that the black plastic actuator is in place behind the top of the pickup controller board.
7	Remove the paper pickup block and maintain pickup connectivity. Place probes between J601-11 (GND) and J601-7 (+5 V) on the solder side of the pickup controller board. Does the voltage measure 5 V?	Yes No	Replace the pickup controller board. Replace the DC controller-board-to-pickup-controller-board cable.

Table 13. Toner LED Is On or Flashes After Printer Warmup			
Step	**Check**	**Result**	**Action**
1	Try a known-good toner cartridge. Does the problem persist?	No	Problem solved.
2	Have you recently serviced the printer and has this symptom existed ever since?	Yes	You probably did not fully reseat the high-voltage power supply, connector block, or transfer block assembly; or connector J210 on the DC Controller board is not secure. Make sure these modules are securely installed.
3	Have you just performed the engine diagnostic?	Yes	Confirm there is not still a serial loopback connector installed in the serial port.
4	Remove the toner cartridge and inspect all the toner contacts for damage or excess toner buildup. Are the contacts clean and in good condition?	No	Clean or repair the contacts if possible. Take special note of TB403, which is the pronged contact that the toner cartridge mates into. This contact ties into the toner sensor inside the cartridge.
5	Remove the rear panel and I/O shield. Place probes between J210-6 (HVRST) and J210-10 (GND) and switch on the printer. Does the voltage change from 0 to 5 V about one second after the printer starts up?	No Yes	Replace the DC Controller board. Perform the first module exchange below. If the problem persists, reinstall the original module and perform the next exchange: • Replace the HV power supply • Replace the power supply-to-HVPS interface board. • Replace the transfer block assembly. • Replace the DC controller-board-to-HVPS cable.

Table 14. Paper-Out LED is On After Printer Warmup			
Step	**Check**	**Result**	**Action**
1	Is the cassette empty or not installed?	Yes	Make sure that the cassette is present and has paper.
2	Remove the cassette and inspect the paper-sensing lever. Is the lever broken?	Yes	Replace the sensor holder assembly.
3	Defeat the cassette paper sensing lever by pushing it and holding it in (as if a cassette were present). With your other hand, press the three microswitch leaf springs all at the same time. Does the ready LED illuminate after a couple of seconds?	Yes	Replace the pickup controller board.
4	Remove the rear panel and I/O shield. Place probes between J201-7 (+5 V) and J201-1 (GND) on the DC controller board. Switch on the printer. Does the voltage measure 5 V?	No	Replace the DC controller board.
5	Remove the paper pickup block and maintain pickup connectivity. Place probes between J601-11 (GND) and J601-7 (+5 V) on the solder side of the pickup controller board. Does voltage measure 5 V?	No	Replace the DC-controller-to-pickup-controller cable.
6	Measure the voltage between J605-5 (GND) and J605-3 (1STS). Does the voltage measure 5 V?	No	Replace the pickup controller board.
7	Keep the probes in the same position and manually trip the cassette sensor lever. Does the voltage drop to 0 V when you trip the lever?	No Yes	Replace the sensor holder assembly. Replace the pickup controller board.

Table 15. Paper-Jam LED is On After Printer Warmup			
Step	**Check**	**Result**	**Action**
1	Is the delivery/interlock sensor snagged?	Yes	Remove the top cover and delivery roller assembly, and unsnag the sensor spring. The spring should be straight. If the actuator is snagged, it will not spring back and forth as you try to trip it.
2	Is the delivery-sensing lever snagged?	Yes	Remove the top cover and delivery roller assembly and see what is snagging the lever. If necessary, remove and dismantle the fuser assembly and replace the delivery-sensing lever.
3	Is the registration-sensing lever snagged?	Yes	If the lever is broken or snagged, remove the pickup block and troubleshoot further. If necessary, replace the sensor holder assembly.
4	Remove the rear panel, I/O shield, top cover, and delivery roller assembly. Is the purple cable between the delivery/interlock sensor and the DC controller board securely connected?	No	Secure the cable.
5	Place probes between J208-2 (GND) and J208-3 (PSNS). Does the voltage rise to 5 V as you open the fuser door?	No	Replace the delivery/interlock assembly.
6	Place probes between J201-7 (+5 V) and J201-1 (GRD) on the DC controller board. Does the voltage measure 5 V?	No	Replace the DC controller board.

Table 15. Paper-Jam LED is On After Printer Warmup (Continued)			
Step	**Check**	**Result**	**Action**
7	Remove the paper pickup block and maintain pickup connectivity. Place probes between J601-7 (+5 V) and J601-11 (GND) on the solder-side of the pickup controller board. Does the voltage measure 5 V?	No	Replace the DC-controller board-to-pickup-controller-board cable.
8	Place probes between J605-6 (RESS) and J605-5 (GND). Does the voltage measure 5 V?	No	Replace the pickup controller board.
9	Keep the probes in the same position and manually trip the registration sensor lever. Does the voltage drop to 0 V when you trip the lever?	No Yes	Replace the sensor holder assembly. Replace the DC controller board.

Important When there is a failure of the fusing system, the DC controller board shuts off current to the fuser roller heater and charges capacitor C208 on the DC controller board to prevent overheating. If there is a failure of the fusing system, you must turn off the power and leave it off for about 10 minutes, or manually discharge the capacitor before switching power back on.

Table 16. Fuser Assembly Error			
Step	**Check**	**Result**	**Action**
1	Remove the rear panel, I/O board, and I/O shield. Is connector J210 on the DC controller board secure?	No	Secure the connector.
2	Is the power supply firmly seated?	No	Seat the power supply.

Table 16. Fuser Assembly Error (Continued)			
Step	**Check**	**Result**	**Action**
3	Remove the fuser assembly and let it cool. Measure the resistance between J743-6 and J743-7 on the fuser. (Refer to the wiring diagram for illustration and pin layout of connector J743.) Does the resistance measure between 180 and 280 kΩ?	No	Disconnect J744 and check for same resistance. Replace the thermistor or the connector cable, as needed.
4	Measure the resistance between J743-1 and J743-8 on the fuser. Does the resistance measure approximately 3 Ω or less?	No	If there is continuity through the heater bulb, replace the heater bulb. If there is continuity across the thermoprotector, replace the fuser connector cable. If there is not continuity across the thermoprotector replace the thermoprotector, and proceed to the next step.
5	Reinstall the fuser. Place probes between J212-1 (/FSRD) and TB201-6 (GND) on the DC controller board. Does the voltage change from approximately 5.1 V to 1.5 V a few seconds after the printer starts up?	No	Replace the DC controller board.
6	Place probes between J212-2 (RLD) and TB201-6 (GND). Does the voltage measure approximately 2.1 V?	No Yes	Replace the DC controller board. Replace the power supply.

Table 17. Laser/Scanner Error			
Step	**Check**	**Result**	**Action**
1	Remove the rear panel and I/O shield. Are the DC controller board connectors J205 and J206 secure?	No	Secure the cables.
2	Remove the top cover and delivery roller assembly. Are all three laser/scanner assembly connectors secure?	No	Secure the cables.
3	Remove the two cables that run from the DC controller board to the laser/scanner assembly and check the resistance of each. Is the resistance approximately 1 ohm or less for each wire?	No Yes	Replace the defective cable. Replace the laser/scanner assembly. If the problem persists, reinstall the original module and replace the DC controller board.

Table 18. Main Motor Error			
Step	**Check**	**Result**	**Action**
1	Remove the rear panel and I/O shield. Is the main motor cable secure at J211 on the DC controller board?	No Yes	Secure the cable. Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: • Replace the main motor. • Replace the DC controller board. • Replace the main motor cable.

Table 19. Fan Error			
Step	**Check**	**Result**	**Action**
1	Remove the rear panel and I/O shield. Are the fan cables secure at J209, J214, and J213 on the DC controller board?	No	Secure the cables.
2	Observe fan operation of FM1 (power supply fan), FM2 (controller board fan), and FM3 (internal fan). FM1 and FM2 exhaust outward through the vents in the external plastics. FM3 vents internally and runs only during a print cycle, so you'll have to remove the top cover and defeat sensors to observe it. Are all the fans operating correctly?	No	Check power distribution to each fan by placing multimeter probes between pin 1 (fan drive) and pin 3 (ground) at the DC controller connector for that fan and restart the printer. FM1: connector J209 FM2: connector J214 FM3: connector J213 FM1, FM2, and FM3 should go from 0 V to 24 V then down to about 16 V. If any of these does not behave in this manner: • Replace the DC controller board. • Replace the power supply. • Replace any faulty fan.
3	Place the probes at J209-2 (FLOCK) and J209-3 (GND) on the DC controller board, and switch on the power. Does the voltage measure 2.2 V or more?	Yes No	Replace the power supply fan (FM1). Replace the DC controller board.

Table 20. I/O Board Error			
Step	**Check**	**Result**	**Action**
1	Do the diagnostic LEDs indicate an I/O board error?	Yes	Replace the I/O board.
2	Did you receive a SIMM error?	Yes	Replace the faulty SIMM.
3	Did you receive a ROM error?	Yes	Replace the I/O board.

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

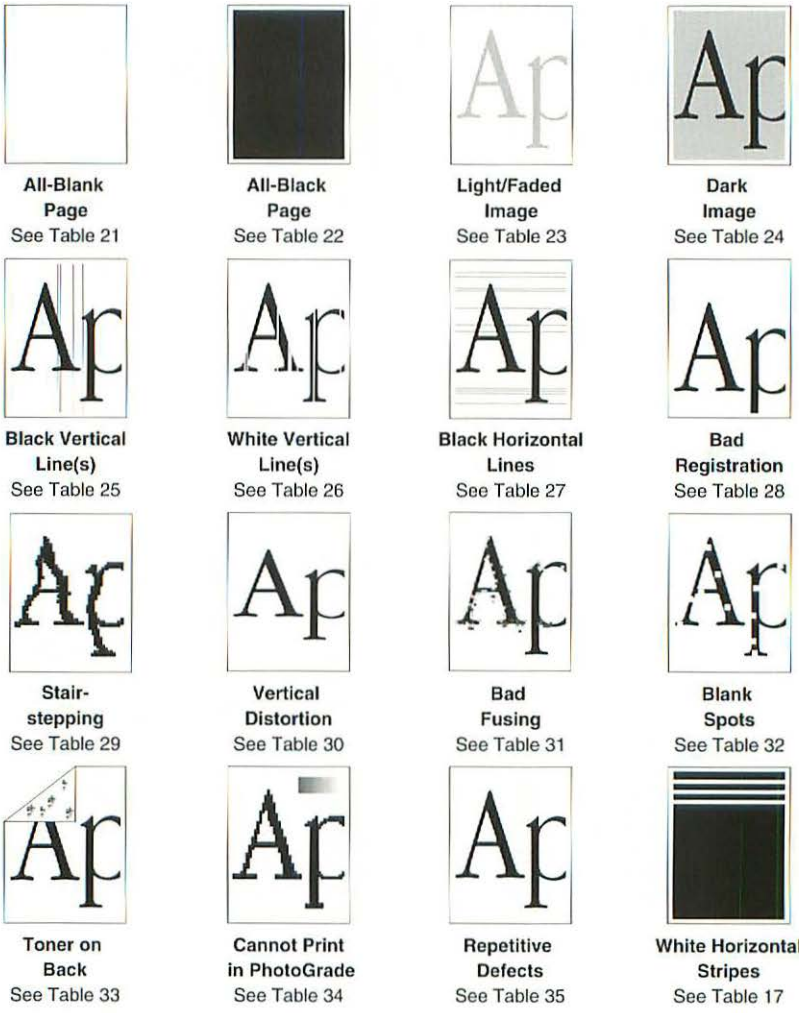


Figure 28. Print Quality Problems

Table 21. All-Blank Page			
Step	**Check**	**Result**	**Action**
1	Is the sealing tape removed from the toner cartridge?	No	Remove the sealing tape.
2	Have you recently installed a laser/scanner unit and has this symptom existed since?	Yes	The laser shutter may have been installed incorrectly. The shutter should spring back and forth as you insert the toner cartridge.
3	Does this symptom occur only with envelopes?	Yes	Instruct the customer to adjust margins in the software application.
4	Run the Extended Power-On Self Test. Does the test indicate a specific error (see Figure 12)?	Yes	Go to the appropriate troubleshooting table that describes the error indicated.
5	Remove the rear panel and I/O shield. Place probes between J210-6 (HVRST) and J210-10 (GND). Does the voltage change from 0 to 5 V about one second after the printer starts up?	No	Replace the DC controller board.
6	Place probes between J210-9 (SLO2) and J2 10-10 (GND). Does the voltage measure approximately 0.7 V about one second after the main motor starts?	No Yes	Replace the DC controller board. Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: • Replace the high-voltage power supply. • Replace the power-supply-to-HVPS interface board. • Replace the transfer block assembly.

Table 22. All-Black page			
Step	**Check**	**Result**	**Action**
1	Run the Extended Power-On Self Test (see "Printer Diagnostics"). Does the test indicate a specific error (see Figure 12)?	Yes	Go to the appropriate troubleshooting table that describes the error indicated.
2	Place probes between J210-9 (SLO2) and J210-10 (GND). Does the voltage measure approximately 0.7 V about one second after the main motor starts?	No Yes	Replace the DC controller board. Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: • Replace the high-voltage power supply. • Replace the power-supply-to-HVPS interface board.

Table 23. Uniformly Light/Faded Image Over Entire Page			
Step	**Check**	**Result**	**Action**
1	Adjust the density using the Printer Utility. Does the problem persist?	No	Problem solved.
2	Try printing with known-good paper. Does the problem persist?	No	Problem solved.
3	Replace the transfer roller with a known-good transfer roller. Does the problem persist?	No	Problem solved.
4	Have you recently serviced the printer and has this symptom existed ever since?	Yes	Confirm that the high-voltage power supply is installed correctly and that good contact is being made with the transfer block assembly.
5	Remove the rear panel and I/O shield. Place probes between J210-9 (SLO2) and J210-10 (GND) and switch on the printer. Does the voltage read about 0.7 V about one second after the main motor starts?	No Yes	Replace the DC controller. Replace the high-voltage power supply. If the problem persists, replace the high-voltage connector board.

Table 24. Uniformly Dark Image Over Entire Page			
Step	**Check**	**Result**	**Action**
1	Adjust the density using the Printer Utility. Does the problem persist?	No	Problem solved.
2	Try printing with known-good paper. Does the problem persist?	No	Problem solved.
3	Clean the printer drum grounding contact and cartridge contact and print a test page. Does the problem persist?	No	Problem solved.
4	Remove the rear panel and I/O shield. Place probes between J210-6 (HVRST) and J210-10 (GND). Does the voltage change from 0 to 5 V about one second after the printer starts up?	No Yes	Replace the DC controller board. Replace the high-voltage power supply. If the problem persists, replace the high-voltage connector board.

Table 25. Black Vertical Lines, Sharp and Well-Defined			
Step	**Check**	**Result**	**Action**
1	Try a known-good toner cartridge. Does the problem persist?	No	Problem solved.
2	Does the symptom occur on a service test page?	No Yes	Replace the I/O board. Replace the fuser assembly. If the problem persists, replace the laser/scanner assembly.

Table 26. White Vertical Lines, Sharp and Well-Defined			
Step	**Check**	**Result**	**Action**
1	Try a known-good toner cartridge. Does the problem persist?	No	Problem solved.
2	Is there a hair or other obstruction that can be blocking the laser beam?	Yes	Remove the obstruction.
3	Does the symptom appear on the service test page?	No Yes	Replace the I/O board. Replace the laser/scanner assembly.

Table 27. Black Horizontal LIne, Sharp and Well-Defined			
Step	**Check**	**Result**	**Action**
1	Try a known-good toner cartridge. Does the problem persist?	No	Problem solved.
2	Does the symptom appear on the service test page?	No Yes	Replace the I/O board. Replace the laser/scanner assembly.

Table 28. Bad Registration/Image Cut Off			
Step	**Check**	**Result**	**Action**
1	Try printing with less paper at the source. Does the problem persist?	No	Problem solved.
2	Run a print from a different paper source. Does the problem persist?	No	Replace or reinstall the faulty pickup roller.
3	Perform the registration adjustment (see "Registration Adjustment" in this chapter). Does the problem persist?	No Yes	Problem solved. Replace the sensor holder assembly.

Table 29. Stairstepping/Vertical Lines Jagged or Shaky			
Step	**Check**	**Result**	**Action**
1	Run a service test page. Does the problem persist?	No	Replace the I/O board.
2	Run the Extended Power-On Self Test (see "Printer Diagnostics"). Does the test indicate a specific error (see Figure 12)?	Yes No	Go to the appropriate troubleshooting table that describes the error indicated. Replace the laser/scanner assembly. If the problem persists, replace the DC controller board.

Table 30. Vertical Elongation or Foreshortening			
Step	**Check**	**Result**	**Action**
1	Run the Extended Power-On Self Test (see "Printer Diagnostics"). Does the test indicate a specific error (see Figure 12)?	Yes No	Go to the appropriate troubleshooting table that describes the error indicated. Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: • Replace the laser/scanner assembly. • Replace the DC controller board. • Replace the main motor.

Table 31. Bad Fusing			
Step	**Check**	**Result**	**Action**
1	Are the fuser roller levers in a down (print-mode) position?	No Yes	Set the envelope levers to a down (print-mode) position. Go to Table 16, Fuser Assembly Error.

Table 32. Blank Spots/Random Pattern or Location			
Step	**Check**	**Result**	**Action**
1	Try printing with known-good paper. Does the problem persist?	No	Problem solved.
2	Are humidity conditions according to specifications?	No	Inform the customer of the changes that are necessary.
3	Are you printing on the correct side of the paper?	No Yes	Turn over the paper. Go to Table 31, Bad Fusing.

Table 33. Toner on Back of Page			
Step	**Check**	**Result**	**Action**
1	Is the toner smudge in a small area behind the upper-left corner of the page?	Yes	Clean or replace the pickup roller.
		No	Clean with a dry, lint-free cloth or replace the transfer roller, transfer guide assembly, or lower fuser roller.

Table 34. Cannot Print in PhotoGrade			
Step	**Check**	**Result**	**Action**
1	Have you upgraded printer memory to 12 MB of RAM?	No	You must have a minimum of 12 MB of RAM to run PhotoGrade at 600 dpi.

Table 35. Repetitive Defects			
Step	**Check**	**Result**	**Action**
1	Try a known-good toner cartridge. Does the problem persist?	No	Problem solved.
2	Does the symptom occur on a service test page?	No	Replace the I/O board.
3	Is the repetitive staining along the left edge of the paper?	Yes	Clean the feeder rollers with a dry, lint-free cloth.
4	Interrupt a print cycle (see "Interrupting a Print Cycle" under "Troubleshooting Tips"). Is the symptom present on the drum?	Yes	Clean or replace the pickup/transfer rollers and guides as required.
		No	Clean or replace the fuser or delivery rollers.

Table 36. Picking Up From Wrong Source			
Step	**Check**	**Result**	**Action**
1	Is the selected paper source empty?	Yes	Select Paper Handling in the Apple Printer Utility and disable the Tray Switching option if you do not want paper to feed from a secondary source when the selected source is empty.
		No	There is a problem in the sensing system. Make sure that automatic tray switching is off and try printing again. If there are jam or pickup problems at that point, refer to Figure 29.

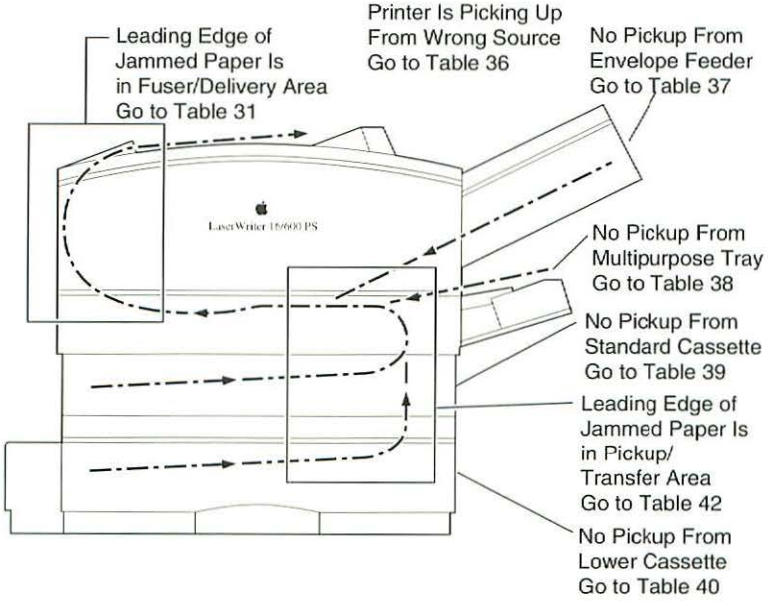


Figure 29. Paper Transport Problems

Table 37. No Pickup From Envelope Feeder			
Step	**Check**	**Result**	**Action**
1	Is paper picking up correctly from the standard cassette?	No	Go to Table 39.
2	Remove the left, right, and bottom covers of the envelope feeder and install the feeder into the pickup block. Do the envelope feeder motor and gearing engage after you restart?	Yes	Remove the paper pickup block from the printer and maintain pickup connectivity (see "Troubleshooting Tips" in this chapter).
3	Place probes on the solder side of the pickup controller board between J603-4 (GND) and the power supply side of diode D606. Does the voltage measure 5 V?	No Yes	Replace the pickup controller board. Perform the first module exchange below. If the problem persists, reinstall the original module and perform the next exchange: • Replace the envelope feeder controller board. • Replace the printer interface cable in the envelope feeder. • Replace the feeder interface cable in the pickup block.
4	Measure the voltage between J604-4 (GND) and J604-1 (+24 V). Does the voltage measure 24 V?	No	Replace the pickup controller board.
5	Place probes between J136-1 (+24 V) and J136-4 (GND) on the receptacle that the envelope feeder plugs into. Does the voltage measure 24 V?	No Yes	Replace the feeder interface cable. Perform the first module exchange below. If the problem persists, reinstall the original module and perform the next exchange: • Replace the envelope feeder controller board. • Replace the envelope feeder motor. • Replace the printer interface cable inside the envelope feeder.

