



LaserWriter Printers  
Volume IV

# Service Guide

Color LaserWriter 12/600PS

November 1995

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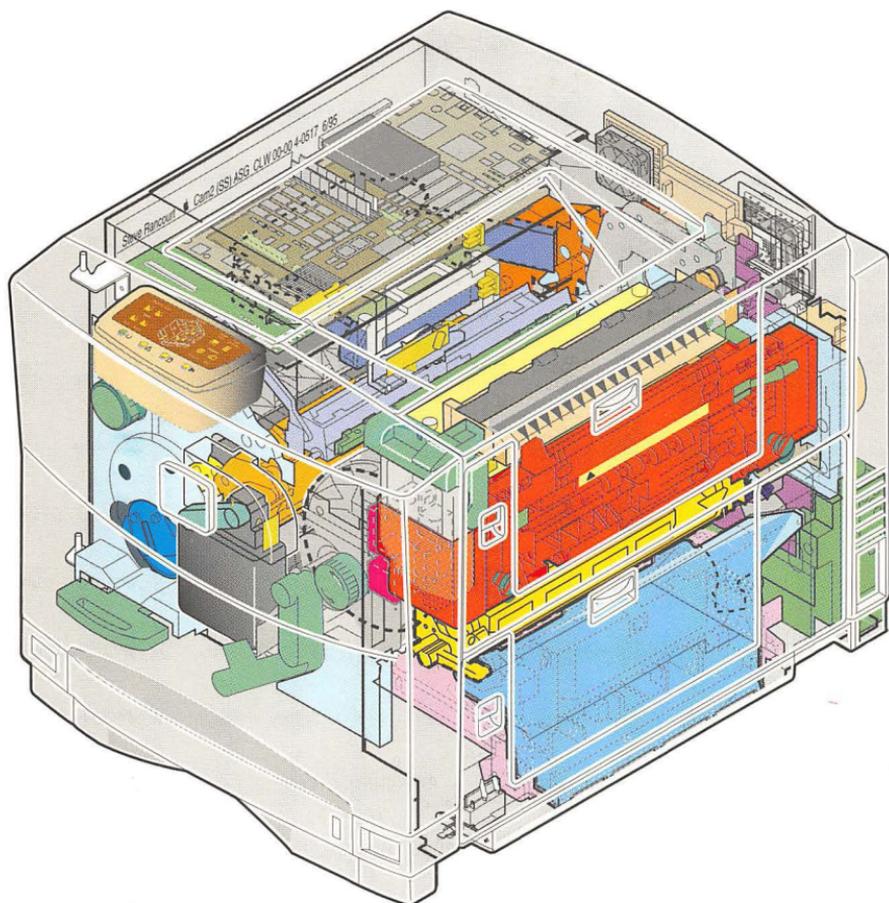
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# Color LaserWriter 12/600 PS



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## Table of Contents

### Chapter 1 Introduction

Introduction .....	2
Safety.....	3
LaserWriter Safety Rules .....	4
Toner Safety .....	4
Laser Safety.....	4
ESD Damage Prevention Rules .....	5
Setting Up an ESD-Safe Workstation .....	6

### Chapter 2 Printer Connections

Connecting the Printer to a Computer .....	8
Connecting LocalTalk Cables .....	8
Connecting to an IBM PC or Compatible with a Parallel Cable .....	10
Connecting to an Ethernet Network .....	11
Printer Ports .....	13
Printer Pinouts .....	14

### Chapter 3 Parts

Front and Back Views .....	20
Internal Views.....	21
Exploded View—Color LaserWriter 12/600 PS .....	23
Exploded View—Sheet Feeder.....	25
Parts List.....	26
Finished Goods Parts.....	29
Replacing Consumables.....	30
Replacing Toner Cartridges.....	30
Replacing the Toner Disposal Box.....	32
Replacing the Photoconductor Cartridge .....	34
Replacing the Fuser and Fuser Oil Bottle .....	36
Fuser Oil Extraction from the Oil Reservoir.....	38
Fuser Oil Extraction from the Overflow Pan.....	39
Replacing the Transfer Drum Cleaning Unit.....	40
Replacing the Air and Ozone Filters .....	42
Replacing the Separation Discharge Assembly.....	43
I/O Controller and I/O Interconnect Boards .....	44
DC and Mechanical Controller Boards.....	45

### Chapter 4 Specifications

Specifications .....	48
Theory.....	50
Block Diagram.....	51

---

## Chapter 5 Upgrades

Hard Disk Drive Upgrade .....	54
Connecting a Previously Used Hard Drive .....	54
Connecting an External Hard Drive .....	54
Adding an Internal Hard Drive .....	54
RAM Upgrade .....	56
Sheet Feeder Upgrade .....	58

## Chapter 6 Printer Diagnostics

Status Panel .....	62
Power-On Self-Test (POST) .....	64
Extended POST (EPOST) .....	71
Density Control Panel .....	73
Density Adjustments .....	74
Test Page Pattern Selection .....	75
Separation Voltage Designation .....	76
Diagnostic Utility .....	77

## Chapter 7 Troubleshooting

Troubleshooting Checklist .....	80
Tools .....	81
Verifying Printer Operation .....	82
Observing the Printer in Validation State .....	84
Troubleshooting Flowcharts .....	85
Symptom-Driven Troubleshooting .....	91
Front Door Opens Too Easily .....	91
Paper Jams or Blank Pages .....	91
Loud Grinding Sound From Toner Carousel .....	91
Paper Intermittently Jams at the Separation Claw or Doesn't Come Off the Transfer Drum at All .....	91
Printing Software Not Installed .....	92
Page Count Keeps Resetting Every Time the Printer is Turned Off .....	92
Moving the Printer Caused a Fuser Oil Pump Error .....	92
Print Quality Issues .....	93
Text Prints Fine, but Equivalent Bitmapped Text Prints Blurry and Exhibits a Fuzzy Halo Effect .....	93
Two Color LaserWriter 12/600 PS Printers Print Slightly Different Colors When Printing the Same Document .....	93
One Color Prints Too Light .....	93
Excessive Background Toner .....	94
Banding .....	94

---

Horizontal Defects .....	95
Oil Spots on the Paper.....	96
Small Amounts of Toner on the Page.....	96
“Best” Print Quality Mode .....	96
Troubleshooting Tables.....	98
Paper Transport Troubleshooting .....	118
Troubleshooting Locators .....	123
J-Connector Locators .....	128
Sheet Feeder Wiring Diagram.....	130
Color LaserWriter 12/600 PS Wiring Diagram .....	131
Power and Drive Train Views/ Disassembly .....	133

---

## List of Figures

Figure 1. LocalTalk Connection .....	9
Figure 2. Parallel Port Connection .....	10
Figure 3. Ethernet Transceivers .....	11
Figure 4. Ethernet Connections .....	12
Figure 5. Color LaserWriter 12/600 PS Printer Ports .....	13
Figure 6. Color LaserWriter 12/600 PS Cable Connectors .....	13
Figure 7. Color LaserWriter 12/600 PS Front and Back Views .....	20
Figure 8. Color LaserWriter 12/600 PS Internal Views .....	21
Figure 9. Color LaserWriter 12/600 PS Exploded View .....	23
Figure 10. Exploded View—Sheet Feeder .....	25
Figure 11. Replacing Toner Cartridges .....	31
Figure 12. Replacing the Toner Disposal Box .....	33
Figure 13. Replacing the Photoconductor Cartridge .....	35
Figure 14. Replacing the Fuser and Fuser Oil Bottle .....	37
Figure 15. Fuser Oil Extraction from the Oil Reservoir .....	38
Figure 16. Fuser Oil Extraction from the Overflow Pan .....	39
Figure 17. Replacing the Transfer Drum Assembly .....	41
Figure 18. Replacing the Air and Ozone Filters .....	42
Figure 19. Replacing the Separation Discharge Assembly .....	43
Figure 20. I/O Controller and I/O Interconnect Boards .....	44
Figure 21. DC Controller Board .....	45
Figure 22. Mechanical Controller Board .....	45
Figure 23. Cross-Sectional View .....	50
Figure 24. Color LaserWriter 12/600 PS Block Diagram .....	51
Figure 25. Hard Drive Installation .....	55
Figure 26. RAM Installation .....	57
Figure 27. Sheet Feeder Installation .....	59
Figure 28. Status Panel LEDs .....	62
Figure 29. Status Panel Lights .....	63
Figure 30. POST Codes Matrix .....	65
Figure 31. EPOST Test Page .....	71
Figure 32. EPOST Codes Matrix .....	72
Figure 33. Density Control Panel .....	73
Figure 34. Density Adjustments .....	74
Figure 35. Test Pattern Selection Mode .....	75
Figure 36. Test Patterns .....	75
Figure 37. Diagnostic Connection .....	77
Figure 38. Printer Validation State .....	83
Figure 39. Flowchart A .....	85
Figure 40. Flowchart B .....	86
Figure 41. Flowchart C .....	87

---

Figure 42. Flowchart D .....	88
Figure 43. Flowchart E.....	89
Figure 44. Flowchart F.....	90
Figure 45. Print Quality Problems.....	97
Figure 46. Paper Transport Problems.....	118
Figure 47. Switch Locations.....	123
Figure 48. Sensor Locations .....	124
Figure 49. Solenoid and Clutch Locations .....	125
Figure 50. Motor/Fan/Heater Locations .....	126
Figure 51. Circuit Board Locations .....	127
Figure 52. J-Connector Locations .....	128
Figure 53. Sheet Feeder Wiring Diagram .....	130
Figure 54. Color LaserWriter 12/600 PS Wiring Diagram .....	131
Figure 55. Color LaserWriter 12/600 PS Power and Drive Assemblies .....	133

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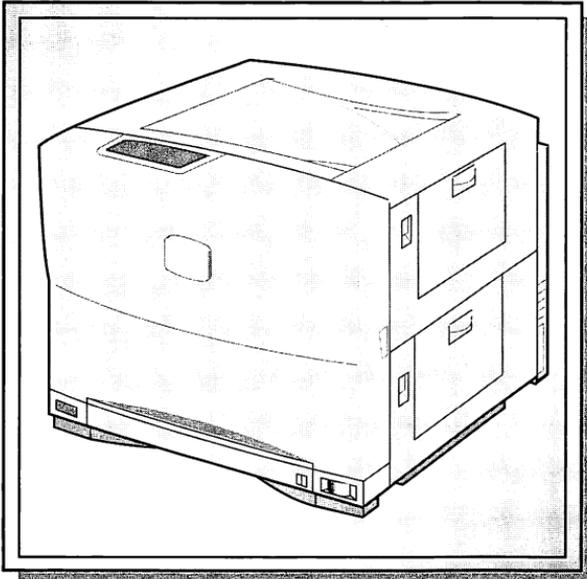
## List of Tables

Table 1.	RS-422 (LocalTalk) Port .....	14
Table 2.	HDI-30 SCSI Port .....	14
Table 3.	Centronics (IEEE 1284) 36-Pin Parallel Port .....	16
Table 4.	Apple AAUI Ethernet Port .....	17
Table 5.	Print Engine Specifications .....	48
Table 6.	I/O Board Specifications .....	49
Table 7.	RAM Configurations .....	56
Table 8.	POST Codes Notes .....	66
Table 9.	Roller Diameters .....	95
Table 10.	Light/Faded Image .....	98
Table 11.	Dark Image/Overexposure .....	99
Table 12.	All-Blank Page .....	99
Table 13.	All-Black Page .....	100
Table 14.	Dirt on Back .....	100
Table 15.	Spots Every 5.07" (129 mm) .....	101
Table 16.	Vertical Line(s) .....	101
Table 17.	White Vertical Lines .....	102
Table 18.	White Horizontal Lines .....	102
Table 19.	Blank Spots .....	103
Table 20.	Bad Fusing .....	103
Table 21.	Distortion .....	104
Table 22.	Color Aberration .....	104
Table 23.	Streaking .....	105
Table 24.	Oil Stains .....	105
Table 25.	Banding .....	106
Table 26.	Fusing Failure (Abnormal Warm-Up) .....	107
Table 27.	Fusing Failure (Temperature High) .....	108
Table 28.	Fusing Failure (Heater Wire Breakage) .....	108
Table 29.	Oil Overflow Failure .....	109
Table 30.	Main Motor Failure .....	109
Table 31.	Drum Motor Failure .....	110
Table 32.	Carousel Rotation Failure .....	111
Table 33.	Toner Cartridge Engagement/Separation Failure .....	112
Table 34.	Beam Detect Failure .....	112
Table 35.	Laser Failure .....	113
Table 36.	Scanner Motor Failure .....	113
Table 37.	DC Controller Failure (5 V/24 V) .....	113
Table 38.	Temperature/Humidity Sensor Failure .....	114
Table 39.	Fuser Fan FMI Failure .....	114
Table 40.	No DC Power .....	115
Table 41.	No Manual Feed Pickup .....	115

---

Table 42. No Cassette Feed Pickup .....	116
Table 43. No Sheet Feeder Pickup .....	116
Table 44. Registration Roller Does Not Rotate .....	117
Table 45. Insufficient High-Voltage Power Supply Output .....	117
Table 46. Pickup Block Troubleshooting .....	119
Table 47. Transfer Drum Troubleshooting .....	120
Table 48. Fuser/Delivery Area Troubleshooting .....	121

# Introduction



Introduction  
Safety

2  
3

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## Introduction

The *Apple Service Guide for LaserWriter Printers*, Volume IV, is designed to help Apple-certified technicians troubleshoot and repair Apple Color LaserWriter 12/600 PS printers at the customer's site.

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 *Apple Service Guide for LaserWriter Printers*, Volume IV, contains seven chapters:

- Chapter 1: Introduction
- Chapter 2: Printer Connections
- Chapter 3: Parts
- Chapter 4: Specifications
- Chapter 5: Installing Options
- Chapter 6: Printer Diagnostics
- Chapter 7: Troubleshooting

Chapter 1 – Introduction: 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 2 – Printer Connections: This chapter contains information on printer connections, pinouts, and signal descriptions.

Chapter 3 – Parts: This chapter contains key identifying graphics, exploded view diagrams, service part lists, and consumable supplies.

Chapter 4 – Specifications: This chapter contains printer specifications and color theory information.

Chapter 5 – Installing Options: This chapter contains information on installing memory, a sheet feeder, and internal and external hard disk drives.

Chapter 6 – Printer Diagnostics: This chapter contains information on printer diagnostics including power-on self tests, status panel/LED error tables, and test page information.

Chapter 7 – Troubleshooting: This chapter contains troubleshooting checklists, flowcharts, tables, graphic locators for boards, sensors, paper paths, etc., and a wiring diagram.

### 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.



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## Safety

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**▲Warning** The 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.

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**▲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.

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**▲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.

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## 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:**
  - DC power supply
  - High-voltage contact assembly
  - Mechanical controller board

---

## Toner Safety

Toner is a nontoxic substance composed of small colored components. 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. Toner dust also is a hazard if it is inhaled, so avoid contact with toner dust.

---

## Laser Safety

When servicing the optical system of the LaserWriter, be careful not to place screwdrivers or other shiny objects in the path of the laser beam. The reflected laser beam, though invisible, can permanently damage your eyes.

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

Because the laser beam is invisible, a warning label is attached to the cover of the laser/scanner unit.

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## ESD Damage Prevention Rules

Follow these steps 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 non-conductors 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.

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## Setting Up an ESD-Safe Workstation

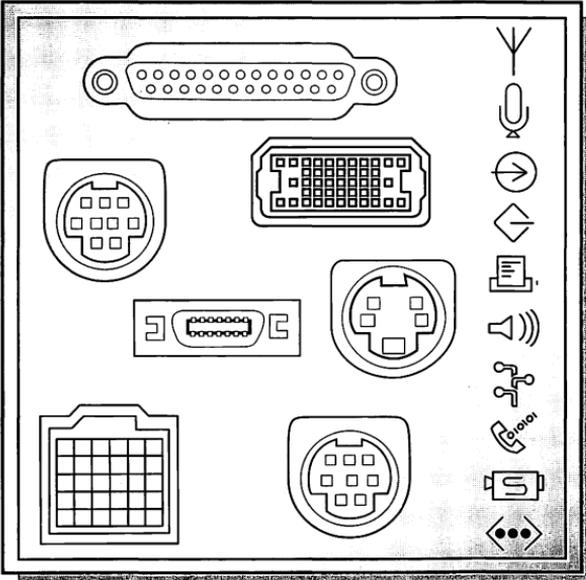
You need the following materials to set up an ESD-safe workstation:

- 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

To set up the workstation,

1. Remove all ESD hazards from the area. Nonconductive materials (see rule 5 under “ESD 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.

# Printer Connections



Connecting the Printer to a Computer	8
Printer Ports	13
Printer Pinouts	14

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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 LocalTalk or Ethernet cable, and how to connect to a 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.

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### Connecting LocalTalk Cables

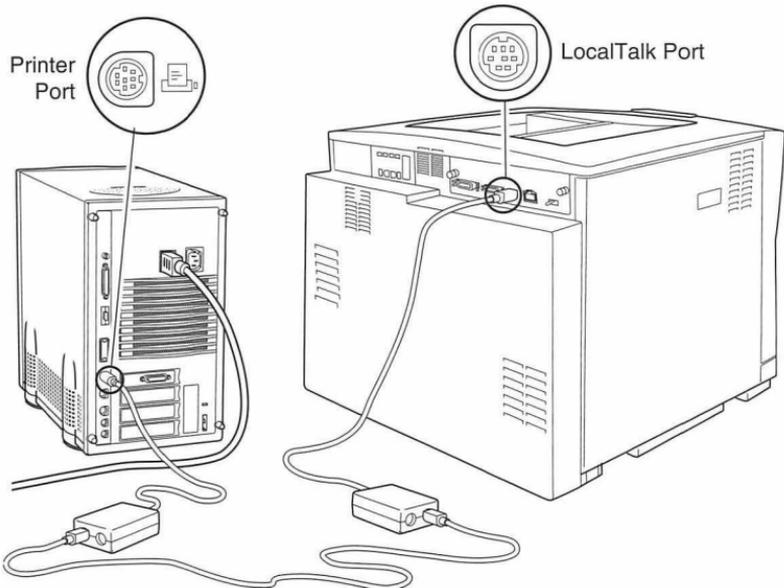
You can connect the printer to a Macintosh computer by attaching a LocalTalk cable to the LocalTalk port on the printer, as illustrated in Figure 1.

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

### Note

You can use Ethernet transceivers (instead of LocalTalk connectors) to connect a Macintosh directly to the printer.

6. Install the printer software from the disks that came with the printer.
7. Open the Chooser and click the LaserWriter icon.
8. Click the name of the LaserWriter. Now you have selected the LaserWriter printer for printing.
9. Close the Chooser.



**Figure 1. LocalTalk Connection**

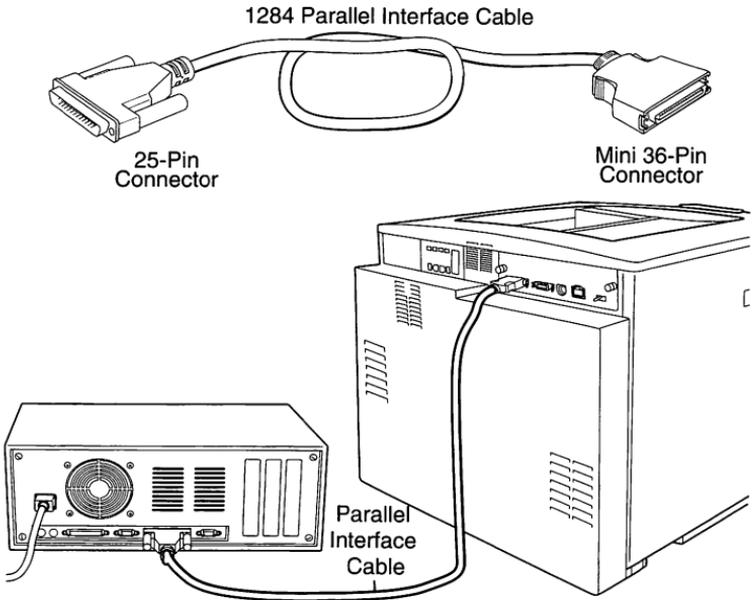
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## Connecting to an IBM PC or Compatible with a Parallel Cable

The LaserWriter 12/600 PS has a Centronics-type parallel port for connection to MS-DOS computers. This connection requires a special parallel interface cable.

**Important** Purchase the 1284 parallel cable, part number M4235ZM/A, designed for the parallel port on the LaserWriter 12/600 PS. If another cable is used, you may damage the printer's parallel port.

1. Attach the cable's 25-pin connector to the parallel port on the computer, as shown in Figure 2.
2. Attach the cable to the parallel port on the printer.
3. Check that the port selected in the Setup Printer dialog box matches the port you connect the printer to. (LPT1 is the recommended setting.)
4. Connect the power cable and turn on the printer.



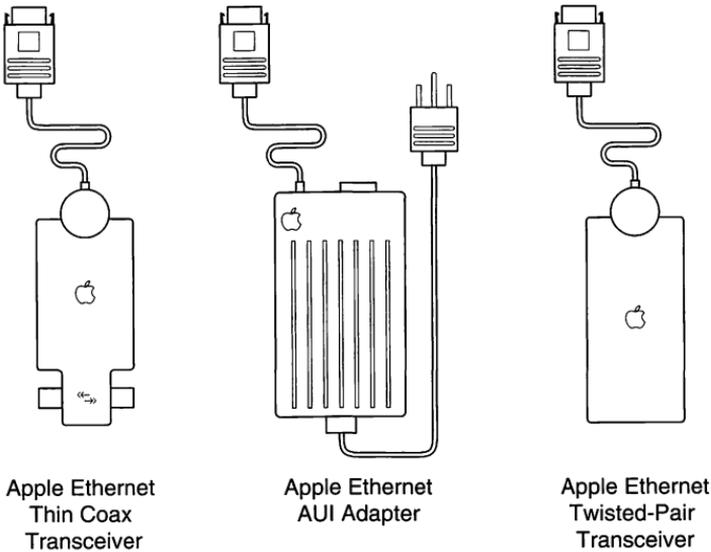
**Figure 2. Parallel Port Connection**

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## Connecting to an Ethernet Network

The LaserWriter 12/600 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.

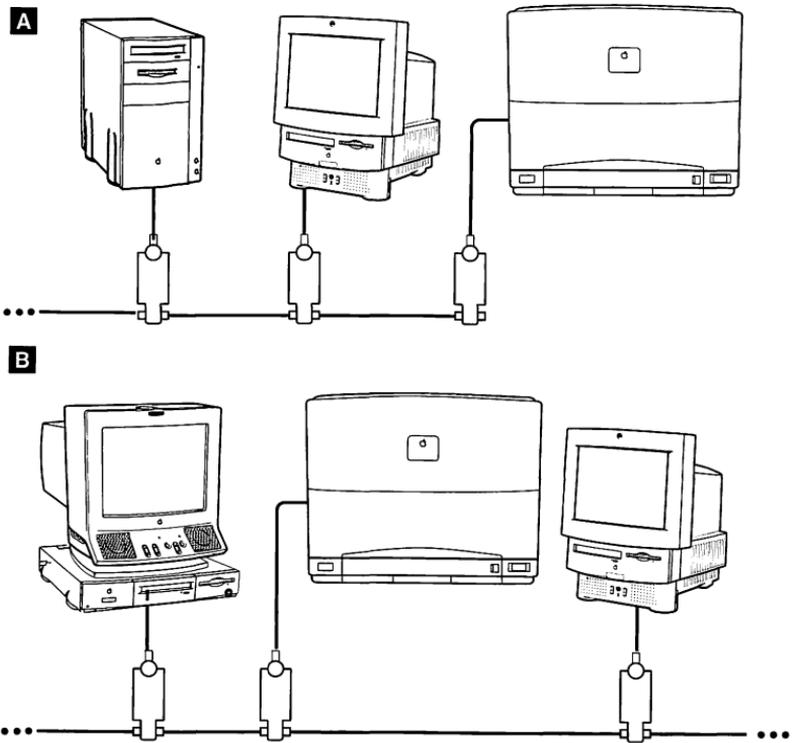
1. Obtain an Ethernet transceiver and an Ethernet cable appropriate for the network's media type—thin, thick (AUI), or twisted pair (see Figure 3).



**Figure 3. Ethernet Transceivers**

- Note** Apple transceivers are self-terminating. Do not add a terminator to the end of the network.
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 (see Figure 4):
    - To connect the printer to the end of an Ethernet network (Figure 4A), 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.

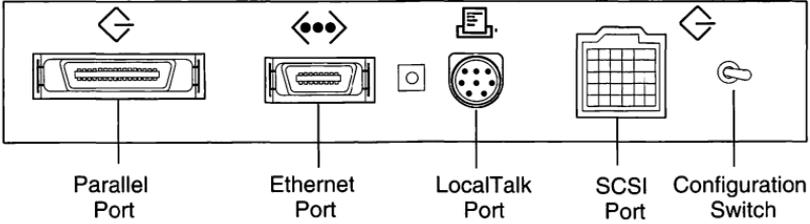
- To connect the printer between two devices (Figure 4B), disconnect one Ethernet cable from the transceiver of the device immediately to the left or right of the printer and plug it into the left or right of the printer and plug it into the printer's transceiver. Then connect the new Ethernet cable to the free socket on the printer's transceiver, and to the socket on the other device's transceiver.
- To connect to an Ethernet hub, see the documentation that came with the Ethernet hub.



**Figure 4. Ethernet Connections**

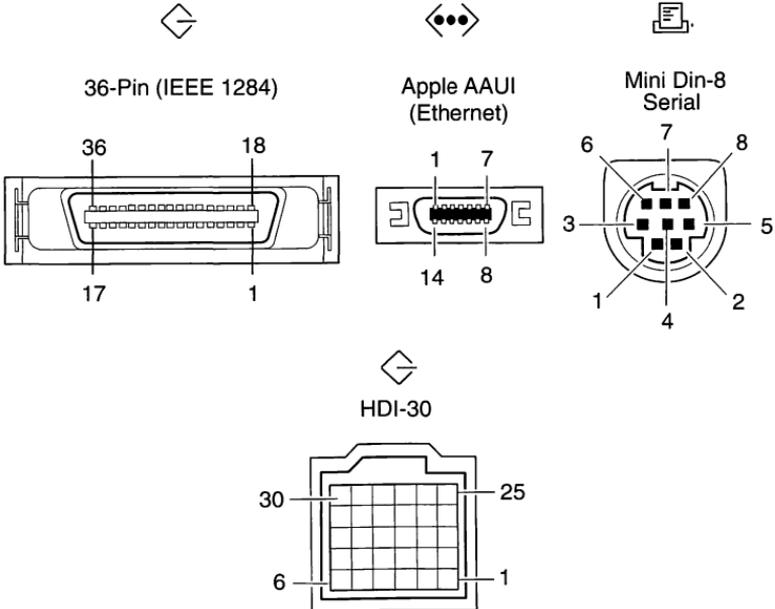
# Printer Ports

Figure 5 shows the printer ports.