Table 38. No Pickup From Multipurpose Tray			
Step	**Check**	**Result**	**Action**
1	Is paper picking up correctly from the standard cassette?	No	Go to Table 39.
2	Maintain I/O connectivity (see "Troubleshooting Tips" in this chapter). Do the pickup motor and gearing engage after you try printing to the multipurpose tray?	No	Remove the rear panel and the right corner panel and check that all the following connectors are secure: • DC controller board connector J201 • Pickup controller board connector J601 • Pickup block motor cable J703
3	Remove the paper pickup block and maintain pickup connectivity (see "Troubleshooting Tips" in this chapter). Closely observe the gear at the end of the pickup block and restart the printer. Do all gears rotate correctly after you restart?	No	Remount or replace the problem gear(s).
4	Select the multipurpose tray as paper source, and print something. Does the multipurpose pickup gear rotate?	No	Make sure that the pickup gear and its spring and hook are installed correctly. If the problem persists, replace the multipurpose pickup solenoid.
5	The problem is mechanical and is caused by failure of one of these components. Restart the printer and attempt another print job. Observe the components closely. Does the symptom persist?	Yes	Remount, clear, or replace the defective component.

Table 39. No Pickup From Standard Cassette			
Step	**Check**	**Result**	**Action**
1	Initiate a service test page. Does the printer pickup from the standard cassette?	Yes	Confirm that I/O cable connections are secure and that configuration settings are correct. To make certain that networking or CPU software is not the root problem, confirm through the printer utility that the startup page is enabled, and restart the printer. If the startup page prints, there is a software or networking problem away from the printer. If the startup page does not print, replace the I/O board.
2	Do the pickup motor and gearing engage after you restart the printer?	Yes	Remove the paper pickup block and maintain pickup connectivity. Closely observe the gear end of the pickup block and restart the printer. All but three ratchet gears should spin freely during the startup sequence. If the problem persists, remount or replace the problem gear(s).
3	Remove the rear panel and the right corner panel. Is the pickup controller board cable securely connected to J201 on the DC controller board?	No	Secure the cable.
4	Is the DC controller board cable securely connected to J601 on the pickup controller board?	No	Secure the cable.
5	Is the pickup block motor cable securely connected at J703 on the pickup sensor board?	No	Secure the cable.

Table 39. No Pickup From Standard Cassette (Continued)			
Step	**Check**	**Result**	**Action**
6	Disconnect J201 on the DC controller board. Place probes between pins J201-1 (GND) and J201-13 (+24 V) on the male connector on the board. Does the voltage measure 24 V?	No Yes	Replace the DC controller board. Replace the pickup-to-DC controller board cable.
7	Place probes between pins J201-1 (GND) and J201-7 (+5 V) on the male connector on the board. Does the voltage measure 5 V?	No	Replace the DC controller board.
8	Reconnect J201. Remove the paper pickup block and maintain pickup connectivity. Measure the voltage between J601-11 (GND) and J601-13 (+24 V) on the pickup controller board. Does the voltage measure 24 V?	No	Replace the pickup-controller-to-DC-controller-board cable.
9	Place probes between pins J601-1 (GND) and J601-7 (+5 V). Does the voltage measure 5 V?	No	Replace the pickup-controller-to-DC-controller-board cable.
10	Place probes between pins J601-1 (GND) and J601-9 (+24 V). Does the voltage measure 24 V?	No Yes	Replace the pickup controller board. Perform the first module exchange below. If the problem persists, reinstall the original module and perform the next exchange: • Replace the pickup motor. • Replace the pickup sensor board.

Table 40. No Pickup From Lower Cassette			
Step	**Check**	**Result**	**Action**
1	Is paper picking up correctly from the standard cassette?	No	Go to Table 39.
2	Disable the startup test page, and remove the top cover, rear panel, and right corner panel from the printer. Disconnect J603 from the exposed edge of the controller board and connect a spare sheet feeder interface cable. Plug the opposite end of the interface cable into the sheet feeder receptacle. Is paper now picked up from the lower cassette?	Yes	Replace the sheet feeder interface cable.
3	Reinstall the sheet feeder and restart the printer. Do the sheet feeder gearing and motor rotate?	No	Confirm that the sensing arm is intact and that the lower cassette is installed. Check that the following connectors are secure: • Connector J201 on the DC controller board. • The two connectors at the edge of the pickup controller board. • The three connectors at the edge of the sheet feeder controller board.
4	Switch off the printer and remove the 4-pin cable from connector J603 along the front edge of the pickup controller board. Place probes between J603-1 (+24 V) and J603-4 (GND) on the pickup controller board. Does the voltage measure 24 V when you switch on the printer?	No Yes	Replace the pickup controller board. Perform the first module exchange listed below. If the problem still persists, reinstall the original module and perform the next exchange. • Replace the sheet feeder controller board. • Replace the sheet feeder controller block. • Replace the sheet feeder motor.

Table 40. No Pickup From Lower Cassette (Continued)			
Step	**Check**	**Result**	**Action**
5	Remove the paper pickup block and maintain pickup connectivity (see "Troubleshooting Tips" in this chapter). Place probes on the solder side of the pickup controller board on J603-4 (GND) and the power supply side of diode D606. Does the voltage measure 5 V when you switch on the printer?	Yes	Perform the first module exchange listed below. If the problem still persists, reinstall the original module and perform the next exchange. • Replace the sheet feeder controller board. • Replace the sheet feeder pickup solenoid. • Replace the sheet feeder controller block. • Remount and/or replace the pickup shaft gear and roller.
6	Place probes between pins J201-1 (GND) and J201-7 (+5 V) on the DC controller board. Does the voltage measure 5 V?	No	Perform the first module exchange listed below. If the problem still persists, reinstall the original module and perform the next exchange. • Replace the I/O board • Replace the DC controller board.
		Yes	Replace the pickup controller board.

Table 41. Leading Edge of Jammed Paper Is in Fuser/Delivery Area

Step	Check	Result	Action
1	Do the delivery rollers turn when you start up the printer?	No	Go to Step 6.
2	Is there crumpled paper just outside the exit point of the fuser assembly?	Yes	A snagged sensing lever is probably the cause of the problem. Remove the top cover and delivery roller assembly, and inspect the delivery/interlock sensor. If the delivery-sensing lever is broken, replace it.
3	Is there an accordian-style jamming just short of the paper delivery tray?	Yes	The delivery guide pins might have been installed incorrectly. These are the four small pins on the delivery roller assembly. They should point outward, with the flow of paper.
4	Does jamming occur only when paper feeds from the multipurpose tray?	Yes	Inspect the sensing lever for multipurpose paper-end sensor PS701. Unsnag or replace it if it is damaged.
5	Remove the rear panel and I/O shield. Place probes betweenJ208-2 (GND) and J208-3 (PSNS) on the DC controller board. Does the voltage rise from 0 to 5 V as you open the fuser access door?	Yes No	Replace the DC controller board. Replace the delivery/interlock sensor.
6	Remove the rear panel and I/O shield. Restart the printer and observe the main motor. Does the main motor spin when the printer starts up?	Yes	Trace mechanical drive components from the delivery rollers back to the main motor, taking special note of the delivery drive belt. Clean or replace parts as necessary.
7	Make sure that the main motor is secure at J211 on the DC controller board, then run the Extended Power-On Self Test. Does the diagnostic indicate a main motor error?	Yes No	Go to Table 18. Check main motor drive components for binding or improper installation. Clean or replace parts as required.

Table 42. Leading Edge of Jammed Paper Is in Pickup/Transfer Area			
Step	**Check**	**Result**	**Action**
1	Try printing with known-good paper. Does the problem persist?	No	Problem solved.
2	Try feeding the paper from one of the other paper sources. Does jamming still occur?	No	Go to Table 43, 44, 45, or 46, as applicable.
3	Remove the toner cartridge, hold the green knob, and lift the delivery guide. Does the registration sensor arm move back and forth freely when you flick it with your finger?	No	Clear it if possible. If the arm is snagged beyond repair, replace the sensor holder assembly.
4	Check for obstructions, especially beneath the upper guide plate situated between the pickup block and the transfer roller. Are there obstructions?	Yes	Clear the obstructions.
5	Is the trailing edge of the jammed paper about an inch short of the registration sensor arm?	Yes	If paper has jammed there, especially if there is no sign of crumpling, there is almost certainly a failure in the delivery sensing system. Go to Table 41.
6	Remove the paper pickup block from the printer and maintain pickup connectivity. You will be taking measurements from the solder side of the pickup controller board. Place probes between J605-5 (GND) and J605-6 (RESS) and manually trip the registration sensor arm. Does the voltage measure about 5 V (normal) and 0 V (tripped)?	Yes No	Replace the pickup controller board. Replace the sensor holder assembly.

Table 43. Paper Jams in Pickup/Transfer Area When Feeding From the Standard Cassette

Step	Check	Result	Action
1	Is the black ribbed paper guide firmly seated?	No	Reseat the black ribbed paper guide. If this guide is damaged or unseated, paper may jam at the entrance to the paper pickup block.
2	Is the white passive roller on the cassette OK?	No	Clean the roller so that it forms a smooth gripping surface against the lower feed roller.
3	Is the lower feed roller OK?	No	Replace or reinstall the lower feed roller and/or its gearing. Note that the upper feed rollers serve other paper sources, so they are not likely to be the cause of the problem.

Table 44. Paper Jams in Pickup/Transfer Area When Feeding From the Multipurpose Tray

Step	Check	Result	Action
1	Try printing with known-good paper. Does the problem persist?	No	Problem solved.
2	Is the multipurpose tray width guide set correctly?	No	Set the guide so that it is snug against the edge of the paper.
3	Is the multipurpose pickup roller slipping when it tries to pull in the paper?	Yes	Reinstall or replace the multipurpose pickup roller. If you have recently taken apart the pickup block gearing and paper has not fed successfully since then, the problem could be incorrect installation of the gears.
4	Are there two sheets at the jam location?	Yes	Replace the multipurpose tray guide assembly.

Table 45. Paper Jams in Pickup/Transfer Area When Feeding From the Optional Sheet Feeder			
Step	**Check**	**Result**	**Action**
1	Is the black ribbed paper guide firmly seated?	No	Reseat the black ribbed paper guide. If this guide is damaged or unseated, paper may jam at the entrance to the paper pickup block.
2	Is the standard 250-sheet cassette installed and in good condition?	No	Paper fed from the sheet feeder passes through the slit in the standard cassette located 2 inches back from the face plate. Make sure the standard cassette is fully inserted and that no blockage exists in this opening.
3	Are the feeder rollers in the sheet feeder OK?	No	The sheet feeder has one primary and two passive feeder rollers. Because power is reaching the pickup roller, any problem would probably be with binding or obstruction in the roller/gear system. Perform the sheet feeder bypass procedure and observe the functioning of the feeder components (see *Service Source CD* for additional information).

Table 46. Paper Jams in Pickup/Transfer Area When Feeding From the Envelope Feeder			
Step	**Check**	**Result**	**Action**
1	Is the envelope feeder width guide set correctly?	No	Set the guide so that it is snug against the edge of the envelopes.
2	Is the envelope feeder correctly installed into the printer?	No	Reinstall the feeder so that it is mounted solidly onto the black positioning pin in the upper-left corner of the pickup block opening. If the feeder isn't mounted correctly, or if the pin is damaged, the pickup block entrance may not align properly.
3	Have you recently taken the feeder apart and has it exhibited this problem since then?	Yes	You may not have reinstalled the gear/roller system correctly. Refer to *Service Source CD* for more information.
4	Is the fork-shaped separation guide installed correctly?	No	There should be a 1.5 mm opening between the separation guide and the primary feed roller. Refer to the Adjustments chapter in the LW 16/600 PS Envelope Feeder manual on *Service Source CD* for more information.

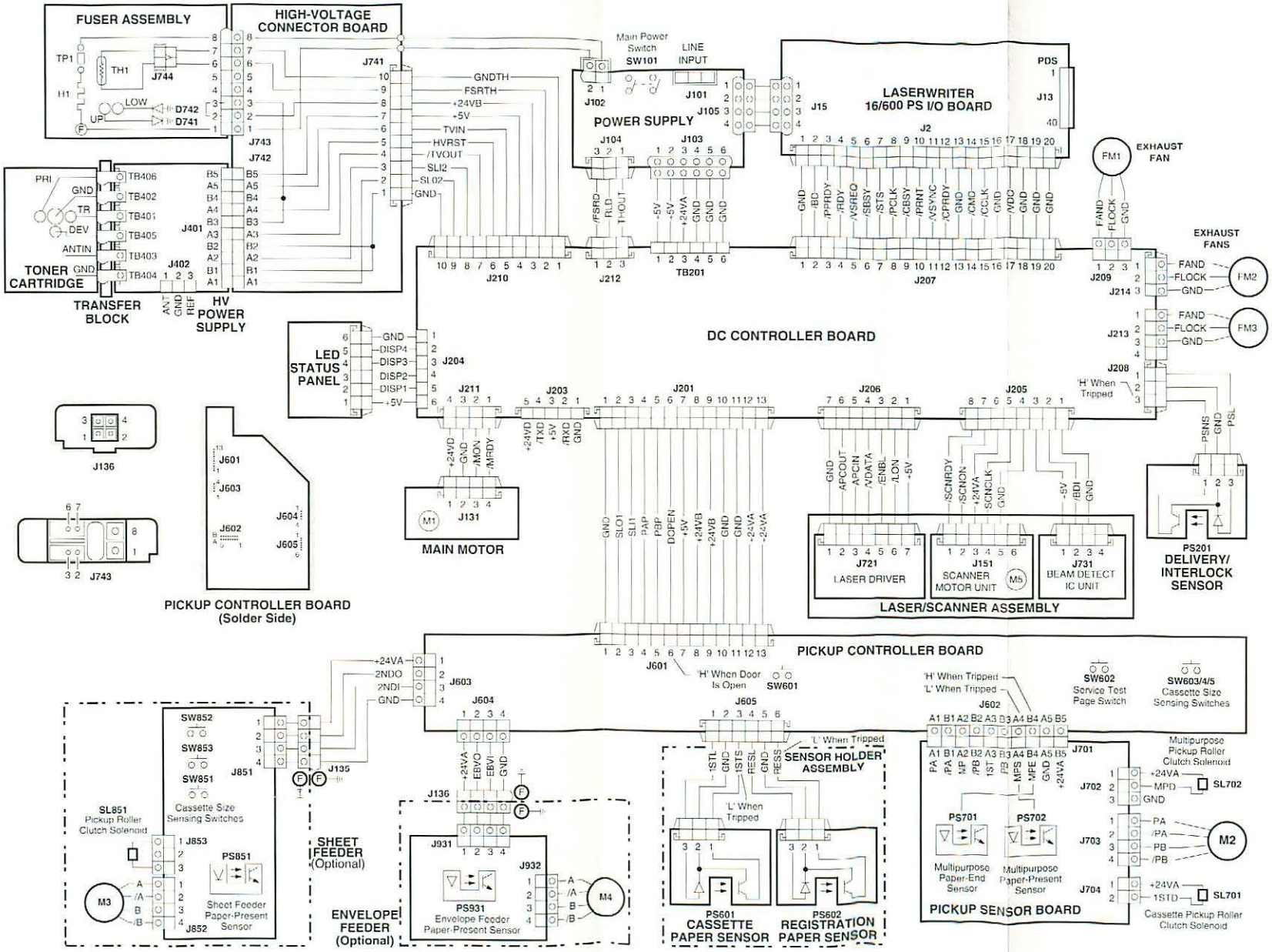


Figure 30. LaserWriter 16/600 PS Wiring Diagram

LaserWriter Select 360

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Wiring Diagram	161

Exploded View

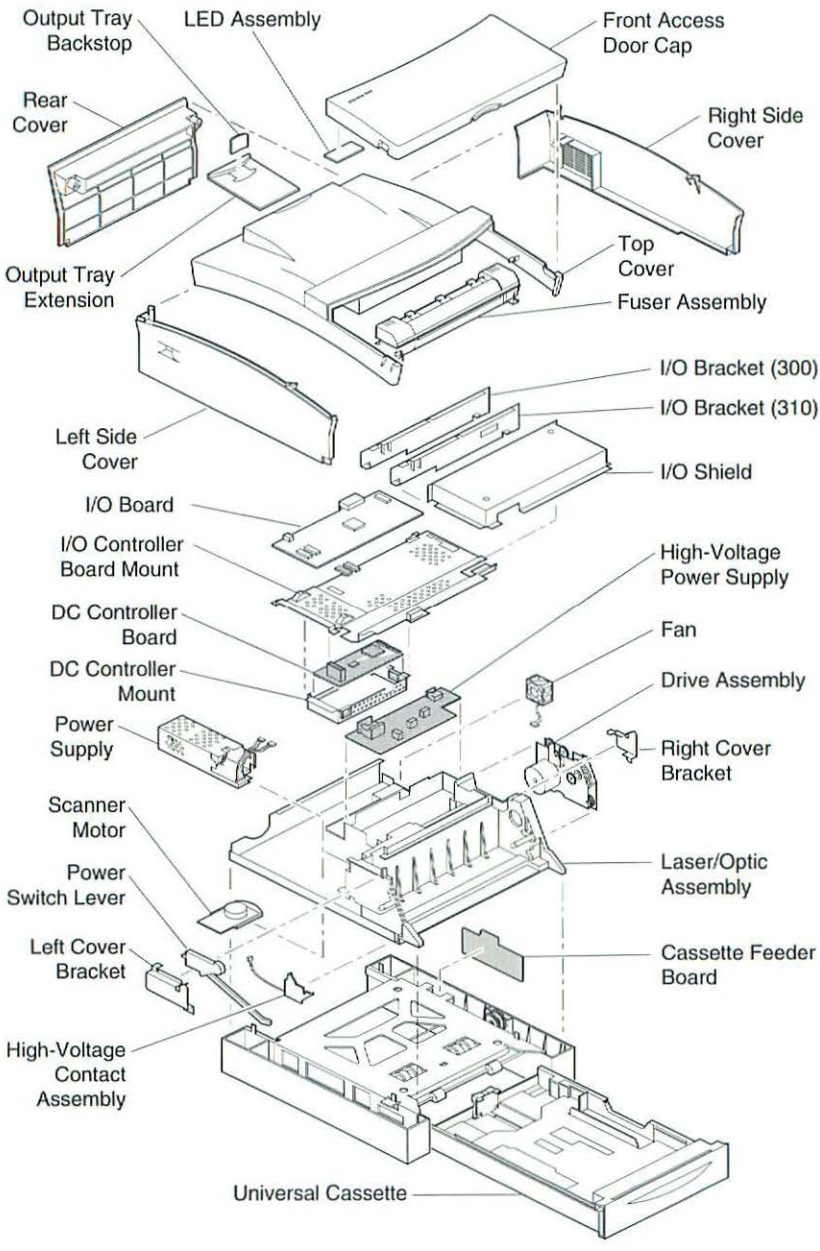


Figure 31. LaserWriter Select 360 Exploded View (1 of 2)

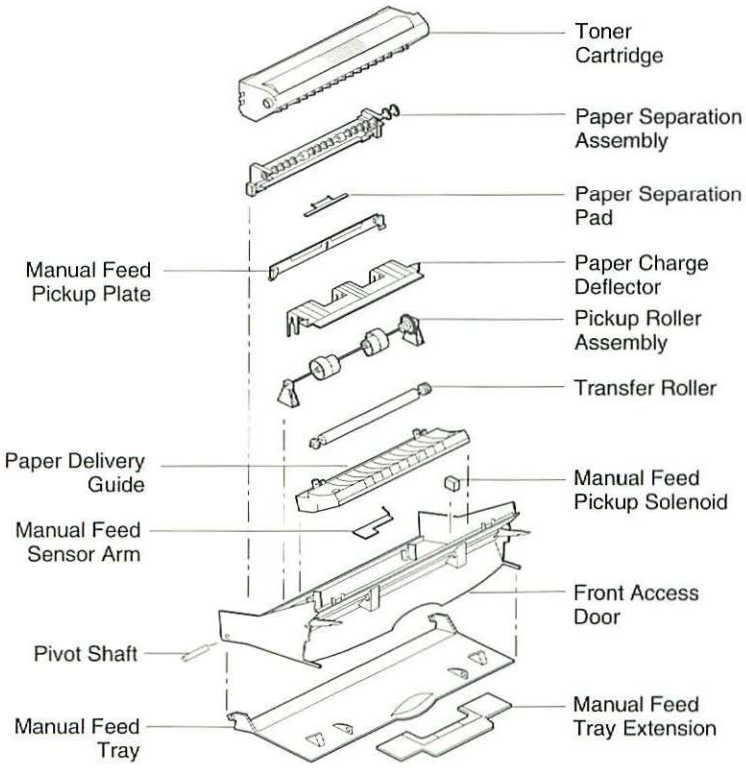


Figure 31. LaserWriter Select 360 Exploded View (2 of 2)

- Cassettes
  - 500 Sheet Feeder, A4 922-1110
  - 500 Sheet Feeder, Letter 922-1111
  - Envelope Cassette 922-1101
  - Legal Cassette 922-1102
  - Universal Cassette 922-1100
  - Postcard Attachment 922-1103
- Cassette Feeder Covers
  - Cassette Grounding Spring 922-1092
  - Left Bottom Cover 922-1093
  - Right Bottom Cover 922-1094
- Cassette Pickup/Feed
  - Feed Roller Shaft 922-1087
  - Feed Solenoid 922-1007
  - Gear T21/36 922-1090
  - Gear T32 922-1089
  - Gear T41 922-1088
  - Optional Feeder, Clips 922-1098
  - Optional Feeder, Connector Cover 922-1099
  - Optional Feeder, Grounding Spring 922-1097
  - Pickup Roller Shaft 922-1085
  - Pickup Rollers 922-1086
  - Pickup Solenoid 922-1006
  - Roller Bushings 922-1095
- Cassette Sensor Components
  - Cassette Feeder PCB 922-1003
  - Cassette Feeder PCB, Optional Feeder 922-1004
  - Cassette Size Actuator 922-1091
  - Optional Feeder Connector 922-1096
  - Paper Sensing Arm 922-1084
- DC Controller Board 661-0821
- DC Controller Cables
  - Beam Detect Cable 922-1010
  - Cable Sensor Harness 922-1380
  - Cassette Feeder Cable 922-1073
  - HVPS and Toner Sensor Cable 922-1009
  - Laser Scanner Motor Cable 922-1008
  - LED Cable 922-1036
- Drive Assembly 922-0639
- Fax Card 661-0868
- Front Access Door
  - Cable Guide 922-1079

Front Access Door Cap 922-1016
Front Access Door 922-1026
Front Access Door Cover 922-1015
Front Door Ground Spring 922-1044
LED Assembly 922-1033
Left Release Lever 922-1024
Manual Feed Pickup Plate 922-1032
Manual Feed Pickup Solenoid 922-1005
Pivot Shaft 922-1075
Release Lever Spring 922-1046
Right Release Lever 922-1025
Fuser Assembly
Delivery Sensor Lever 922-1051
Engine Thermoprotector 922-1061
Exit Bearing 922-1066
Exit Gear 922-1067
Fuse Contact 922-1064
Fuser Assembly, 110/115 V 661-0825
Fuser Assembly, 220/240 V 661-0826
Fuser Delivery Roller 922-1052
Fuser Heater Bulb 110/115 V 922-1047
Fuser Heater Bulb 220/240 V 922-1048
Fuser Heater Roller 922-1049
Fuser Heater Roller Gear 922-0643
Fuser Paper Guide 922-1053
Fuser Pressure Roller 922-0644
Fuser Roller Thermoprotector 922-1060
Fuser Top Cover 922-1055
Paper Guide Springs 922-1065
Pressure Roller Bearing 922-1058
Pressure Roller Spring 922-1059
Right Gear, 16T 922-1063
Right Gear Shaft 922-1062
Temperature Sensor 110 V 922-1056
Temperature Sensor 220 V 922-1057
High Voltage Contact Assembly 922-1105
High Voltage Power Supply 661-0822
I/O Controller 661-0820
I/O Controller Mount 922-1080
I/O Shield 922-1081
Internal Engine
Fan 922-1001
Laser and Optic Assembly 661-0827

- Left Double Gear 922-1076
- Right Double Gear 922-1077
- Scanner Motor 661-0828

Kits
- Drive Assembly Screw Kit 076-2003
- Fuser Ring Kit 076-0459
- PCB Screw Kit 076-2002
- Spring Kit 076-2004
- Standard Screw Kit 076-2001
- I/F Screw Kit 076-0460

Main Covers
- Left Cover Bracket 922-1020
- Left Side Cover 922-1013
- Rear Cover 922-1012
- Right Cover Bracket 922-0645
- Right Side Cover 922-1014
- Top Cover 922-1011

Main Motor 922-0638

Manual Feed Sensor Assembly
- Manual Feed Sensor 922-1039
- Manual Feed Sensor Arm 922-1037
- Manual Feed Sensor Spring 922-1038

Paper Registration
- Paper Charge Deflector 922-1040
- Paper Registration Arm 922-1043
- Paper Registration Sensor 922-1041
- Registration Sensor Spring 922-1042

Paper Separation
- Front Door Gear 922-1074
- Paper Feed Roller 922-1029
- Paper Separation Assembly 922-1034
- Paper Separation Pad 922-1035

Pickup Roller Assembly
- Pickup Rollers 922-1031
- Pickup Roller Assembly 922-1030

Power Supply, 110/115 V 661-2006

Power Supply, 220/240 V 661-2007

Power Switch Lever 922-1072

Power Switch Lever Spring 922-1045

Sheet Feeder (500 Sheet)
- Left Bottom Cover 922-0650
- Right Bottom Cover 922-0651

Rear Cover 922-0652
Stepper Switch Assembly 922-0641
Toner Cartridge Sensor Assembly
Toner Cartridge Drive Gear 922-1069
Toner Cartridge Sensor Assembly 922-1002
Toner Cartridge Sensor Cover 922-1078
Transfer Roller Assembly
Paper Delivery Guide 922-0642
Static Eliminator 922-1068
Transfer Roller 922-0640
Trays
Manual Feed Tray 922-1017
Manual Feed Tray Extension 922-1019
Manual Feed Ramp 922-1023
Output Tray Extension 922-1018
Output Tray Backstop 922-1022

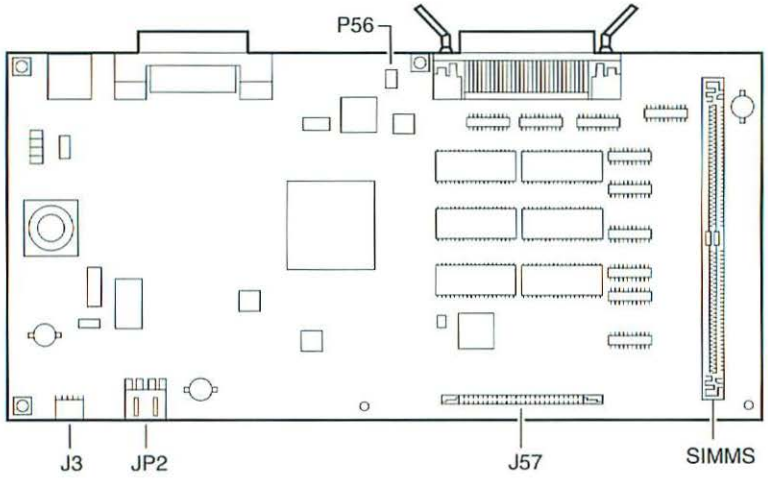


Figure 32. LaserWriter Select 360 I/O Controller Board

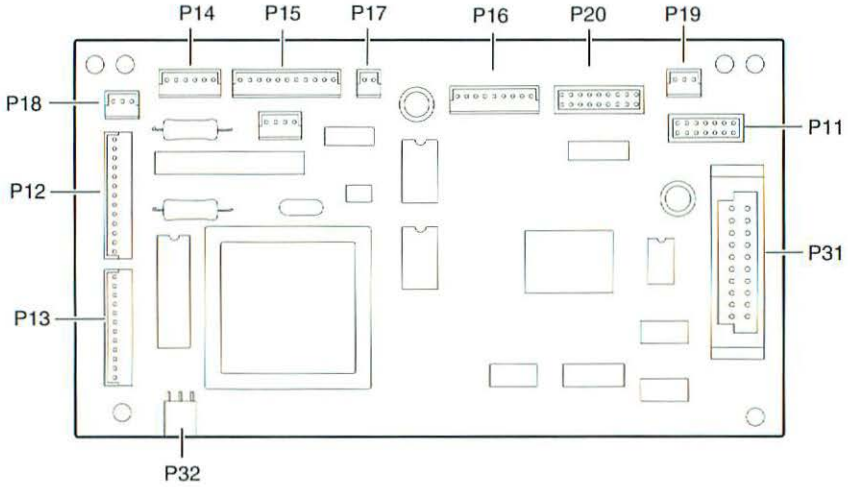


Figure 33. LaserWriter Select 360 DC Controller Board

Specifications

Table 47. LaserWriter Select 360 Print Engine Specifications	
Marking Engine	Fuji Xerox P1 engine
Print Resolution	600 dots per inch (dpi), 300 dpi in PCL mode
Speed	10 pages per minute maximum; actual performance depends on the application.
Paper Feed	Input: Automatic with paper cassette; automatic or manual with universal tray Output: Face down
Print Materials	Sizes: letter, A4, B5, executive Media: 20- to 28-lb. bond paper, letterhead and colored stock, medium-weight transparency material, envelopes, and labels.
Paper Capacities	250-sheet universal cassette: letter, A4, B5 250-sheet legal cassette: optional 500-sheet cassette (optional): letter, A4, and B5 Envelope cassette: optional
Printable Surface	Letter size: 8.0 x 10.5 in. Legal size: 8.0 x 13.0 in. A4: 7.41 x 10.86 in. B5: 7.69 x 10.16 in. Printable area may vary depending upon application.
Dimensions	Height: 8.0 in. (25.3 cm) Width: 15 in. (38 cm) Depth: 18.3 in. (45 cm) Weight: 26.4 lb. (12 kg)
Operating Requirements	50–90.5° F (10–32.5° C) 20–80% relative humidity
Power Requirements	U.S./Japan: 100–115 VAC, 50–60 Hz Europe/Australia: 220–240 VAC, 50 Hz

Table 48. LaserWrier Select 360 I/O Specifications	
Processor	AMD Am 29200; 15 MHz
DRAM	7 MB (3 MB soldered on board), expandable to 16 MB—if you install a 16 MB RAM SIMM, the 3 MB of soldered RAM is not used.
ROM	4 MB
Interfaces	Simultaneous connection to parallel, LocalTalk, and serial RS-4222; optional fax (send and receive)
Imaging Languages Supported	PostScript and HP PCL Auto Select feature allows printer to automatically switch between protocols.
Built-in Fonts	Fonts from the following families: Avant Garde, Bookman, Courier, Helvetica, Helvetica Narrow, New Century Schoolbook, Palatino, Symbol, Times, Zapf Chancery, Zapf Dingbats.

Status LEDs

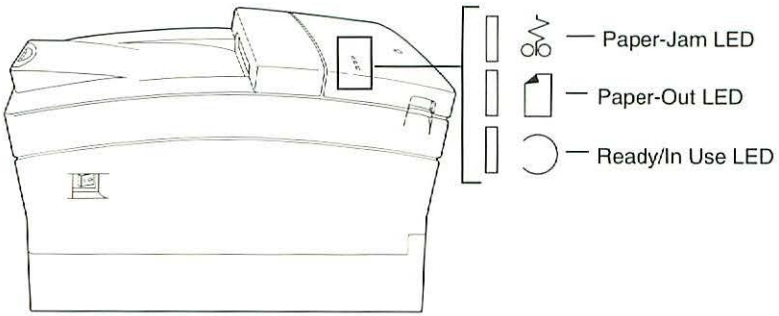


Figure 34. LaserWriter Select 360 Status LEDs

The LaserWriter Select 360 has three status LEDs (see Figure 34) located on the top of the front access door:

- Ready/In Use – The green Ready LED flashes during printer warmup and when the printer is operating. The LED is steady when the printer is warmed up and ready to print. The LED is off when the printer is not ready, an error condition exists, or the top cover is open.
- Paper-Out – The red Paper-Out LED is on and steady when the printer is out of paper or the paper tray is missing. The LED flashes when the printer is ready to accept manually fed paper.
- Paper-Jam – The red Paper-Jam LED comes on when paper jams inside the printer. The LED remains on until the jam is cleared.

The status LEDs may indicate an error condition within the printer or with the print job. If an error condition exists, the status LEDs indicate the specific error by varying the state of the LEDs (blinking, solid, etc.) These error conditions are driver-specific and may vary depending upon the specific CPU. Check the status of the printer under the Print Monitor of your computer system to determine the specific error condition.

Power-On Self Test

The LaserWriter Select 360 goes through a self-diagnostic test each time that you switch the printer on. The diagnostic test is called the Power-On Self Test (POST).

Note This test is not the same as the engine diagnostic test (see "Printer Diagnostics"). Unlike the engine diagnostic test, POST does not require the placement of any loopback cable.

Observing how the LEDs extinguish can help isolate certain failure areas:

1. When you switch on a functional printer, all LEDs illuminate for a short time.
2. The Ready/In Use LED extinguishes when no errors are found on the I/O controller board.
3. Then the Paper-Out LED extinguishes when no errors are found on the RAM card.
4. Finally, the Paper-Jam LED extinguishes when no errors are found in the engine.

Printer Diagnostics

Note Only the LaserWriter Select 360 offers diagnostic LEDs, which indicate defective modules (see Figure 35).

Switch off the LaserWriter Select 360 and remove the jumper from JMP1 on the I/O controller if a jumper is present. Set the mode switch on the back panel to 9.

The reporting sequence (which repeats continuously) is as follows:

1. All LEDs are on for one second.
2. All LEDs are off for one second.
3. The LEDs that indicate the problem are on for one second.
4. All LEDs are off for one second.

Note A SIMM error can result from insufficient memory. You must have a minimum 7 MB of RAM installed.

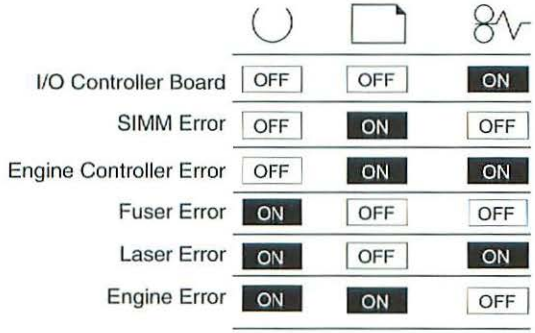


Figure 35. LaserWriter Select 360 Diagnostic LEDs

Service Test Page

The LaserWriter Select 360 service test page consists of a line matrix, as shown in Figure 36. The LaserWriter Select 360 printer produces a service test page when you jumper pins P32-1 and P32-2 on the DC controller board. The service test page confirms print engine operation.

Note LaserWriter Select printers do not produce a startup test page (a page that is automatically produced when you switch on the printer).

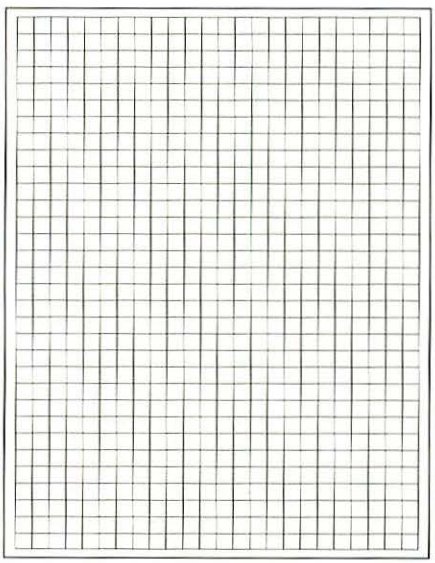


Figure 36. Service Test Page

To generate a service test page with the I/O board and mount intact, follow these steps:

1. Remove the printer covers.
2. Plug in the printer and switch it on. Wait until the delivery rollers stop rotating.
3. Insert a straightened paper clip in the hole on the back of the I/O board mount, as shown in Figure 37. Move the paper clip back and forth to jumper P32. Remove the paper clip when you hear the fan come on and the transfer rollers begin to rotate. A few seconds later the test page will appear.

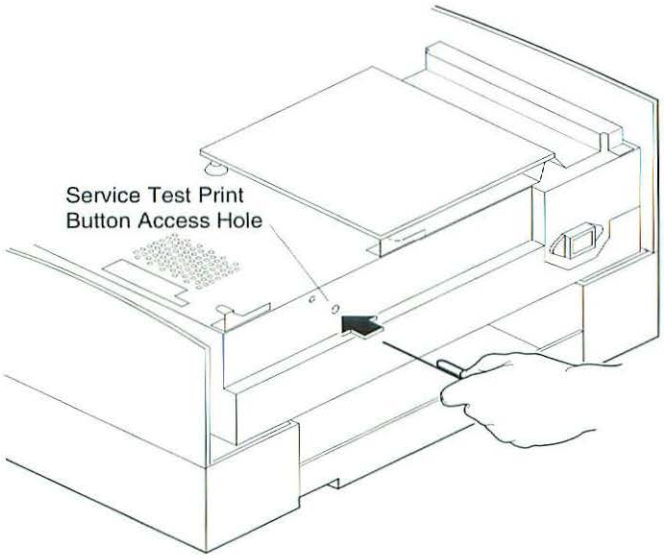


Figure 37. Generating a Service Test Page With I/O Board Intact

To generate a service test page with the I/O board and mount removed, follow these steps:

1. Refer to the "Troubleshooting Preparation" section under "Troubleshooting the LaserWriter Select 360." Follow steps 1 through 3.
2. Plug in the printer and switch it on. Wait until the delivery rollers stop rotating.
3. Using a paper clip or jeweler's screwdriver, jumper the two pins at connector P32 (see Figure 38).

4. In order to avoid a paper jam, remove the piece of paper that you previously inserted into the paper delivery sensor ("Troubleshooting Preparation" step 3) as soon as the printed page begins to exit the fuser assembly rollers.

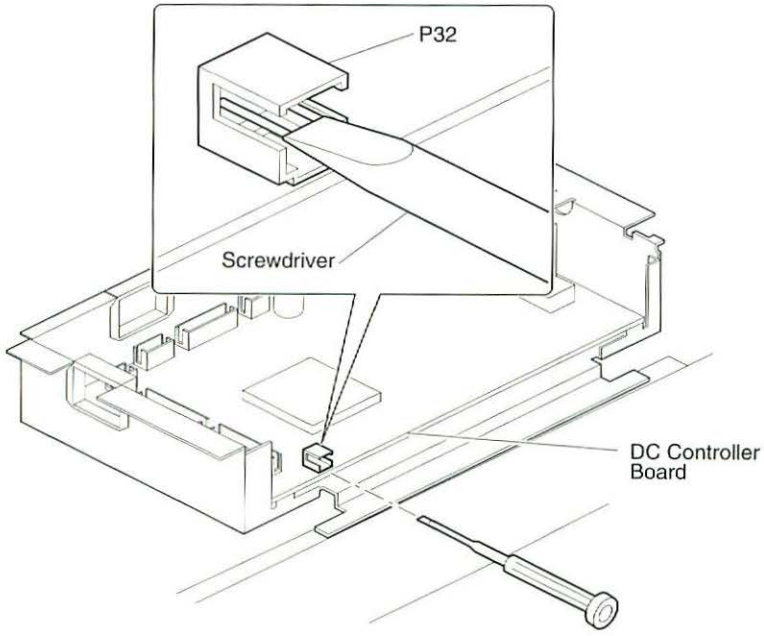


Figure 38. Generating a Service Test Page With I/O Board Removed

RAM Upgrade

The printer's standard memory size is 7 MB, 4 MB of which are contained on a removable SIMM (Single Inline Memory Module). Memory can be upgraded to 16 MB total (the largest size supported by the printer) by removing the 4 MB SIMM and replacing it with a 16 MB SIMM. The remaining 3 MB of on-board memory is disabled by the controller whenever a 16 MB SIMM is installed.

The 16 MB SIMM may be purchased from your Apple Authorized Service Provider; it must meet the following specifications:

- Size: 16 MB (4 Mbit x 32 bit)
- Access Time: 80 ns or less
- SIMM Type: 72-pin
- Refresh: 2K Row (11 bit x 11 bit)

Fax Card Upgrade

The optional PostScript fax card offered with the LaserWriter Select 360 can send and receive faxes with traditional fax machines, computers with fax cards, and other PostScript fax-capable printers.

To install the fax card:

1. Remove the covers and I/O shield.
2. Remove the screw that holds the metal shield that covers the fax port hole (see Figure 39A) on the LaserWriter Select 360 I/O bracket.
3. Remove the metal shield from the I/O bracket.
4. Insert the fax card (with the battery facing up) so that the phone connector is visible through the I/O bracket (see Figure 39B).

Important End users have the option of turning the fax speaker on or off, but only Apple authorized service providers can adjust the volume.

When installing the fax card, be sure to set the volume at the mid-range level using a small Phillip screwdriver or a video adjustment tool. Be careful that you don't over-rotate the dial or you could damage it.

5. Press down gently on the fax card to secure connector J1 on the fax card to connector J57 on the I/O board.
6. Secure the fax card to the I/O bracket using the screw that previously held the metal shield over the fax port hole.
7. Affix the fax label on the back ledge beneath the fax port.

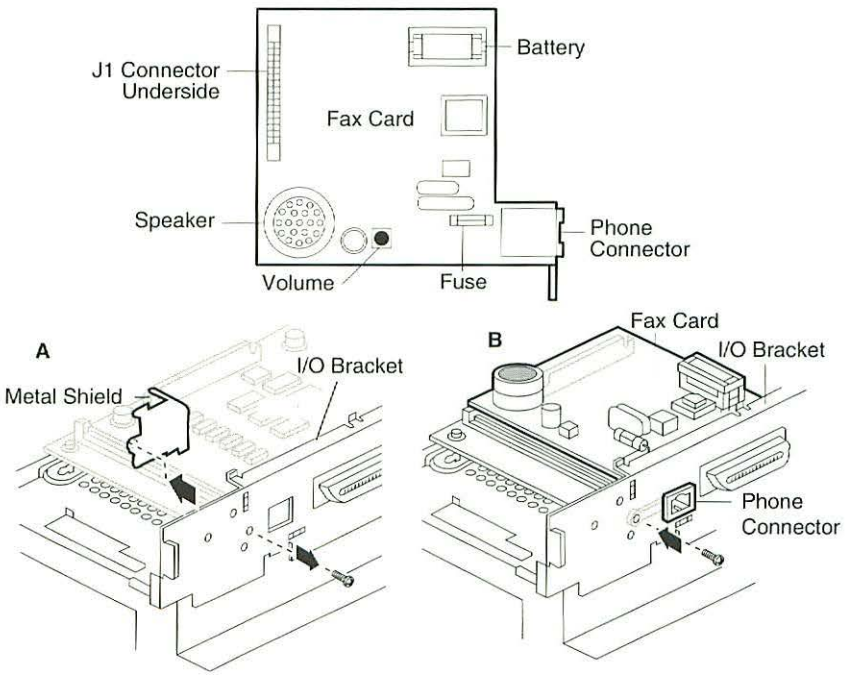


Figure 39. LaserWriter Select 360 Fax Card Upgrade

Before you begin troubleshooting, check the printer setup and operating conditions described in the "Pre-Power-On Checklist" section. If the problem persists, refer to the flowcharts found later in this troubleshooting section.