**Figure 5. Color LaserWriter 12/600 PS Printer Ports**

Figure 6 shows the pin numbers for Color LaserWriter 12/600 PS peripheral cable connectors as viewed from the front of the cable connector.



**Figure 6. Color LaserWriter 12/600 PS Cable Connectors**

## Printer Pinouts

Pin	Signal Name	Signal Description
1	CLK	Rxd and Txd clock (output)
2	NC	No connection
3	TxD-	Trasmit data (output)
4	GND	Signal ground
5	RxD-	Receive data (input)
6	TxD+	Transmit data (output)
7	Vcc	+ 5 VDC regulated, 300 mA max (output power)
8	RxD+	Receive data (input)

\*Connector : mini DIN-8 male

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
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
12	GND	Signal ground

**Table 2. HDI-30 SCSI Port (Continued)**

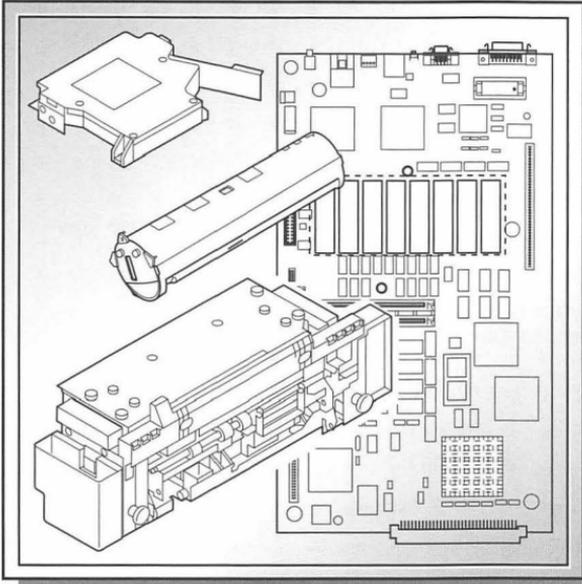
Pin	Signal Name	Signal Description
13	GND	Signal ground
14	Data5/	Data bit 5
15	GND	Signal ground
16	Data6/	Data bit 6
17	GND	Signal ground
18	Data7/	Data bit 7
19	PARITY/	Data parity
20	GND	Signal ground
21	REQ/	Request
22	GND	Signal ground
23	BUSY/	Busy
24	GND	Signal ground
25	ATN/	Attention
26	C/D/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

<b>Table 3. Centronics (IEEE 1284) 36-Pin Parallel Port</b>	
<b>Pin</b>	<b>Signal Description</b>
1	Data strobe
2	Data 1
3	Data 2
4	Data 3
5	Data 4
6	Data 5
7	Data 6
8	Data 7
9	Data 8
10	Acknowledge
11	Busy
12	Paper Err
13	Select
14	No connection
15	No connection
16	Signal ground
17	Chassis ground
18	+5 V (through 1K $\Omega$ resistor)
19-30	Signal ground
31	Prime
32	Fault
33	+5 V (through 1K $\Omega$ resistor)
34	No connection
35	+5 V (through 1K $\Omega$ resistor)
36	No connection

**Table 4. Apple AAUI Ethernet Port\***

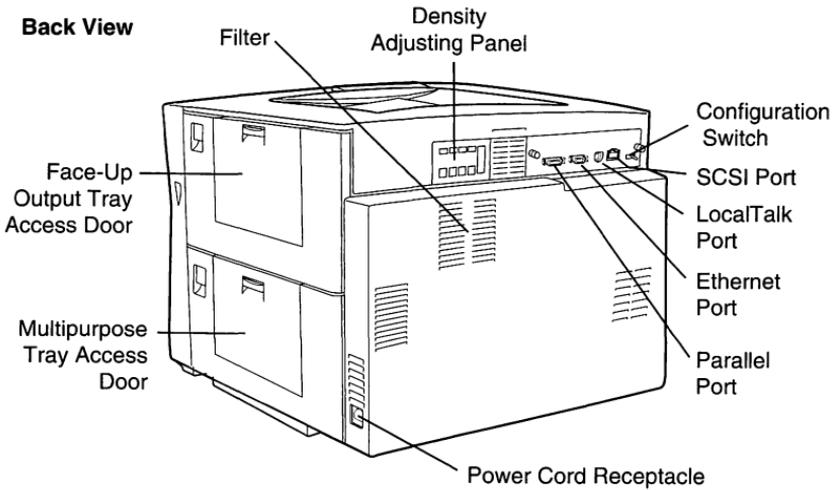
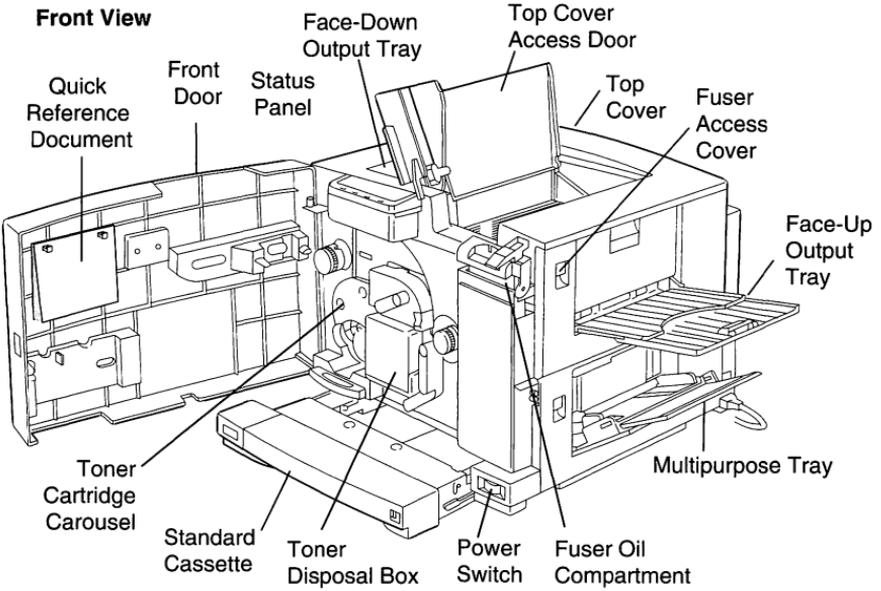
Pin	Signal Name	Signal Description
1	FN Pwr	+12 volts @ 175mA or +5 volts @ 420 mA
2	DI-A	Data in circuit A
3	DI-B	Data in circuit B
4	VCC	Voltage common
5	CI-A	Control in circuit A
6	CI-B	Control in circuit B
7	+5 V	+5 volts (from host)
8	+5 V	Secondary +5 volts (from host)
9	DO-A	Data out circuit A
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: Custom 14-pin .05-inch spaced ribbon (AAUI)



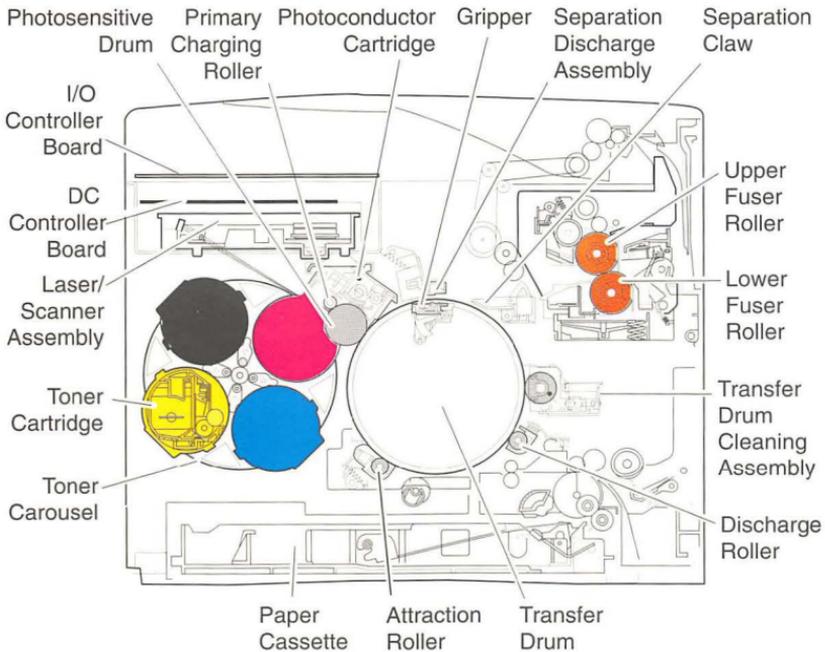
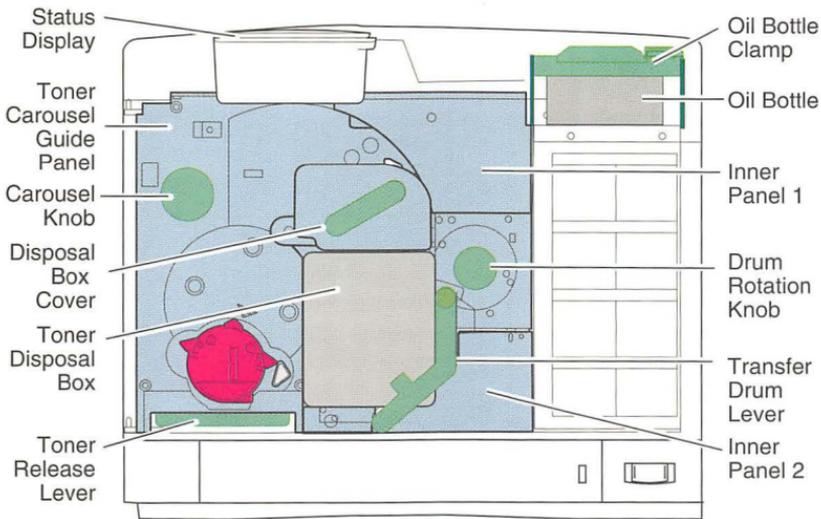
Front and Back Views	20
Internal Views	21
Exploded View—Color LaserWriter 12/600 PS	23
Exploded View—Sheet Feeder	25
Parts List	26
Finished Goods Parts	29
Replacing Consumables	30
I/O Controller and I/O Interconnect Boards	44
DC and Mechanical Controller Boards	45

# Front and Back Views



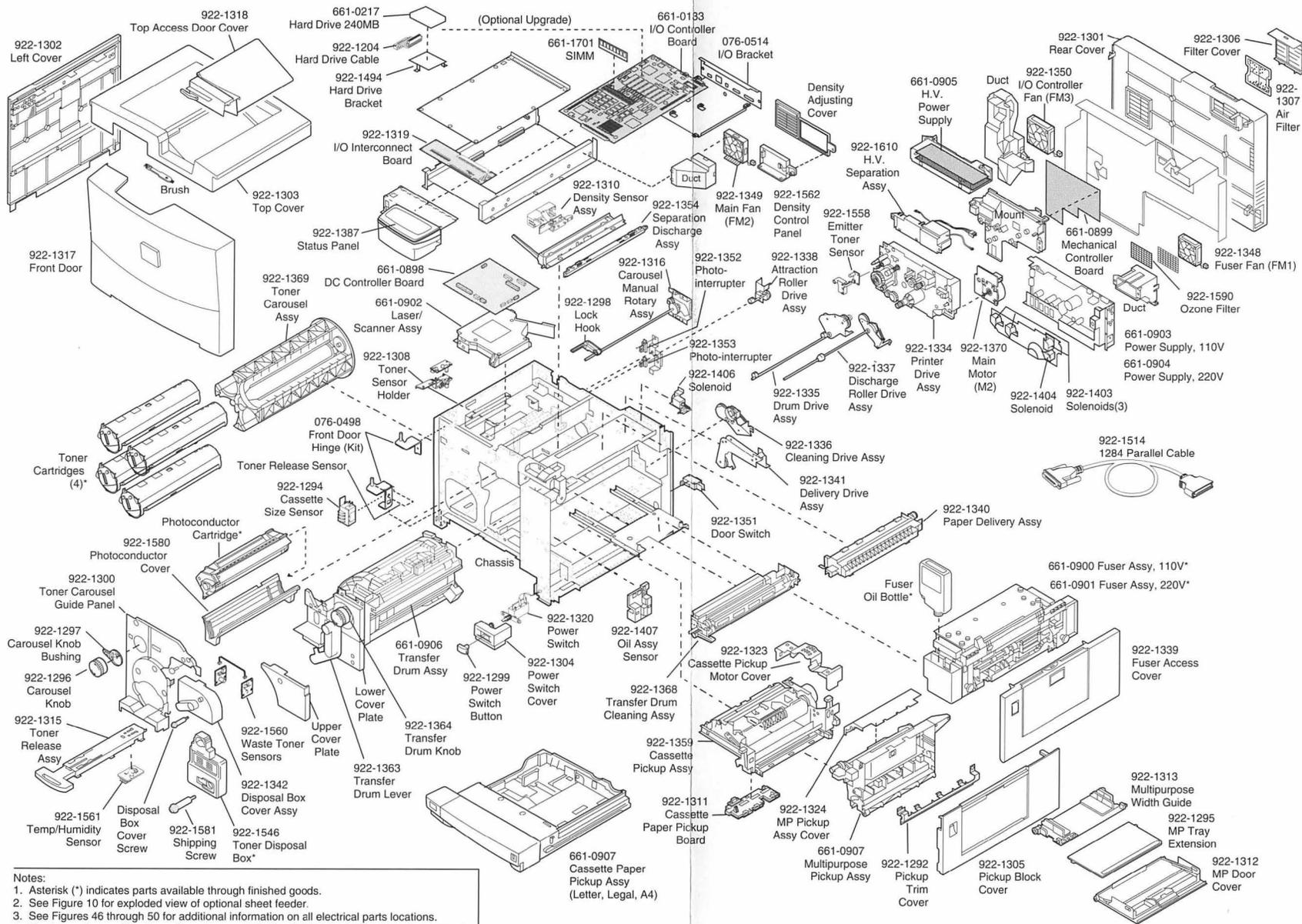
**Figure 7. Color LaserWriter 12/600 PS Front and Back Views**

## Internal Views



**Figure 8. Color LaserWriter 12/600 PS Internal Views**

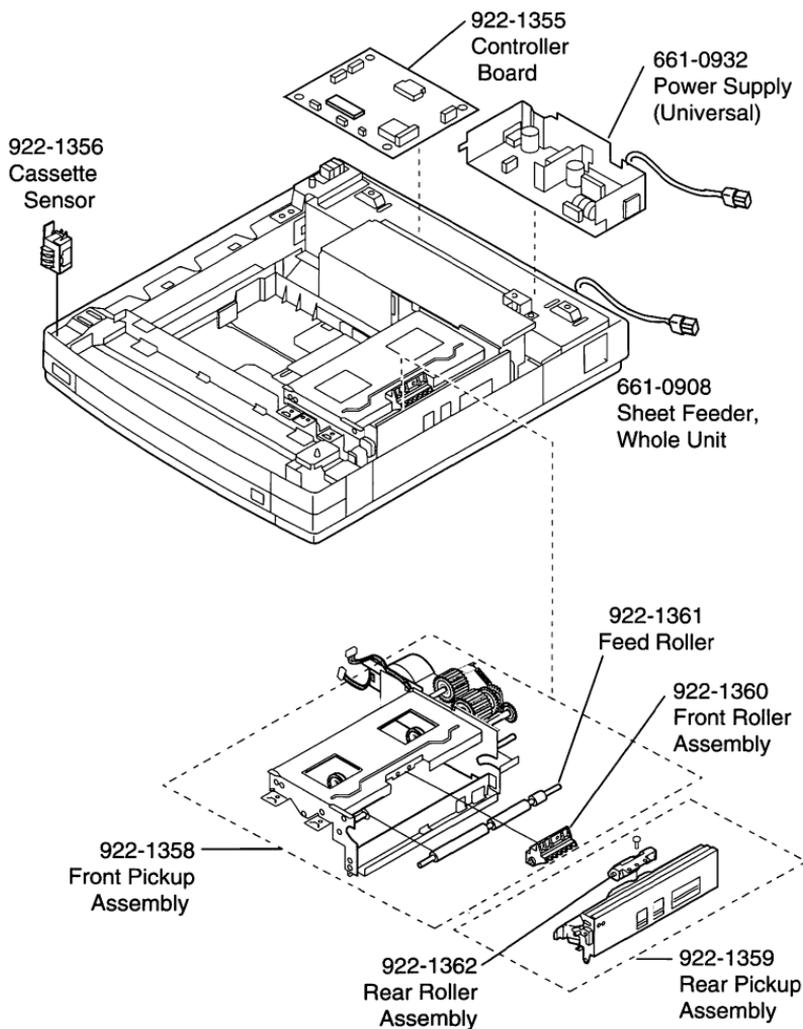
# Exploded View—Color LaserWriter 12/600 PS



Notes:  
 1. Asterisk (\*) indicates parts available through finished goods.  
 2. See Figure 10 for exploded view of optional sheet feeder.  
 3. See Figures 46 through 50 for additional information on all electrical parts locations.  
 4. Hardware shown without a part number are not offered. They are assembly reference only.

Figure 9. Color LaserWriter 12/600 PS Exploded View

## Exploded View—Sheet Feeder



**Figure 10. Exploded View—Sheet Feeder**

---

## Parts List

Air Filter .....	922-1307
Attraction Roller Drive Assembly .....	922-1338
Boards	
Board, Cassette Pickup Assembly .....	922-1311
Board, DC Controller .....	661-0898
Board, I/O Controller .....	661-0133
Board, I/O Interconnect .....	922-1319
Board, Mechanical Controller .....	661-0899
Board, Sheet Feeder Controller .....	922-1355
Bracket, Hard Drive .....	922-1494
Bushing, Carousel Knob .....	922-1297
Button, Power Switch .....	922-1299
Cables	
Cable, 1284 Parallel .....	922-1514
Cable, AC Power .....	922-1451
Cable, Carousel Sensor .....	922-1329
Cable, Cassette Pickup .....	922-1331
Cable, Cassette Size .....	922-1365
Cable, DC Controller Harness, Front .....	922-1327
Cable, DC Controller Harness, Rear .....	922-1326
Cable, Density Control Panel .....	922-1333
Cable, Door Switch .....	922-1325
Cable, Fuser Interconnect .....	922-1321
Cable, High-Voltage .....	922-1332
Cable, Main, Sheet Feeder .....	922-1357
Cable, Ribbon (J103—J501) .....	922-1346
Cable, Ribbon (J108—J802) .....	922-1345
Cable, Ribbon (J110—J401) .....	922-1343
Cable, Ribbon (J112—J2007) .....	922-1344
Cable, Solenoid Harness .....	922-1330
Cable, Temperature/Humidity .....	922-1569
Cable, Toner Sensor .....	922-1328
Cable, Utility Interface .....	922-1703
Carousel Manual Rotary Assembly .....	922-1316
Cassettes	
Cassette, A4 .....	922-1497
Cassette, Letter .....	922-1498
Cassette Pickup Assembly .....	661-0907
Cassette, Universal .....	922-1496
Cleaning Drive Assembly .....	922-1336

Covers	
Cover, Cassette Pickup Motor .....	922-1323
Cover, Cassette Size .....	922-1294
Cover, Fuser Access .....	922-1339
Cover, Left .....	922-1302
Cover, MP Door .....	922-1312
Cover, MP Pickup Assembly .....	922-1324
Cover, MP Tray Extension .....	922-1295
Cover, Photoconductor .....	922-1580
Cover, Pickup Block .....	922-1305
Cover, Pickup Trim .....	922-1292
Cover, Power Switch .....	922-1304
Cover, Rear .....	922-1301
Cover, Top .....	922-1303
Cover, Top Access Door .....	922-1318
Cover, Upper Filter .....	922-1306
Delivery Drive Assembly .....	922-1341
Density Sensor Assembly .....	922-1310
Discharge Roller Drive Assembly .....	922-1337
Disposal Box Cover Assembly .....	922-1342
Drum Drive Assembly .....	922-1335
Fans	
Fan, Fuser .....	922-1348
Fan, I/O Controller .....	922-1350
Fan, Main .....	922-1349
Feed Roller, Sheet Feeder .....	922-1361
Front Door .....	922-1317
Fuser Assembly, 110 V .....	661-0900
Fuser Assembly, 220 V .....	661-0901
High-Voltage Power Supply .....	661-0905
Kits	
Cassette Rail Kit .....	076-0499
Foot Kit .....	076-0497
Front Door Hinge Kit .....	076-0498
I/O Bracket & Label Kit .....	076-0514
Paper Pickup Block Kit .....	076-0500
Screw Kit .....	076-0501
Knob, Carousel .....	922-1296
Knob, Transfer Drum .....	922-1364
Laser/Scanner Assembly .....	661-0902
Lever, Transfer Drum .....	922-1363
Motor, Main (M2) .....	922-1370
Multipurpose Pickup Assembly .....	922-1322



Multipurpose Width Guide .....	922-1313
Panel, Density Adjusting.....	922-1562
Panel, Toner Carousel Guide.....	922-1300
Paper Delivery Assembly .....	922-1340
Photo-Interrupter 1 .....	922-1352
Photo-Interrupter 2 .....	922-1353
Pickup Assembly, Sheet Feeder, Front .....	922-1358
Pickup Assembly, Sheet Feeder, Rear .....	922-1359
Power Supply, 110 V.....	661-0903
Power Supply, 220 V.....	661-0904
Power Supply, Sheet Feeder, Universal.....	661-0932
Printer Drive Assembly .....	922-1334
Roller Assy, Sheet Feeder, Front.....	922-1360
Roller Assy, Sheet Feeder, Rear .....	922-1362
Sensors	
Sensor, Cassette, Sheet Feeder .....	922-1356
Sensor, Oil Assembly.....	922-1407
Sensor, Temperature/Humidity.....	922-1561
Sensor, Waste Toner .....	922-1560
Separation Discharge Assembly .....	922-1354
Sheet Feeder, Whole Unit.....	661-0908
Shipping Screw.....	922-1581
SIMM, DRAM, 4 MB, 60ns, 72-Pin.....	661-1701
Solenoid 1.....	922-1403
Solenoid 2.....	922-1404
Solenoid 3.....	922-1406
Spring Removal Tool .....	922-1547
Status Panel .....	922-1387
Switch, Power (SW1).....	922-1320
Switch, Door (SW2) .....	922-1351
Syringe .....	922-1549
Toner Carousel Assembly.....	922-1369
Toner Carousel Interlock .....	922-1298
Toner Disposal Box.....	922-1546
Toner Release Assembly .....	922-1315
Toner Sensor, Emitter .....	922-1558
Toner Sensor Holder .....	922-1308
Toner Sensor, Receiver.....	922-1559
Transfer Drum Assembly.....	661-0906
Transfer Drum Cleaning Assembly .....	922-1368

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## Finished Goods Parts

Apple is offering user-installable consumables and a maintenance kit. The consumables consist of four toner cartridges, fuser oil, organic photoconductor and special transparencies. The maintenance kit (required after 60,000 pages) consists of a fuser, air filter, ozone filter, transfer drum cleaning assembly, and a separation discharge assembly.

This list contains both standard and optional parts. In the U.S.A., for Color LaserWriter supplies direct from Apple, call 1-800-600-7805.

Apple Ethernet AUI Adapter .....	M0432LL/A
Apple Ethernet Thin Coax Transceiver .....	M0329LL/A
Apple Ethernet Twisted Pair Transceiver .....	M0437LL/A
Apple HDI-30 SCSI Cable .....	M2538LL/A
Apple SCSI Cable Extender .....	M0208
Apple SCSI Cable Terminator II (Black) .....	M5871G/A
Apple 1284 Parallel I/O Cable .....	M04235ZM/A
Color LaserWriter Fuser Oil .....	M3755G/A
Color LaserWriter Fuser Replacement Kit (110 V) .....	M3867G/A
Color LaserWriter Fuser Replacement Kit (220 V) .....	M4234G/A
Color LaserWriter Photoconductor Replacement Kit .....	M3761G/A
Color LaserWriter Toner Cartridge, Black .....	M3756G/A
Color LaserWriter Toner Cartridge, Cyan .....	M3757G/A
Color LaserWriter Toner Cartridge, Magenta .....	M3760G/A
Color LaserWriter Toner Cartridge, Yellow .....	M3758G/A
Color LaserWriter Transparencies, A4 .....	M3877G/A
Color LaserWriter Transparencies, Letter .....	M3876G/A
Color LaserWriter 12/600 PS Internal Hard Disk Drive .....	M3875G/A
Color LaserWriter 12/600 PS Universal Cassette .....	M3874G/A
Color LaserWriter 12/600 PS 16 MB Memory Expansion Kit .....	M4255LL/A
Color LaserWriter 12/600 PS 250-Sheet Cassette .....	M3762G/A



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## Replacing Consumables

The following sections contain information on performing regular maintenance tasks on the Color LaserWriter 12/600 PS.

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### Replacing Toner Cartridges

The Color LaserWriter 12/600 PS uses four colors of toner—cyan, magenta, yellow, and black (often referred to as “CMYK”)—applied in layers to create color output. Cartridge life varies, depending on the kind of printing. If the printer is used to produce more graphic images than text, the cartridges may need to be changed more often.

When replacing toner cartridges, follow the steps below or the instructions that come with replacement toner cartridges.

1. Press in the knob (see Figure 11A) that rotates the carousel and turn the knob clockwise. Pressing the knob releases the locking mechanism so the carousel can turn.

#### Note

The toner cartridge carousel has a specific place for each color cartridge, and you won't be able to place colors in the wrong location. Colored tabs show which color toner cartridge belongs in each position.