The flowcharts direct you to perform various tasks and refer you to specific troubleshooting tables. Perform each step in the troubleshooting tables in order, and refer as necessary to the wiring diagram that follows the tables.

Retry the printer each time you change its physical state—for example, when you replace a component—until the problem is resolved. If you replace a module and the problem remains, reinstall the original module before proceeding to the next step in the table.

When the printer is repaired, perform the necessary preventive maintenance before returning it to the customer. Make sure you are familiar with all procedures described in the "Safety" section in the front of this guide before performing any live electrical checks.

Pre-Power-On Checklist

Verify that the following conditions are met before proceeding with the troubleshooting flowcharts or tables:

- Line voltage is OK (115 VAC ± 10%).
- Printer is installed on a solid, level surface.
- Room temperature is between 50–90° F (10–32.5° C).
- Humidity is 20–80%.
- Printer is not located in a hot or humid area, near open flames, or in
- a dusty location.
- Printer is not exposed to ammonia gas.
- Printer is not in direct sunlight.
- Printer is installed in a well-ventilated area.
- Cables and connectors are OK.
- Toner cartridge is installed and has toner.
- Paper cassette is properly loaded with paper.
- Paper is within specifications.
- Front access door is closed.

Troubleshooting Preparation

In order to troubleshoot the inside of the printer, you must prepare the printer as follows:

1. Remove the printer covers and I/O shield.
2. Remove the I/O board mount and set it at an angle on top of the power supply, as shown in Figure 40.

Note Be sure to leave the cables that run to the I/O board and the paper delivery sensor connected.

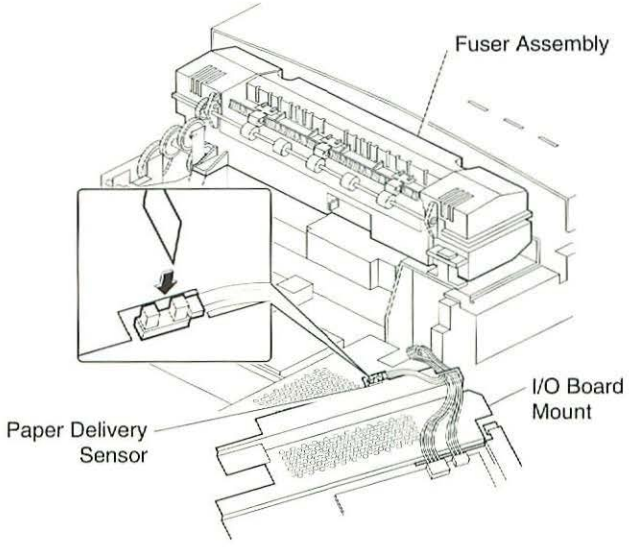


Figure 40. Actuating the Paper Delivery Sensor

3. Insert a folded piece of paper into the U of the paper delivery sensor (see Figure 40 inset) in order to manually actuate the sensor and put the printer in a ready state.

Note If you try to print a service test page or a page from the computer while the folded paper is in the paper delivery sensor, the paper will jam in the printer. To avoid a paper jam, remove the folded piece of paper from the paper delivery sensor as soon as the printed page begins to exit the fuser assembly rollers. Once the printed page has completely exited the fuser, put the piece of folded paper back in the delivery sensor if you wish to resume troubleshooting the inside of the printer.

Paper Sensors

There are four paper sensors in the LaserWriter Select 360 printer. Each sensor consists of an actuator, a U-shaped photo interrupter, and circuitry that communicates back to the DC controller board. These sensors are shown in Figure 41.

PS701 Manual Feed Sensor

PS201 Paper Delivery Sensor

PS601 Paper-Out Sensor

PS602 Registration Sensor

Paper Path

The LaserWriter Select 360 has three paper sources and one output tray in a complete system (see Figure 41).

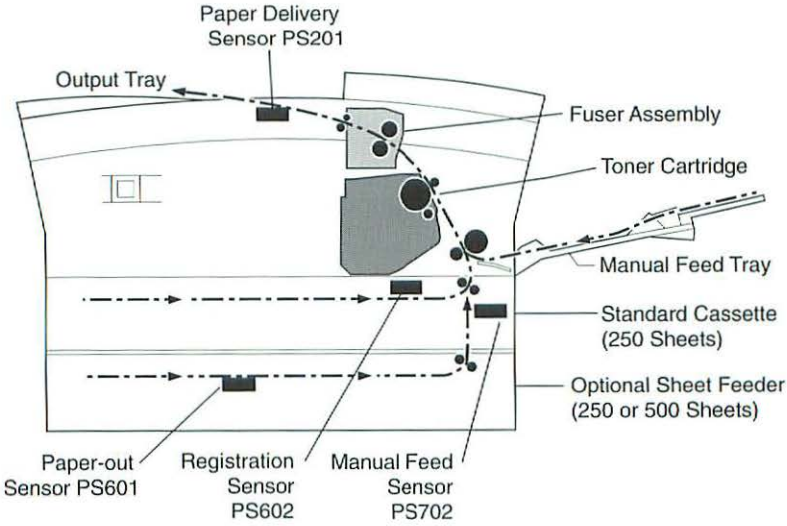


Figure 41. Paper Sensors and Paper Path Locator

LaserWriter Select 360 Troubleshooting Flowcharts

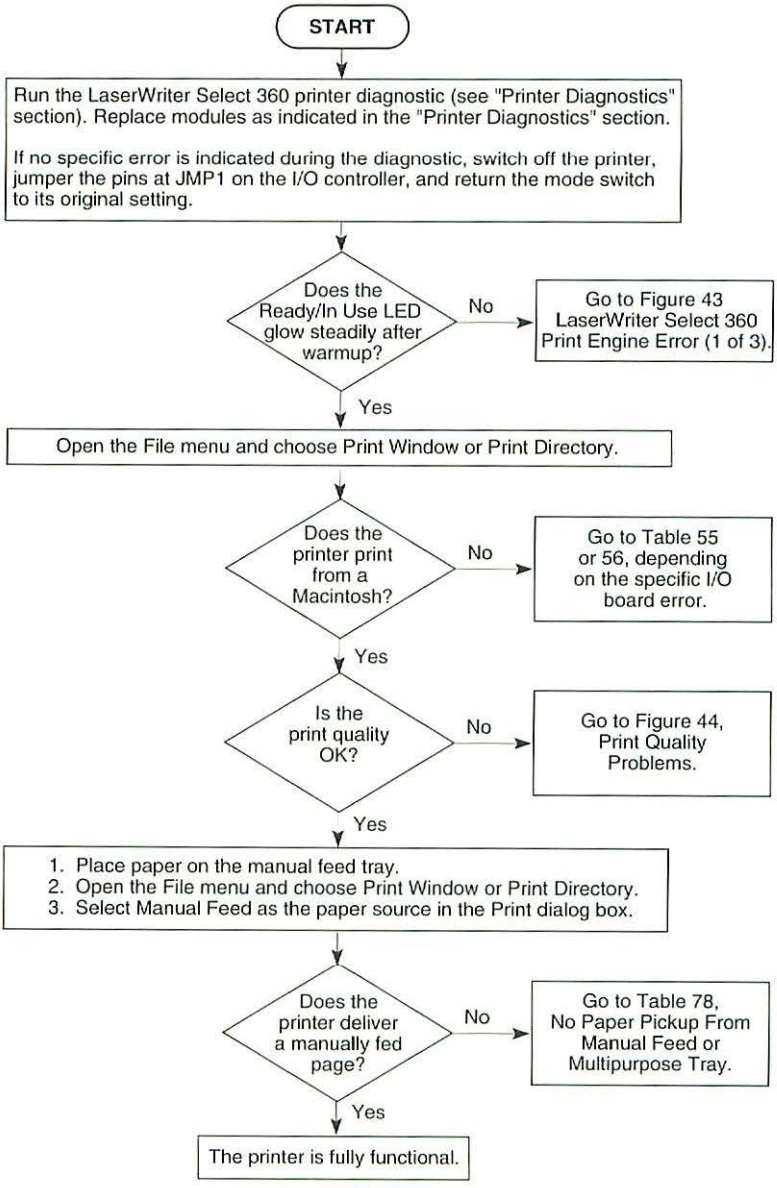


Figure 42. LaserWriter Select 360 Print Engine Check

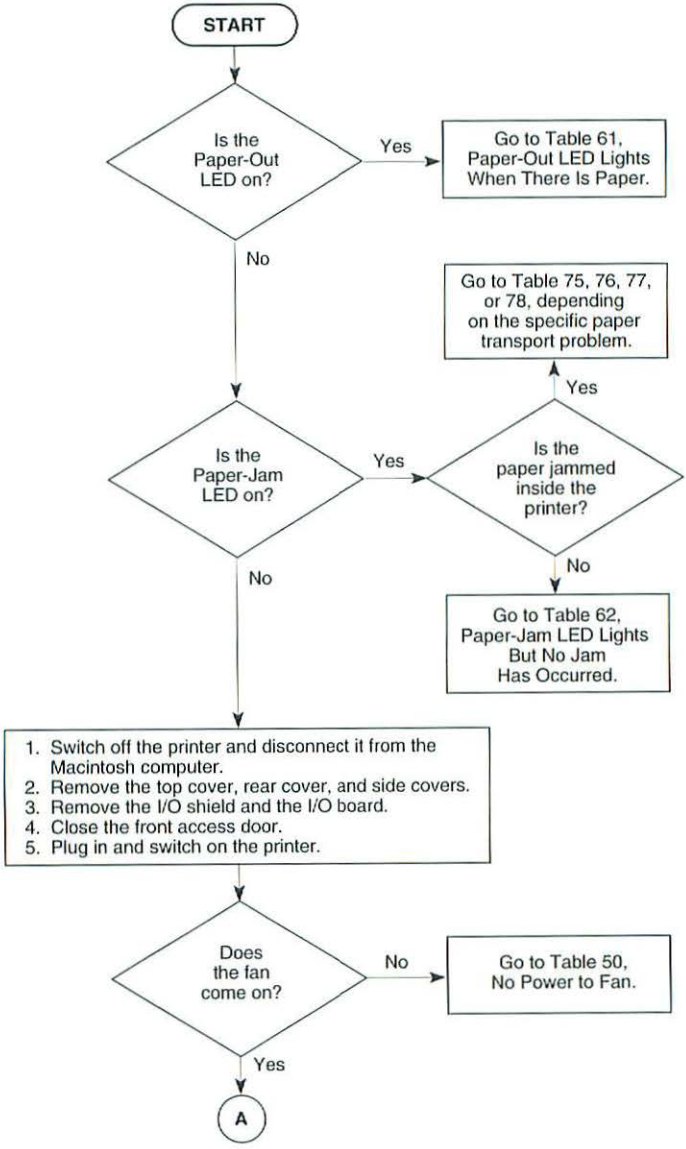


Figure 43. LaserWriter Select 360 Print Engine Error (1 of 3)

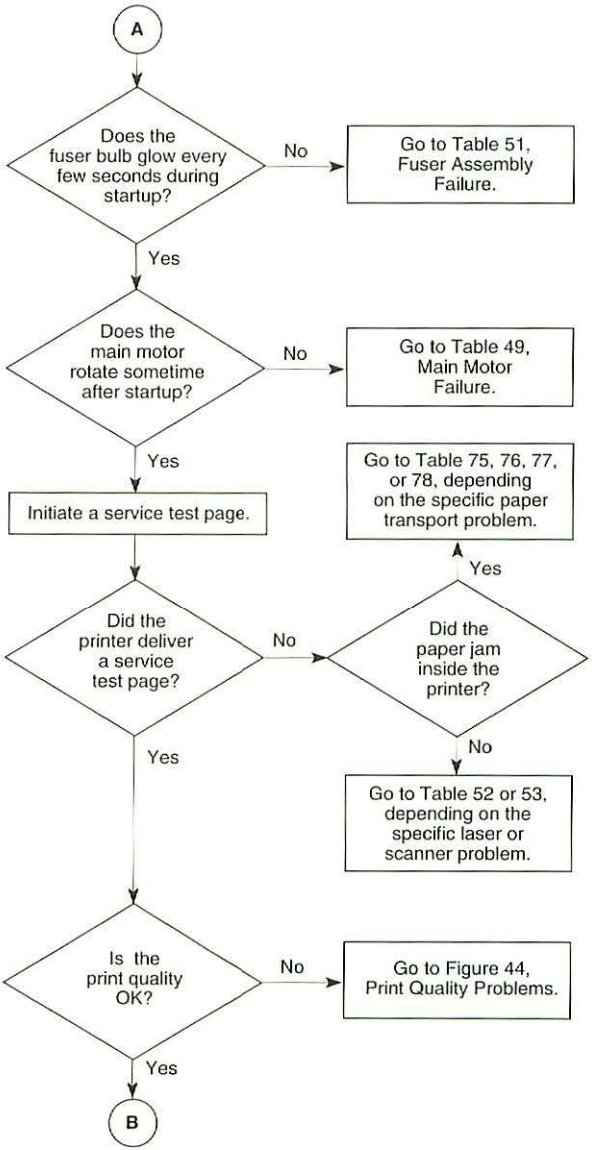


Figure 43. LaserWriter Select 360 Print Engine Error (2 of 3)

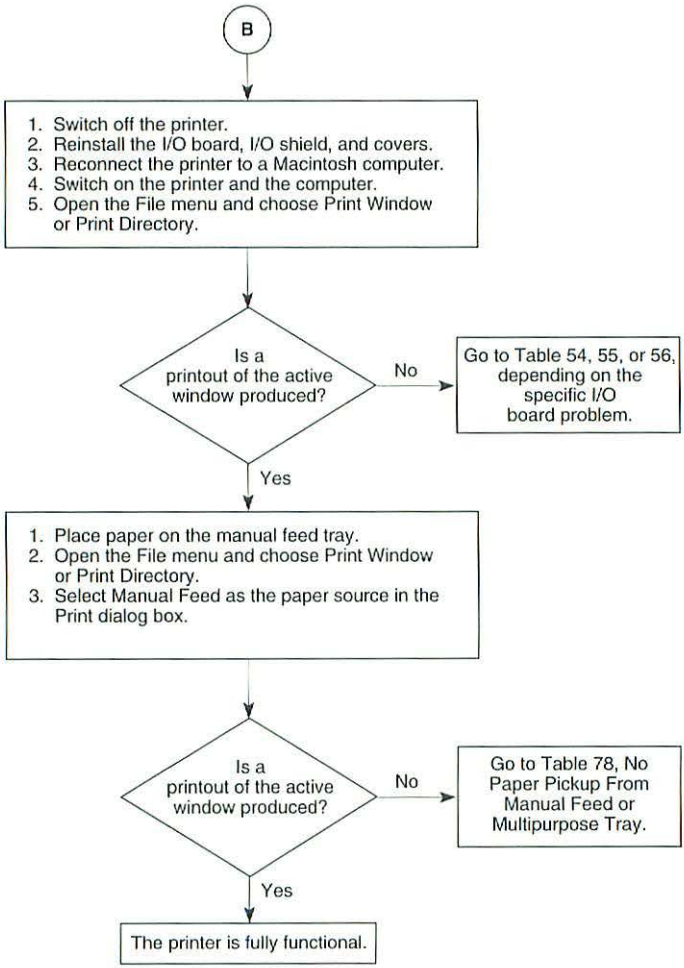


Figure 43. LaserWriter Select 360 Print Engine Error (3 of 3)

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 49. Main Motor Failure

Step	Check	Result	Action
1	Is connector P14 on the DC controller board making good contact?	No	Reconnect P14 to the DC controller board.
2	Are there any obstructions in the drive assembly gear train or paper path?	Yes	Remove the obstructions.
3	Inspect the drive assembly gear train and replace any damaged gears. (Check the gears on the drive assembly, the paper feed roller, and the cassette feeder assembly.) Does the problem persist?	No	Problem solved.
4	Switch off the printer and connect a multimeter between each of the following pairs of pins: • P14-1 (A-COM 24V) and P11-2 (GND) • P14-2 (B-COM 24V) and P11-2 (GND) Does the voltage measure approximately +24 VDC when you switch on the printer?	No	Go to Table 59, Power Supply Failure (+24 VDC).

Table 49. Main Motor Failure (Continued)			
Step	**Check**	**Result**	**Action**
5	Switch off the printer and connect a multimeter between each of the following pairs of pins: • P14-1 (A-COM 24V) and P14-3 (A) • P14-1 (A-COM 24V) and P14-5 (/A) • P14-2 (B-COM 24V) and P14-4 (B) • P14-2 (B-COM 24V) and P14-6 (/B) Is the resistance approximately 5 ohms?	No Yes	Replace the main motor. Replace the DC controller board. If the problem persists, replace the main motor.

Table 50. No Power to Fan			
Step	**Check**	**Result**	**Action**
1	Is a toner cartridge installed in the printer?	No	Install a toner cartridge.
2	Is the AC outlet providing the correct voltage?	No	Try another AC outlet.
3	Is connector P119 making good contact with the paper delivery sensor?	No	Reconnect connector P119 to the paper delivery sensor.
4	Inspect the paper delivery sensor. Does the lever on the fuser assembly cover the paper delivery sensor when no paper is present and uncover the sensor when paper passes through the fuser assembly?	No	Install the paper delivery sensor so that it makes contact with the delivery sensor lever. If the problem persists, replace the delivery sensor lever.

Table 50. No Power to Fan (Continued)			
Step	**Check**	**Result**	**Action**
5	Connect a multimeter between each of the following sets of pins and check for the following voltages: P11-10 (+24 V, brown wire) and P11-2 (GND, black wire) +24 VDC P11-11 (+24 V, brown wire) and P11-2 (GND, black wire) +24 VDC P11-12 (+24 V, orange wire) and P11-2 (GND, black wire) +24 VDC P11-5 (+5 VB, yellow wire) and P11-2 (GND, black wire) +5 VDC P11-6 (+5 VA, blue wire) and P11-2 (GND, black wire) +5 VDC Are the voltages present when you switch the printer back on?	No	Replace the power supply.
6	Switch off the printer, connect a multimeter between connectors P18-3 (+24V) and P18-2 (RTN) on the DC controller, and switch the printer back on. Is the voltage approximately +24 VDC?	Yes	Replace the fan.

Table 50. No Power to Fan (Continued)			
Step	**Check**	**Result**	**Action**
7	Switch off the printer and disconnect connector P119 from the paper delivery sensor. Connect the multimeter between P119-2 (GND) and P119-3 (+5 VDC) and switch on the printer. Does the voltage measure approximately +5 VDC when you switch on the printer?	No Yes	Check the cable connections between P119 and P16 on the DC controller board. If the connections are secure, replace the DC controller board. Replace the paper delivery sensor.

Table 51. Fuser Assembly Failure			
Step	**Check**	**Result**	**Action**
1	Is a toner cartridge installed in the printer?	No	Install a toner cartridge.
2	Switch off the printer, connect a multimeter between pins J101-2 and J101-6 on the fuser assembly, and switch on the printer. Does the voltage measure between +90 and +132 VAC when you switch on the printer?	No	Replace the power supply.
3	Switch off the printer, disconnect connector P11 from the DC controller board. Measure the resistance between connector pins P11-13 (STS) and P11-14 (GND). Is the resistance between 200 kΩ and 350 kΩ at room temperature?	No	Replace the power supply.

Table 51. Fuser Assembly Failure (Continued)			
Step	**Check**	**Result**	**Action**
4	Measure the resistance between pins J101-2 and J101-6 on the fuser assembly. Is the resistance less than 10 Ω?	No	Replace the fuser heater bulb and the thermoprotector.
5	Connect a multimeter between pins P11-1 (HEAT, red wire) and P11-2 (GND, black wire). Does the voltage measure about +4.2 VDC when you switch on the printer?	No	Replace the power supply.
6	Connect a multimeter between connector pins P11-1 (HEAT, red wire) and P11-2 (GND, black wire) on the DC controller board. When you open and close the front access door, does the voltage measure about +3.7 VDC with the door open and briefly drop to 0 VDC about five seconds after you close the door?	No	Go to Table 57, Temperature Sensor Assembly Failure.
7	Switch off the printer and disconnect P111 from the high-voltage power supply. Connect a multimeter between connector pins P11-5 (5 VB, yellow wire) and P11-2 (GND, black wire) on the DC controller board. Does the voltage measure about +5 VDC when you switch on the printer?	No	Replace the power supply.

Table 51. Fuser Assembly Failure (Continued)			
Step	**Check**	**Result**	**Action**
8	Switch off the printer and disconnect connector P12 from the DC controller board. Does the fuser heater bulb light when you switch on the printer?	No	Replace the laser/optic assembly.
9	Switch off the printer and disconnect connector P15 from the DC controller board. Does the fuser heater bulb light when you switch on the printer?	Yes	Replace the DC controller board.
10	Connect the multimeter between pins P15-8 (5 VB, yellow wire) and P15-9 (5 V, orange wire) on the DC controller board. When you remove and insert the toner cartridge does the resistance change from 0 Ω (cartridge inserted) to infinity Ω (cartridge removed)?	No	Replace the toner cartridge sensor assembly.
11	Connect the multimeter between pins P15-10 (EP CHECK, red wire) and P15-11 (GND, brown wire) on the DC controller board. When you remove and insert the toner cartridge, does the resistance change from 0 Ω (cartridge inserted) to infinity Ω (cartridge removed)?	No	Replace the toner cartridge sensor assembly.