2. Turn the knob until the carousel reaches the cartridge that you are replacing. Notice the cartridge rotation process and the color of the tabs on the cartridge (see Figure 11B). The colored tabs show which color toner cartridge belongs in each position.
3. Pull the toner cartridge release lever to eject the toner cartridge (see Figure 11C).
4. Take the toner cartridge out of its packaging and remove the two pieces of packing tape. Make sure the toner color matches the colored tabs beside the opening in the carousel.
5. Distribute the toner powder by gently rocking the toner cartridge back and forth.
6. Grasp the orange plastic tab (sealing tape) on the toner cartridge and pull it away from the cartridge. Pull the tape completely out.
7. Align the arrow on the toner cartridge with the arrow on the carousel and slide the toner cartridge into the printer (see Figure 11D).
8. Press firmly on the toner cartridge until it locks into place. If you don't press firmly enough to install the cartridge correctly, you won't be able to rotate the carousel and install another cartridge.

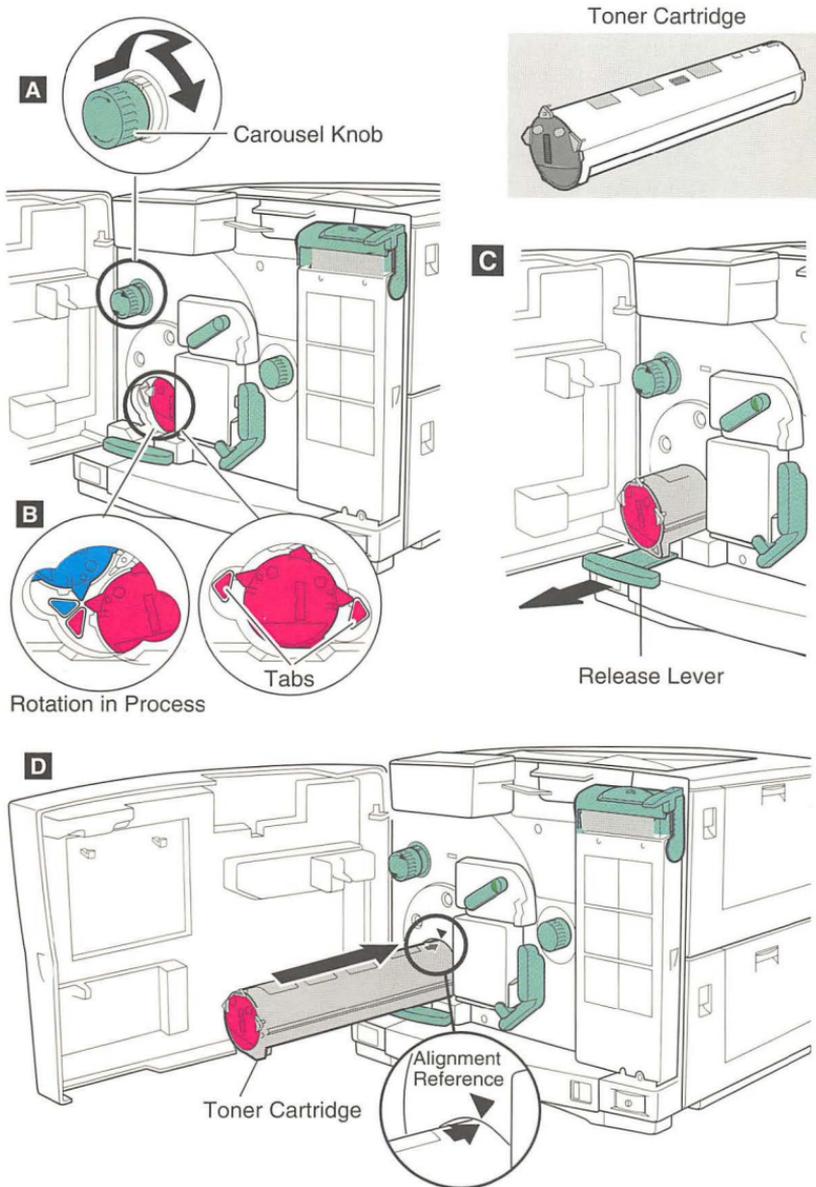


Figure 11. Replacing Toner Cartridges

---

## Replacing the Toner Disposal Box

The toner disposal box is where the printer deposits any excess toner powder. When the toner disposal box is full, the Alert light flashes, and the toner disposal box light on the status panel comes on.

### Note

This part is available as P/N 922-1546. Two toner disposal boxes are also included in the Photoconductor Replacement Kit (finished goods P/N M3761G/A).

If you need to move the printer a long distance, or if the toner disposal box is full, follow the steps below.

1. Open the front door. Lower the transfer drum lever and raise the disposal box cover (Figure 12A).
2. Tap the toner disposal box to settle the toner (Figure 12B).
3. Pull the toner disposal box from the printer (Figure 12C).
4. Remove the black plastic cap in the side of the disposal box and use it to seal the box (Figure 12D).
5. Insert the new toner disposal box, raise the transfer drum lever, and lower the disposal box cover.
6. Close the front door.

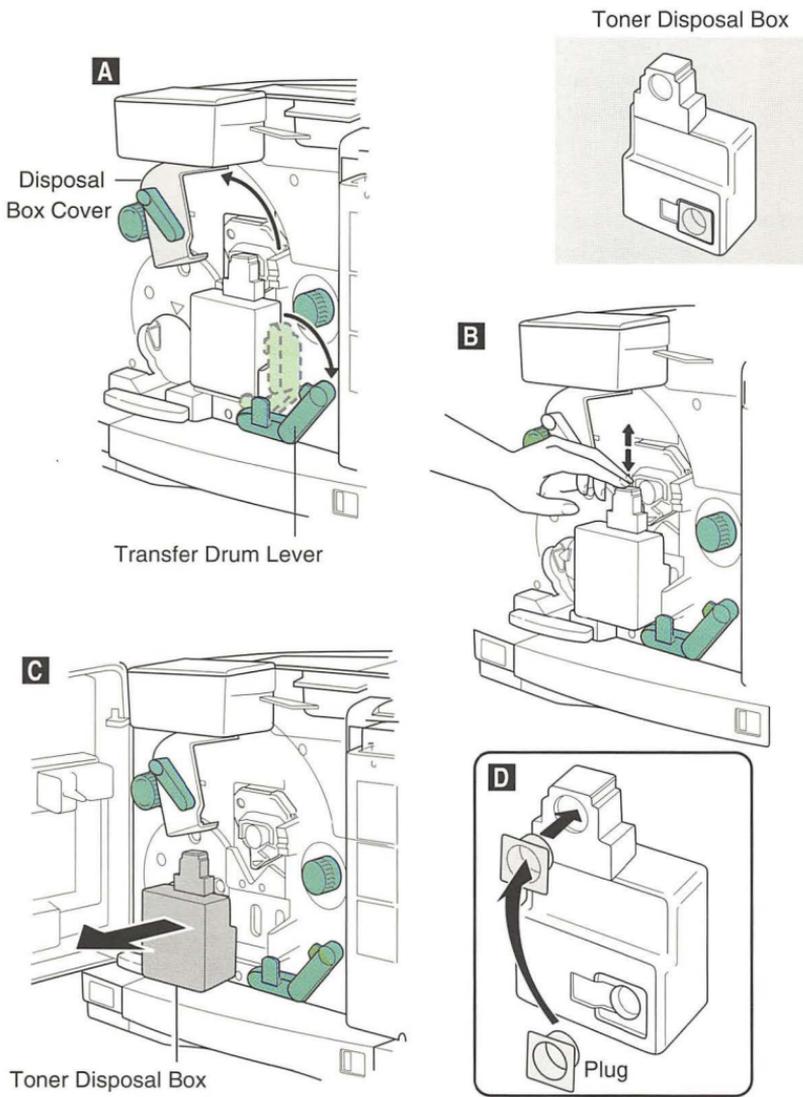


Figure 12. Replacing the Toner Disposal Box

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## Replacing the Photoconductor Cartridge

The photoconductor is a photosensitive device that captures an image in toner and transfers it to the paper. The photoconductor is subject to damage if special care is not taken during removal. You must use the protective orange photoconductor tray when removing the cartridge from the printer.

**Important** When you install a new photoconductor, the DC controller board automatically zeros the parameter that tracks the photoconductor life. Pulling out a new cartridge and reinstalling the old one may result in an old cartridge being tested as new. If you are considering swapping photoconductors to isolate a problem, you must first capture the controller board parameters.

**Note** The photoconductor cartridge is available only as a Photoconductor Replacement Kit (finished goods P/N M3761G/A). The protective tray and two toner disposal boxes are included in this kit. The tray is also available separately as P/N 922-1580. The toner disposal box is available separately as P/N 922-1546.

If you need to move the printer a long distance, or if the photoconductor cartridge needs replacement, follow the steps below.

1. Remove the toner disposal box and toner cartridges.
2. Release the green tab on the right edge of the photoconductor cartridge (Figure 13A).
3. Slide the photoconductor cartridge out of the printer (Figure 13B). Place the photoconductor into its orange protective tray to protect it from exposure to light. Make sure that the tabs on the cartridge track snugly along the top edges of the tray.
4. Line up the arrow on the photoconductor cartridge with the arrow above the compartment opening (Figure 13C). The top of the photoconductor cartridge slides on these tracks.
5. Slide the photoconductor cartridge all the way into the printer. When the photoconductor cartridge is most of the way in, you can remove the orange protective tray. Make sure the photoconductor latch (Figure 13A) locks into place.

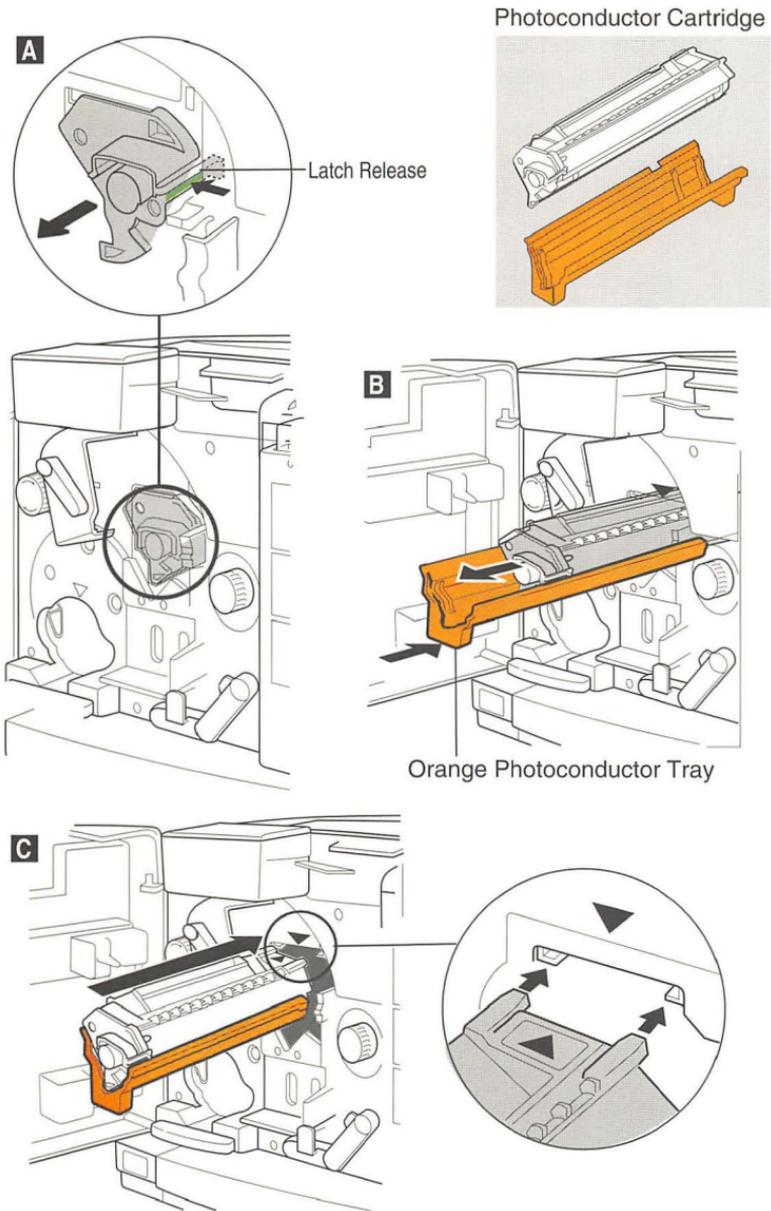


Figure 13. Replacing the Photoconductor Cartridge

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## Replacing the Fuser and Fuser Oil Bottle

When the fuser is near the end of its life, the Alert light and fuser oil light on the status panel flash to notify you. When the fuser oil bottle is nearly empty, the Alert light glows and the oil light blinks on the status panel.

Follow the instructions below when replacing the fuser and fuser oil bottle.

1. Open the fuser access door and the paper pickup door (see Figure 14A).
2. Open the printer's front door. Lower the clamp that covers the fuser oil compartment. Lift the fuser oil bottle from the printer (Figure 14A).

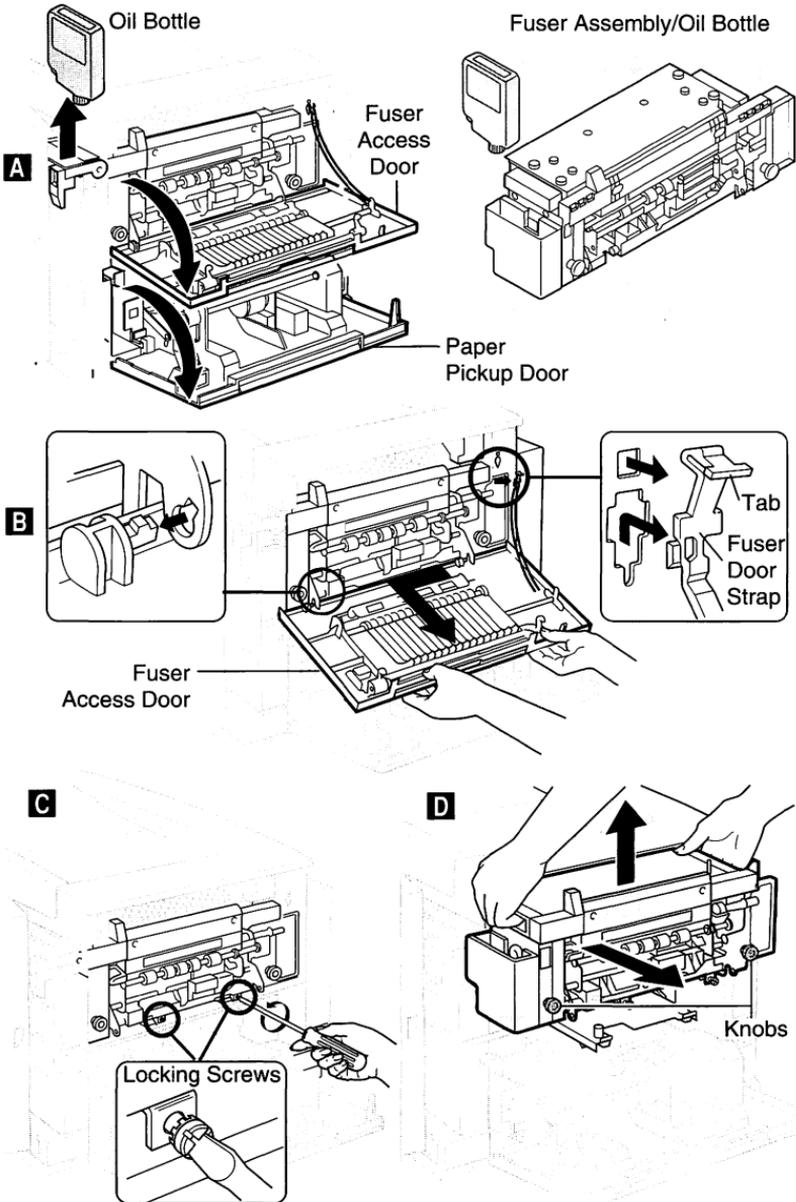
### Note

There is a mechanism in the lid of the bottle that automatically cuts off flow of oil when the bottle is removed from the printer. However, some oil might still drip. Be sure to keep the bottle upright and protected by a paper towel as you continue servicing the printer. If any fuser oil spills on the floor, clean it up immediately. The oil is very slippery on hard surfaces.

### Important

If you are replacing the fuser assembly, perform the "Fuser Oil Extraction" procedure that follows this topic.

3. Remove the tab (Figure 14B) that connects the fuser door strap to the printer. Pull the top of the tab loose, then slide the rest of the tab up and pull it out.
4. Slide the fuser access door leftward out of its hinge connector and remove the door from the printer (Figure 14B).
5. Loosen the two large locking screws at the base of the fuser assembly (Figure 14C). These screws do not come off.
6. Grasp the two knobs (Figure 14D) and slide the fuser unit outward.
7. Grasp the two green handles, lift up, and remove the fuser assembly from the printer (Figure 14D).
8. Lower the replacement fuser into place in the printer.
9. Push the fuser back into the printer. Push firmly. If the fuser isn't all the way in, you won't be able to tighten the two locking screws.
10. Tighten the two locking screws (Figure 14C).
11. Reattach the fuser access door (Figure 14B).
12. Reattach the fuser door strap (Figure 14B).
13. Close the fuser access door and paper pickup door (Figure 14A).
14. Replace the fuser oil bottle (Figure 14A).
15. Close the cover of the fuser oil compartment.
16. Close the printer front door.



**Figure 14. Replacing the Fuser and Fuser Oil Bottle**

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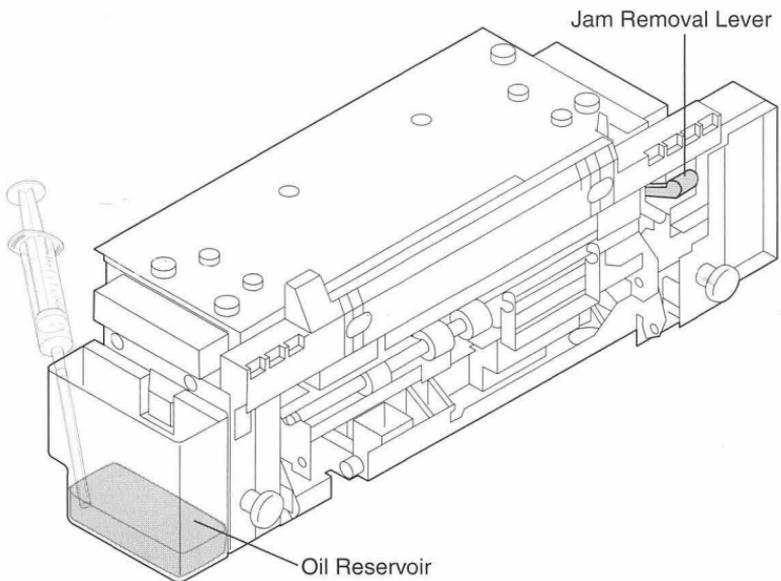
## Fuser Oil Extraction from the Oil Reservoir

Residual oil remains in the fuser assembly after removal of the assembly from the printer. If you are replacing the fuser assembly, you must extract this oil with a syringe and then seal the oil reservoir before returning the assembly to Apple.

**Note** One syringe and a sealing block come with the replacement fuser assembly. The syringe is also available separately as P/N 922-1549.

To extract the oil,

1. Remove the fuser oil bottle.
2. Remove the fuser access door and the fuser assembly.
3. Pump the jam removal lever (Figure 15) fifty times to pump the oil already in the system back into the reservoir.
4. Place the tip of the syringe into the oil at the bottom of the reservoir and draw the oil into the syringe (Figure 15). Inject the oil into the reservoir of the replacement fuser assembly. Repeat this step until there is no residual oil left in the bottom of the reservoir. Stopper the reservoir on the old assembly with the sealing block that is provided.



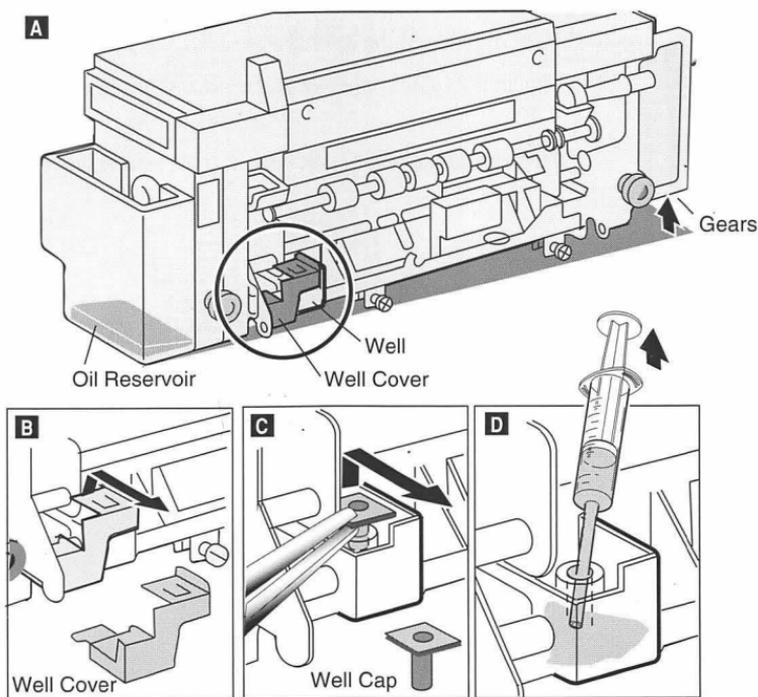
**Figure 15. Fuser Oil Extraction from the Oil Reservoir**

## Fuser Oil Extraction from the Overflow Pan

An oil overflow condition is sensed when a float-type actuator in the overflow pan breaks the photo-interrupter of sensor PS10. The oil that is buoying the actuator can be extracted from the overflow pan through a well located on the delivery side of the fuser assembly.

When the control panel lights indicate an oil pump error (see Figure 30, "POST Codes Matrix," in Chapter 6), an oil-overflow condition is deemed to exist. In this case, you must extract oil from both the reservoir and the overflow well leading to the oil overflow pan.

1. Extract oil from the reservoir first (refer to Figure 16A).
2. Elevate the gear end (Figure 16A) of the fuser assembly so that oil flows toward the well. Remove the well cover and well cap (Figure 16B and 16C).
3. Insert the syringe into the center ring of the well and draw the oil into the syringe (Figure 16D). Repeat this step until there is no residual oil left in the overflow pan. Replace the well cap and well cover.



**Figure 16. Fuser Oil Extraction from the Overflow Pan**

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## Replacing the Transfer Drum Cleaning Unit

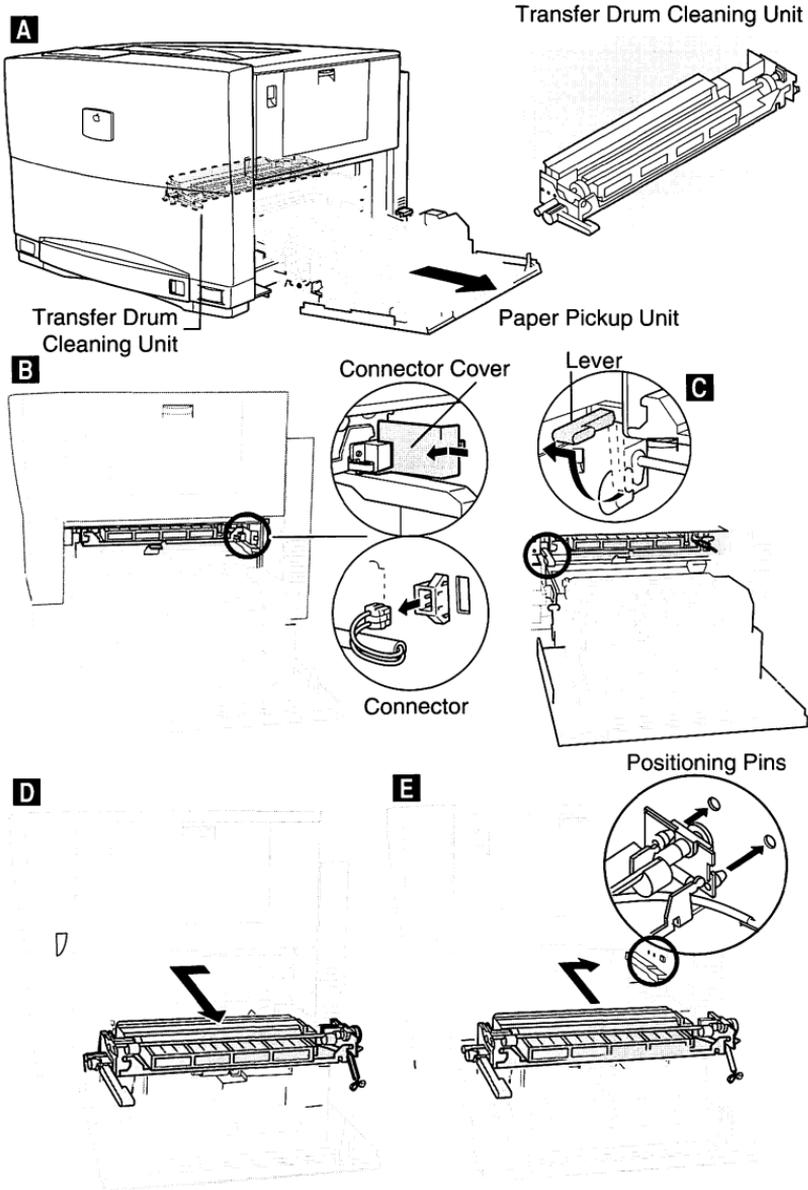
The transfer drum cleaning unit is a consumable that the customer is responsible for, and it is included in the Color LaserWriter 12/600 PS Fuser Replacement Kit. The fuser should be replaced at 60,000 pages. When you replace the fuser, you also replace the transfer drum cleaning unit

1. Open the door to the paper pickup area, release the green lock levers at each side of the pickup block, and slide the paper pickup unit out (Figure 17A).
2. Remove the connector cover at the right end of the assembly and unplug the connector (Figure 17B).
3. Unlock (flip up) the locking lever at the left end of the assembly (Figure 17C).
4. Slide the transfer drum cleaning unit to the left, and pull it out of the printer (Figure 17D).
5. Insert the new cleaning unit.

### Note

Make sure to seat the two positioning pins at the right end of the assembly (Figure 17E).

6. Lock (flip down) the lever (Figure 17C) and snap it into place.
7. Plug in the cable connector and replace the connector cover (Figure 17B).
8. Push the paper pickup unit back into the printer and close the door.



3

**Figure 17. Replacing the Transfer Drum Assembly**

## Replacing the Air and Ozone Filters

The air and ozone filters are consumables that the customer is responsible for and are included in the Color LaserWriter 12/600 PS Fuser Replacement Kit. The fuser should be replaced at 60,000 pages. When you replace the fuser, you also replace the filters.