Table 52. Laser Scanner Failure			
Step	**Check**	**Result**	**Action**
1	Are connectors P12 and P19 on the DC controller board properly seated?	No	Reconnect connectors P12 and P19 to the DC controller board.
2	Switch on the printer, wait until the main motor stops rotating, and connect a multimeter between connector P12-11 (/MOT ON) on the DC controller board and chassis ground. Can you hear the scanner motor start to spin?	No	Go to Table 53, Scanner Assembly Failure.
3	Switch off the printer, connect a multimeter between connectors P11-4 (GND, black wire) and P11-5 (5 VB, yellow wire) on the DC controller board, and switch on the printer. Is the voltage approximately +5VDC?	No	Replace the power supply.
4	Switch off the printer and connect a multimeter between connectors P11-5 (5 VB, yellow wire) and P12-7 (5 VB, black wire) on the DC controller board. Is the resistance less than 5 Ω?	No	Go to Table 58, Toner Cartridge Sensor Failure.
5	Switch off the printer and connect a multimeter between connectors P12-7 (5 VB) and P12-6 (GND) on the DC controller board. Does the voltage measure +5 VDC when you switch on the printer?	Yes No	Replace the laser/optic assembly. Replace the DC controller board.

Table 53. Scanner Assembly Failure			
Step	**Check**	**Result**	**Action**
1	Switch off the printer and connect a multimeter between connectors P12-13 (24 V) and P12-12 (RTN) on the DC controller board. Does the voltage measure about +24 VDC when you switch on the printer?	No	Go to Table 59, Power Supply Failure (+24 VDC).
2	Connect a multimeter between connectors P12-11 (/MOT ON) and P12-10 (GND) on the DC controller board and initiate a service test page. Does the voltage drop to less than +1 VDC during printing and rise to about +4 VDC when the printing stops?	Yes No	Replace the scanner assembly. If the problem persists, replace the laser and scanner motor cable. Replace the DC controller board.

Table 54. Select 360 I/O Board Error			
Step	**Check**	**Result**	**Action**
1	Are the serial and/or parallel cables secure?	No	Tighten the cable connections.
2	If you are using a Macintosh, is the LaserWriter Select 360 driver installed in the System Folder?	No	Use the LaserWriter Select 360 installation disk to install the driver in the System folder.
3	If you are using an IBM PC or compatible computer, check that the correct printer driver is installed. Has it been installed?	No	Install the correct Windows printer driver. Refer to the user's guide for more information.

Table 54. Select 360 I/O Board Error (Continued)			
Step	**Check**	**Result**	**Action**
4	If you are using a Macintosh, are the LaserWriter 8.0 driver (icon) and correct serial port selected?	No	Use the Chooser to select the LaserWriter 8.0 driver.
5	If you are using an IBM PC or compatible computer, is the Windows program open and active?	No	Make sure the window is open and the document window is active. Choose Print from the File menu, select the options you want, and click Print.
6	If you are using a Macintosh, is background printing disabled?	No Yes	Disable background printing (so that error messages display on the screen). Switch the printer off and on again. Install a different LaserWriter Select 360 I/O board.

Table 55. Select 360 I/O Board Error – Serial Connection			
Step	**Check**	**Result**	**Action**
1	Is the serial cable connection secure?	No	Tighten cable connections.
2	Is the serial cable good?	No	Replace cable.
3	Is the LaserWriter Select 360 driver installed in the System Folder?	No	Use the Installer to install the LaserWriter Select 360 driver in the System Folder.
4	Are the LaserWriter Select 360 driver and correct serial port selected?	No	Use the Chooser to select the LaserWriter Select 360 driver and the port (printer or modem) to which the printer is connected.
5	Is the printer connected to the printer port on the Macintosh?	Yes	Make sure AppleTalk is inactive.
6	Is background printing disabled?	No	Disable background printing. If the problem persists, install a different LaserWriter Select 360 I/O board.

Table 56. Select 360 I/O Board Error – Parallel Connection			
Step	**Check**	**Result**	**Action**
1	Are the parallel cable connections correct and secure?	No	Tighten cable connections.
2	Are the parallel cables and connectors good?	No	Replace the defective cables and connectors.
3	Are the software and hardware properly configured to communicate with the parallel port on the printer?	No	Refer to the printer's owner's guide and the computer documentation for proper configuration. Switch the printer off and on again. If the problem persists, install a different I/O board.

Table 57. Temperature Sensor Assembly Failure			
Step	**Check**	**Result**	**Action**
1	After allowing the fuser assembly to cool to room temperature, remove the fuser assembly from the printer. Measure the resistance between J101-1 and J101-4 on the fuser assembly. Is the resistance between 200 kΩ and 350 kΩ?	No	Replace the sensor assembly.

Table 58. Toner Cartridge Sensor Failure			
Step	**Check**	**Result**	**Action**
1	Switch off the printer. Connect a multimeter between P15-8 (5 VB) and P11-2 (GND) on the DC controller board. Does the voltage measure +5 VDC when you switch on the printer?	No	Go to Table 60, Power Supply Failure (+5 VDC).

Table 58. Toner Cartridge Sensor Failure (Continued)			
Step	**Check**	**Result**	**Action**
2	Connect a multimeter between pins P15-8 (5 VB, yellow wire) and P15-9 (5 V, orange wire) on the DC controller board. When you remove and insert the toner cartridge, does the resistance change from 0 Ω (cartridge inserted) to infinity Ω (cartridge removed)?	No	Replace the toner cartridge sensor assembly.
3	Connect a multimeter between pins P15-10 (EP CHECK, red wire) and P15-11 (GND, brown wire) on the DC controller board. When you remove and insert the toner cartridge, does the resistance change from 0 Ω (cartridge inserted) to infinity Ω (cartridge removed)?	No	Replace the toner cartridge sensor assembly.
4	Remove the toner cartridge sensor cover and observe the toner cartridge sensor PCB and actuator. Does the actuator turn on switches S101 and S100 when you install a toner cartridge and turn off the switches when you remove the toner cartridge?	No	Install a new toner cartridge. If switches S101 and S100 still do not turn on when you install the cartridge, replace the toner cartridge sensor assembly.
5	Is there continuity between connectors P15 on the DC controller board and P118 on the toner cartridge sensor board.	Yes No	Replace the DC controller board. Replace the high-voltage/toner cartridge sensor cable.

Table 59. Power Supply Failure (+24 VDC)			
Step	**Check**	**Result**	**Action**
1	Switch off the printer. Connect a multimeter between P11-12 (+24 VDC, orange wire) and P11-2 (GND, black wire) on the DC controller board. Switch on the printer. Is the voltage approximately +24 VDC?	No	Replace the power supply.
2	Switch off the printer. Connect a multimeter between P11-10 (+24 VDC, brown wire) and P11-2 (GND, black wire) on the DC controller board. Switch the printer back on. When you open and close the front access door, does the voltage measure 0 VDC with the door open and +24 VDC with the door closed?	Yes	Replace the DC controller board.
3	Switch off the printer. Connect a multimeter between P11-11 (+24 VDC, brown wire) and P11-2 (GND, black wire) on the DC controller board. Switch the printer back on. When you open and close the front access door, does the voltage measure 0 VDC with the door open and +24 VDC with the door closed?	Yes No	Replace the DC controller board. Replace the power supply.

Table 60. Power Supply Failure (+5 VDC)			
Step	**Check**	**Result**	**Action**
1	Connect a multimeter between the following pairs of pins on the DC controller board: P11-5 (yellow wire) and P11-2 (black wire) P11-6 (blue wire) and P11-2 (black wire) Does the voltage measure +5 VDC when you switch on the printer?	No Yes	Replace the power supply. Replace the DC controller board.

Table 61. Paper-Out LED Lights When There Is Paper			
Step	**Check**	**Result**	**Action**
1	Is the paper cassette installed and does it contain paper?	No	Remove the paper cassette tray and fill it with paper. Reinstall the paper cassette tray and make sure it is seated properly.
2	Remove the paper cassette tray and inspect the paper sensing arm. Does the paper sensing arm appear to be damaged?	Yes	Replace the paper sensing arm.
3	While the paper cassette tray is out, inspect the paper cassette size actuators. Do any of the actuators appear to be bent or damaged?	Yes	Replace the cassette feeder board.
4	While the paper cassette tray is out, switch on the printer. Insert the paper cassette tray. Does the main motor rotate when you insert the paper cassette tray?	No	Replace the cassette feeder board.

Table 61. Paper-Out LED Lights When There Is Paper (Continued)			
Step	**Check**	**Result**	**Action**
5	Prepare the printer for troubleshooting as described in the "Troubleshooting Preparation" section. Disconnect P111 from the high-voltage power supply. Connect a multimeter between connector pins P13-1 (NOPAPER1) and P13-4 (GND) on the DC controller board. Remove and insert the paper cassette tray filled with paper. Does the voltage toggle from +5 VDC (tray removed) to 0 VDC (tray inserted)?	No Yes	Replace the cassette feeder board. If the problem persists, replace the cassette feeder tray cable. Replace the DC controller board.
6	If an optional paper cassette is installed, connect a multimeter between connector pins p13-3 (NOPAPER2) and P13-4 (GND) on the DC controller board. Remove and insert the paper cassette tray filled with paper. Does the voltage toggle from +5 VDC (tray removed) to 0 VDC (tray inserted)?	No Yes	Replace the cassette feeder board. If the problem persists, replace the expansion feeder cable. Replace the DC controller board.

Table 62. Paper-Jam LED Lights But No Jam Has Occurred			
Step	**Check**	**Result**	**Action**
1	Is the paper cassette installed and does it contain paper?	No	Remove the paper cassette tray and fill it with paper. Reinstall the paper cassette tray and make sure it is seated properly.
2	Check the fuser/delivery area or paper registration area for paper fragments. Are there any paper fragments or other obstructions?	Yes	Remove the fragments or obstructions.
3	Is the cable that runs to the paper delivery sensor securely connected?	No	Reconnect the cable to the paper delivery sensor.
4	Initiate a service test page and observe the action of the delivery lever on the fuser assembly. Does the delivery lever swing freely when it passes through the fuser assembly?	No	Replace the delivery sensor lever.
5	Open the front access door and locate the paper registration on the paper charge deflector. Is the paper sensing arm damaged or broken.	Yes	Replace the paper sensing arm.

Table 62. Paper-Jam LED Lights But No Jam Has Occurred (Continued)			
Step	**Check**	**Result**	**Action**
6	Prepare the printer for troubleshooting as described in "Troubleshooting Preparation." Disconnect connector P111 from the high-voltage power supply and connector P16 from the DC controller board. Connect a multimeter between P16-4 (PULLUP 5 V) and P16-5 (GND) on the DC controller board. Does the voltage measure +5 VDC when you switch on the power?	No	Go to Step 9.
7	Switch off the printer and reconnect connector P16 to the DC controller board. Connect a multimeter between connector P16-6 (PregReg) and P16-5 (GND) on the DC controller board. Initiate a service test page. Does the voltage drop from +5 VDC to 0 VDC when the paper passes the paper registration sensor?	No	Go to Step 9.
8	Switch off the printer. Connect a multimeter between connector P16-3 (EXIT) and P16-2 (GND). Switch on the printer and manually actuate the paper delivery sensor by inserting a sheet of paper between the sensor arms. Does the voltage drop from +5 VDC to 0 VDC when you remove the paper from the sensor?	No	Replace the paper delivery sensor. If the problem persists, replace the delivery sensor cable.

Table 62. Paper-Jam LED Lights But No Jam Has Occurred (Continued)			
Step	**Check**	**Result**	**Action**
9	Switch off the printer and connect a multimeter between the following pairs of pins on the DC controller board: P11-5 (yellow wire) and P11-2 (black wire) P11-6 (blue wire) and P11-2 (black wire) Does the voltage measure +5 VDC when you switch on the printer?	No Yes	Replace the power supply Replace the DC controller board.

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

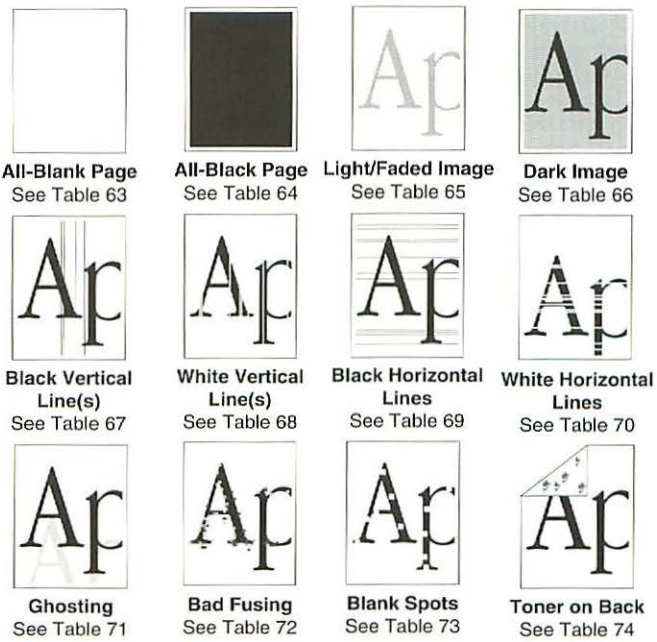


Figure 44. Print Quality Problems

Table 63. All-Blank Page			
Step	**Check**	**Result**	**Action**
1	Remove the toner cartridge from the printer. Is the toner cartridge sealing tape removed?	No	Remove the sealing tape.
2	Replace the toner cartridge. Does the print quality improve?	Yes	Problem solved.
3	Are the high-voltage contacts making good contact with the toner cartridge?	No	Clean the contacts or replace the high-voltage contact assembly.
4	Remove the toner cartridge from the printer. Is any foreign material blocking the laser beam outlet on the inside of the printer chassis? Is any foreign material adhering to the laser beam access slot on the toner cartridge?	Yes	Remove the foreign material.
5	Inspect the drive assembly gear train. Are any gears damaged?	Yes	Replace the drive assembly.
6	Replace the transfer roller. Does the print quality improve?	Yes	Problem solved.
7	Connect the multimeter between connectors P15-7 and P15-1 on the DC controller board. Does the voltage measure +24 VDC when you switch on the printer?	No	Go to Table 59, Power Supply Failure (+24 VDC).

Table 63. All-Blank Page (Continued)			
Step	**Check**	**Result**	**Action**
8	For Steps 8 and 9, remove the top covers, side covers, rear cover, I/O board mount, and the power switch lever. Remove the high-voltage contact assembly and check the continuity on all the high-voltage contacts. Do you find continuity on all the high-voltage contacts?	No	Replace the high-voltage contact assembly.
9	Is there continuity between connector RTN (red wire) on the high-voltage power supply and the red spade connector on the paper delivery guide?	No	Replace the paper delivery guide.
10	Replace the DC controller board. Does the print quality improve?	Yes No	Problem solved. Replace the toner cartridge sensor and high-voltage power supply cable. If the problem persists, replace the high-voltage power supply.

Table 64. All-Black Page			
Step	**Check**	**Result**	**Action**
1	Replace the toner cartridge. Does the print quality improve?	Yes	Problem solved.
2	Are the high-voltage contacts making good contact with the toner cartridge?	No	Clean the contacts or replace the high-voltage contact assembly.

Table 64. All-Black Page (Continued)			
Step	**Check**	**Result**	**Action**
3	Connect the multimeter between connectors P15-7 and P15-1 on the DC controller board. Does the voltage measure +24 VDC when you switch on the printer?	No	Go to Table 59, Power Supply Failure (+24 VDC).
4	Is there continuity between CRU (spring plate) on the high-voltage contact assembly and jack CR on the high-voltage power supply?	No	Replace the high-voltage contact assembly.
5	Is there continuity between P15 on the DC controller board and P111 on the high-voltage power supply?	Yes	Replace the toner cartridge sensor and high-voltage power supply cable.
6	Replace the DC controller board. Does the print quality improve?	Yes No	Problem solved. Replace the high-voltage power supply.

Table 65. Light/Faded Image			
Step	**Check**	**Result**	**Action**
1	Replace the toner cartridge. Does the print quality improve?	Yes	Problem solved.
2	Reload the paper cassette tray with known-good paper. Does the print quality improve?	Yes	Problem solved.

Table 65. Light/Faded Image (Continued)			
Step	**Check**	**Result**	**Action**
3	Remove the toner cartridge from the printer. Is any foreign material blocking the laser beam outlet on the inside of the printer chassis? Is any foreign material adhering to the laser beam access slot on the toner cartridge?	Yes	Remove the foreign material.
4	Are the high-voltage contacts making good contact with the toner cartridge?	No	Clean the contacts or replace the high-voltage contact assembly.
5	Replace the transfer roller. Does the print quality improve?	No	Problem solved.
6	Connect the multimeter between connectors P15-7 and P15-1 on the DC controller board. Does the voltage measure +24 VDC when you switch on the printer?	No	Go to Table 59, Power Supply Failure (+24 VDC).
7	For Steps 7 and 8, remove the top cover, side covers, I/O board mount, and the power switch lever. Remove the high-voltage contact assembly and check the continuity on all the high-voltage contacts. Did you find continuity on all the high-voltage contacts?	No	Replace the high-voltage contact assembly.
8	Is there continuity between connector RTN (red wire) on the high-voltage power supply and the red spade connector on the paper delivery guide?	No	Replace the paper delivery guide.

Table 65. Light/Faded Image (Continued)			
Step	**Check**	**Result**	**Action**
9	Replace the DC controller board. Does the print quality improve?	Yes No	Problem solved. Replace the toner cartridge sensor and high-voltage power supply cable. If the problem persists, replace the high-voltage power supply.

Table 66. Dark Image Over Entire Page			
Step	**Check**	**Result**	**Action**
1	Replace the toner cartridge. Does the print quality improve?	Yes	Problem solved.
2	Is the transfer roller dirty?	Yes	Replace the transfer roller.
3	Connect the multimeter between connectors P15-7 and P15-1 on the DC controller board. Does the voltage measure +24 VDC when you switch on the printer.	No	Go to Table 59, Power Supply Failure (+24 VDC).
4	Remove the top cover, side covers, rear cover, I/O board mount, and the power switch lever. Remove the high-voltage contact assembly and check the continuity on all the high-voltage contacts. Do you find continuity on all the high-voltage contacts?	No	Replace the high-voltage contact assembly.
5	Replace the DC controller board. Does the print quality improve?	Yes No	Problem solved. Replace the toner cartridge sensor and high-voltage power supply cable. If the problem persists, replace the high-voltage power supply.

Table 67. Black Vertical Lines			
Step	**Check**	**Result**	**Action**
1	Replace the toner cartridge. Does the print quality improve?	Yes	Problem solved.
2	Replace the transfer roller. Does the print quality improve?	No	Connect the grounding contact to the static eliminator.
3	Remove the paper delivery guide. Is the static eliminator on the paper delivery guide properly grounded?	No	Connect the grounding contact to the static eliminator.
4	Remove the fuser assembly and inspect the fuser heater roller. Are there scratches on the fuser heater roller?	Yes	Replace the fuser heater roller or the fuser assembly.

Table 68. White Vertical Lines			
Step	**Check**	**Result**	**Action**
1	Remove the toner cartridge from the printer. Is any foreign material blocking the laser beam outlet on the inside of the printer chassis?	Yes	Remove the foreign material.
2	Inspect the paper path. Is any foreign material blocking the paper path?	Yes	Remove the foreign material.
3	Replace the toner cartridge. Does the print quality improve?	Yes	Problem solved.
4	Replace the transfer roller. Does the print quality improve?	Yes	Problem solved.

Table 68. White Vertical Lines (Continued)			
Step	**Check**	**Result**	**Action**
5	Remove the fuser assembly and heater roller. Are there scratches on the fuser heater roller?	Yes	Replace the fuser heater roller or the fuser assembly.
6	Replace the I/O board. Does the print quality improve?	Yes	Problem solved.

Table 69. Black Horizontal Lines			
Step	**Check**	**Result**	**Action**
1	Replace the toner cartridge. Does the print quality improve?	Yes	Problem solved.
2	Are the high-voltage contacts making good contact with the toner cartridge?	No	Clean the contacts or replace the high-voltage contact assembly.
3	Replace the transfer roller. Does the print quality improve?	Yes	Problem solved.
4	Remove the fuser assembly and inspect the fuser heater roller. Are there scratches on the fuser heater roller?	Yes	Replace the fuser heater roller or the fuser assembly.
5	Connect the multimeter between connectors P15-7 and 15-1 on the DC controller board. Does the voltage measure +24 VDC when you switch on the printer?	No	Go to Table 59, Power Supply Failure (+24 VDC).

Table 69. Black Horizontal Lines (Continued)			
Step	**Check**	**Result**	**Action**
6	Remove the top cover, side covers, rear cover, I/O board mount, and the power switch lever. Remove the high-voltage contact assembly and check the continuity on all the high-voltage contacts. Do you find continuity on all the high-voltage contacts?	No	Replace the high-voltage contact assembly.
7	Replace the DC controller board. Does the print quality improve?	Yes	Problem solved.
8	Replace the toner cartridge sensor and high-voltage power supply cable. Does the print quality improve?	Yes	Problem solved.
9	Replace the high-voltage power supply. Does the print quality improve?	Yes	Problem solved.
10	Replace the I/O board. Does the print quality improve?	Yes	Problem solved.

Table 70. White Horizontal Lines			
Step	**Check**	**Result**	**Action**
1	Check the paper in the paper cassette tray for dampness. Is the paper damp?	Yes	Replace the paper.
2	Replace the toner cartridge. Does the print quality improve?	Yes	Problem solved.