1. Remove the filter cover (Figure 18A).
2. Unlock the air filter by sliding it in the direction of the arrow (Figure 18B). Lift the air filter off the cover.
3. Insert the new air filter by aligning the slots with the tabs on the air filter cover (Figure 18B). Slide the new filter in the opposite direction of the arrow to lock it in place.
4. Grasp the tab on the used ozone filter and remove the filter from its slot (Figure 18C).
5. Slide the new ozone filter in the slot and replace the cover over both filters.

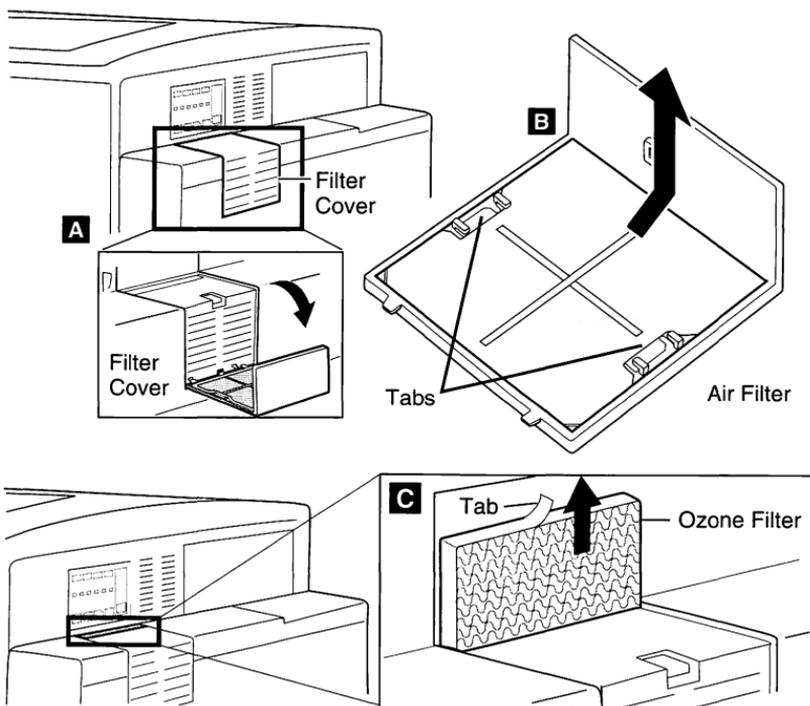


Figure 18. Replacing the Air and Ozone Filters

## Replacing the Separation Discharge Assembly

1. Open the printer door.
2. Open the top cover (Figure 19A).
3. Remove the used separation discharge unit (Figure 19B).
4. Insert the new separation discharge unit (Figure 19C).
5. Slide the separation discharge unit to the left to lock it in place.

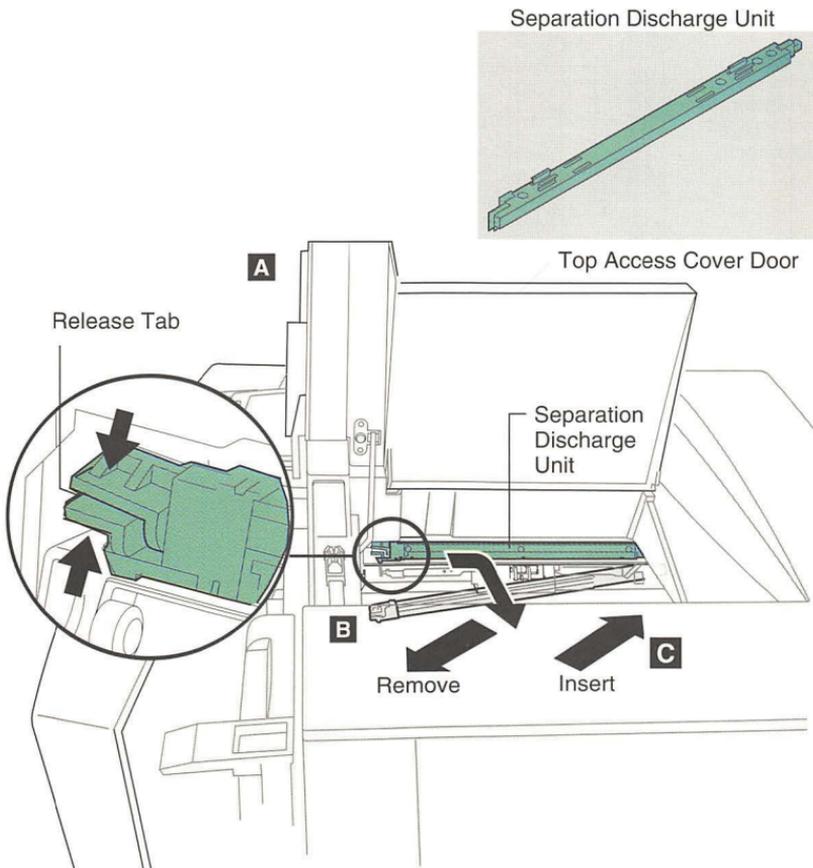


Figure 19. Replacing the Separation Discharge Assembly

## I/O Controller and I/O Interconnect Boards

Figure 20 shows the I/O Controller and I/O Interconnect circuit boards for the Color LaserWriter 12/600 PS.

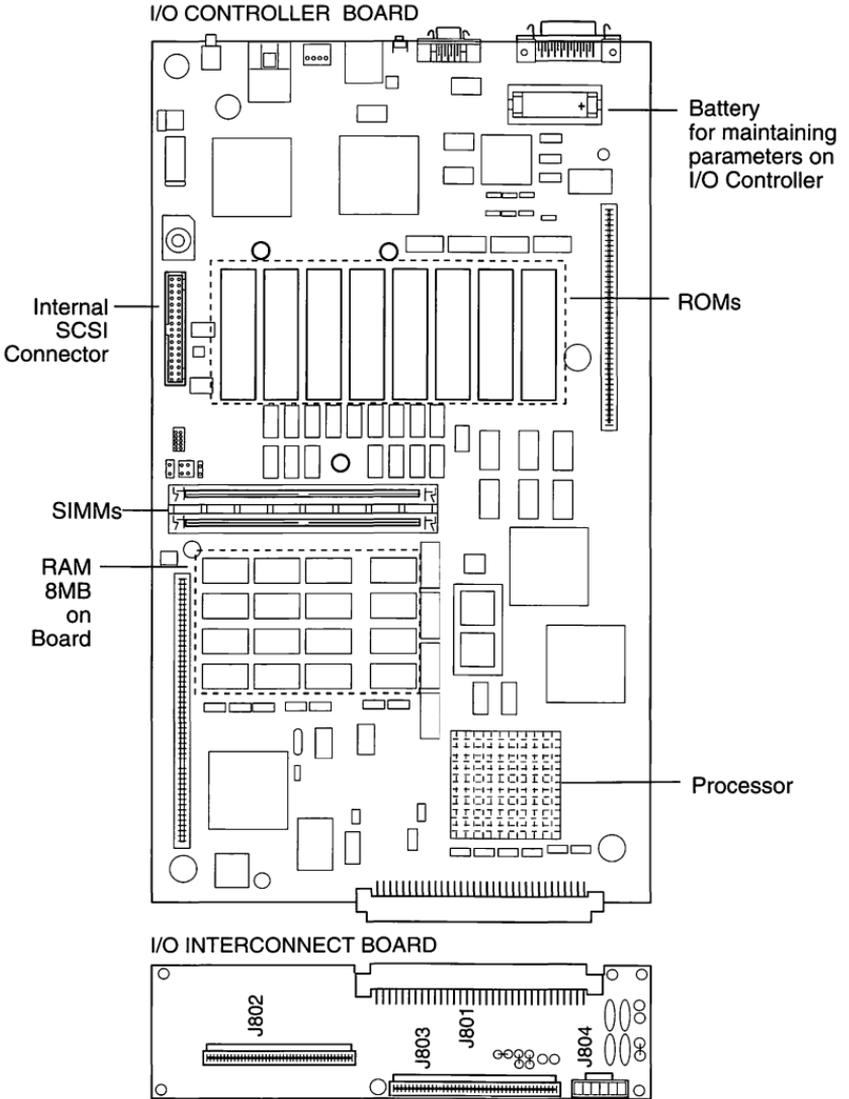
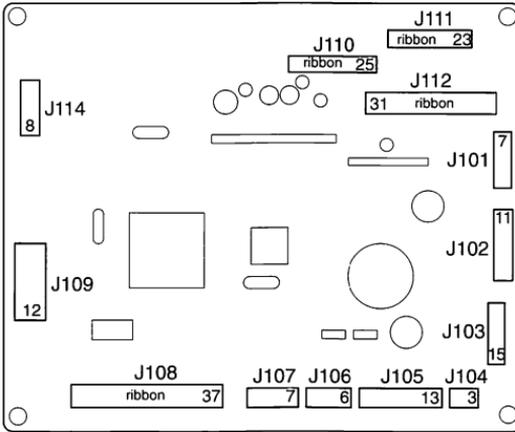


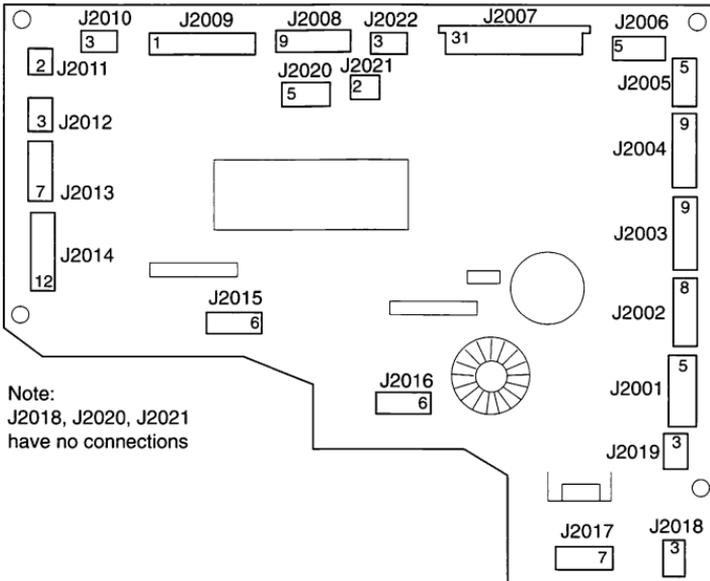
Figure 20. I/O Controller and I/O Interconnect Boards

## DC and Mechanical Controller Boards

Figure 21 shows the DC Controller Board and Figure 22 shows the Mechanical Controller Board in the Color LaserWriter 12/600 PS.



**Figure 21. DC Controller Board**



**Figure 22. Mechanical Controller Board**

# Specifications



Specifications	48
Theory	50
Block Diagram	51

## Specifications

<b>Engine</b>	Canon P320PCB laser-xerographic
<b>Printing Method</b>	Electrophotography using single-component microfine toner
<b>Optical System</b>	Semiconductor laser
<b>Resolution</b>	600x600 dpi with Color PhotoGrade
<b>Printing Speed</b>	3 pages per minute in color 12 pages per minute in black, magenta, cyan, or yellow 1 page per minute for a transparency
<b>Dimensions</b>	Height: 18 in. (46 cm) Width: 21 in. (54 cm) Depth: 24 in. (60.4 cm) Weight: 110 lb. (50 kg)
<b>Operating Environment</b>	50-86° F (10-30° C) 20-80% relative humidity non-condensing
<b>Power Consumption</b>	Operating average: 110/120 V, approximately 535 W; 220/240 V, approximately 524 W
<b>Macintosh Requirement</b>	System Software 7.0 or later
<b>Print Materials</b>	Uses 16- to 28-pound laser-quality bond. Accepts most textured and colored stock. Transparencies: Use only Apple Color LaserWriter 12/600 PS letter size transparencies Envelopes: Does not accept envelopes as print media
<b>Print Capacity</b>	Standard paper cassette (250 sheets of 20-pound paper) is configured for letter (in U.S.) and A4 (in Europe/Pacific) Multipurpose tray (100 sheets) Optional 250-sheet universal cassette The LaserWriter 8.3 print driver supports letter, A4, B5, and legal size paper with this printer.

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**Table 6. I/O Board Specifications**

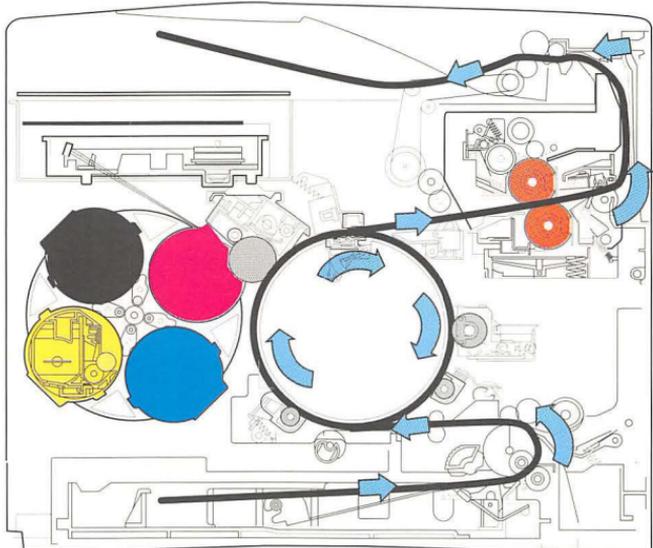
<b>Processor</b>	AMD 29030 (RISC) running at 25 MHz
<b>RAM</b>	12 MB, expandable to 40 MB
<b>ROM</b>	8 MB standard (including 39 Type 1 fonts)
<b>Ports</b>	LocalTalk, Ethernet, and high-speed parallel (IEEE P1284) connections
<b>Imaging Languages Supported</b>	PostScript Level 2
<b>Settings</b>	Two-position communication configuration switch



## Theory

Here is an abbreviated summary of how the Color LaserWriter 12/600 PS operates. Figure 23 shows a cross-sectional view of the paper path, toner carousel, transfer drum and fuser rollers.

1. The controller sends a compressed page to the video coprocessor.
2. The laser, on a scan-line-by-line basis, pulses on and off to paint each successive layer of the image on the photoconductor drum one color at a time. The color order is magenta-cyan-yellow-black. Laser light hits the photoconductor on all the dots where toner should appear.
3. The toner carousel rotates to bring the appropriate color toner cartridge into contact with the photoconductor (this contact is between the toner developer rollers and the photoconductor); toner jumps from the developer roller (negative) to the photoconductor (a greater negative charge).
4. The transfer drum receives the paper from the paper tray cassette. The paper is clipped onto the transfer drum at one end and held around the drum by an electrostatic charge.
5. The photoconductor transfers each color plane of the image to the paper wrapped around the transfer drum. The transfer drum makes four rotations, one for each toner cartridge when printing color.
6. When all applicable colors have been applied, the paper, released from the transfer drum, exits through the hot fuser assembly rollers and out to the top tray or face-up tray.



**Figure 23. Cross-Sectional View**

# Block Diagram

Printer functions can be divided into four systems: the overall control system, the image formation system, the laser/scanner system, and the paper pickup/feed system.

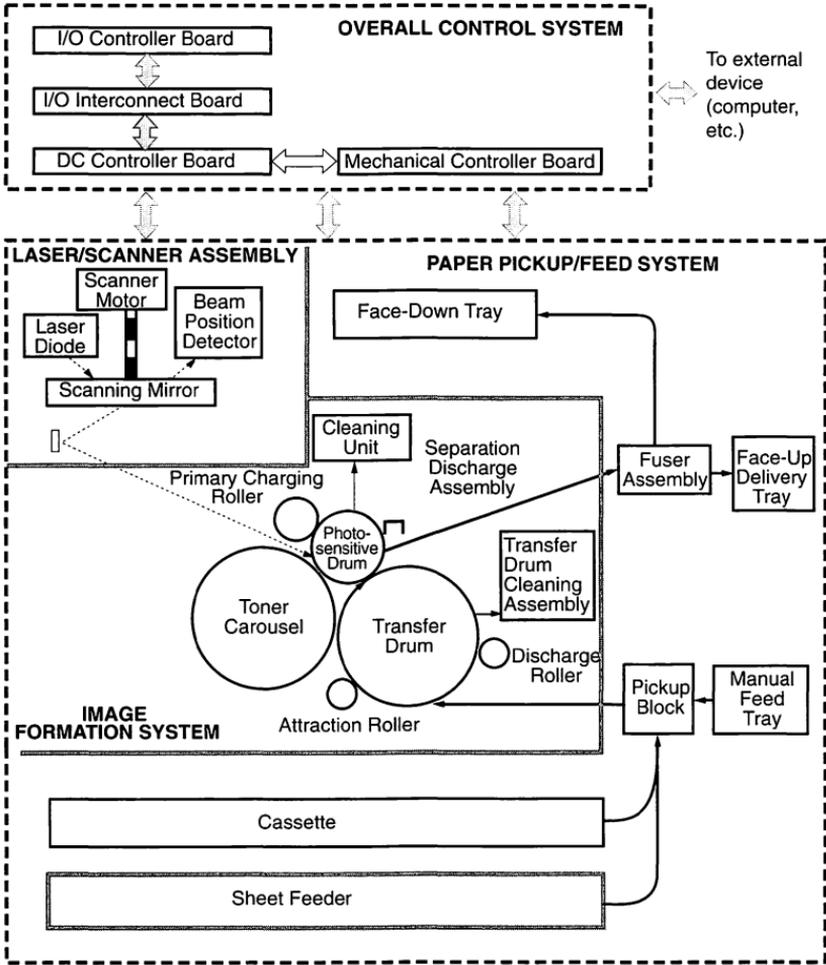
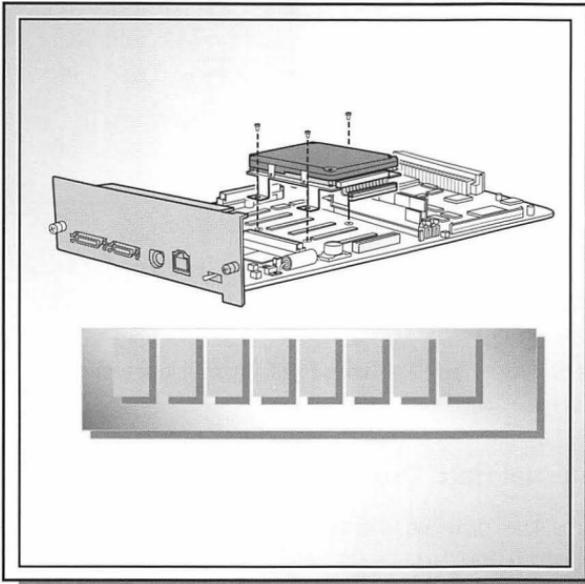


Figure 24. Color LaserWriter 12/600 PS Block Diagram



4

# Upgrades



Hard Disk Drive Upgrade

54

RAM Upgrade

56

Sheet Feeder Upgrade

58

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## Hard Disk Drive Upgrade

You can install an internal hard disk drive and attach up to six external SCSI 40 MB (or larger) hard drives to the Color LaserWriter 12/600 PS. The hard drive provides space for font storage.

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### Connecting a Previously Used Hard Drive

The Color LaserWriter 12/600 PS recognizes disks formatted for use with the Macintosh HFS format. However, the printer does not recognize disks using other formats. If you attach such a disk to the printer, you will need to reinitialize the disk before you can use it and then reload any fonts from your computer.

**▲Caution** Reinitializing erases everything, including all fonts previously stored on the disk.

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### Connecting an External Hard Drive

You must use an HDI-30 SCSI System cable to connect the first external hard drive to the external SCSI port. For each additional hard drive you connect to the Color LaserWriter 12/600 PS, you will need a SCSI peripheral cable, which links two SCSI devices. You'll also need a SCSI terminator connected to the last device in the SCSI chain.

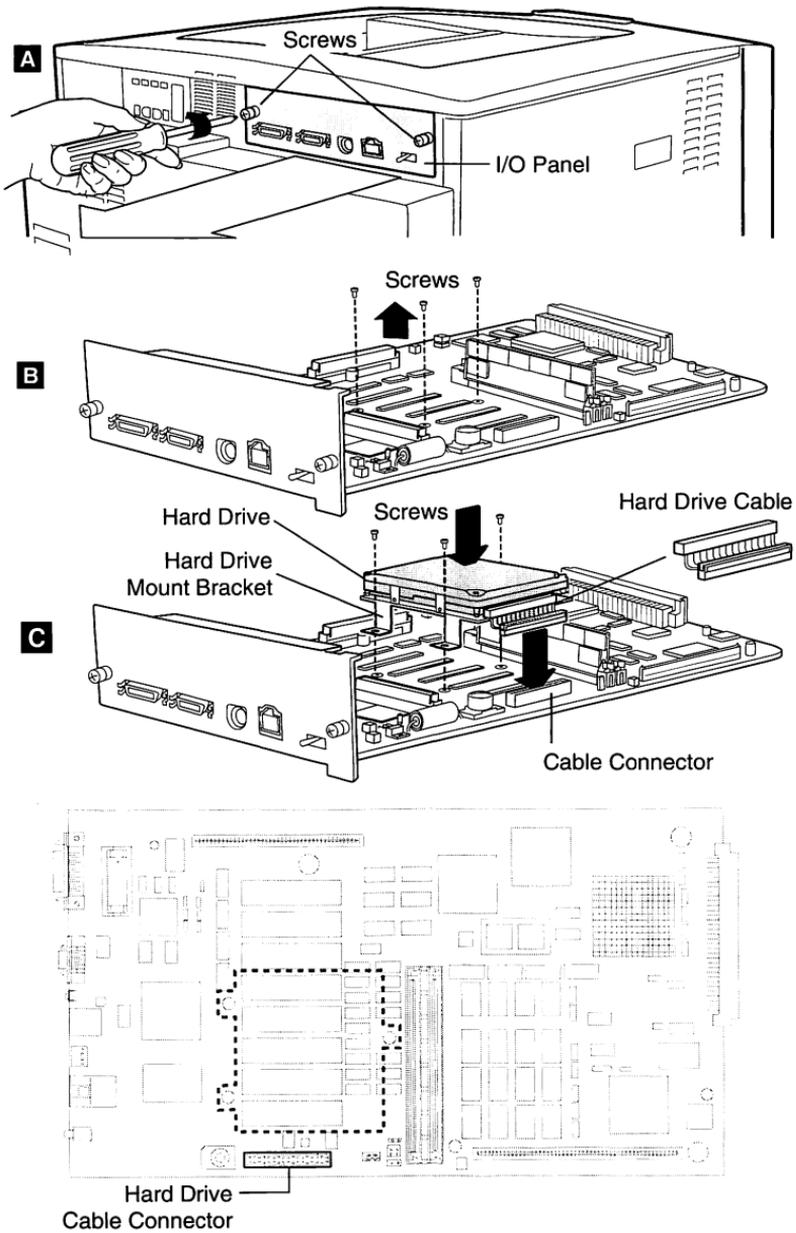
---

### Adding an Internal Hard Drive

To install the internal hard drive, remove the controller board from the printer, connect the hard drive to the board, and replace the board in the printer (see Figure 25). Be sure to wear a grounding wriststrap when working on the controller board.

**▲Warning** Make sure the printer is turned off and plugged in (for grounding).

1. Remove the two screws that hold the controller board (Figure 25A).
2. Grasp the metal frame of the controller board and slide it out of the printer. Avoid touching the surface of the controller board with hands or tools to avoid damaging the printed circuits.
3. Remove the three screws from the controller board (Figure 25B).
4. Attach the hard drive cable to the controller board (Figure 25C).
5. Secure the brackets on the hard drive to the controller board with the three screws that came in the package with the hard drive.
6. Slide the controller board back into the printer.
7. Replace the two screws that hold the controller board in place.
8. Initialize the hard drive (using the Apple Printer Utility 2.0 or greater) before using it.



**Figure 25. Hard Drive Installation**

## RAM Upgrade

The printer comes with 8 MB of RAM soldered on the controller board and a 4 MB SIMM in slot J10 on the board. Memory can be upgraded to 40 MB (maximum) by installing up to 32 additional MB of RAM in the printer. SIMM speed should be 60 ns or faster. Additional RAM can be purchased in units of 1, 4, and 16 MB SIMMS

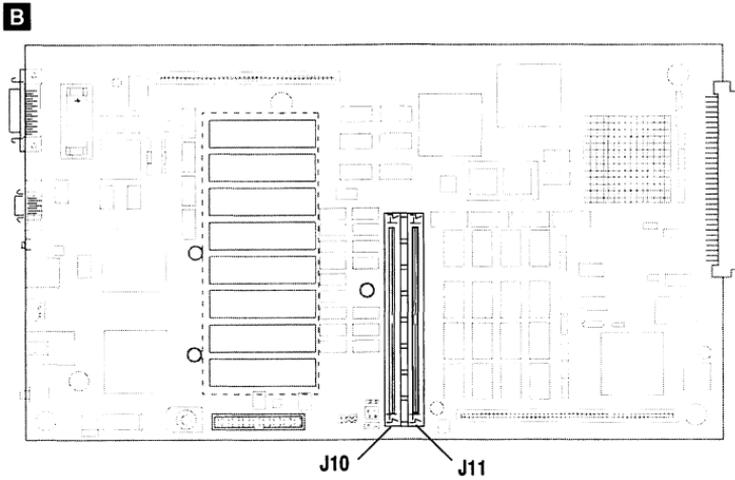
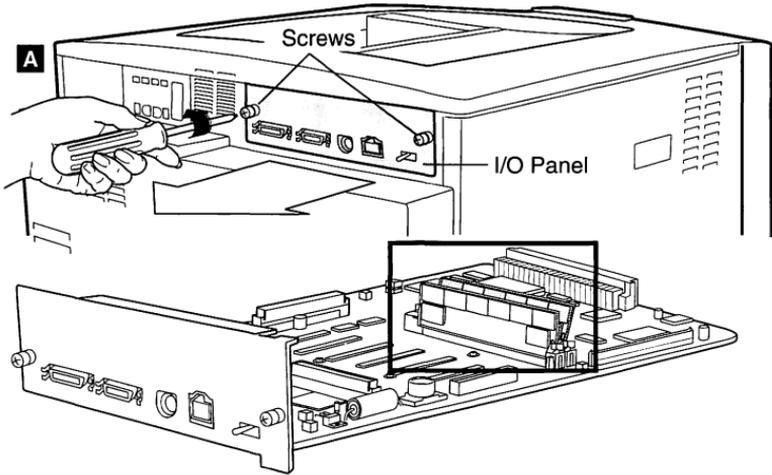
The controller board has two slots, marked J10 and J11, for installing additional memory. Table 7 lists RAM configurations. Remember, the total amount of memory includes the 8 MB of RAM soldered on the controller board.

<b>Total Amount of Memory</b>	<b>Slot J10</b>	<b>Slot J11</b>
12 MB (standard)	4 MB	0 MB
13 MB	4 MB	1 MB
16 MB	4 MB	4 MB
24 MB	16 MB	0 MB
25 MB	16 MB	1 MB
28 MB	4 MB	16 MB
40 MB	16 MB	16 MB

To install RAM,

**▲Warning** Make sure the printer is turned off and plugged in (for grounding).

1. Remove the two screws that hold the controller board in place (Figure 26A). Make sure to put on a grounding wriststrap before handling the SIMM or any internal printer parts.
2. Grasp the metal frame of the controller board and slide it out of the printer.
3. Insert the SIMM into the connector at an angle and press the SIMM into the retaining clips on each end of the connector until the clips snap and fasten the SIMM in place (Figure 26B). If you are installing two SIMMs, install one in slot J10 first. (This makes access to the J11 slot easier.)
4. Repeat step 3 to install the second SIMM if necessary.
5. Slide the controller board back into the printer.
6. Replace the two screws that hold the controller board in place (Figure 26A).



**Figure 26. RAM Installation**

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## Sheet Feeder Upgrade

**Important** The Color LaserWriter 12/600 PS is very heavy and requires two people to lift it.

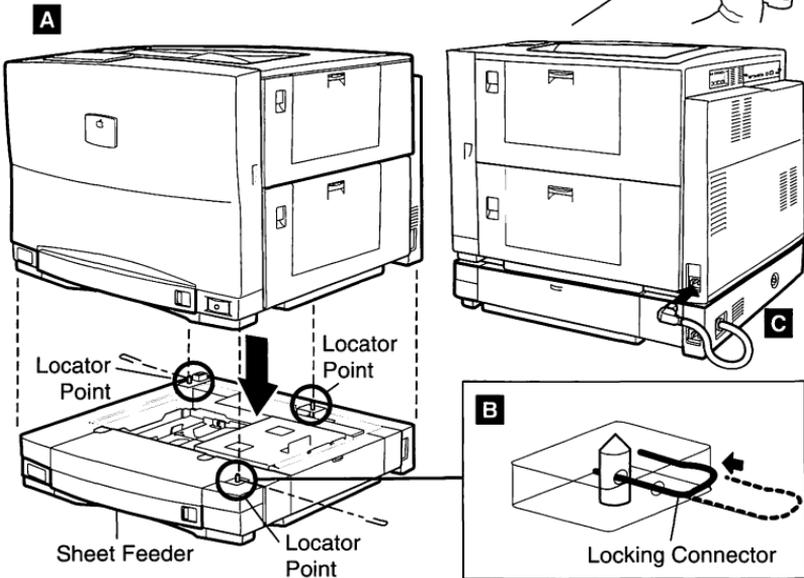
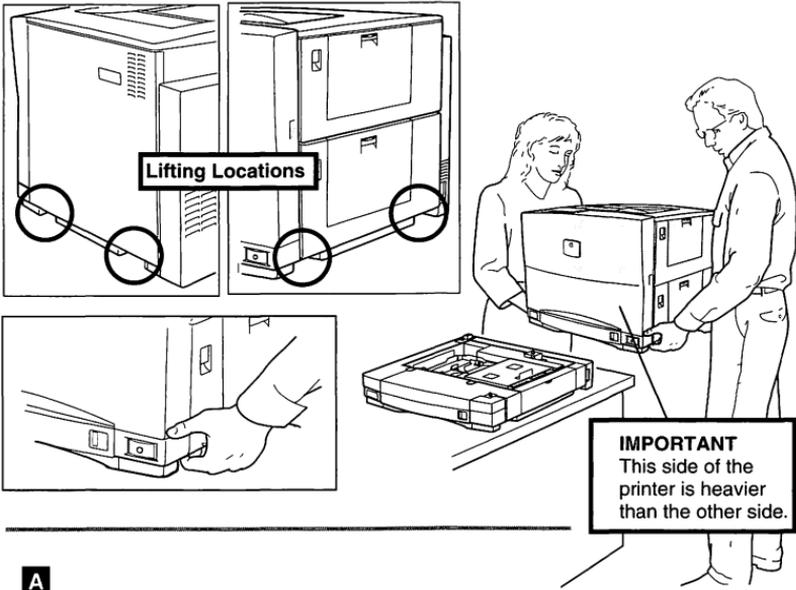
The sheet feeder adds approximately four inches to the height of the Color LaserWriter 12/600 PS. Select a location that accommodates the increased height of the printer.

Follow these steps to install the 250-sheet feeder:

1. Turn off and unplug the printer.
2. Squeeze the handle of the universal paper cassette (lifting it slightly), and pull the cassette out from the feeder.
3. Orient the sheet feeder base so that its paper cassette and the printer's paper cassette will be on the front side when the printer is on the feeder base.
4. Remove the paper cassette from the printer.
5. With another person, lift the printer, position it directly over the feeder base, and gently lower the printer until it sits evenly on the feeder (see Figure 27A).

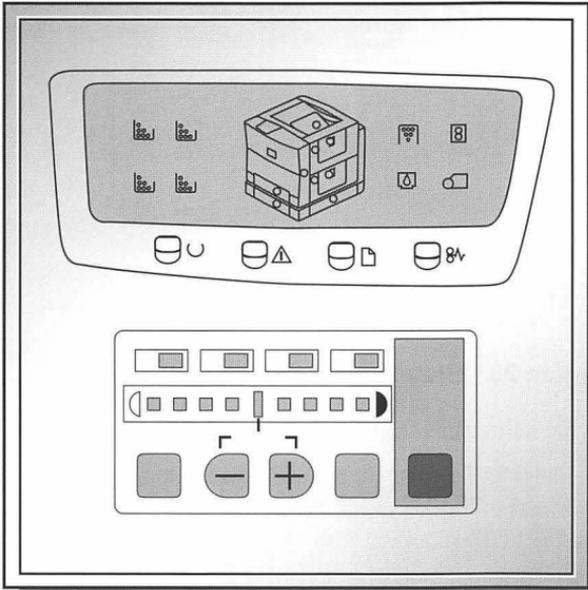
**Note** Notice the three locator points (Figure 27A) that protrude from the feeder. The printer fits over these points.

6. Insert the locking connectors (Figure 27B). Insert the straight end of a locking connector through the foot of the printer, securing it to the locator point.
7. Insert both paper cassettes (one goes inside the printer, the other inside the feeder).
8. Connect the feeder's short power cable to the printer (Figure 27C).
9. Connect the longer power cable (the one previously used for the printer) between the feeder and a grounded electrical outlet.
10. Turn on the printer.
11. Configure the printer software to use the 250-sheet feeder.



**Figure 27. Sheet Feeder Installation**

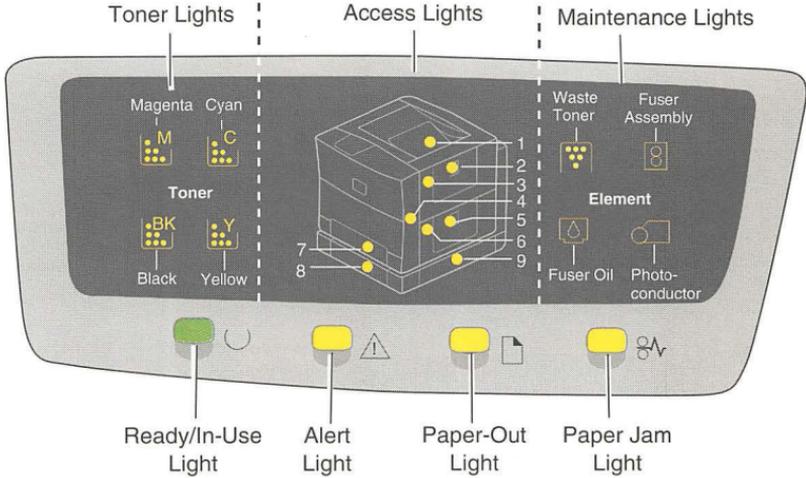
# Printer Diagnostics



Status Panel	62
Power-On Self-Test (POST)	64
Extended POST (EPOST)	71
Density Control Panel	73
Density Adjustments	74
Test Page Pattern Selection	75
Separation Voltage Designation	76
Diagnostic Utility	77

## Status Panel

When a problem occurs, the printer stops working, and the lights on the status panel blink in patterns that are meaningful in diagnosing and fixing problems.



**Figure 28. Status Panel LEDs**

Figure 28 identifies the status panel LEDs.

- Toner lights – indicate the color (C, M, Y, BK) of the toner cartridge that requires replacement. The LED lights when the volume of toner in the toner cartridge falls to the stipulated level.
- Access lights – correspond to the access points for removing paper jams or installing consumables.
- Maintenance lights – indicate
  1. When the toner within the waste toner bottle reaches the stipulated amount.
  2. When the time is near to replace the fuser assembly. About 500 prints can be produced after this LED lights.
  3. When the volume of oil in the fuser assembly falls to the stipulated level. About 50 prints can be produced after this LED lights.
  4. When the photoconductor cartridge needs to be replaced.
- Ready/In Use light – flashes when the printer is in the wait state and lights solid when it is in the ready state.
- Alert light – lights to inform you of a consumable or paper problem.
- Paper-out light – lights when paper is absent at the selected pickup slot.
- Paper jam light – lights when a paper jam occurs.

Figure 29 shows the possible arrays that customers can see during normal printer operation.

				 = Flashing	Description	Printer Stops
					Warming Up /Processing	No
					Printer Ready	No
					Low Magenta	No
					Low Cyan	No
					Low Yellow	No
					Low Black	No
					Low Fuser Assembly	500 pages later
					Low Fuser Oil	50 pages later
					Photoconductor Warning	No
				 ✖	No Magenta Cartridge	Yes
				 ✖	No Cyan Cartridge	Yes
				 ✖	No Yellow Cartridge	Yes
				 ✖	No Black Cartridge	Yes
				 ✖	Toner Disposal Box Full	Yes
				 ✖	No Fuser Assembly	Yes
				 ✖	No Fuser Oil	Yes
				 ✖	No Photoconductor Cartridge	Yes
				Access Lights 	Door Open	Yes
					See Figure 30 "POST Codes Matrix"	Yes
					Run Extended POST to isolate further	Yes

Figure 29. Status Panel Lights

---

## Power-On Self-Test (POST)

The Color LaserWriter 12/600 PS goes through a self-diagnostic test each time you switch the printer on. All the status panel lights illuminate briefly. This confirms that power is getting to the status panel and that all LEDs are operational. The lights then extinguish and the four primary lights (arranged horizontally along the bottom of the panel) come back on. This marks the start of the Power-On Self-Test (POST). POST is a set of diagnostic procedures that are written into firmware on the I/O controller board. POST occurs during normal printer startup.

POST checks the following four areas of the printer:

- Stage 1: I/O controller (CPU and SIMMs)
- Stage 2: I/O controller (miscellaneous)
- Stage 3: Printer engine
- Stage 4: Optional hardware

POST extinguishes the primary lights left to right as each test stage passes. In a functional printer, the testing process takes about 40 seconds, after which the normal warmup continues. However, if POST detects a fault during any stage, the status panel enters an error state and flashes the Paper-Out and Paper Jam lights forever. At this point, no further printer operation is possible until the fault is resolved.

Observation of the primary lights prior to an error array can be an effective I/O controller confidence test. If the Ready/In Use and Maintenance lights (waste toner, fuser assembly, fuser oil and photoconductor lights) extinguish during POST, stages 1 and 2 have passed, signifying that the I/O controller is functional.

When the primary POST error array occurs, some combination of secondary lights also illuminates. This secondary array isolates the error designation to the module or piece-part level. To decipher the meaning of the secondary lights, ask yourself two questions: which toner lights are on at the left of the status panel, and how many maintenance lights are on at the right of the status panel (see Figure 28)? Then refer to Figure 30 to see what the error designation is and to the corresponding note (Table 8) for what service action is required.

POST error arrays can occur during normal printer operation. Therefore, customers can observe an array and describe it to you, even though they will not know its significance (see Figure 30).

**Important** An error designation does not necessarily mean that the named module is defective—it means that something along the functional path is defective. Please refer to Table 8, “POST Codes Notes,” for more information.

* = Flashing							
				Toner Lights	Maintenance Lights	Error Designation	Note
					0	I/O Controller Board	1
					1	RAM SIMM 1 (J11)	2
					2	RAM SIMM 2 (J10)	2
					2	Hard Drive	3
					3	ROM Checksum	1
					0	Fuser Assembly	4
					1	Fuser Oil Pump	5
					2	Temp/Humidity Sensor	6
					3	Paper Pickup Block	7
					4	Calibration Density Sensor	8
					0	DC Controller Board	9
					1	Power Supply	4
					2	Toner Carousel	10
					3	Laser/Scanner Assembly	11
				 	0	Main Motor	12
				 	1	Drum Motor	13
				 	2	Scanner Motor	11
				 	0	I/O Controller Fan	14
				 	1	Fuser Fan	15
				 	2	Main Fan	16
					(Unknown error. Run Extended POST to isolate further.)		17

Figure 30. POST Codes Matrix

The notes in Table 8 correspond to the “Notes” column in Figure 30, “POST Codes Matrix.”

**Table 8. POST Codes Notes**

Note	Service Action Required
1	<p>On site, first make sure that the controller and interconnect boards are firmly installed and that the connectors are secure, especially the cable between J802 on the interconnect board and J108 on the DC controller board. Tighten the two screws on the I/O bracket. If the problem persists, replace the I/O controller board.</p> <p><b>Note:</b> In rare instances, a faulty I/O interconnect board could also return this error.</p>
2	<p>Make sure that the SIMMs are securely installed in the correct sockets and match one of the supported configurations listed on page 146 of the User Guide. If the problem persists, replace the SIMM.</p>
3	<p>This error indicates that POST detects that the hard drive is present but failing. Make sure that the cable is firmly connected. If the problem persists, replace the hard drive</p>
4	<p>The DC controller has detected an error in the fuser heater bulb circuit. Over the phone, ask if the customer has just replaced the fuser. If yes, then confirm that the correct voltage fuser was installed and that the two captive screws were fully tightened after installation.</p> <p>On site, check to see if the fuser bulbs glow during warmup. If the bulbs glow, the power supply is probably okay and the thermistor within the fuser assembly is bad. This suggests replacement of the fuser assembly. If the fuser bulbs don't glow, either fuser bulb circuitry is blown inside the fuser, the power supply is faulty, or a connection or cable is bad. First check that J1 (the 4-pin black and white cable), and J2 (the 9-pin yellow cable) are secure at the power supply.</p> <p>If the connectors are secure, remove the fuser assembly and measure continuity between pins J21-1 and J21-2 and then between pins J21-3 and J21-4 on the fuser assembly.</p> <p>A lack of continuity at either point indicates that the fuser heater circuitry is broken, in which case you should replace the fuser assembly. If continuity is confirmed, replace the power supply.</p>

**Table 8. POST Codes Notes (Continued)**

Note	Service Action Required
5	<p>The DC controller has detected that oil-overflow sensor PS10 is returning low. This is consistent with an oil-overflow condition, in which the oil in the overflow pan floats the actuator upward into the photo-interrupter.</p> <p>On site, if the printer has just been serviced and has exhibited this error ever since, immediately check connector J2009 on the mechanical controller board. Disconnect J2009, remove it from the cable guides along the top of the board, and then reconnect it. Test the printer.</p> <p>If the printer has just been moved or tilted, the problem might be that oil has contaminated the sensor. Replace the photo-interrupter (P/N 922-1353) and test the printer.</p> <p>If the problem persists, open the fuser access door and lower the fuser delivery roller. The actuator for PS10 rises through the "floor" on the delivery side of the fuser roller. If you have a dental mirror, you can place it against the lower fuser roller and get an unobstructed view of the actuator and photo-interrupter.</p> <p>If you do not have a mirror, you can remove the two screws and the black trim piece above the fuser roller opening to get a partial direct view of the actuator.</p> <p>If the flag is up, then oil is filling the pan. Replace the fuser assembly. Make sure to extract oil from both the reservoir and the well before returning the fuser to Apple (see "Fuser Oil Extraction from the Oil Reservoir" in Chapter 3).</p> <p>If the flag is not up, then the problem is somewhere between the photo-interrupter and the DC controller. Replace the fuser assembly. If the problem persists, reinstall the customer's fuser assembly and replace the fuser interconnect cable.</p>
6	<p>The DC controller has detected an error in the temperature/humidity sensor circuit. On site, check the transit coupling into which the temperature/humidity cable connects, and check the connection at J2005 on the mechanical controller board. Test the printer.</p> <p>If the problem persists, replace the temperature/humidity sensor.</p> <p><b>Note:</b> In rare instances, a faulty temperature/humidity cable or rear DC controller harness cable could also return this error.</p>



**Table 8. POST Codes Notes (Continued)**

<b>Note</b>	<b>Service Action Required</b>
7	<p>The DC controller has detected an error in the cassette pickup circuit. On site, check to make sure that the cassette pickup assembly mates firmly into the receptacle connector. Check the connection at J2002 on the mechanical controller board. Test the printer.</p> <p>If the problem persists, replace the cassette pickup board and test the printer. If the problem persists, replace the cassette pickup assembly.</p> <p><b>Note:</b> In rare instances, a faulty rear DC controller harness cable could also return this error.</p>
8	<p>The DC controller has detected an error in the calibration density sensor circuit. On site, check to make sure that the black arm at the end of the density sensing assembly is correctly attached to the top access door, and that there is nothing keeping the assembly from pivoting down and resting above the transfer drum. Check the ribbon cable connection at J103 on the DC controller board and at its opposite end on the sensing assembly.</p> <p>If the problem persists, replace the density sensing assembly.</p>
9	Replace the DC controller board (P/N 661-0898).

**Table 8. POST Codes Notes (Continued)**

Note	Service Action Required
10	<p>The DC controller has detected incorrect timing at carousel position sensor PS4. This is consistent with a jammed carousel.</p> <p>Over the phone, ask if the printer has been on-line yet. If it has not, the problem is likely in initial setup, most likely in the handling of the toner cartridges. Make sure that the customer has removed the sealing tape from each cartridge and that the cartridges are correctly installed.</p> <p>If the printer has been operational, ask if the carousel knob is able to advance the carousel. If the knob operates properly, and the customer can confirm carousel movement during startup, the problem is likely with connections or intermittent blockage.</p> <p>On site, remove the top and left covers. Switch on the printer and try to determine if there is any mechanical drive trying to rotate the carousel. If there is, the printer drive assembly is probably not at fault. If the carousel does rotate, then the toner carousel assembly is faulty only if the position flags on its rear face have been damaged.</p> <p>If there is obvious blockage of the carousel, clear it if possible. You can remove the toner release assembly if you need better access. Examine the toner carousel interlock. If it is broken, replace it.</p> <p>If there is no evidence of blockage, reconnect J2006 and J2016 on the mechanical controller board and test the printer. If the problem persists, work inward and confirm the cable connection at the carousel position sensor, replacing the photo-interrupter as required.</p>
11	<p>The DC controller has detected an error in the laser/scanner assembly.</p> <p>On site, check connections at J102, J110, and J111 on the DC controller board and at the connectors on the laser/scanner assembly. Test the printer. If the problem persists, replace the laser/scanner assembly.</p> <p><b>Note:</b> In rare instances, a faulty cable could also return this error.</p>
12	<p>The DC controller has detected a main motor error. On site, remove J2013 from the mechanical controller board and reconnect it. Test the printer. If the problem persists, replace the main motor.</p>
13	<p>The DC controller has detected a drum motor error. On site, remove J2015 from the mechanical controller board and reconnect it. Test the printer. If the problem persists, replace the printer drive assembly.</p>

## Extended POST (EPOST)

**Table 8. POST Codes Notes (Continued)**

Note	Service Action Required
14	The DC controller has detected an I/O controller fan error. On site, remove J2010 from the mechanical controller board and reconnect it. Test the printer. If the problem persists, replace the I/O controller fan
15	The DC controller has detected a fuser fan error. On site, remove J2012 from the mechanical controller board and reconnect it. Test the printer. If the problem persists, replace the fuser fan.
16	The DC controller has detected a main fan error. On site, remove J2019 from the mechanical controller board and reconnect it. Test the printer. If the problem persists, replace the main fan.
17	<p>When all four lights flash, there is an error that could not be detected within the short span of POST. There are three errors of this type, the laser/scanner error and certain kinds of fuser and carousel errors.</p> <p><b>Note:</b> The type of fuser error that flashes four lights during POST will appear as a detected fuser error (yellow + zero) if you switch off and immediately restart the printer.</p> <p>Over the phone, ask the customer to restart the printer. If the four lights resume flashing, the problem is probably in the laser/scanner assembly or carousel, in that order. If the fuser error appears, go to note 4.</p> <p>On site, initiate EPOST and act on the resulting error code.</p>

---

Some error conditions that stop printer operation cannot be detected within the short period of time that POST runs. When this occurs, the status panel flashes all four primary lights.

To identify the specific error condition that is causing the “all flashing” array, you must restart the printer under Extended POST (EPOST). This mode simply extends the amount of time given to the testing, so that all errors are detectable. It also reports on jams and consumables. See Figure 32, “EPOST Codes Matrix.”

Whereas POST messages can be relayed to you by the customer over the phone, EPOST requires that you be at the printer.

To initiate EPOST, you must have the printer loopback test plug (P/N 922-1489). This test plug is colored bright green to differentiate it from the older version black plug. Do not use the black plug on the Color LaserWriter 12/600 PS. It won't harm anything; it just won't work.

Switch off the printer and install the test plug into the LocalTalk port on the back of the I/O controller board. Switch the printer on. The printer will now behave normally, except that the startup sequence will last longer. In addition, if no error is detected by Extended POST, an EPOST test page (Figure 31) will print before control is passed on to the PostScript interpreter.

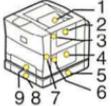


**Figure 31. EPOST Test Page**

**Note** Remember to remove the loopback plug after running EPOST.

Extended POST (EPOST) reports the errors shown in Figure 30, “POST Codes Matrix,” plus all the errors shown in Figure 32, “EPOST Codes Matrix.” Note that EPOST consumable and jam errors do not necessarily correspond to status panel readouts during normal operation.

⚡ = Flashing



		Toner Lights	Access Lights	Maintenance Lights	Error Designation
					7 (none) Low Magenta
					7 (none) Low Cyan
					7 (none) Low Yellow
					7 (none) Low Black
					7 (none) No Magenta Cartridge
					7 (none) No Cyan Cartridge
					7 (none) No Yellow Cartridge
					7 (none) No Black Cartridge
					7 (none) Low Fuser Oil
					7 (none) No Fuser Oil
					7 (none) Photoconductor Warning
					7 (none) Photoconductor End of Life
					7 (none) No Photoconductor
					3 (none) No Cleaning Web
					3 (none) No Fuser Assembly
					7 (none) Toner Disposal Box Full
					6 (none) Pickup Block Door Jam
					7 (none) Front Door Jam
					2 (none) Fuser Door Jam
					1 (none) Top Access Door Jam
					6, 8, 9 (none) Pre-Registration Jam
					6, 8, 9 (none) Leading Edge Jam
					1, 6, 7 (none) Transfer Grip Jam
					1, 7 (none) Transfer Drum Jam
					3 (none) Paper Delivery Jam

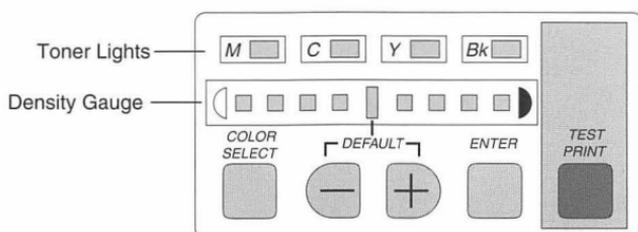
Figure 32. EPOST Codes Matrix

## Density Control Panel

The density control panel on the rear of the printer can be used to generate a service test page and to set three distinct types of adjustments. Some adjustment settings are persistent (i.e., they will remain in effect after a printer restart), and some are nonpersistent (i.e., they will default to factory setting after a printer restart).

**Important** Changing the density settings may adversely affect the output quality.

In addition to the test print button, the density control panel (see Figure 33) has four toner-indicator lights along the top, an LED density gauge in the middle, and four input buttons along the bottom of the panel.



**Figure 33. Density Control Panel**

These controls have the following functions:

1. **TEST PRINT** button: Press this button to generate a service test page. If the printer is in energy-saving mode, you must either print to the printer or restart the printer before you can run a service test page.
2. **ENTER** button: Engages the currently selected value.

**Note** Items 3 through 6 are labelled on the panel according to their density adjustment functions. During other adjustments, ignore the labels and the functions described below.

3. **COLOR SELECT** button: Selects the color whose density you want to adjust.
4. **Density gauge**: Indicates the currently selected density value for the selected color. Light density to the left, dark to the right.

**Note** During printer-ready state, you can tell if the density settings are not at the factory default by looking at the center density gauge LED above the word **DEFAULT**. If this LED is off, then the density settings have been changed from the default.

5. **Plus/minus (+/-) buttons**: Advance the density gauge setting (lighter or darker).
6. **Toner Lights**: An illuminated toner light indicates the color that is being adjusted.

## Density Adjustments

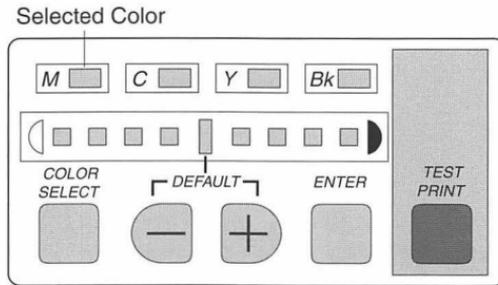
This feature is offered for customers who have multiple Color LaserWriter 12/600 PS printers in a single location and need to adjust one printer to match the output of another.

**Important** The range of settings is limited. Use this feature only if you have prior experience in four-color density adjustments.

The printer needs to be switched on and in a ready state to make density adjustments. Density adjustments are persistent.

To adjust the density,

1. Press the **COLOR SELECT** button as many times as necessary until the desired toner light illuminates.



**Figure 34. Density Adjustments**

2. Press the plus or minus button to change the setting for that color. One of the density gauge LEDs will light whenever the selected setting differs from the previously entered setting.
3. Repeat steps 1 and 2 if you want to adjust other colors.
4. Press the **ENTER** button to engage the settings.