Table 70. White Horizontal Lines (Continued)			
Step	**Check**	**Result**	**Action**
3	Are the high-voltage contacts making good contact with the toner cartridge?	No	Clean the contacts or replace the high-voltage contact assembly.
4	Remove the toner cartridge from the printer. Is any foreign material blocking the laser beam outlet on the inside of the printer chassis? Is any foreign material adhering to the laser beam access slot on the toner cartridge?	Yes	Remove the foreign material.
5	Replace the transfer roller. Does the print quality improve?	Yes	Problem solved.
6	Connect the multimeter between connectors P15-7 and P15-1 on the DC controller board. Does the voltage measure +24 VDC when you switch on the printer?	No	Go to Table 59, Power Supply Failure (+24 VDC).
7	For Steps 7 and 8, remove the top covers, rear cover, I/O board mount, and power supply switch lever. Remove the high-voltage contact assembly and check the continuity on all the high-voltage contacts. Do you find continuity on all the high-voltage contacts?	No	Replace the high-voltage contact assembly.
8	Is there continuity between connector RTN (red wire) on the high-voltage power supply and the red spade connector on the paper delivery guide?	No	Replace the paper delivery guide.

Table 70. White Horizontal Lines (Continued)			
Step	**Check**	**Result**	**Action**
9	Replace the DC controller board. Does the print quality improve?	Yes No	Problem solved. Replace the toner cartridge sensor and high-voltage power supply cable. If the problem persists, replace the high-voltage power supply.
10	Replace the toner cartridge sensor and high-voltage power supply. Does the print quality improve?	Yes	Problem solved.
11	Replace the high-voltage power supply. Does the print quality improve?	Yes	Problem solved.
12	Replace the I/O board. Does the print quality improve?	Yes	Problem solved.

Table 71. Ghosting			
Step	**Check**	**Result**	**Action**
1	Replace the toner cartridge. Does the print quality improve?	Yes	Problem solved.
2	Is the transfer roller dirty?	Yes	Replace the transfer roller.
3	Remove the fuser assembly and inspect the fuser heater roller and the fuser pressure roller. Are there scratches on either roller?	Yes	Replace the fuser heater roller, the fuser pressure roller, or the fuser assembly.
4	Connect the multimeter between connectors P15-7 and P15-1 on the DC controller board. Does the voltage measure +24 VDC when you switch on the printer?	No	Go to Table 59, Power Supply Failure (+24VDC).

Table 71. Ghosting (Continued)			
Step	**Check**	**Result**	**Action**
5	Remove the top cover, side covers, rear cover, I/O board mount, and power supply switch lever. Remove the high-voltage contact assembly and check the continuity on all the high-voltage contacts. Do you find continuity on all the high-voltage contacts?	No	Replace the high-voltage contact assembly.
6	Replace the DC controller board. Does the print quality improve?	Yes No	Problem solved. Replace the toner cartridge sensor and high-voltage power supply cable. If the problem persists, replace the high-voltage power supply.

Table 72. Bad Fusing			
Step	**Check**	**Result**	**Action**
1	Check the paper in the paper cassette tray for dampness. Is the paper damp?	Yes	Replace the paper.
2	Is the fuser assembly properly installed and secure?	No	Reinstall the fuser assembly.
3	Install a known-good fuser assembly. Does the print quality improve?	Yes	Problem solved.
4	Install a known-good power supply. Does the print quality improve?	Yes	Problem solved.
5	Install a known-good DC controller. Does the print quality improve?	Yes	Problem solved.

Table 73. Blank Spots/Random Pattern or Location			
Step	**Check**	**Result**	**Action**
1	Replace the toner cartridge. Does the print quality improve?	Yes	Problem solved.
2	Check the paper in the paper cassette tray for dampness. Is the paper damp?	Yes	Replace the paper.
3	Is the transfer roller dirty?	Yes	Replace the transfer roller.
4	Remove the fuser assembly and inspect the fuser heater roller and the fuser pressure roller. Are there scratches on either of the rollers?	Yes	Replace the fuser heater roller, the fuser pressure roller, or the fuser assembly.

Table 74. Toner on Back of Page			
Step	**Check**	**Result**	**Action**
1	Replace the toner cartridge. Does the print quality improve?	Yes	Problem solved.
2	Does the printer operating environment meet recommended setup and operating conditions?	No	Make recommended changes to printer operating environment or setup. See the Pre-Power-On Checklist section under "Troubleshooting the LaserWriter Select 360" for recommended setup and operating instructions.
3	Is the transfer roller dirty?	Yes	Replace the transfer roller.
4	Remove the fuser assembly and inspect the fuser heater roller and the fuser pressure roller. Are there scratches on either of the rollers?	Yes	Replace the fuser heater roller, the fuser pressure roller, or the fuser assembly.

Table 75. Paper Jams in Fuser/Delivery Area			
Step	**Check**	**Result**	**Action**
1	Initiate a service test page. Does the test page jam as it leaves the fuser assembly?	No	Problem solved.
2	Is the cable that runs to the paper delivery sensor securely connected?	No	Reconnect the cable to the paper delivery sensor.
3	Initiate another test page and observe the action of the delivery lever on the fuser assembly. Does the lever swing freely when paper passes through the fuser assembly?	No	Replace the delivery sensor lever.
4	Allow the fuser rollers to cool and then remove the fuser assembly. Inspect the fuser rollers. Are the fuser rollers worn or damaged?	Yes	Replace the fuser assembly.
5	Do the fuser rollers rotate without binding?	Yes	Replace the fuser assembly.
6	Remove the I/O shield, the I/O board, and the I/O board mount. Replace the fuser assembly and disconnect P111 from the high-voltage power supply. Connect a multimeter between connector pins P16-1 (PULLUP +5 V) and P16-2 (GND) on the DC controller board. Does the voltage measure +5 VDC when you switch on the printer?	No	Go to Table 60, Power Supply Failure (+5 V).

Table 75. Paper Jams in Fuser/Delivery Area (Continued)			
Step	**Check**	**Result**	**Action**
7	Verify that the cable that runs to the paper delivery sensor is still securely connected. Connect a multimeter across connector pins P16-3 (EXIT) and P16-2 (GND) on the DC controller board. Manually actuate the paper delivery sensor by inserting a sheet of paper between the sensor arms. Does the voltage drop from +5 VDC to 0 VDC when you remove the paper from the sensor?	Yes No	Replace the DC controller board. Replace the paper delivery sensor. If the problem persists, replace the delivery sensor cable.

Table 76. Paper Jams in Paper Pickup Area			
Step	**Check**	**Result**	**Action**
1	Reload the paper cassette tray with known-good paper. Does the problem still occur?	No	Problem solved.
2	Does the jam occur when the manual feed or optional multipurpose tray is being used?	Yes	Go to Step 17.
3	Is the paper cassette installed properly in the printer?	No	Reinstall the paper cassette properly.
4	Is the paper cassette loaded with too much paper?	Yes	Remove the excess paper.
5	Are the cassette feed rollers damaged or worn?	Yes	Replace the cassette pickup rollers.
6	Are the cassette feed rollers damaged or worn?	Yes	Replace the cassette feed roller shaft.

Table 76. Paper Jams in Paper Pickup Area (Continued)			
Step	**Check**	**Result**	**Action**
7	Is connector P13 on the DC controller board making good contact?	No	Reconnect P13 to the DC controller board.
8	Is connector P115 on the cassette feeder board making good contact?	No	Reconnect P115 to the cassette feeder board.
9	Are the cassette pickup and cassette feed solenoids securely connected to the cassette feeder board?	No	Reconnect P201 and P202 to the cassette feeder board.
10	Switch off the printer. Connect the multimeter between P13-7 (+24 V) and P13-8 (TURN1). Does the resistance measure between 220 and 240 Ω?	No	Replace the cassette feed solenoid.
11	Connect the multimeter between P13-10 (+24 V) and P13-11 (FEED1). Does the resistance measure between 110 and 130 Ω?	No	Replace the cassette pickup solenoid.
12	Open the front access door and locate the paper registration arm on the paper charge deflector. Is the paper registration arm damaged or broken?	Yes	Replace the paper registration arm.
13	Close the front access door and disconnect connector P16 from the DC controller board. Connect a multimeter between connector pins P16-4 (PULLUP 5 V) and P16-5 (GND) on the DC controller board. Does the voltage measure +5 VDC when you switch on the power?	No	Go to Table 60, Power Supply Failure (+5 VDC).

Table 76. Paper Jams in Paper Pickup Area (Continued)			
Step	**Check**	**Result**	**Action**
14	Replace the DC controller board. Does the problem still occur?	No	Problem solved.
15	Reconnect connector P16 to the DC controller board. Connect a multimeter between pins P16-6 (/PREREG) and P16-5 (GND) on the DC controller board. Initiate a service test page. Does the voltage drop from +5 VDC to 0 VDC when the paper passes the paper registration sensor?	No	Replace the paper registration sensor located on the paper charge deflector.
16	Does the manual feed or multipurpose tray have too much paper? (The manual feed tray holds one sheet of paper at a time and the multipurpose tray holds 50 sheets of paper.)	Yes	Remove excess paper.
17	Is connector P17 on the DC controller board making good contact?	No	Reconnect connector P17 to the DC controller board.
18	Open the front access door and observe the rollers on the pickup roller assembly. Are the pickup rollers worn or deformed?	Yes	Replace the pickup rollers.
19	Using a paper clip or screwdriver, manually activate the manual feed solenoid. Manually rotate the large black gear on the pickup roller assembly toward the manual feed solenoid. Does the pickup roller rotate without binding?	No	Replace the pickup roller assembly.

Table 76. Paper Jams in Paper Pickup Area (Continued)			
Step	**Check**	**Result**	**Action**
20	Disconnect P111 from the high-voltage power supply. Connect the multimeter between connector pins P17-1 (+24 V) and P11-2 (GND) on the DC controller board. Does the voltage measure +24 VDC when you switch on the printer?	No	Go to Table 59, Power Supply Failure (+24 VDC).
21	Connect the printer to a computer and place a sheet of paper on the manual feed or multipurpose tray. Connect the multimeter between connector pins P17-2 (+24 V) and P11-2 (GND) on the DC controller board. Select Manual Feed and print a page. Does the voltage drop from +24 VDC to 0 VDC when the manual feed pickup solenoid is actuated?	No Yes	Replace the manual feed pickup solenoid. Replace the DC controller board.

Table 77. No Paper Pickup From Cassette			
Step	**Check**	**Result**	**Action**
1	Is connector P13 on the DC controller board making good contact?	No	Reconnect P13 to the DC controller board.
2	Is connector P115 on the cassette feeder board making good contact?	No	Reconnect P115 to the cassette feeder board.
3	Is cassette feed solenoid connector P202 securely connected to the cassette feeder board?	No	Reconnect P202 to the cassette feeder board.

Table 77. No Paper Pickup From Cassette (Continued)			
Step	**Check**	**Result**	**Action**
4	Is cassette pickup solenoid connector P201 securely connected to the cassette feeder board?	No	Reconnect P201 to the cassette feeder board.
5	Remove the paper cassette tray. Visually inspect the paper sensing arm. Does the paper sensing arm appear to be damaged?	Yes	Replace the paper sensing arm.
6	Prepare the printer for troubleshooting as described in the "Troubleshooting Preparation" section. Switch off the printer. Connect the multimeter between P13-7 (+24 V) and P13-8 (/TURN1). Does the resistance measure between 220 and 240 Ω?	No	Replace the cassette pickup solenoid.
7	Connect the multimeter between P13010 (+24 V) and P13-11 (/FEED1). Does the resistance measure between 110 and 130 Ω?	No	Replace the cassette feed solenoid.
8	If only one paper cassette is installed, connect a multimeter between connector pins P13-1 (NO PAPER1) and P13-4 (GND) on the DC controller board. While you remove and insert a paper cassette tray filled with paper, does the voltage toggle from 0 VDC (inserted) to +5 VDC (removed)?	No	Replace the cassette feeder board. If the problem persists, replace the cassette feeder tray.

Table 77. No Paper Pickup From Cassette (Continued)			
Step	**Check**	**Result**	**Action**
9	Replace the DC controller board. Does the problem still occur?	No	Problem solved.
10	If an optional paper cassette is installed, connect a multimeter between connector pins P13-3 (NO PAPER2) and P13-4 (GND) on the DC controller board. While you remove and insert a paper cassette tray filled with paper, does the voltage toggle from 0 VDC (inserted) to +5 VDC (removed)?	No	Replace the cassette feeder board. If the problem persists, replace the expansion feeder cable.

Table 78. No Paper Pickup From Manual Feed or Multipurpose Tray			
Step	**Check**	**Result**	**Action**
1	Is connector P17 on the DC controller board making good contact?	No	Reconnect P17 to the DC controller board.
2	Is connector P16 on the DC controller board making good contact?	No	Reconnect P16 to the DC controller board.
3	Disconnect connector P111 from the high-voltage power supply. Disconnect connector P16 from the DC controller board. Connect the multimeter between connector pins p16-7 (PULLUP 5 V) and P16-8 (GND). Does the voltage measure +5 VDC when you switch on the power?	No	Go to Table 60, Power Supply Failure (+5 VDC).

Table 78. No Paper Pickup From Manual Feed or Multipurpose Tray (Continued)			
Step	**Check**	**Result**	**Action**
4	Connect the multimeter between connector pins P16-9 (No Paper) and P16-8 (GND). Does the voltage measure +5 VDC when you switch on the power?	No	Replace the DC controller board.
5	Connect the multimeter between connector pins p16-9 (No Paper) and P16-8 (GND). Does the voltage drop from +5 VDC to 0 VDC when you place a sheet of paper on the manual feed tray?	No	Replace the manual feed sensor. If the problem persists, replace the manual feed sensor cable.
6	Connect the multimeter between connector pins P17-1 (24 V) and P11-2 (GND) on the DC controller board. Does the voltage measure +24 VDC when you switch on the printer?	No	Go to Table 59, Power Supply Failure (+24 VDC).
7	Switch off the printer. Connect a multimeter between pins P17-1 (24 V) and P17-2 (/FEED). Does the resistance measure between 210 and 230 Ω?	No Yes	Replace the manual feed pickup solenoid. Replace the DC controller board.

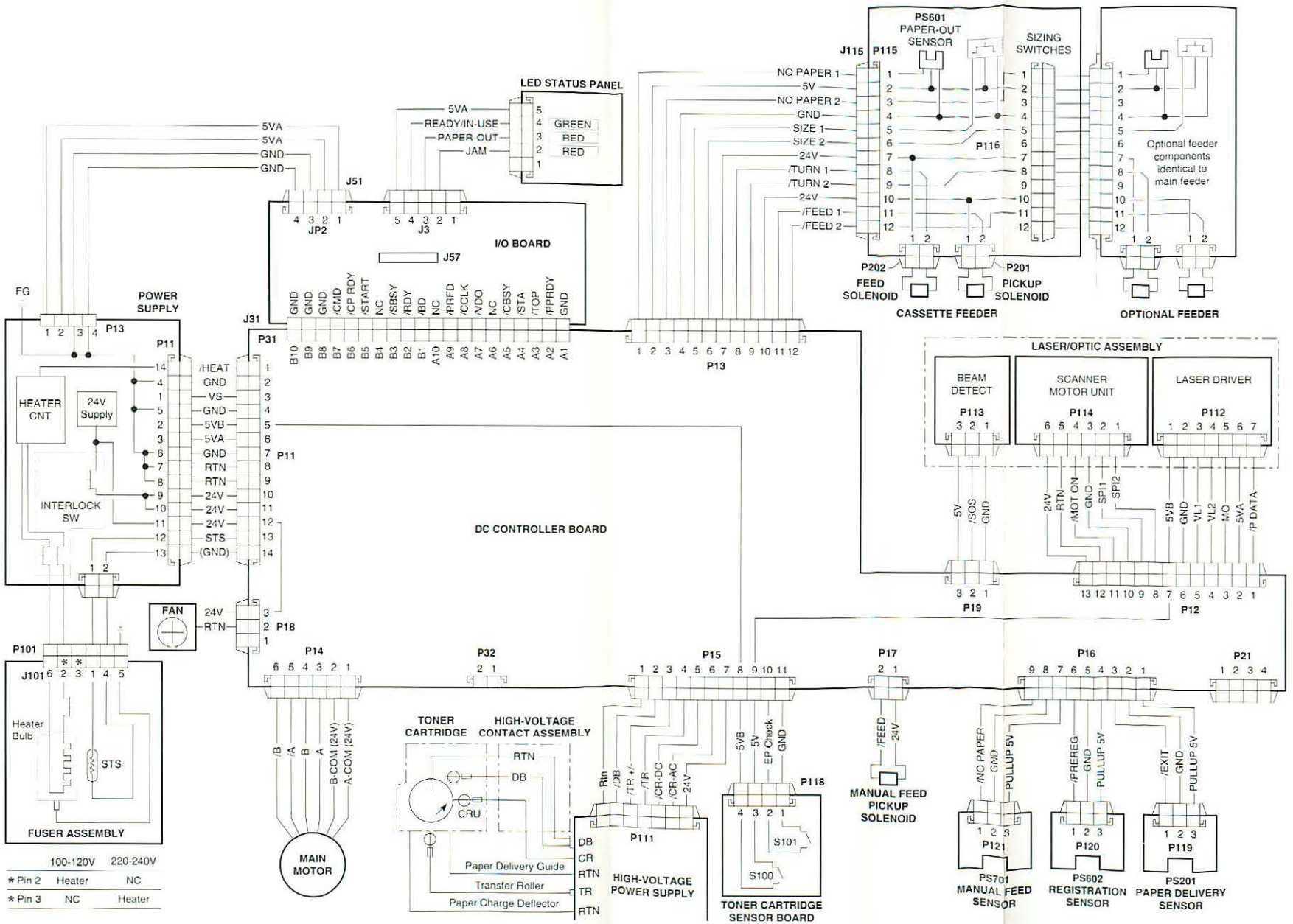
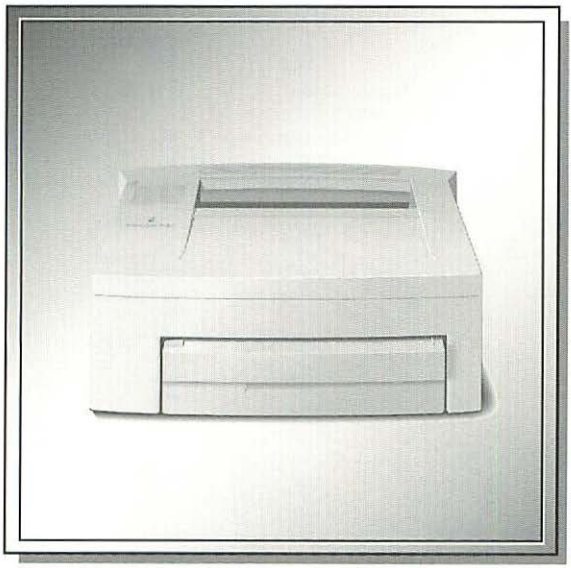


Figure 45. LaserWriter Select 360 Wiring Diagram

Personal LaserWriter 320
LaserWriter 4/600 PS



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Exploded View

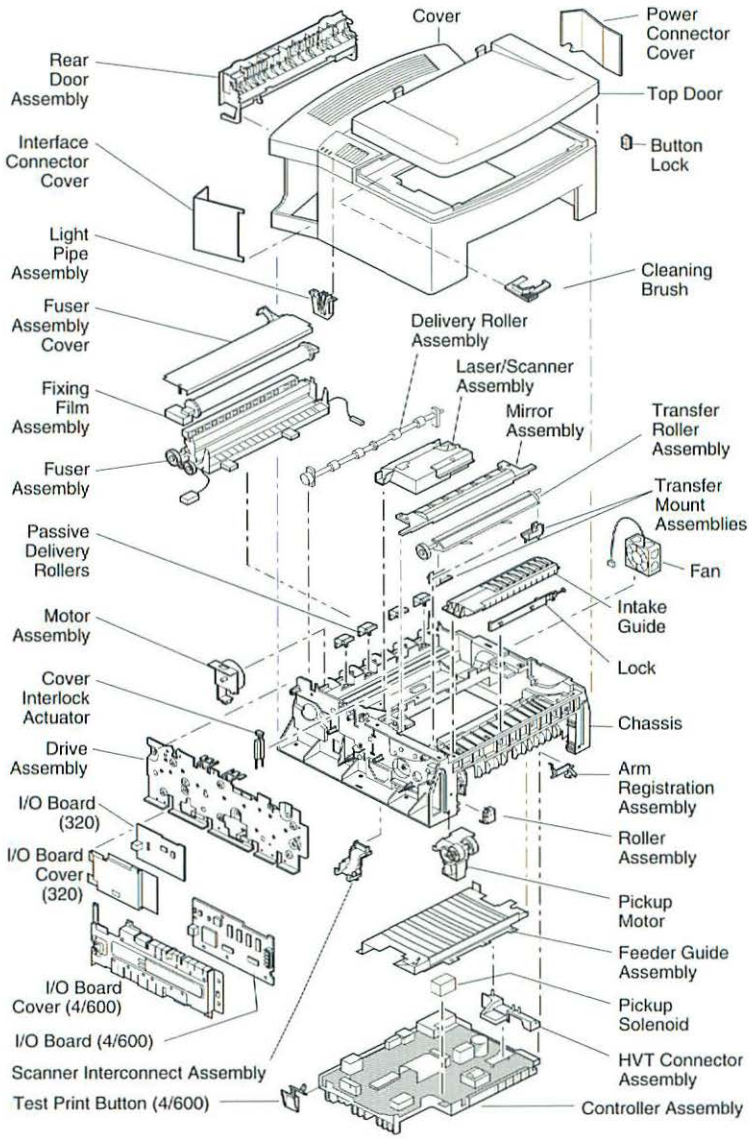


Figure 46. Personal LaserWriter 320 and LaserWriter 4/600 PS

- Cable
  - Cable, Power Cord, Australia 922-0493
  - Cable, Power Cord, Denmark 922-0495
  - Cable, Power Cord, Israel 922-0496
  - Cable, Power Cord, Japan 922-0497
  - Cable, Power Cord, Switzerland 922-0494
  - Cable, Power Cord, U.S. 922-0491
  - Cable, Power Cord, UK 922-0492
- Cassette, Universal 922-0459
- Chassis & Internal Components
  - Arm Registration Assembly 922-0470
  - Chassis 922-0481
  - Cover Interlock Actuator 922-0475
  - Fan 922-0456
  - Grounding Plate 922-0480
  - Lock (Pkg. of 5) 922-0473
  - Motor Assembly 922-0455
  - Roller Assembly 922-0471
- Cleaning Brush (LaserWriter 4/600 PS) 922-1506
- Controller Assembly
  - Controller Assembly, 120 V (Personal LaserWriter 320) 661-0029
  - Controller Assembly, 240 V (Personal LaserWriter 320) 661-0028
  - Controller Assembly, 110 /115 V (LaserWriter 4/600 PS) 661-0201
  - Controller Assembly, 220/240 V (LaserWriter 4/600 PS) 661-0203
  - HVT Connector Assembly 922-0453
  - Pickup Solenoid 922-0458
- Cover Assembly
  - Cover Assembly (Personal LaserWriter 320) 922-0462
  - Cover (LaserWriter 4/600 PS) 922-1384
  - Cover, Interface Connector 922-0461
  - Cover, Power Connector 922-0460
  - Door, Top (Personal LaserWriter 320) 922-0463
  - Door, Top (LaserWriter 4/600 PS) 922-1385
  - Kit, Button Lock Assembly 076-0683
  - Light Pipe Assembly 922-0465
  - Rear Door Assembly 922-0464
- Delivery Roller Assemblies
  - Delivery Roller Assembly 922-0466
  - Passive Delivery Rollers 922-0467
- Drive Assembly 922-0454