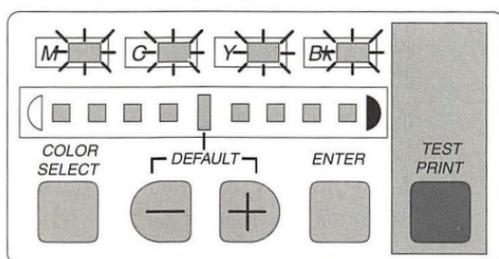
**Note** If you want to quickly return the printer to its factory defaults, press and hold both the plus and minus buttons for at least five seconds.

## Test Page Pattern Selection

Test pattern selection mode (see Figure 35) allows you to select one of six test page patterns based upon which one would best confirm a print quality issue.

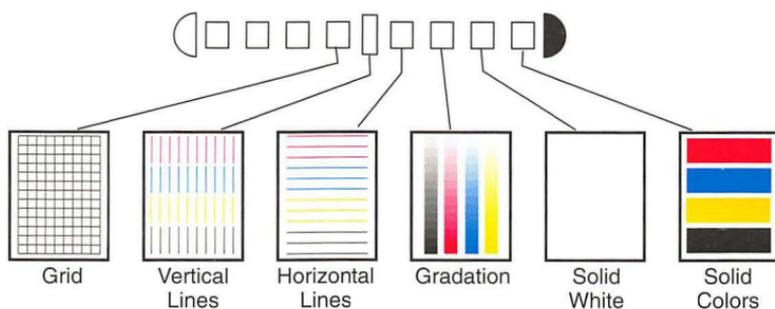
Test pattern selection is nonpersistent. After restart, the test page reverts to the default vertical line pattern. To activate test pattern selection mode,

1. Hold down the **COLOR SELECT** button and press the **ENTER** button eight times. The four toner lights will flash to indicate that you are in the test pattern selection mode (Figure 35).



**Figure 35. Test Pattern Selection Mode**

2. Using the plus or minus button, advance the density gauge setting to illuminate the LED corresponding to the desired pattern (Figure 36). The density gauge LEDs will flash when the selected setting differs from the previously entered setting. (Only LEDs 4 through 9 on the density gauge correspond to available patterns.)



**Figure 36. Test Patterns**

3. Press the **ENTER** button to engage the setting. If you make no further adjustments, the printer will exit from the test pattern selection mode in 30 seconds.

---

## Separation Voltage Designation

This feature allows you to override the printer sensing system and force the separation discharge assembly on or off. Forcing-on is intended as a failsafe in some image-offset problems or in low temperature/low humidity conditions where paper is not properly separating from the transfer drum. Forcing-off is a countermeasure against displacement.

The separation voltage designation is nonpersistent. After restart, the designation will revert to automatic. To force on the separation discharge assembly,

1. Hold down the COLOR SELECT button on the density control panel and press the ENTER button three times. The yellow and black toner lights will flash to indicate that you are in the separation voltage designation mode.
2. Using the plus or minus buttons, advance the density gauge setting to illuminate the LED corresponding to the desired designation. The density gauge will flash whenever the selected setting differs from the previously entered setting. Only LEDs 4, 5, and 6 on the density gauge correspond to available designations:
  - LED 4 is Separation Voltage Forced ON
  - LED 5 is Automatic (Separation Voltage Determined by Sensing System)
  - LED 6 is Separation voltage Forced OFF
3. Press the ENTER button to engage the setting.

## Diagnostic Utility

The Color LaserWriter Service Utility is a stand-alone application for the Macintosh that lets you interact with the printer in real time. You connect the computer to the printer's I/O Test (IOT) connector by means of a special diagnostic interface cable, part number 922-1703 (Figure 37).

The IOT connector is J109 on the DC controller board. It is accessible through the left side of the printer (see Figure 37). If the left cover is in place, you must remove the small IOT access plate built into the cover.

With the diagnostic utility, you can upload and download printer parameters from the DC controller board.

### Note

Use the utility whenever you replace the DC controller board in the Color LaserWriter 12/600 PS. The utility creates a file containing the parameter settings stored in the EEPROM on the existing DC controller board. After changing the controller board, transfer the settings from the file to the EEPROM on the new controller board.

The diagnostic utility can be found on the *MacTest Pro Diagnostic CD* and on *Service Source*. Refer to the CD for modifications of the Color LaserWriter Service Utility and for information on how to operate the utility.

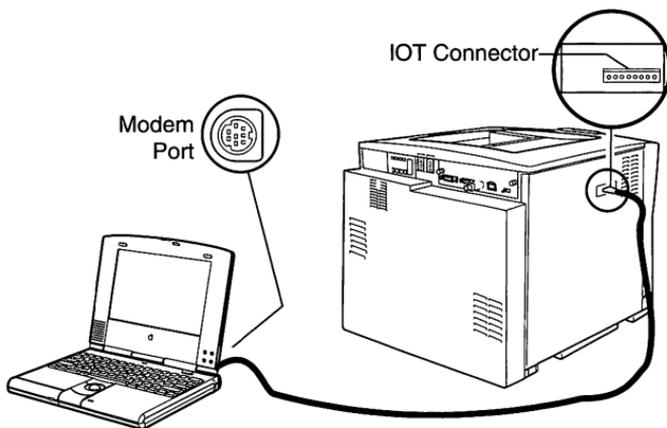
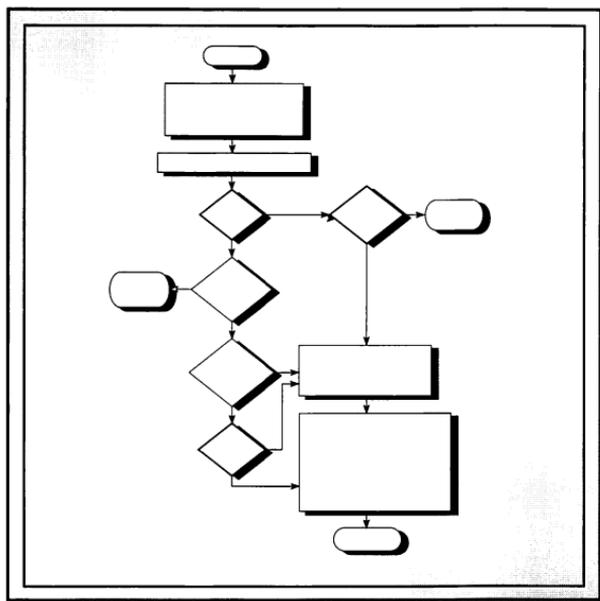


Figure 37. Diagnostic Connection

# Troubleshooting



Troubleshooting Checklist	80
Tools	81
Verifying Printer Operation	82
Observing the Printer in Validation State	84
Troubleshooting Flowcharts	85
Symptom-Driven Troubleshooting	91
Print Quality Issues	93
Troubleshooting Tables	98
Paper Transport Troubleshooting	118
Troubleshooting Locators	123
J-Connector Locators	128
Sheet Feeder Wiring Diagram	130
Color LaserWriter 12/600 PS Wiring Diagram	131
Power and Drive Train Views /Disassembly	133

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## Troubleshooting Checklist

Before troubleshooting the printer, make sure that you have checked the following items in the order in which they are listed.

1. Make sure that the printer is on a flat, sturdy surface and that it is isolated from vibrations, direct sunlight, or environmental conditions that do not meet specification.
2. Install the photoconductor cartridge and toner disposal box and lower the disposal box cover.
3. Examine each cartridge and make sure that its inner workings are locked and cannot turn within the cartridge housing.

### Note

If you can turn the inner housing to see the toner-coated developing cylinder, the cartridge is not locked. Hold the cartridge in your hands with the dark black inner housing facing up. Turn the inner housing until it clicks into place and cannot turn any more.

4. Load each toner cartridge into its corresponding bay.

### Note

If you cannot install a cartridge, make sure that its sealing tape is removed and that you are installing the cartridge according to the instructions in the user guide. After you load the fourth cartridge, advance the carousel manually another half-revolution to assure that the fourth cartridge is installed correctly.

5. Make sure that the fuser oil bottle is installed and that the oil bottle clamp is in an up position.
6. Load the cassette tray with paper that is approved for use in this printer and install the cassette into the printer.
7. Raise the transfer drum lever and close the front door.
8. Close the pickup block door and fuser access door if they are open.
9. If you have just run EPOST, remove the loopback test plug from the I/O controller board.
10. Plug in the printer.
11. If you are on-site with a Macintosh, connect the Macintosh to the AppleTalk connector on the I/O controller board.

---

## Tools

The following tools are required for servicing the Color LaserWriter 12/600 PS printer:

- PowerBook computer with AppleTalk connectors, or suitable Macintosh
- Color LaserWriter Service Utility with diagnostic interface cable
- Digital multimeter
- Phillips screwdriver (various sizes)
- Medium size flat-blade screwdriver
- Precision flat-blade screwdriver set
- Needle-nose pliers
- Cotton gloves (for use with transfer drum)
- Extraction syringe (for use with the fuser assembly)
- Lint-free paper or cloth
- Photoconductor cartridge tray

The following tools are recommended for servicing the printer:

- Vacuum designed for servicing of xerographic copiers.
- Magnifying loupe
- Dental mirror for inspecting the oil-overflow sensor

**Note** It is highly recommended that you use magnetized screwdrivers when working on this printer.

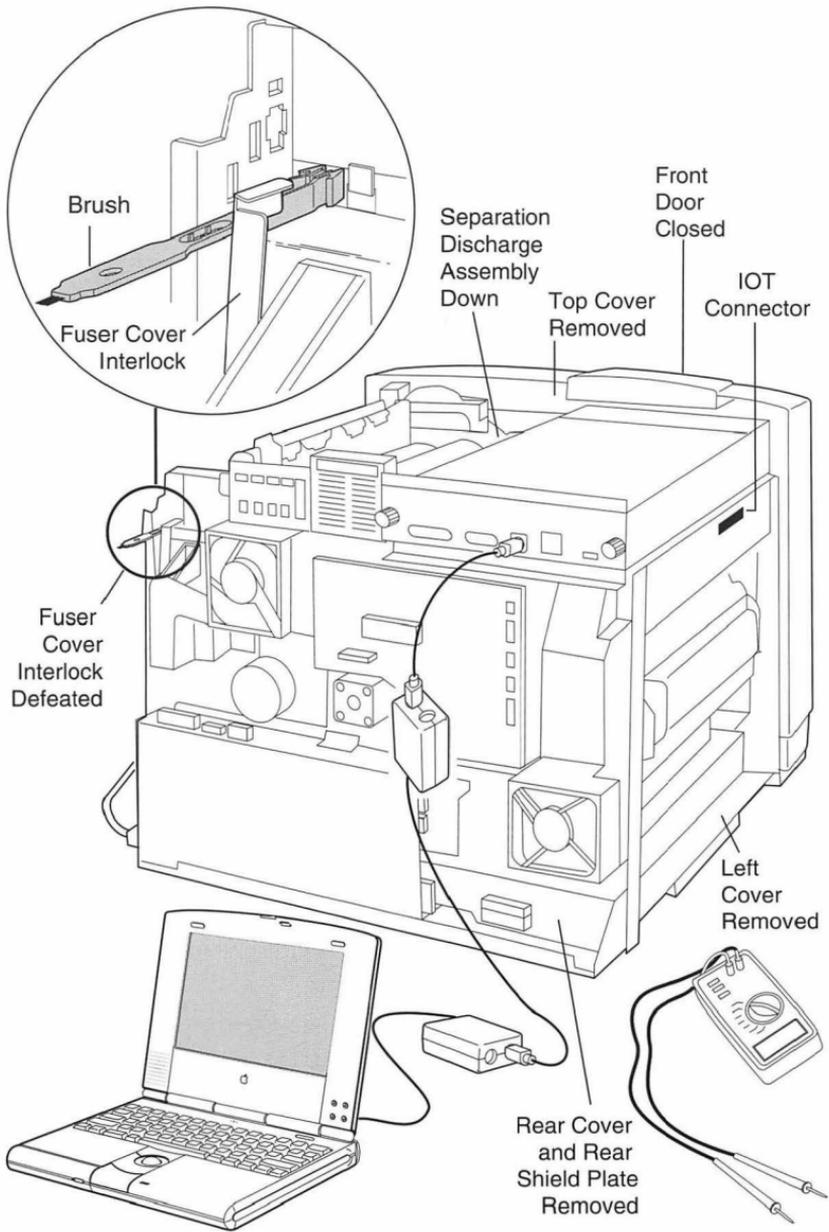
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## Verifying Printer Operation

To observe an operational engine, place the printer into the validation state (Figure 38). The validation state is also the point in reassembly where you should verify printer operation.

To place the printer into the validation state,

1. Remove the top cover, left cover, rear cover, rear shield plate and fuser access cover. Make sure that all consumables are installed correctly, that the front door and pickup block door are closed, and that the separation discharge assembly is down and resting just above the transfer drum. Plug in the printer.
2. Defeat the fuser cover interlock by wedging the green cleaning brush tool between the chassis and the actuator plate.
3. If you have a PowerBook computer with proper cabling, connect it to either the LocalTalk port on the I/O controller board or the IOT connector on the DC controller board (see “Diagnostic Utility” in Chapter 6 for more information).



**Figure 38. Printer Validation State**

---

## Observing the Printer in Validation State

The printer in validation state is its own best instructional and training aid. When you first have an operational printer in this state, observe as much as you can, paying special attention to the following.

### **Door Switch**

Before you turn on power, open and close the doors and observe how the door switch cam assembly works. Only when all three doors are closed will the door switch be pressed.

### **Front Door**

With power still turned off, open the front door and advance the toner carousel by pressing and turning the green carousel knob. Observe how the manual rotary assembly meshes with the carousel when you press the knob and how the toner cartridges remain plumb as you rotate the carousel.

As you close the door, observe how the door presses against the knob and elevates the tip of the carousel interlock. Also note the other two actuators that slide into the chassis. The large one nearer the hinge opens the laser shutter and the small one on the right strikes a transfer rod that actuates the door switch.

### **Main Motor**

Observe the behavior of the main motor and the three fans. When you see the main motor spin or fans rotate, you know that power is at least getting as far as the mechanical controller board.

### **Carousel**

Watch and listen as the carousel rotates to check for presence of toner cartridges. When the calibration tests begin, look between the mechanical controller board and the main fan and observe the bolt action of the cartridge press drive gear.

### **Fuser Bulb**

Observe how the fuser bulb glows during warmup. This glowing confirms that the fuser bulb circuit is intact.

### **Solenoids**

Observe the solenoids as they release press drive into the cleaning brush and discharge roller. At the end of density calibration, observe how the cleaning belt drive solenoid behaves like a small piston to advance the cleaning belt.

### **Imaging**

Through the top of the printer, observe the calibration patches being placed onto the transfer drum, and listen as the cleaning brush is powered on to clean off the drum. If the startup page prints, notice the layering of colors as the paper comes to the top of the drum and, finally, how the separation claw actuates to skim the paper from the drum.

## Troubleshooting Flowcharts

This section is geared toward a procedural approach to troubleshooting. If you do not know where to start, or you want to verify printer operation after servicing, go to Flowchart A.

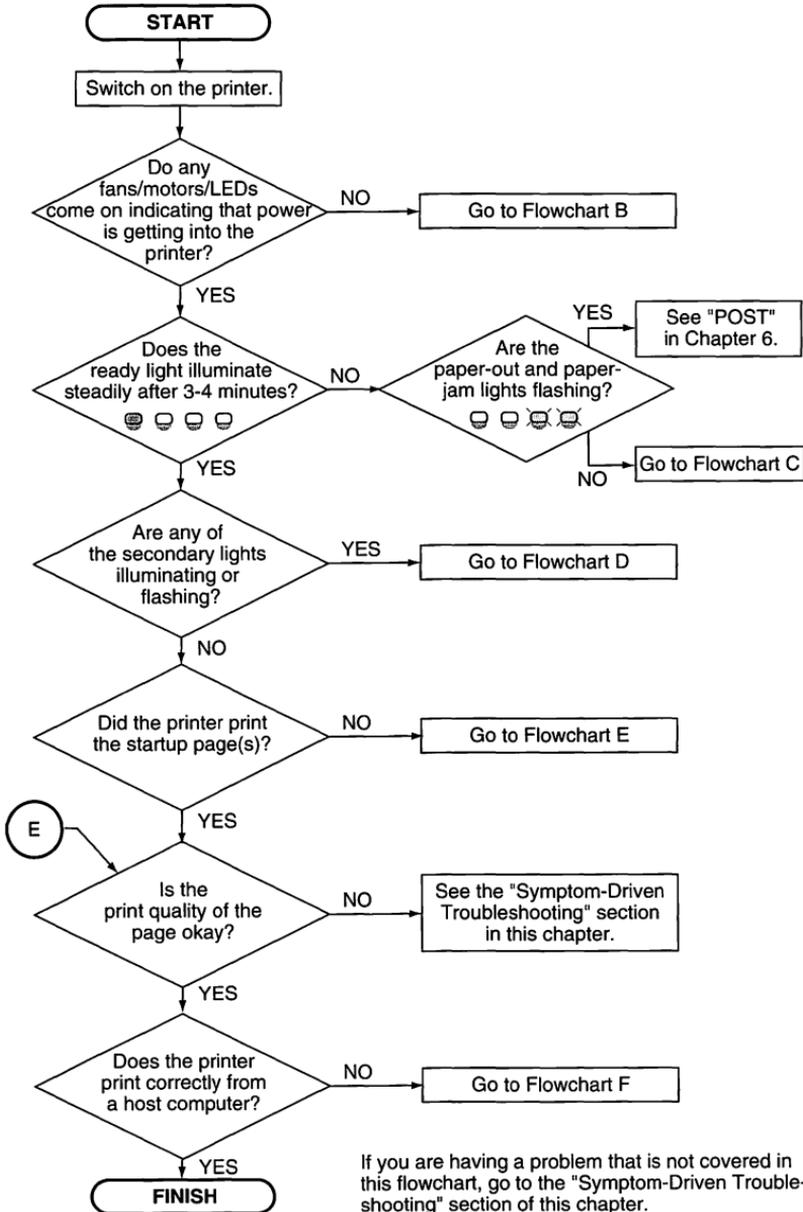
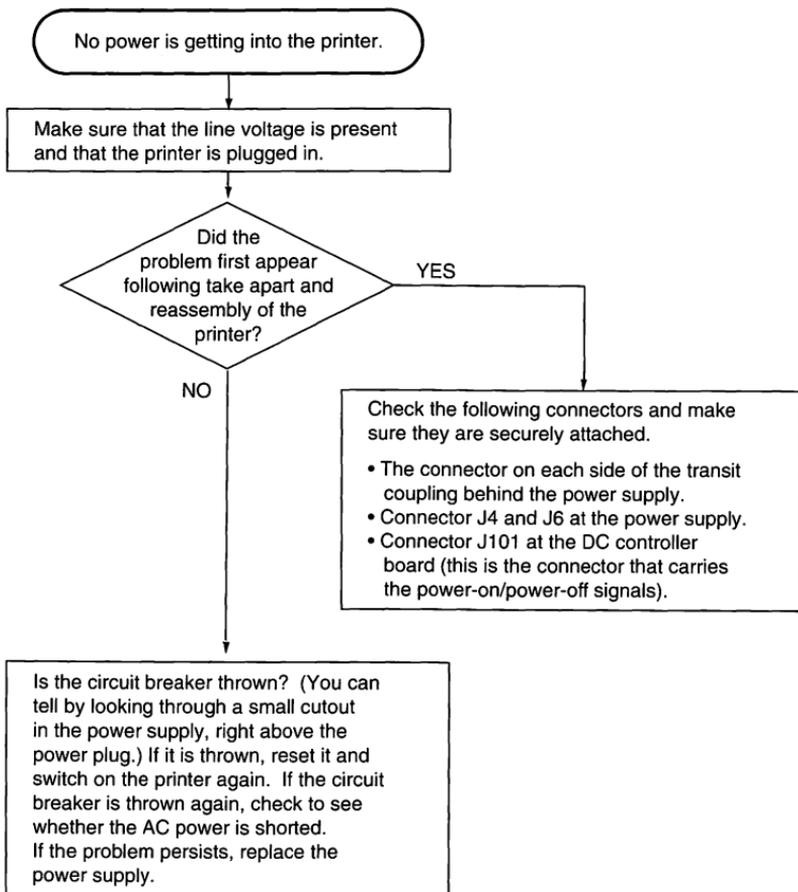


Figure 39. Flowchart A



**Figure 40. Flowchart B**

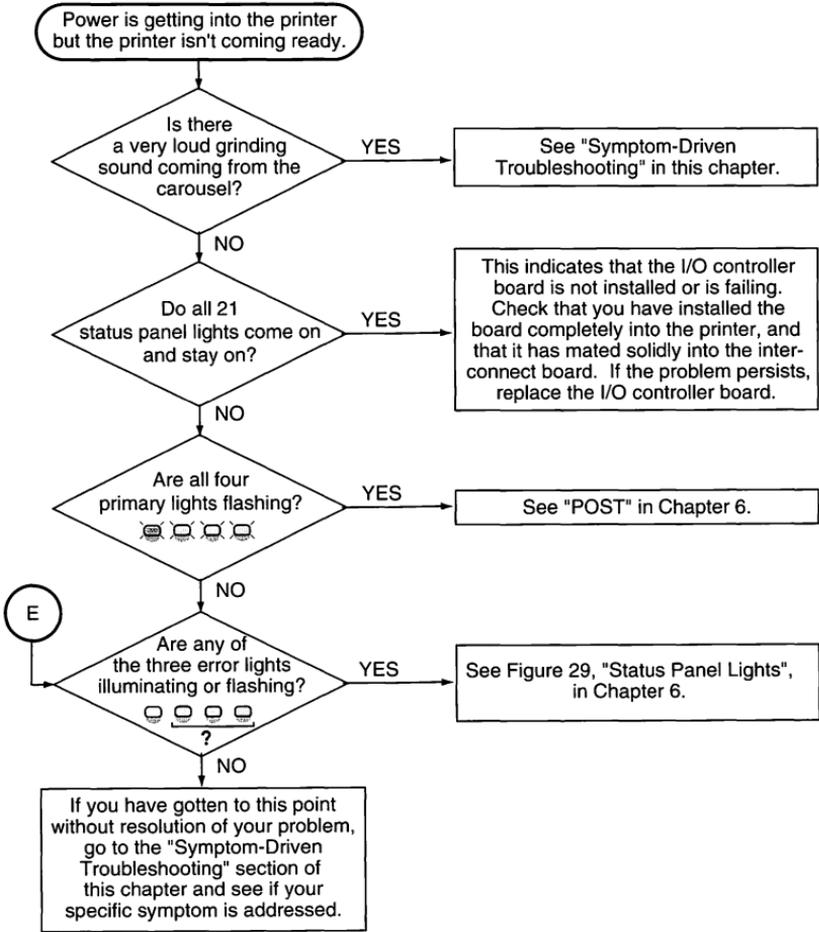
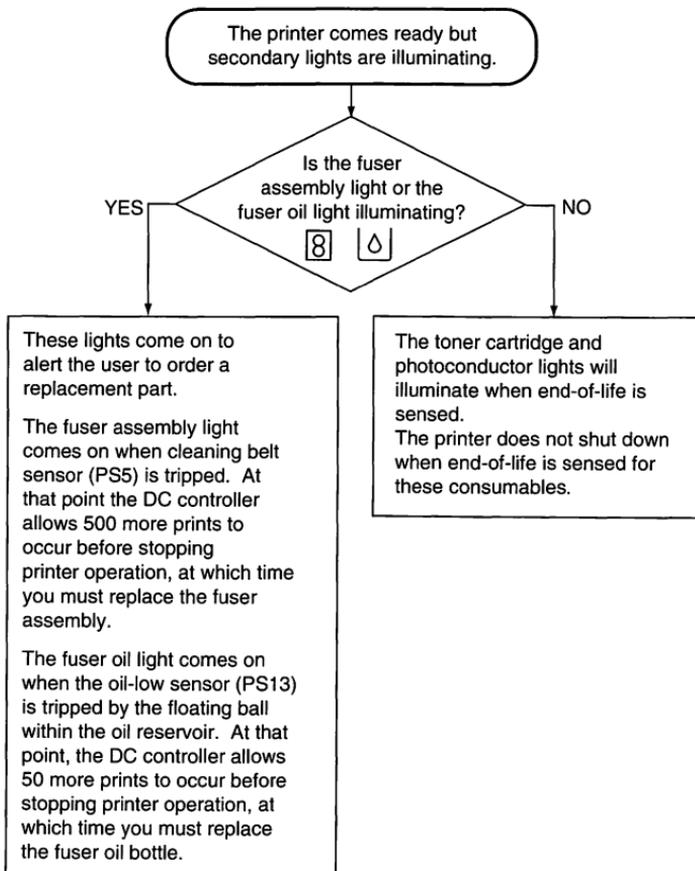
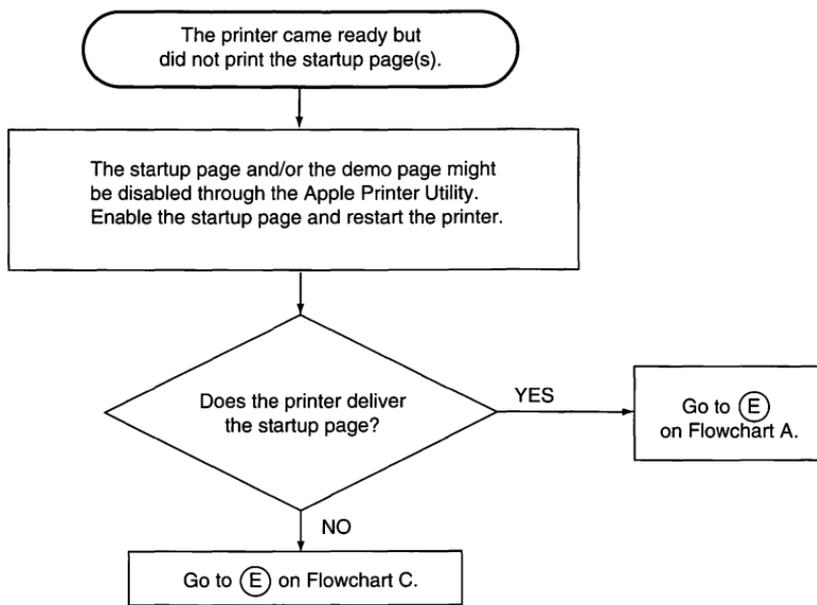


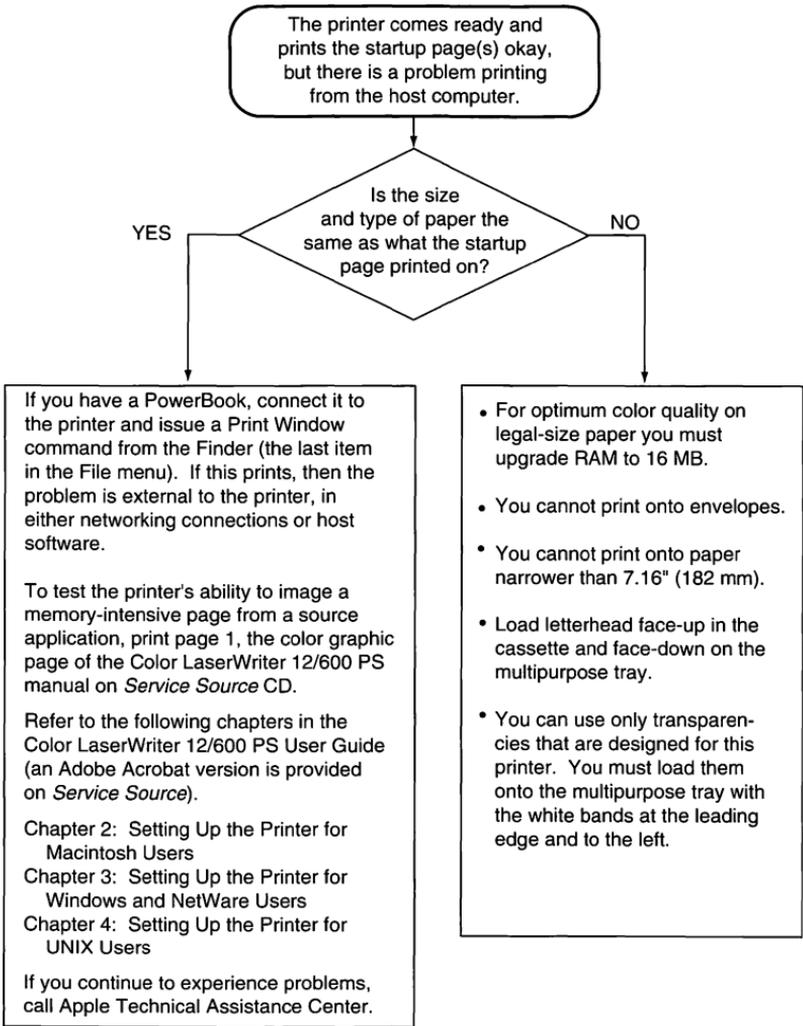
Figure 41. Flowchart C



**Figure 42. Flowchart D**



**Figure 43. Flowchart E**



**Figure 44. Flowchart F**

### **Front Door Opens Too Easily.**

When you open and close the front door with the power on, the DC controller assumes that you have opened the door to clear a jam, and drives the cleaning brush to remove scattered toner. This causes a delay. If you want to tighten the door so that you do not open it inadvertently, perform the “Front Door Latch Adjustment” procedure described in the Take Apart chapter of the Color LaserWriter 12/600 PS manual on *Service Source* CD.