Fuses
- Fuse, 125 V, 10A (Pkg. of 10) 922-0484
- Fuse, 210 V (Pkg. of 10) 922-0485
- Fuse, 250 V, 3.15 A (Pkg. of 10) 922-0486

Fuser Assembly
- Fixing Film Assembly, 110 V 922-0450
- Fixing Film Assembly, 220 V 922-0451
- Fuser Assembly, 110 V 661-0025
- Fuser Assembly, 220 V 661-0026

Intake Guide (LaserWriter 4/600 PS) 922-1386
I/O Board (LaserWriter 4/600 PS) 661-0200
I/O Board (Personal LaserWriter 320) 661-0687
I/O Board Shield 922-0660
Kit, Hardware 076-0455
Kit, Screw 076-0456
Laser/Scanner Assembly
- Laser/Scanner (LaserWriter 4/600 PS) 661-0202
- Laser/Scanner (Personal LaserWriter 320) 661-0027
- Mirror Assembly 922-0468
- Scanner Interconnect Assembly 922-0457

Lever, Test Print (LaserWriter 4/600 PS) 922-1507
Paper Feed Assembly
- Feeder Guide Assembly 922-0469
- Intake Guide 922-0472
- Transfer Mount Assembly, Left 922-0477
- Transfer Mount Assembly, Right 922-0478
- Transfer Roller Assembly 076-0168

Paper Pickup Assembly
- Pickup Motor (Pickup Assembly) 922-0452
- Roller, Paper Pickup 922-0472

RAM Cards
- 2 MB RAM Expansion Card 661-0688
- 4 MB RAM Expansion Card (LaserWriter 4/600 PS) 661-0247
- 6 MB RAM Expansion Card 661-0689

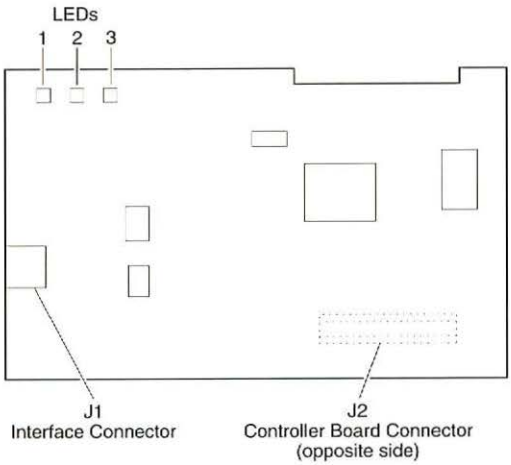


Figure 47. Personal LaserWriter 320 I/O Board

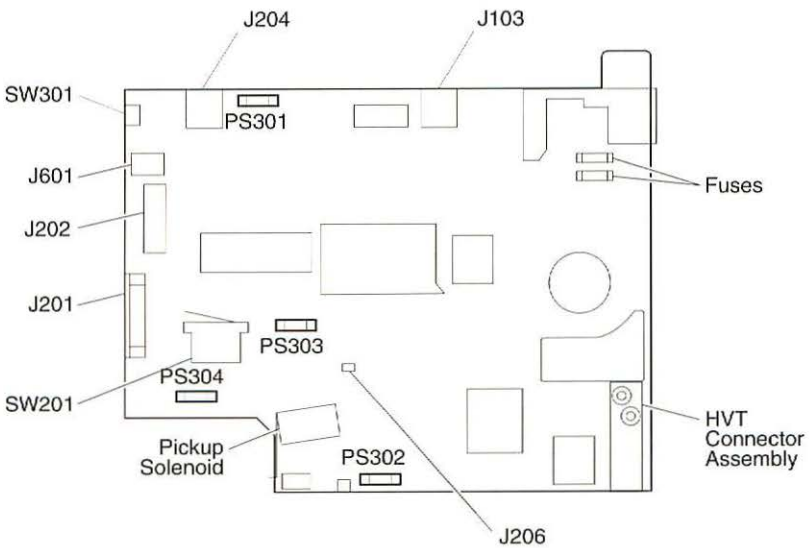


Figure 48. Personal LaserWriter 320 Controller Assembly Board

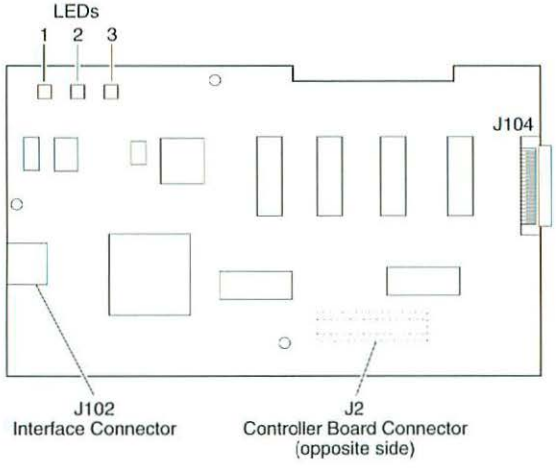


Figure 49. LaserWriter 4/600 PS I/O Board

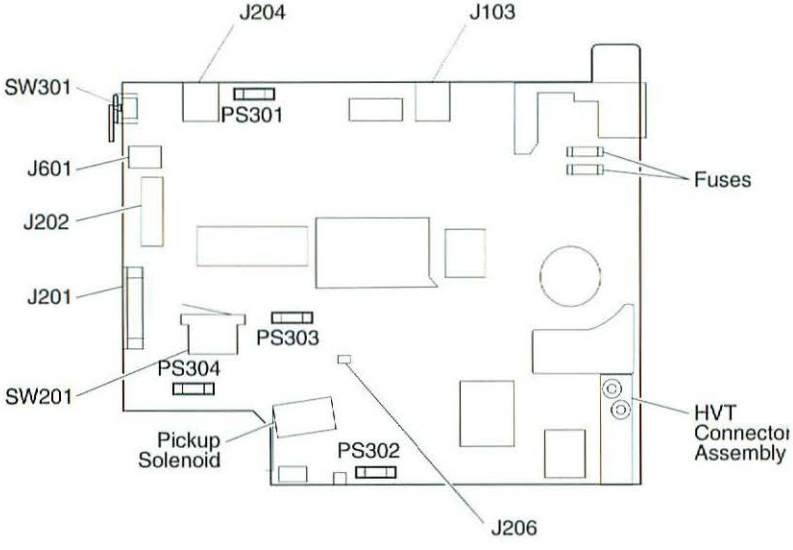


Figure 50. LaserWriter 4/600 PS Controller Assembly Board

Specifications

Table 79. Print Engine Specifications	
Marking Engine	Canon P90 engine
Print Resolution	Personal LaserWriter 320: 300 dots per inch (dpi) LaserWriter 4/600 PS: 600 dots per inch (dpi)
Speed	Approximately 4 pages/min. (A4); actual performance depends on the application.
Paper Feed	Input: Automatic with universal paper cassette; manual feed available for special print materials Output: Face-down or face-up
Print Materials	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
Paper Capacities	Capacity in: • Cassette—100 sheets; • Manual—single sheets, envelopes, transparency material, etc. Capacity out: 25 plain sheets (face-down delivery); transparency material, labels, and postcard paper are delivered face-up only and must be removed by hand.
Imaging Language Supported	QuickDraw (PLW 300) PostScript Level 2 (PLW 320)
Macintosh Requirements	Personal LaserWriter 320: Macintosh computer with system 6.0.7 or later LaserWriter 4/600 PS: Macintosh computer with system 7.0 or later
Imageable 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 and the LaserWriter 4/600 PS require a total of 4 MB of RAM in order to print edge to edge on legal paper.
Dimensions	Height: 6.3 in. (16.1 cm) Width: 15.2 in. (38.5 cm) Depth: 14.9 in. (37.9 cm) Weight: 15.4 lb. (7 kg) without cartridge

Table 79. Print Engine Specifications (Continued)	
Operating Requirements	50–90.5° F (10–32.5° C) 20-80% relative humidity
Power Requirements	U.S./Japan: 100–120 VAC; 50–60 Hz Europe/Australia: 220–240 VAC; 50 Hz

Table 80. I/O Board Specifications	
Processor	AMD 29205 processor
RAM	2 MB (expandable to 8 MB)
DRAM	512K, expandable to 1.5 MB or 4.5 MB
ROM	2.5 MB
Interfaces	RS-422
Printing Protocols	QuickDraw
Built-in 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

Paper Paths

Figure 51 shows the Personal LaserWriter 320 and the LaserWriter 4/600 PS paper paths. Paper enters from the paper cassette or the manual-feed slot and exits to the face-down tray or through the face-up delivery slot.

When the paper delivery selector is in the down position (see Figure 51), paper is delivered face-up. When the selector is in the up position, paper is delivered face-down.

Note Default delivery is face-down at the top of the printer.

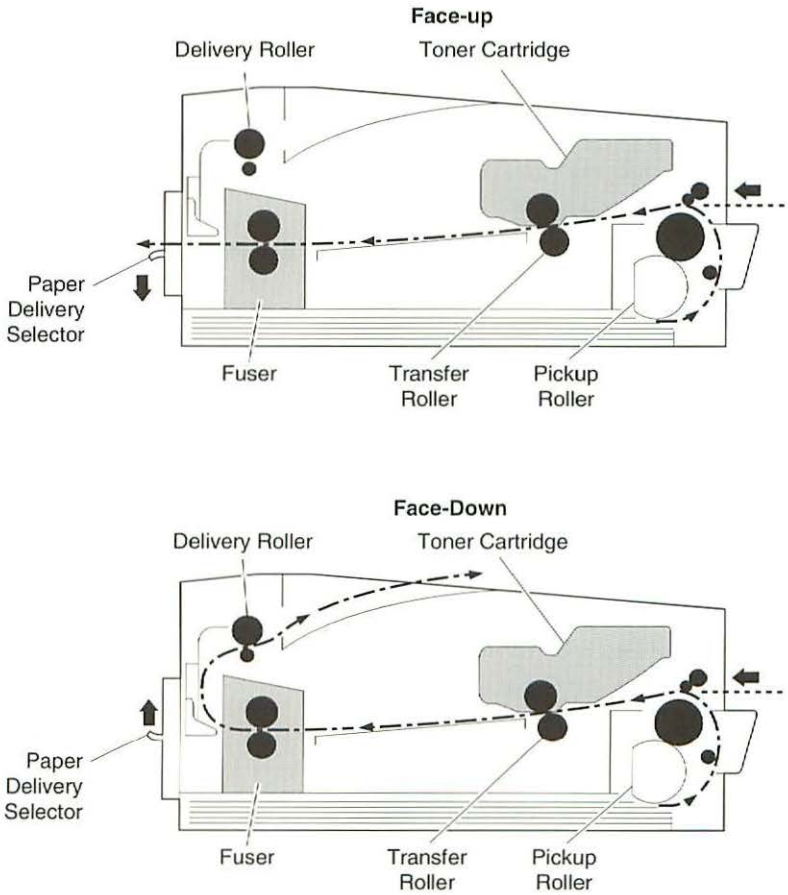


Figure 51. Paper Paths

Status LEDs

The Personal LaserWriter 320 and the LaserWriter 4/600 PS have three status LEDs (see Figure 52A): 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.

Power-On Self Test

The Personal LaserWriter 320 and the LaserWriter 4/600 PS go through a self-diagnostic test each time that you switch the printer on. The diagnostic test is called the Power-On Self Test (POST).

This test is not the same as the engine diagnostic test (see "Printer Diagnostics"). Unlike the engine diagnostic test, POST does not require the placement of any loopback cable.

Observing how the LEDs extinguish can help isolate certain failure areas (see Figure 52B).

Printer Diagnostics

The Personal LaserWriter 320 has self-diagnostic capability built into the I/O board. When the printer is in diagnostic mode, the LEDs are displayed in special diagnostic sequences. See Figure 52C for error configurations.

To enter the diagnostic mode, switch off the printer, place a serial loopback cable (P/N 077-8265) 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 test detects an error, the LEDs flash repeatedly through the following sequence until you switch off the printer.

1. All LEDs are on for one second.
2. All LEDs are off for one second.
3. The LEDs that indicate the problem are on for one second.
4. All LEDs are off for one second.

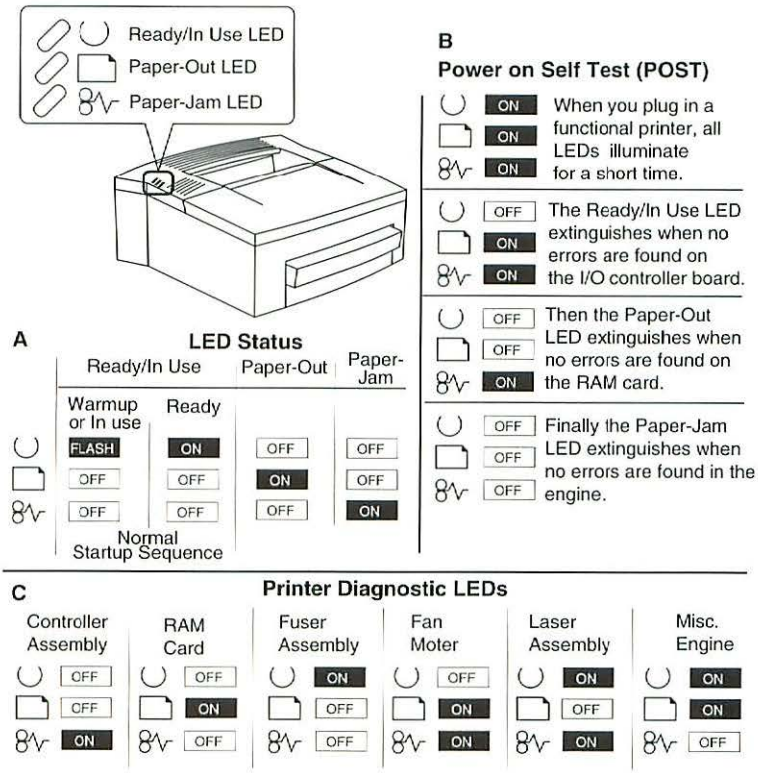


Figure 52. LED Configurations

Sensing System

The Personal LaserWriter 320 and the LaserWriter 4/600 PS have four paper sensors (see Figure 53). Each sensor consists of an actuator and a U-shaped photo interrupter that is soldered to the controller assembly. The paper sensors are actuated when an arm or lever swings against the paper as the paper moves through the printer.

The 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. The 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.

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

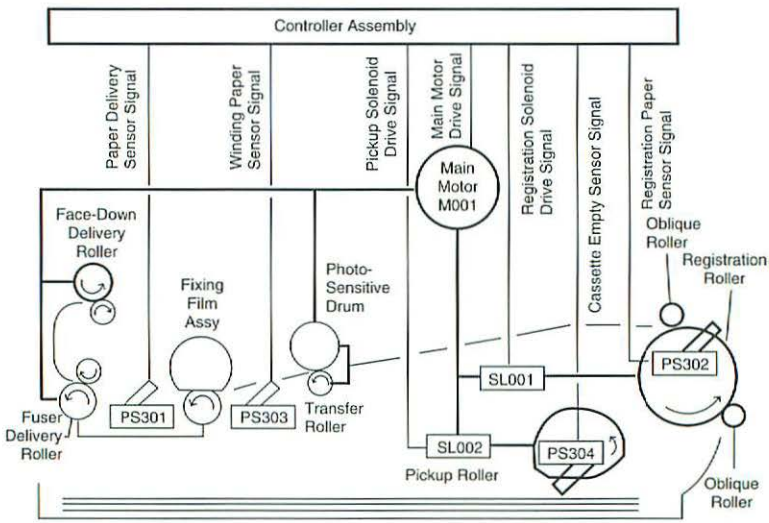


Figure 53. Sensing System

Service Test Page, Personal LaserWriter 320

The Personal LaserWriter 320 service test page, which consists of a series of vertical lines, confirms print engine operation. To print a service test page, follow these steps:

1. Remove the printer cover.
2. Install a toner cartridge and fill the paper cassette tray.
3. Plug in the printer and switch it on.
4. Defeat the paper delivery sensor, PS301, with a piece of folded paper, as shown in Figure 54. Insert the paper only until it touches the metal shaft of the fuser. If you insert the paper too far, the sensor remains open and the printer determines that a paper jam exists.
5. Cover the toner cartridge with a piece of paper to prevent exposure of the drum.
6. Press down on the toner cartridge and the cover interlock actuator while you press the service test page button with a screwdriver.

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, 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.

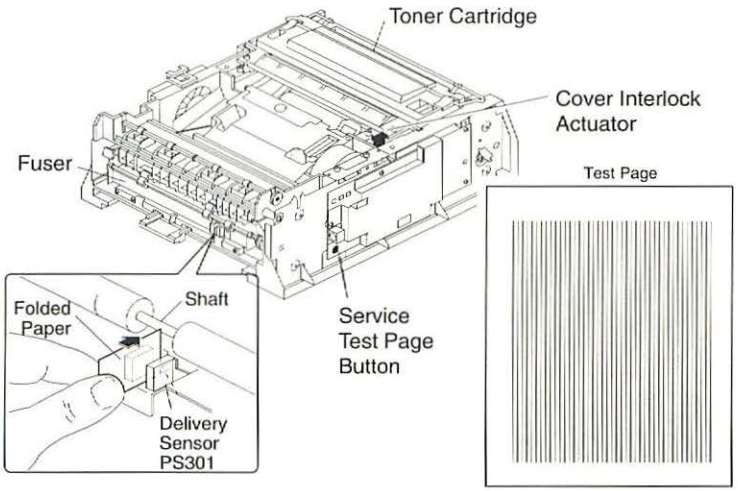


Figure 54. Printing a Service Test Page on the Personal LaserWriter 320

Service Test Page, LaserWriter 4/600 PS

The LaserWriter 4/600 PS service test page is generated by the controller assembly and serves to confirm print engine operation. Pulling a test print lever produces the service test page, which consists of a series of vertical lines.

To print a service test page, follow these steps:

1. Install a toner cartridge and fill the paper cassette tray.
2. Plug in the printer and switch it on.
3. Raise the edge of the printer and pull the plastic test print lever located underneath the printer, as shown in Figure 55.

Note If a service test page is initiated on a functioning LaserWriter 4/600 PS before the power-on I/O startup page is produced, an all-black service test page will be generated. Initiate the service test page after the I/O startup test page or when an I/O test page is not produced.

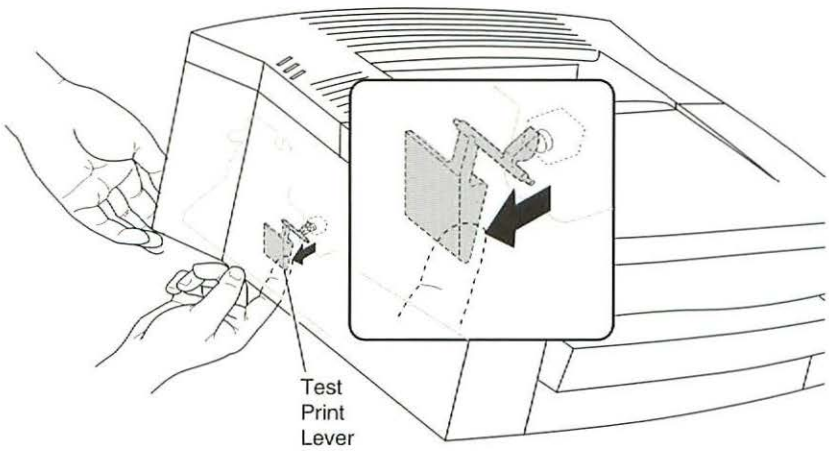


Figure 55. Printing a Service Test Page on the LaserWriter 4/600 PS

Mirror Adjustment

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 as follows:

1. Align the adjustment scale on the mirror assembly with the mark on the printer chassis, as shown in Figure 56A.
2. Load the printer with letter-size paper and initiate a service test page as described in the "Service Test Page" section.
3. Using a straight edge, draw a line across the top of each vertical line on the service test page. Place a triangle against the first vertical line on the service test page and trace its top edge, as shown in Figure 56B.
4. Measure the error between line 1 and line 2, as shown in Figure 56B.
5. 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 to move the left side of the image up; shift the mirror away from the laser/scanner to move the right side of the image up (see Figure 56A).