---

### **Paper Jams or Blank Pages**

The Color LaserWriter 12/600 PS is the first printer from Apple in which high-voltage power plays a role in both paper handling and image quality. Inadequate transfer of high-voltage power to the attraction roller, separation discharge assembly, or the transfer drum itself can result in paper jams, while the cutting of high-voltage to imaging rollers can result in blank pages. If you experience such a problem, refer to the lower right corner of the wiring diagram in this chapter. Note what cables are going to what locations, and make sure that all connections and contacts are secure.

---

### **Loud Grinding Sound From Toner Carousel**

This indicates blockage of the carousel. If the printer has not yet been operational, the problem is likely to be in initial setup, probably in the handling of the toner cartridges. See “Troubleshooting Checklist” for information on locking the internal workings of the cartridge.

If the printer has been operational, and this problem arose suddenly, place the printer into a validation state (see “Verifying Printer Operation” in this chapter). Examine the carousel manual rotary assembly and the carousel interlock. Remove the toner release assembly, if you need more space to clear blockage.

---

### **Paper Intermittently Jams at the Separation Claw or Doesn't Come Off the Transfer Drum at All**

The problem might be environmental. Force the separation voltage on (see “Separation Voltage Designation” in Chapter 6), and see if the problem improves. This setting will not persist after printer shutdown, so it will need to be reentered.

---

## **Printing Software Not Installed**

Desktop printing software requires System 7.1.1 (Finder 7.1.3) or later. If you have System 7.1, then Print Monitor 7.1.2 has been installed. To get desktop printing capability, install System 7.1.1 or later, and reinstall the Color LaserWriter 12/600 PS software.

---

## **Page Count Keeps Resetting Every Time the Printer is Turned Off**

The Color LaserWriter 12/600 PS uses a 3.6-volt lithium battery at location BT1 on the I/O controller to retain the page count and other parameters when the printer is powered off. If the battery voltage drops or the battery is removed from the I/O controller, the page count information will no longer be retained. Consult the *Service Source* CD for additional information on battery testing and replacement procedures.

Replacement batteries are available through Service (part number 742-0011).

---

## **Moving the Printer Caused a Fuser Oil Pump Error**

Before moving a Color LaserWriter 12/600 PS to a new location make sure the oil has been properly extracted from the fuser. If oil is present in a printer that is being moved and tilted, the oil overflow sensor can become contaminated, which will cause the oil pump error. When the oil pump error occurs, servicing is required.

Before moving the printer, follow the extraction procedures described in Chapter 3.

---

## Print Quality Issues

This topic addresses general print quality defects that can occur in the Color LaserWriter 12/600 PS. Since color quality is largely subjective and some nuances are nearly impossible to describe, we encourage you to familiarize yourself with all the general issues covered in this topic.

**Note** Best quality paper will yield best results. If color matching is critical, discourage customers strongly from using colored or off-white paper. Avoid recycled paper, if possible.

---

### **Text Prints Fine, but Equivalent Bitmapped Text Prints Blurry and Exhibits a Fuzzy Halo Effect.**

When an object gets a full saturation of two colors, the haloing effect normal to all laser imaging is compounded. To offset this, the I/O controller checks incoming fonts and decreases their saturations slightly in cases where unacceptable haloing would otherwise occur. For example, a green font (100% cyan with 100% yellow) might be adjusted to 80% cyan and 80% yellow. This adjustment does not visually alter the color.

Since font ID drives this process, bitmapped text is ignored and is imaged as a normal graphic. To offset haloing in graphics, you must make adjustments by hand in the source application.

This same process allows live black text to be imaged in black toner only, instead of 100% saturation of cyan, magenta, and yellow. Live text will be extremely sharp; graphic text will tend to be blurry.

---

### **Two Color LaserWriter 12/600 PS Printers Print Slightly Different Colors When Printing the Same Document**

The printer is adjusted at the factory to produce the best possible image quality. If you want to change from these defaults, see “Density Control Panel” in Chapter 6.

---

### **One Color Prints Too Light**

First check that the “Default” light is illuminated on the density control panel (refer to Chapter 6, “Test Page Pattern Selection”). If it is illuminated, hold the plus and minus keys down for at least five seconds to return density settings to factory settings.

If this does not solve the problem, the next step is to install a known-good toner cartridge for the color that is not printing. If the problem persists, select the “Solid Colors” test pattern (refer to Chapter 6, “Test Page Pattern Selection”) and print a service test page.

---

If the problem does not appear on the service test page, then the problem is not with the engine. If the problem exists on the solid colors service test page, initiate EPOST (see “Extended POST (EPOST)” in Chapter 6) and print an EPOST Test Page.

---

### **Excessive Background Toner**

This problem can occur if fuser oil migrates onto the surface of the transfer drum or photoconductor. The area affected will vary depending on the extent of oil contamination. The recommended procedure for cleaning the transfer drum and photoconductor is to print blank pages until the problem clears up. It may be necessary to print 50–100 sheets for the problem to disappear completely.

---

### **Banding**

The term “banding” is generically defined as nonuniform density along the length of the page, and usually appears as some kind of horizontal print defect. Banding can be very difficult to measure but is easily discerned by the human eye.

Banding caused by electrophotographic and high-voltage processes has been minimized in this printer, but will appear in some cases. This banding is a natural function of digital imaging and cannot be completely remedied.

To minimize this effect, try to avoid large flat areas of color, as they will most readily reveal this type of banding, and keep the printer away from machinery that might cause excessive vibration. In addition, take care in maintaining the printer and in keeping it clean and level.

Banding caused by mechanical processes can be remedied. See “Horizontal Defects” and refer to Table 25.

#### **Note**

Customers who have damaged their photoconductor during installation describe the problem as banding. The problem occurs frequently.

---

## Horizontal Defects

Horizontal print defects that occur vertically and repetitively down a single page are almost always caused by dirty or damaged rollers. By measuring the tracks on the page and noting the side of the page that the tracks are on, you can isolate horizontal defects to a specific roller within the printer. The following table lists the major rollers within the printer and the kinds of defects caused by them.

**Table 9. Roller Diameters**

<b>Roller</b>	<b>Defect Interval</b>	<b>Possible Defects</b>
Upper Fuser Roller	5.27" (134 mm)	Repetitive tracking on front of page
Lower Fuser Roller	5.27" (134 mm)	Repetitive tracking on back of page
Photosensitive Drum	5.07" (129 mm)	Repetitive tracking, spots, or lines on front of page
Developing Cylinder	1.96" (50 mm)	Blank spots, tracks on front of page
Primary Charging Roller	1.49" (38 mm)	Blank spots, tracks on front of page
Attraction Roller	1.96" (50 mm)	Tracking on front or back of page
Discharge Roller	1.96" (50 mm)	Tracking on back of page
Cleaning Brush	3.70" (94 mm)	Tracking on back of page
Fuser Delivery Rollers	2.48" (63 mm)	Tracking on front or back of page

---

## **Oil Spots on the Paper**

The purpose of silicone oil is to prevent the layers of toner from sticking to the fuser rollers. Oil spots on paper should occur infrequently, and then usually on the back of the page. Some factors that are known to increase the incidence of oil staining are

- Failure to remove the orange spacers from inside the fuser access door.
- Turning the printer on and off repeatedly over a short period of time (e.g., five times in an hour).
- A printer coming out of a very long standby mode may exhibit some staining on the first couple of pages.
- Using recycled paper over a prolonged period can plug the fuser's oil filter which in turn can cause long streaks on the back of the paper.

---

## **Small Amounts of Toner on the Page**

To prevent small amounts of toner on the page, clean the toner off the following areas:

- Clean the density sensor and separation discharge wire with the brush provided, as described on page 223 of the user guide. Clean the paper pickup area as described on page 226 of the user guide.
- Print ten blank pages. This will help clean toner off rollers.

---

## **“Best” Print Quality Mode**

Selecting the “Best” mode in the print dialog box adds one rotation to the transfer drum. This additional rotation occurs before any imaging to allow the paper to fully adhere to the transfer drum. This precaution corrects small registration problems that might occur during the imaging of the magenta layer, the first color that is transferred.

Figure 45 shows examples of image quality defects. Refer to the appropriate troubleshooting table to correct the quality of the image.



**Light/Faded Image**  
See Table 10



**Dark Image/Overexposure**  
See Table 11



**All-Blank Page**  
See Table 12



**All-Black Page**  
See Table 13



**Dirt on Back**  
See Table 14



**Spots Every 5.07" (129 mm)**  
See Table 15



**Vertical Line(s)**  
See Table 16



**White Vertical Line(s)**  
See Table 17



**White Horizontal Lines**  
See Table 18



**Blank Spots**  
See Table 19



**Bad Fusing**  
See Table 20



**Distortion**  
See Table 21



**Color Aberration**  
See Table 22



**Streaking**  
See Table 23



**Oil Stains**  
See Table 24



**Banding**  
See Table 25

**Figure 45. Print Quality Problems**

## Troubleshooting Tables

**Table 10. Light/Faded Image**

Step	Check	Result	Action
1	Set the image density to the default settings (refer to Chapter 6, "Test Page Pattern Selection"). Does the image quality improve?	Yes No	Problem solved. Operate the density control panel to adjust the density.
2	Replace the photoconductor with a known-good photoconductor.  <b>Note:</b> You must download printer parameters before doing this procedure (refer to "Diagnostic Utility" in Chapter 6). Does the problem persist?	Yes  No	Check the continuity between the transfer drum-use contact and the high-voltage PCB.  Clean the high-voltage contact and ensure the continuity. If the problem persists, replace the defective part.  Problem solved.
3	Replace the toner cartridge with a known-good cartridge. Does the problem persist?	No	Problem solved.
4	Open the front cover during printing. Is the toner image on the photosensitive drum surface being sufficiently transferred?	Yes	Proceed to Step 7.
5	Replace the paper supply. Does the print image darken when you use new paper?	Yes	Problem solved. Advise the user on paper storage.
6	After cleaning the developing bias-use contact and the toner cartridge contact, does the image density improve when you print a test page?	Yes No	Clean the contacts and ensure their connections.  Replace and check in the following order: • High-voltage power supply • Mechanical controller board

**Table 11. Dark Image/Overexposure**

Step	Check	Result	Action
1	Set the image density to the default settings (see "Note" under "Density Adjustments" in Chapter 6. Does the image quality improve?	Yes	Problem solved.
		No	Operate the density control panel to adjust the density.
2	Is the lens of the density sensor assembly soiled?	Yes	Clean the density sensor using the procedures listed in the maintenance section of the user's guide.
3	The photoconductor may be worn out. Replace the photoconductor with a known-good photoconductor. Does the problem persist? <b>Note:</b> You must download printer parameters before doing this procedure (refer to "Diagnostic Utility" in Chapter 6).	Yes	Replace and check in the following order: <ul style="list-style-type: none"> <li>• High-voltage power supply</li> <li>• Mechanical controller board</li> </ul>
		No	Problem solved.
4	Make sure the software being used supports ColorSync. Does the problem persist?	Yes	Replace the software with the LaserWriter 8.3 driver or later.
		No	Finished.

**Table 12. All-Blank Page**

Step	Check	Result	Action
1	Is the laser shutter actuator on the inside of the front door damaged?	Yes	Replace the front door.
2	Does the laser shutter open completely when you press the shutter arm?	No	Refer to Symptom-Driven Troubleshooting, "Paper Jams or Blank Pages," in this chapter.

**Table 12. All-Blank Page (Continued)**

Step	Check	Result	Action
3	Is there continuity between the developing bias contact plate and the high-voltage power supply?	Yes	Replace and check in the following order: <ul style="list-style-type: none"><li>• High-voltage power supply</li><li>• Mechanical controller board</li></ul>
		No	Replace the high-voltage cable.

**Table 13. All-Black Page**

Step	Check	Result	Action
1	Install a known-good photoconductor.	Yes	Replace and check in the following order: <ul style="list-style-type: none"><li>• High-voltage power supply</li><li>• Mechanical controller board</li></ul>
	<b>Note:</b> You must download printer parameters before doing this procedure (refer to “Diagnostic Utility” in Chapter 6).  Does the problem persist?	No	Problem solved.

**Table 14. Dirt on Back**

Step	Check	Result	Action
1	Is the back of the paper periodically soiled?	Yes	Refer to Table 9, “Roller Diameters,” in this chapter to pinpoint the soiled roller and clean it. Replace it if you cannot clean it.

**Table 15. Spots Every 5.07" (129 mm)**

Step	Check	Result	Action
1	Spots or marks that repeat vertically down the paper every 5.07" (129 mm) are typically the result of a scratch, scuff mark, or other defect on the surface of the photoconductor. Damaged photoconductors cannot be repaired. Has the image quality improved?	No	Replace the photoconductor.
2	Are there repeating defects which occur at intervals <i>other than</i> 5.07 inches?	Yes  No	Refer to Table 9, "Roller Diameters," in this chapter to identify the source causing the repeating defects.  Problem solved.

**Table 16. Vertical Line(s)**

Step	Check	Result	Action
1	Vertical lines that appear on printed output may result from a scratch on the surface of the photoconductor.  Is the line of a predominant color, such as cyan, magenta, yellow, or black?	Yes	The toner cartridge may be damaged. Replace the toner cartridge(s) associated with the colors that are appearing.
2	Does the image improve when you clean the separation corona wire?	Yes	Clean the wire.
3	Is the circumference of the upper fuser roller flawed?	Yes	Replace the fuser assembly.

<b>Step</b>	<b>Check</b>	<b>Result</b>	<b>Action</b>
1	Does a white vertical line appear for all colors?	No	Remove the cartridge of the color for which the white line is appearing. Distribute the toner powder by gently rocking the cartridge back and forth, as shown in Chapter 1 of the user guide.
2	Does the print quality improve when you clean the separation corona wire?	Yes	Clean the wire.
3	Is the oil applying mechanism abnormal?	Yes	Replace the fuser assembly.
4	Is there dirt, paper dust, etc., on the mirror in the laser/scanner unit?	Yes	Replace the laser/scanner assembly.
5	Is there foreign matter such as hair attached to the printer laser emission hole or the cartridge laser incidence hole?	Yes No	Remove the foreign matter. Check whether parts are making contact while the print paper is winding on the transfer drum.

<b>Step</b>	<b>Check</b>	<b>Result</b>	<b>Action</b>
1	Does a white horizontal line appear periodically?	Yes	Refer to "Horizontal Defects" and Table 9, in this chapter.
2	Check the photoconductor cartridge for visible defects. Does a horizontal line repeat every 5.07"?	Yes No	Replace the photoconductor cartridge. <b>Caution:</b> Make sure to move the teal green transfer drum lever to the right so the photoconductor cartridge does not get scratched during removal or replacement. Problem solved.

**Table 19. Blank Spots**

Step	Check	Result	Action
1	Is the paper within specification?	No	Print with recommended paper. If the outcome is good, ask the customer to use recommended paper.
2	Is the paper damp?	Yes	Replace the paper. Ask the customer to keep the paper wrapped to prevent moisture.
3	Does only one color exhibit blank spots?	Yes	Replace the toner cartridge of the color that exhibits the spots.
4	Are dirt, deformations, etc., visible on the transfer sheet?	Yes	Replace the transfer drum assembly.
		No	Replace the photoconductor cartridge.

**Table 20. Bad Fusing**

Step	Check	Result	Action
1	Does poor fusing appear vertically and in a line?	Yes	Check for flaws on the upper and lower fuser rollers.
2	Is the upper fuser roller soiled?	Yes	Clean the roller. If you cannot clean it, replace the fuser assembly.
3	Is oil uniformly applied to the upper fuser roller?	No	Check the operation of the oil applying assembly.
4	Is the fuser nip width within the standard?	Yes	Use paper that is within specification. If the outcome is good, ask the customer to use recommended paper.
		No	Replace the fuser assembly.

<b>Table 21. Distortion</b>			
<b>Step</b>	<b>Check</b>	<b>Result</b>	<b>Action</b>
1	Is the connection good between the DC controller board connector J208 and connectors J102, J110, and J111?	No	Reconnect them.
2	Is the connection good between the laser/scanner assembly connectors J401, J402, J451, and J701?	Yes	Replace and check in the following order: <ul style="list-style-type: none"> <li>• Laser/scanner assembly</li> <li>• DC controller board</li> </ul>
		No	Reconnect them.

<b>Table 22. Color Aberration</b>			
<b>Step</b>	<b>Check</b>	<b>Result</b>	<b>Action</b>
1	Is the transfer drum gripper damaged or is the gripper spring deformed?	Yes	Replace the transfer drum assembly.
2	Is the transfer sheet gouged or torn off?	Yes	Replace the transfer drum assembly.
3	Is the photoconductor cartridge gear worn or loose?	Yes	Replace the printer drive assembly.
4	Is the transfer drum gear worn or loose?	Yes	Replace the drum drive assembly.
		No	Check for nonuniformity or chattering of the transfer drum rotation.

**Table 23. Streaking**

Step	Check	Result	Action
1	Is the paper moist?	Yes	Replace the paper. Ask the customer to keep the paper sealed to prevent excess moisture absorption.
2	Does the print defect improve when you forcibly turn <i>off</i> the separation voltage? Refer to "Separation Voltage Designation," in Chapter 6.	Yes	Problem solved.
3	Was toner scattered on the print image after performing Step 2?	Yes No	Replace the paper. Replace and check as follows: <ul style="list-style-type: none"><li>• Separation discharge assembly</li><li>• Fuser assembly</li></ul>

**Table 24. Oil Stains**

Step	Check	Result	Action
1	Oil staining will occur naturally after the printer has been idle for an extended period or after the printer has been restarted often in a short period of time.	No	Refer to Print Quality Issues, "Oil Spots on the Paper," in this chapter.
	Does the oil staining disappear after a couple of prints?	Yes	Problem solved.

**Table 25. Banding**

Step	Check	Result	Action
1	<p>Check the photoconductor cartridge for damage.</p> <p>This problem is commonly described as banding, although it is caused by an installation error.</p> <p>Does the image quality improve when you print a test page?</p>	<p>No</p>          <p>Yes</p>	<p>Replace the photoconductor cartridge.</p> <p><b>Important:</b> Make sure to move the teal green transfer drum lever to the right before removing or inserting a photoconductor cartridge, or if the orange shipping screw isn't removed, then the surface of the photoconductor will be damaged when it rubs on the surface of the transfer drum as it is pushed into position.</p> <p>Problem solved.</p>

**Table 26. Fusing Failure (Abnormal Warm-Up)**

Step	Check	Result	Action
1	Check the connections at J112 on the DC controller board and J2007 on the mechanical controller board. Are they firmly connected?	No	Reconnect them.
2	Turn the power switch <i>off</i> , remove the fuser assembly and measure the resistance between connectors J21-5 and J21-6. Is it between 180 k $\Omega$ and 280 k $\Omega$ at room temperature?	No	Check the wiring between DC controller connector J112 and the thermistor and if it is normal, replace the fuser assembly.
3	Is there continuity between connectors J21-1 and J21-2 when the fuser assembly is removed?	No	Replace the fuser assembly.
4	Is there continuity between connectors J21-3 and J21-4 when the fuser assembly is removed?	No	Replace the fuser assembly.
5	Is the thermistor intact and making good contact with the lower fuser roller?	No	Replace the fuser assembly.
6	Is the thermistor surface soiled?	Yes	Clean it.
7	Is the problem solved when you replace the power supply?	Yes No	Finished. Replace and check as follows: <ul style="list-style-type: none"><li>• DC controller board.</li><li>• Mechanical controller board</li></ul>

**Table 27. Fusing Failure (Temperature High)**

Step	Check	Result	Action
1	Turn the power switch <i>off</i> , and remove the fuser assembly. Measure the resistance between connectors J21-5 and J21-6. Is it 1 k $\Omega$ or less?	Yes	Check the wiring between DC controller board connector J112 and the thermistor. If it is normal replace the fuser assembly.
		No	Replace and check as follows: <ul style="list-style-type: none"><li>• DC controller board.</li><li>• Mechanical controller board.</li></ul>

**Table 28. Fusing Failure (Heater Wire Breakage)**

Step	Check	Result	Action
1	Turn the power switch <i>off</i> and remove the fuser assembly. Is there continuity between connectors J21-1 and J21-2?	No	Replace the fuser assembly.
2	Is there continuity between connectors J21-3 and J21-4 when the fuser assembly is removed?	No	Replace the fuser assembly.
3	Is the problem solved when you replace the power supply unit?	Yes	Finished.
		No	Replace and check as follows: <ul style="list-style-type: none"><li>• DC controller board.</li><li>• Mechanical controller board.</li></ul>

**Table 29. Oil Overflow Failure**

Step	Check	Result	Action
1	Are the connections good at oil overflow sensor connector J29, fuser assembly connector J21, and mechanical controller board connector J2009?	No	Reconnect them.
2	Is there blockage in the hose between the oil bottle case and the gear pump?	Yes	Remove the blockage, or replace the fuser assembly.
3	Is the problem solved when you replace the fuser assembly?	Yes No	Finished. Replace and check as follows: <ul style="list-style-type: none"><li>• Mechanical controller board.</li><li>• DC controller board.</li></ul>

**Table 30. Main Motor Failure**

Step	Check	Result	Action
1	Are mechanical controller board connector J2013 and main motor connector J58 firmly attached?	No	Reconnect them.
2	Disconnect connector J7 from the power supply. When you turn the door switch (SW2) <i>on</i> , is there continuity between connectors J7-1 (+24 VB) and J7-2 (+24 VA)?	No Yes	Replace the door switch. Finished.

**Table 30. Main Motor Failure (Continued)**

Step	Check	Result	Action
3	About one minute after turning the power switch <i>on</i> , does the voltage between mechanical controller board connectors J2013-3 (/MON) and J2013-4 (GND) change from about 5 VDC to 0 V?	Yes  No	Replace the main motor.  Replace the mechanical controller board.

**Table 31. Drum Motor Failure**

Step	Check	Result	Action
1	Is mechanical controller board connector J2015 firmly attached?	No	Reconnect it.
2	Disconnect connector J7 from the power supply. When you turn the door switch (SW2) <i>on</i> , is there continuity between connectors J7-1 (+24 VB) and J7-2 (+24 VA)?	No	Replace the door switch.
3	Does the drum motor rotate?	No	Replace and check as follows: <ul style="list-style-type: none"><li>• Printer drive assembly.</li><li>• Mechanical controller board.</li></ul>
4	Is transfer drum top sensor connector J43 good?	Yes  No	Replace and check as follows: <ul style="list-style-type: none"><li>• Transfer drum assembly</li><li>• DC controller board</li></ul> Reconnect it.

**Table 32. Carousel Rotation Failure**

Step	Check	Result	Action
1	Does the toner carousel rotate?	Yes	Go to Step 5.
2	Is mechanical controller board connector J2016 firmly attached?	No	Reconnect it.
3	Disconnect connector J7 from the power supply. When you turn the door switch (SW2) <i>on</i> , is there continuity between connectors J7-1 (+24 VB) and J7-2 (+24 VA)?	No	Replace the door switch.
4	Does the developing unit motor rotate?	Yes	Replace and check as follows: <ul style="list-style-type: none"><li>• Printer driver assembly.</li><li>• Mechanical controller board</li></ul>
		No	Replace and check as follows: <ul style="list-style-type: none"><li>• Printer drive assembly</li><li>• Mechanical controller board</li></ul>
5	Are mechanical controller board connector J2006 and carousel position sensor connector J60 making good contact?	Yes	Clean the sensor. If it is not possible to clean it, replace and check as follows: <ul style="list-style-type: none"><li>• Developing rotary position sensor.</li><li>• Mechanical controller board</li></ul>
		No	Reconnect them.