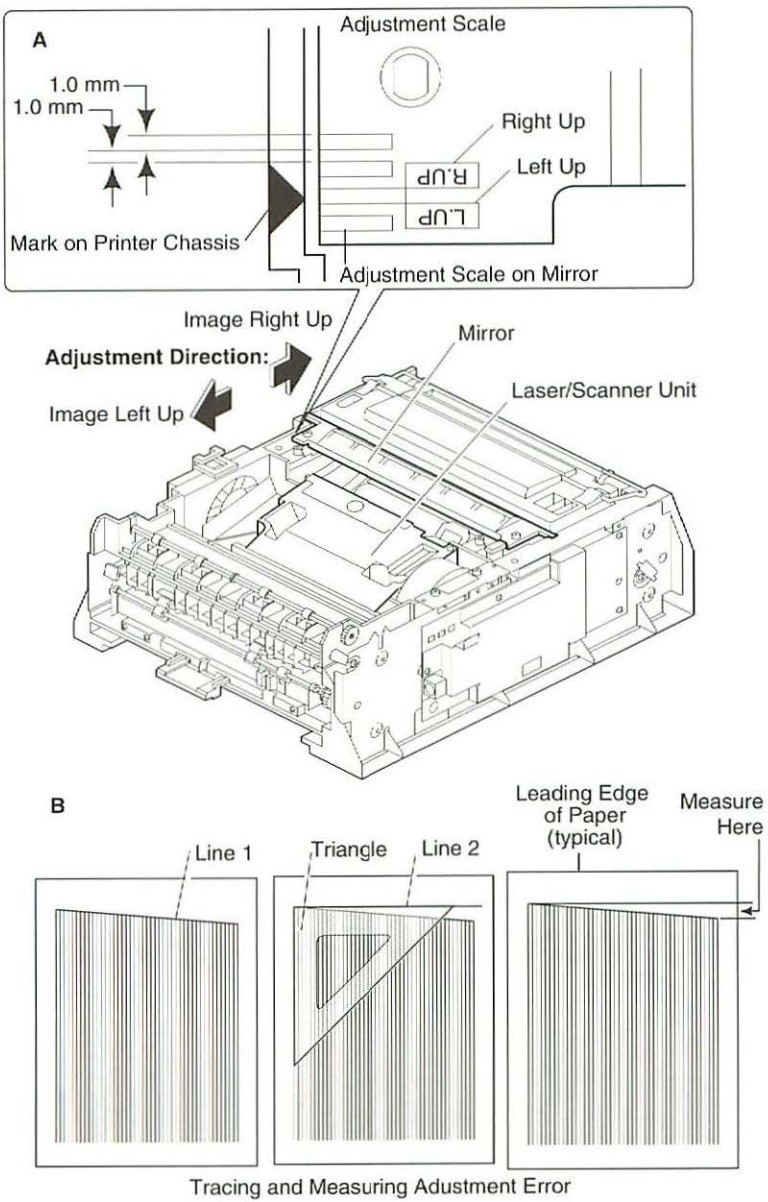


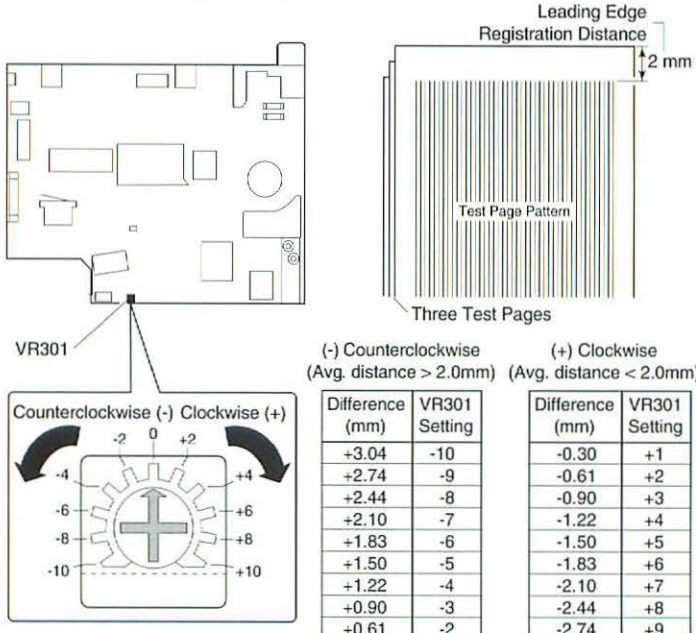
Figure 56. Mirror Adjustments

Registration Adjustment

You must adjust the printer registration whenever you replace the controller assembly. The optimum registration is 2 mm, as shown in Figure 57.

Adjust the printer registration as follows:

1. Using a jeweler's screwdriver, reset VR301 on the controller assembly to "0" (see Figure 57).
2. Switch on the printer and wait for it 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 pattern.
5. Calculate the average distance by adding the three measurements and dividing by three.
6. Adjust VR301 so that the average value becomes 2.0 mm. 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 (see Figure 57).
7. Print three more test pages. If the average registration distance is not 2.0 mm, repeat this procedure .



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

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

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

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

Figure 57. Determining the Proper VR301 Setting

Before you begin troubleshooting, check the printer setup and operating conditions described in the Pre-Power-On Checklist section. If the problem persists, refer to the flowchart later in this troubleshooting section.

The flowchart directs you to perform various tasks and refers you to specific troubleshooting tables. Perform each step in the troubleshooting tables in order until the problem is resolved and refer as necessary to the wiring diagram that follows the tables.

Retry the printer each time you change its physical state—for example, when you replace a component—until the problem is resolved. If you replace a module and the problem remains, reinstall the original module before proceeding to the next step in the table.

When the printer is repaired, perform the necessary preventive maintenance before returning it to the customer. Make sure you are familiar with all procedures described in the "Safety" section in the front of this guide before performing any live electrical checks.

Pre-Power-On Checklist

Verify that the following conditions are met before proceeding with the troubleshooting flowchart or tables:

- Line voltage is OK (115 VAC ± 10%).
- Printer is installed on a solid, level surface.
- Room temperature is between 50–90° F (10–32.5° C).
- Humidity is 20–80%.
- Printer is not located in a hot or humid area, near open flames, or in a dusty location.
- Printer is not exposed to ammonia gas.
- Printer is not in direct sunlight.
- Printer is installed in a well-ventilated area.
- Cables and connectors are OK.
- Toner cartridge is installed and has toner.
- Paper cassette is properly loaded with paper.
- Paper is within specifications.
- Top access door is closed.
- Rear door assembly is closed.

Troubleshooting Tips

Following are tips for troubleshooting the Personal LaserWriter 320 and the LaserWriter 4/600 PS.

Drum Exposure

When the printer cover is removed, the photosensitive drum inside the toner cartridge may be exposed to light. 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, follow these guidelines:

- 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 open toner packages in areas that are exposed to direct sunlight.
- Always cover the toner cartridge with a piece of paper when printing with the printer cover removed.

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.

Avoiding Paper Jams

Follow these guidelines to 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 by 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.

Printing with the Cover Removed

When printing test pages with the printer cover removed, you must press down on the toner cartridge to ensure contact between the HVT connector assembly and the contact points on the toner cartridge. If you do not apply proper pressure during the print cycle, you may get blank pages.

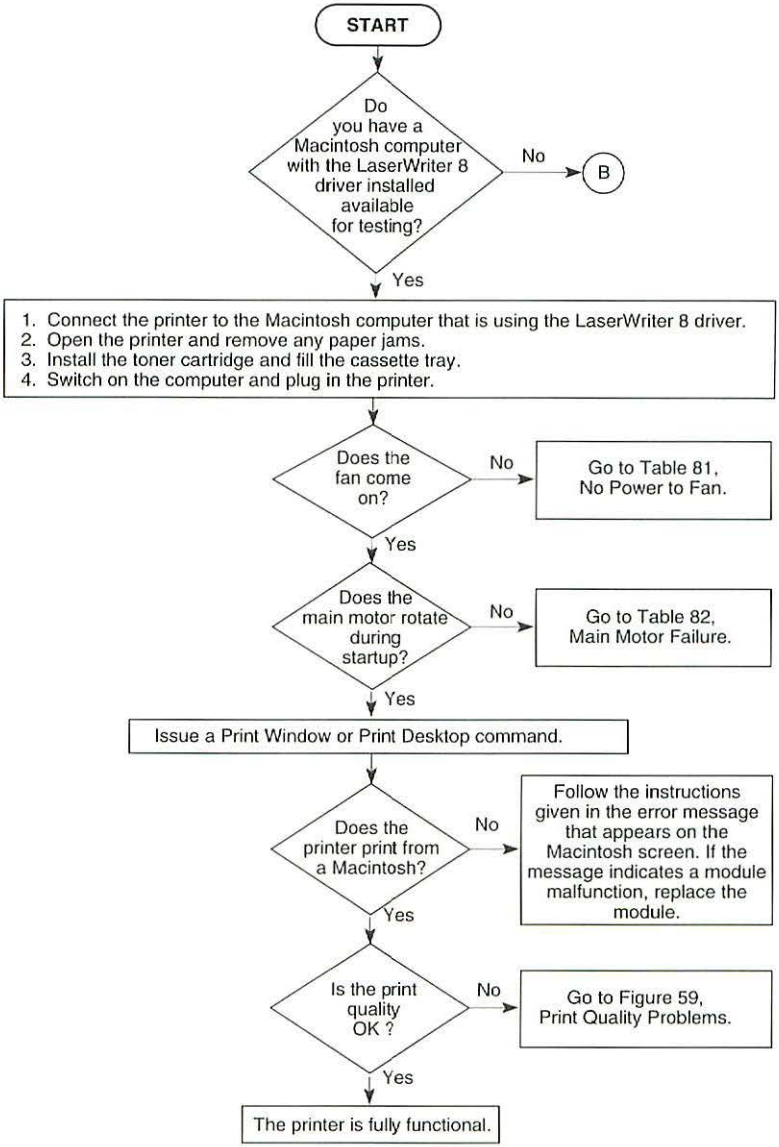


Figure 58. Print Engine Check (1 of 2)

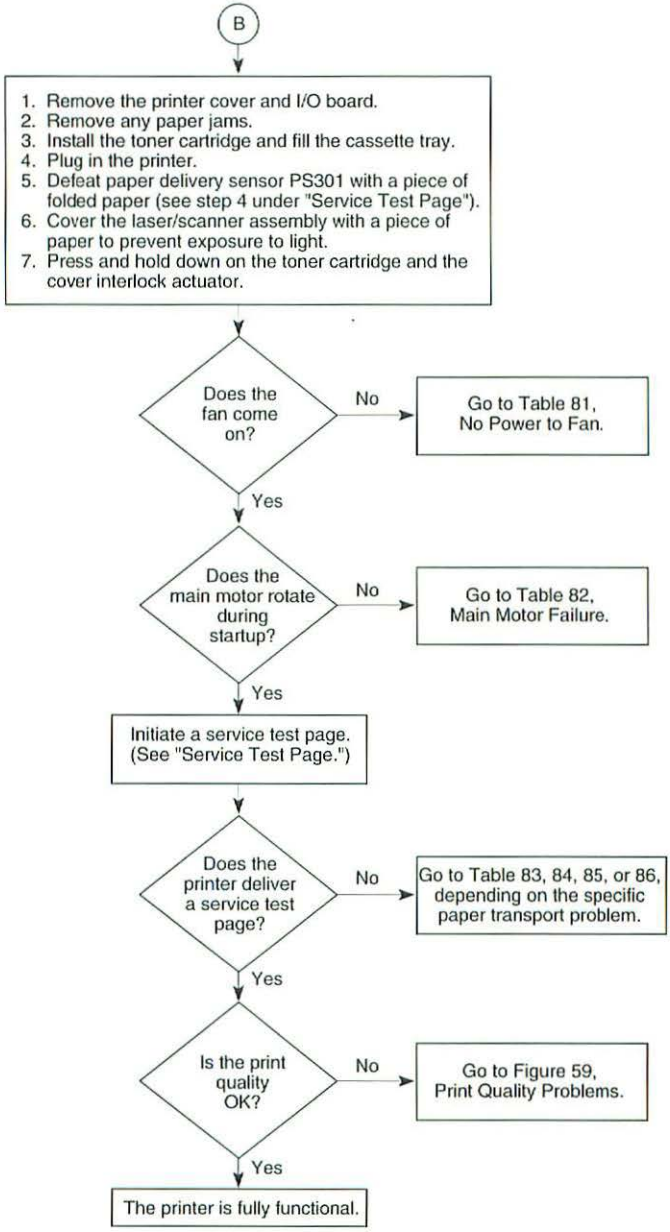


Figure 58. Print Engine Check (2 of 2)

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 81. 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 81. 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 82. 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: • Replace the motor. • Replace the controller assembly.

Table 83. 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 83. 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: • Replace the controller assembly • Replace the pickup motor.

Table 84. 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: • Replace the pickup motor. • Replace the controller assembly. • Replace the fuser assembly.

Table 85. 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 85. 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 86. 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 reseat the delivery roller assembly and/or passive delivery rollers.

Table 86. 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.

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

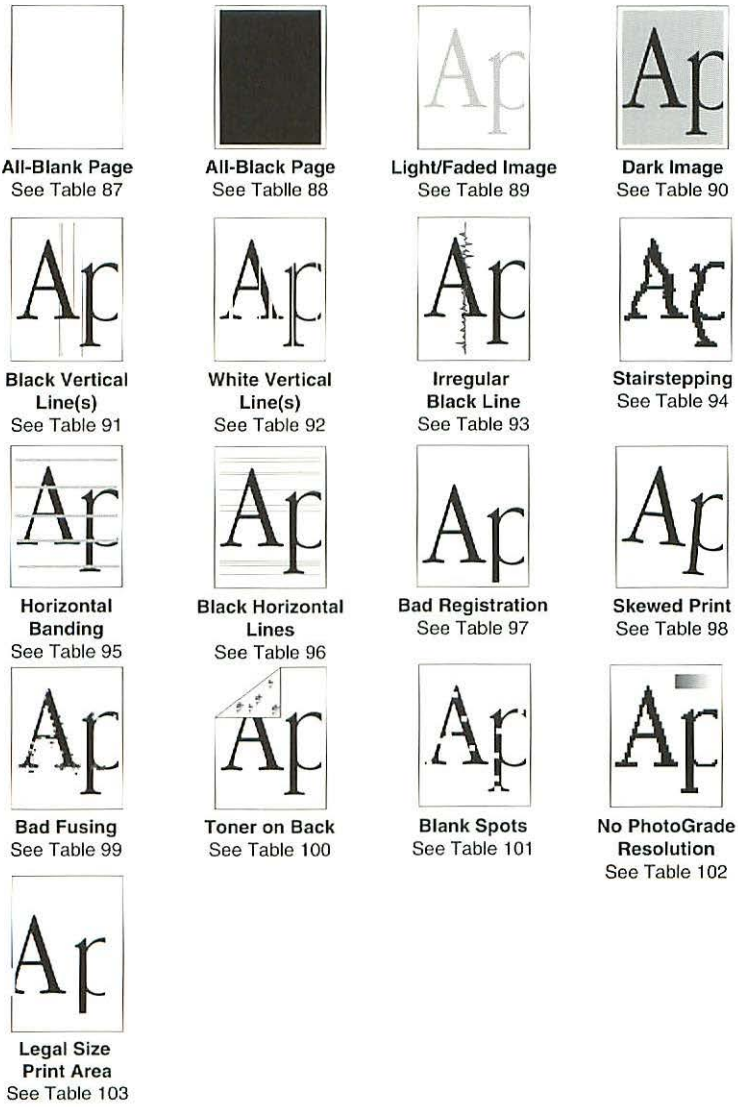


Figure 59. Print Quality Problems

Table 87. 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 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: • Replace the controller assembly. • Replace the laser/scanner assembly.

Table 88. All-Black Page			
Step	**Check**	**Result**	**Action**
1	Replace the controller assembly with a known-good controller assembly. Does the problem persist?	No Yes	Problem solved. Replace the laser/scanner assembly.

Table 89. 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: • Replace the transfer roller assembly. • Replace the HVT connector assembly. • Replace the controller assembly. • Replace the laser/scanner assembly.

Table 90. 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 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: • Replace the controller assembly. • Replace the laser/scanner assembly.

Table 91. 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 No	Replace I/O board. Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: • Replace the fuser assembly. • Replace the laser/scanner assembly.

Table 92. 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: • Replace the pickup motor. • Replace the laser/scanner assembly. • Replace the mirror assembly.

Table 93. Irregular Black Lines			
Step	**Check**	**Result**	**Action**
1	Replace the toner cartridge. Does the problem persist?	No	Problem solved.

Table 94. 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: • Replace the laser/scanner assembly. • Replace the controller assembly.

Table 95. 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 96. 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 No	Replace the I/O board. Replace the fuser assembly. Replace the laser/scanner assembly.

Table 97. 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 Yes	Problem solved. Perform the first module exchange listed below. If the problem persists, reinstall the original module and perform the next exchange: • Clean or replace the pickup roller as needed. • Replace the pickup motor. • Replace the arm registration assembly if broken. • Replace the controller assembly.

Table 98. Skewed Print			
Step	**Check**	**Result**	**Action**
1	Adjust the mirror assembly (see "Mirror Adjustment"). Does the problem persist?	No	Problem solved.

Table 99. 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: • Clean the transfer roller. • Replace the transfer roller. • Replace the fuser assembly.

Table 100. 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 101. 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: • Replace the fuser assembly. • Replace the transfer roller.

Table 102. 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 103. 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.

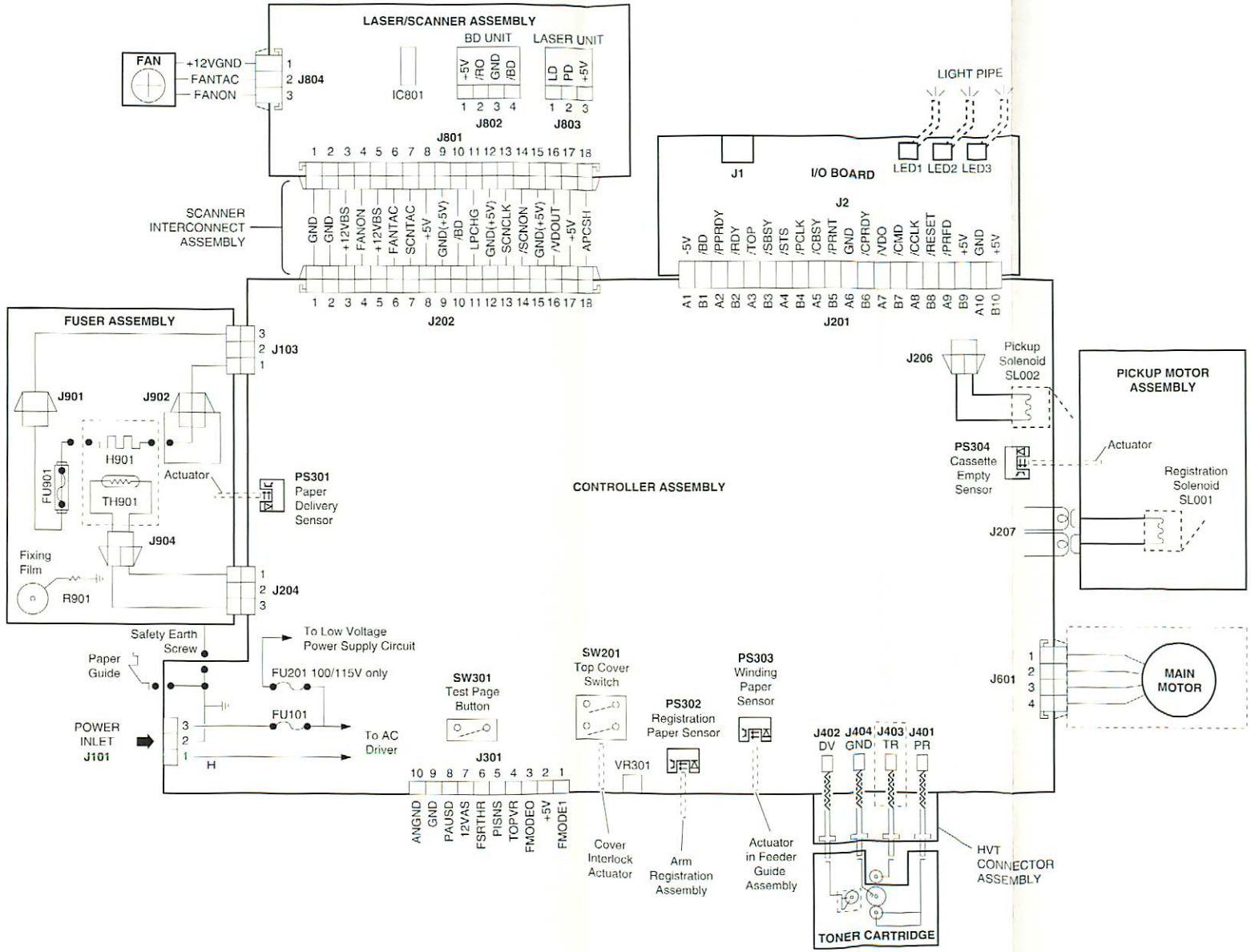


Figure 60. Personal LaserWriter 320 and LaserWriter 4/600 PS Wiring Diagram

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