<b>Step</b>	<b>Check</b>	<b>Result</b>	<b>Action</b>
1	Is mechanical controller board connector J2016 making good contact?	No	Reconnect it.
2	Disconnect J7 from the power supply. When you turn the door switch (SW2) <i>on</i> , is there continuity between connectors J7-1 (+24 VB) and J7-2 (+24 VA)?	No	Replace the door switch.
3	Does the developing unit motor rotate?	No	Replace and check as follows: <ul style="list-style-type: none"> <li>• Printer drive assembly</li> <li>• Mechanical controller board</li> </ul>
4	Are mechanical controller board connector J2006, toner cartridge position sensor connector J59, and carousel position sensor J60 good?	Yes	Replace and check as follows: <ul style="list-style-type: none"> <li>• Toner cartridge position sensor.</li> <li>• Carousel position sensor.</li> <li>• Mechanical controller board</li> </ul>
		No	Reconnect them.

<b>Step</b>	<b>Check</b>	<b>Result</b>	<b>Action</b>
1	Are the connectors J102, J110, and J111 making good contact on the DC controller board? Are laser/scanner connectors J401, J402, and J451 making good contact?	Yes	Replace and check as follows: <ul style="list-style-type: none"> <li>• Laser/scanner assembly</li> <li>• DC controller board</li> </ul>
		No	Reconnect them.

**Table 35. Laser Failure**

Step	Check	Result	Action
1	Are DC controller board connectors J110 and J111 making good contact? Are laser/scanner connectors J401 and J402 good?	Yes	Replace and check as follows: <ul style="list-style-type: none"> <li>• Laser/scanner assembly.</li> <li>• DC controller board.</li> </ul>
		No	Reconnect them.

**Table 36. Scanner Motor Failure**

Step	Check	Result	Action
1	Is DC controller board connector J102 making good contact?	No	Reconnect it.
2	Are there about 24 VDC between DC controller PCB connectors J102-10 (24 VB) and J102-5 (GND)?	No	Check whether +24 VDC is being supplied between DC controller board connectors J101-4 (24 VB) and J101-3 (GND). If it is not, replace the power supply.
3	Test print a page. Does the voltage between DC controller board connectors J102-8 (/SCNON) and J102-7 (GND) change from about 5 VDC to 0 V?	Yes	Replace the laser/scanner assembly.
		No	Replace the DC controller board.

**Table 37. DC Controller Failure (5 V/24 V)**

Step	Check	Result	Action
1	Are DC controller board connector J101 and power supply unit connector J4 making good contact?	Yes	Replace and check as follows: <ul style="list-style-type: none"> <li>• Power supply.</li> <li>• DC controller board.</li> </ul>
		No	Reconnect them.

<b>Table 38. Temperature/Humidity Sensor Failure</b>			
<b>Step</b>	<b>Check</b>	<b>Result</b>	<b>Action</b>
1	Are temperature/humidity sensor connector J73, and J15, and mechanical controller board connector J2005 making good contact?	Yes	Replace and check as follows: <ul style="list-style-type: none"> <li>• Temperature/humidity sensor.</li> <li>• Mechanical controller board.</li> <li>• DC controller board.</li> </ul>
		No	Reconnect them.

<b>Table 39. Fuser Fan FMI Failure</b>			
<b>Step</b>	<b>Check</b>	<b>Result</b>	<b>Action</b>
1	Is mechanical controller board connector J2012 making good contact?	No	Reconnect it.
2	Disconnect mechanical controller board connector J2012. Immediately after turning the power switch <i>on</i> , does the voltage between mechanical controller board connectors J2012-3 (FAND1) and J2012-1 (GND) change from 0 V to about 24 VDC?	Yes	Replace the fuser fan.
		No	Replace the mechanical controller board.

**Table 40. No DC Power**

Step	Check	Result	Action
1	Is there correct voltage at the outlet?	No	Plug in the printer at an outlet that is supplying the correct voltage.
2	Turn the power switch <i>off</i> , and disconnect connectors J3, J4, and J5. Plug in the power cable, and turn the power switch <i>on</i> . Are the above-mentioned power supply connectors correctly outputting DC power? Refer to the wiring diagram for detailed pin/voltage information.	Yes	Turn the power switch <i>off</i> , connect one of the disconnected connectors, and turn the power switch <i>on</i> . Repeat this for all the connectors, and investigate the connector operating the circuit breaker, checking the wiring from that connector and the DC load.
3	Is the power supply fuse blown?	Yes	Replace the fuse.
		No	Replace the power supply.

**Table 41. No Manual Feed Pickup**

Step	Check	Result	Action
1	Print a service test page. Refer to Chapter 6, "Test Page Pattern Selection." Is the paper picked up?	Yes	Replace the I/O controller board.
2	Is the pickup motor drive properly transmitted by the gears?	No	Check the gears. If they are damaged, replace the cassette pickup assembly.
3	Does the cassette pickup motor rotate?	No	Replace the cassette pickup assembly.
4	Turn the power switch <i>off</i> , remove the cassette pickup board, and disconnect the connector J33. Check the resistance between cable connectors J33-1 and J33-2. Is it about 100 $\Omega$ ?	Yes	Replace the cassette pickup board.
		No	Replace the multipurpose pickup assembly.

<b>Step</b>	<b>Check</b>	<b>Result</b>	<b>Action</b>
1	Print a service test page. Is the paper picked up?	Yes	Replace the I/O controller board.
2	Is the cassette pickup motor drive properly transmitted by the gears?	No	Check the gears, and replace any damaged parts.
3	Check the connection of the cassette pickup board connector J304. Does it appear normal?	Yes	Replace the cassette pickup assembly.
		No	Replace the cassette pickup board.
4	Turn the power switch <i>off</i> , remove the cassette pickup assembly, and disconnect the pickup board connector J303. Measure the resistance between cable connectors J303-1 and J303-2. Is it about 100 $\Omega$ ?	Yes	Replace the cassette pickup board.
		No	Replace the cassette pickup assembly.

<b>Step</b>	<b>Check</b>	<b>Result</b>	<b>Action</b>
1	Print a service test page. Is the paper picked up?	Yes	Replace the I/O controller board.
2	Is the sheet feeder motor drive properly transmitted by the gears?	No	Check the gears, and replace the sheet feeder assembly if necessary.
3	Does the sheet feeder motor rotate?	No	Check in the following order: <ul style="list-style-type: none"> <li>• Check the connection of sheet feeder controller board connector J353, and if it is normal replace the front (sheet feeder) pickup assembly.</li> <li>• Replace the sheet feeder controller board.</li> </ul>

**Table 43. No Sheet Feeder Pickup (Continued)**

Step	Check	Result	Action
4	Turn the power switch <i>off</i> , remove the sheet feeder, and disconnect the sheet feeder controller board connector, J354. Measure the resistance between cable connectors J354-1 and J354-2. Is it about 130 $\Omega$ ?	Yes	Replace the sheet feeder controller board.
		No	Replace the front (sheet feeder) pickup assembly.

**Table 44. Registration Roller Does Not Rotate**

Step	Check	Result	Action
1	Is the cassette pickup motor drive properly transmitted by the gears?	No	Check the gears, and replace the cassette pickup assembly if necessary.
2	Turn the power switch <i>off</i> , remove the pickup block, and disconnect connector J34. Measure the resistance between cable connectors J34-1 and J34-2. Is it about 145 $\Omega$ ?	Yes	Replace the cassette pickup board.
		No	Replace the cassette pickup assembly.

**Table 45. Insufficient High-Voltage Power Supply Output**

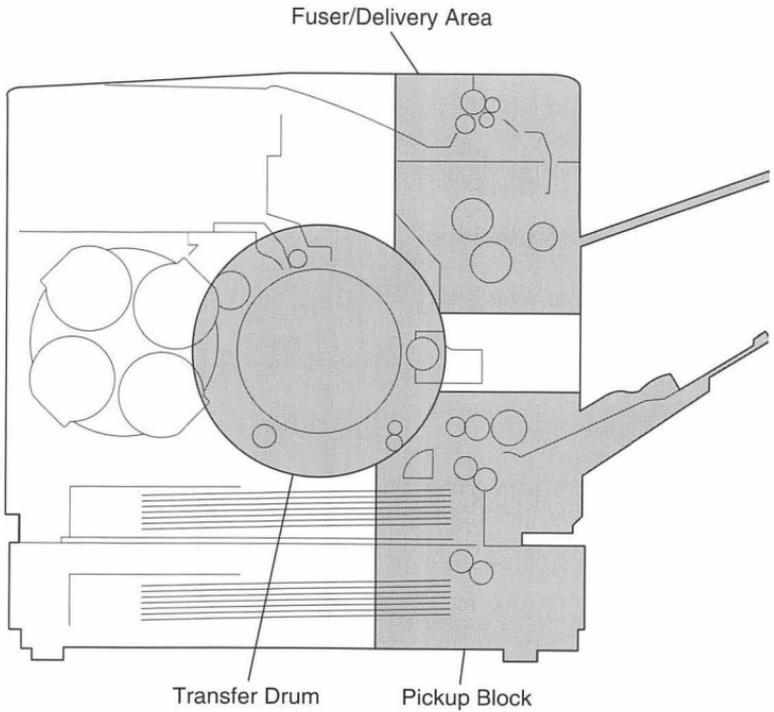
Step	Check	Result	Action
1	Are the high-voltage contact terminals soiled or burnt?	No	Clean the high-voltage contacts.
2	Is the problem solved when you replace the high-voltage power supply?	Yes	Problem solved.
		No	Replace and check as follows: <ul style="list-style-type: none"> <li>• Mechanical controller board</li> <li>• DC controller board</li> </ul>

## Paper Transport Troubleshooting

The paper transport route can be divided into three sections (see Figure 46):

- Pickup block
- Transfer drum
- Fuser/delivery area

Measures to counter jamming in these sections are explained in the tables that follow.



**Figure 46. Paper Transport Problems**

**Table 46. Pickup Block Troubleshooting**

<b>Step</b>	<b>Check</b>	<b>Result</b>	<b>Action</b>
1	Is paper within specifications?	No	Advise the customer to use recommended paper.
2	Is the print paper deformed with curls, waves, etc.?	Yes	Replace the paper. Advise the user on the storage method.
3	Is paper jammed in the manual feed unit?	Yes	Go to Step 8.
4	Is paper jammed in the cassette feed unit?	Yes	Go to Step 10.
5	Is the registration roller clutch operating properly?	No	Check the registration roller clutch.
6	Is the registration roller worn, deformed, or soiled?	Yes	Clean the roller if it is soiled. Replace it if worn or deformed.
7	Is the paper top sensor prism soiled?	Yes	Clean it. If it cannot be cleaned or is flawed, replace the cassette pickup assembly.
		No	Replace the cassette pickup assembly.
8	Is more paper set in the manual feeding tray than prescribed?	Yes	Advise the user not to set more than the prescribed amount of paper in the tray.
9	Does the pickup roller rotate during printing?	No	Replace the cassette pickup assembly.
10	Is the cassette set properly?	Yes	Position the cassette properly.
11	Is the paper correctly positioned against the cassette claw?	No	Position the paper correctly.
12	Is the paper folded?	Yes	Replace the paper.

**Table 46. Pickup Block Troubleshooting (Continued)**

Step	Check	Result	Action
13	Is more print paper set in the cassette than prescribed?	Yes	Advise the user not to set more than the prescribed amount of paper in the cassette.
14	Is the cassette pickup roller, or the feed roller worn or deformed?	Yes	Replace and check in the following order: <ul style="list-style-type: none"> <li>• cassette pickup assembly</li> <li>• feed roller (sheet feeder)</li> </ul>
		No	Refer to Table 42, "No Cassette Feed Pickup" or Table 43, "No Sheet Feeder Pickup."

**Table 47. Transfer Drum Troubleshooting**

Step	Check	Result	Action
1	Is the gripper damaged?	Yes	Replace the transfer drum assembly.
2	Does the gripper properly open and hold the print paper?	No	Check as follows: <ul style="list-style-type: none"> <li>• Whether the gripper hold-down spring is deformed or disconnected,</li> <li>• Whether the gripper lever is bent,</li> <li>• Whether the operation of the gripper drive mechanism within the transfer drum is smooth,</li> <li>• Whether the gripper solenoid connector is disconnected.</li> </ul>
3	Is the attraction roller worn or deformed?	Yes	Replace the transfer drum assembly.
4	Is the discharge roller worn or deformed?	Yes	Replace the transfer drum assembly.
5	Is the high-voltage contact of the attraction roller or the discharge roller soiled or burnt?	Yes	Clean the high-voltage contact. Replace it if it cannot be cleaned.

**Table 47. Transfer Drum Troubleshooting (Continued)**

Step	Check	Result	Action
6	Is the spring pressing the attraction roller or the discharge roller against the transfer drum stretched?	Yes	Check the spring. If it cannot be adjusted, replace the transfer drum assembly.
7	Is the transfer sheet soiled or deformed?	Yes	Replace the transfer drum assembly.
		No	Replace the high-voltage power supply.

**Table 48. Fuser/Delivery Area Troubleshooting**

Step	Check	Result	Action
1	Do the fuser rollers rotate smoothly	No	Replace the fuser assembly.
2	Is the upper fuser roller or the lower fuser roller deformed?	Yes	Replace the fuser assembly.
3	Is the entrance guide soiled? Is there a protrusion due to a flaw or toner adhesion?	Yes	Clean the entrance guide.
4	Is the lower fuser roller engagement (nip width) as prescribed?	No	Replace the fuser assembly.
5	Is the cleaning belt being wound correctly?	No	Replace the fuser assembly.
6	Is the fuser separation guide soiled? Or, is there a protrusion due to a flaw or toner adhesion?	No	Adjust it so that it moves smoothly.
7	Does the delivery paper sensor lever move smoothly?	No	Adjust it so that it moves smoothly.

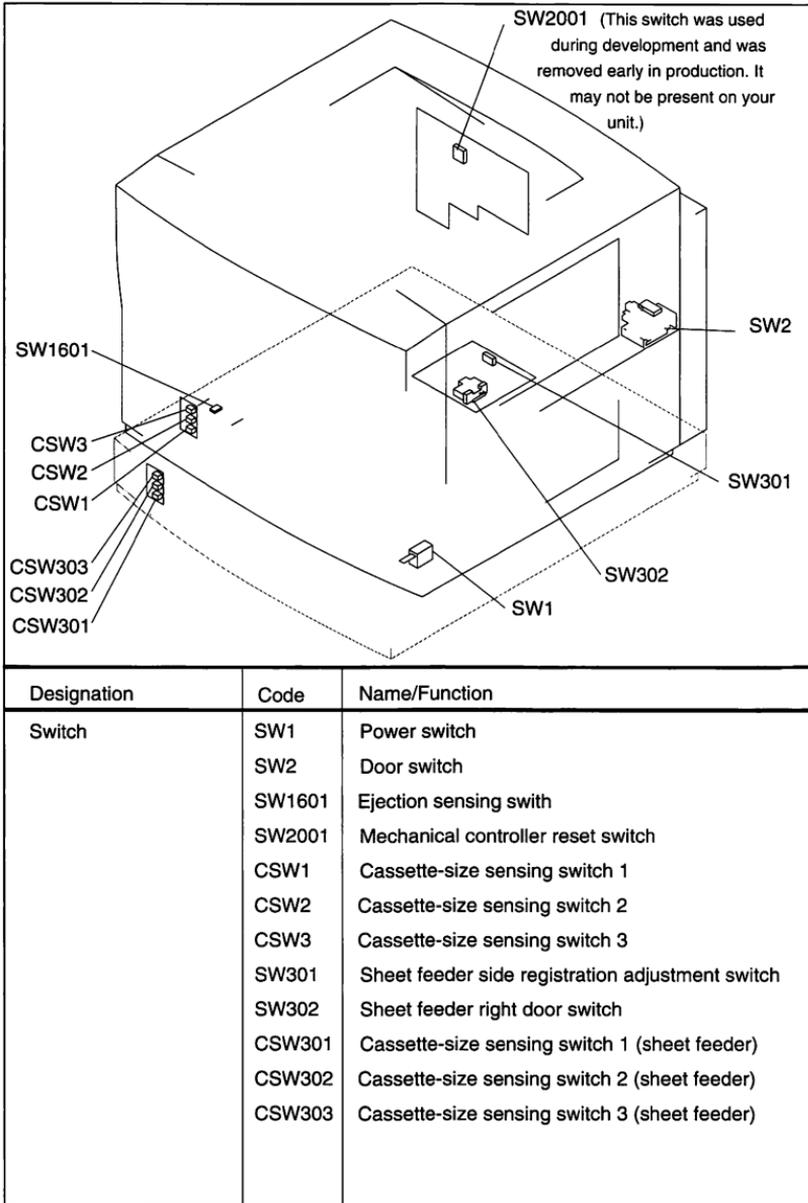
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**Table 48. Fuser/Delivery Area Troubleshooting (Continued)**

<b>Step</b>	<b>Check</b>	<b>Result</b>	<b>Action</b>
8	Does the delivery paper sensor operate correctly?	No	Replace the fuser assembly.
9	Is the fuser delivery roller rotating smoothly? Or, is the face-down delivery roller rotating smoothly?	Yes	Check the operation of the oil applying unit.
		No	Check the delivery drive units, and replace the damaged part.

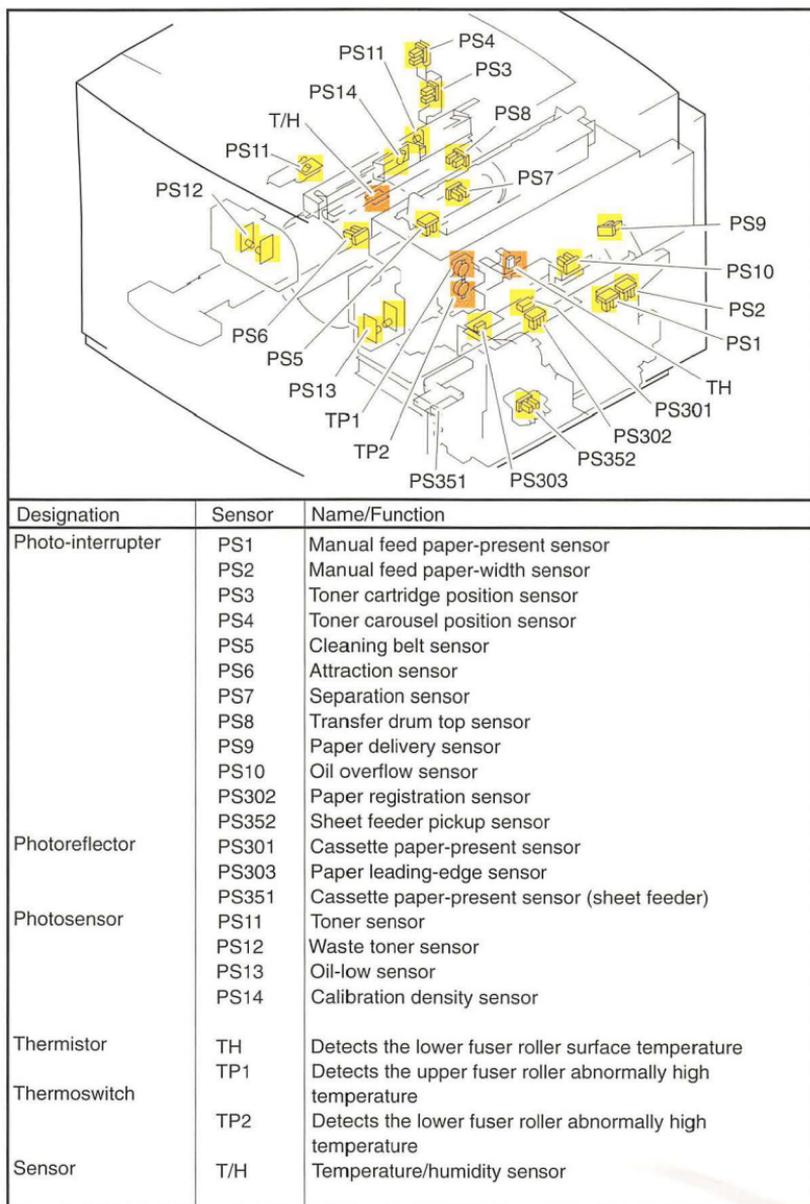
## Troubleshooting Locators

Figure 47 shows switch locations for the Color LaserWriter 12/600 PS and the optional sheet feeder.



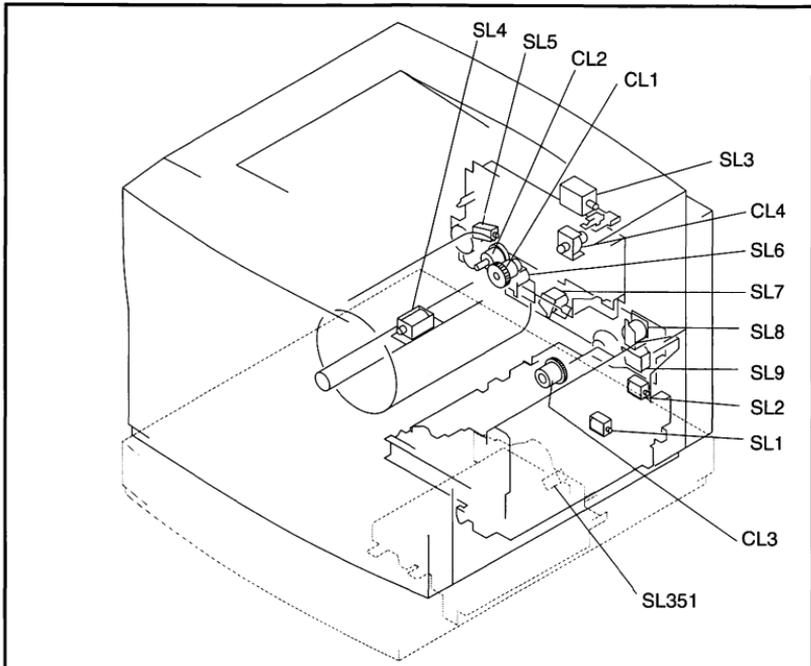
**Figure 47. Switch Locations**

Figure 48 shows sensor locations for the Color LaserWriter 12/600 PS and the optional sheet feeder.



**Figure 48. Sensor Locations**

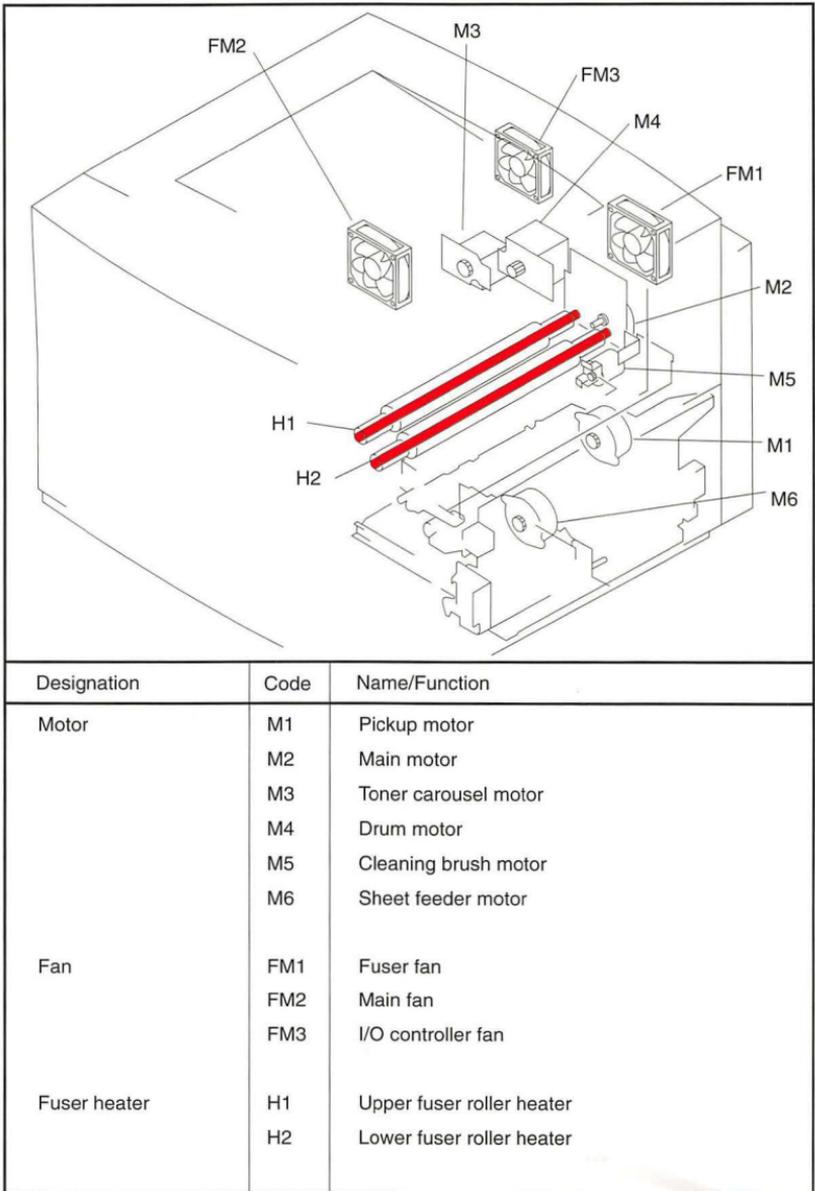
Figure 49 shows solenoid and clutch locations for the Color LaserWriter 12/600 PS and the optional sheet feeder.



Designation	Code	Name/Function
Clutch	CL1	Toner carousel brake clutch
	CL2	Toner carousel drive clutch
	CL3	Registration roller clutch
	CL4	Fuser assembly drive clutch
Solenoid	SL1	Cassette feed solenoid
	SL2	Manual feed solenoid
	SL3	Cleaning belt drive solenoid
	SL4	Gripper drive solenoid
	SL5	Separation claw solenoid
	SL6	Attraction roller press solenoid
	SL7	Transfer drum press solenoid
	SL8	Transfer drum cleaner press solenoid
	SL9	Discharge roller press solenoid
	SL351	Cassette feed solenoid (sheet feeder)

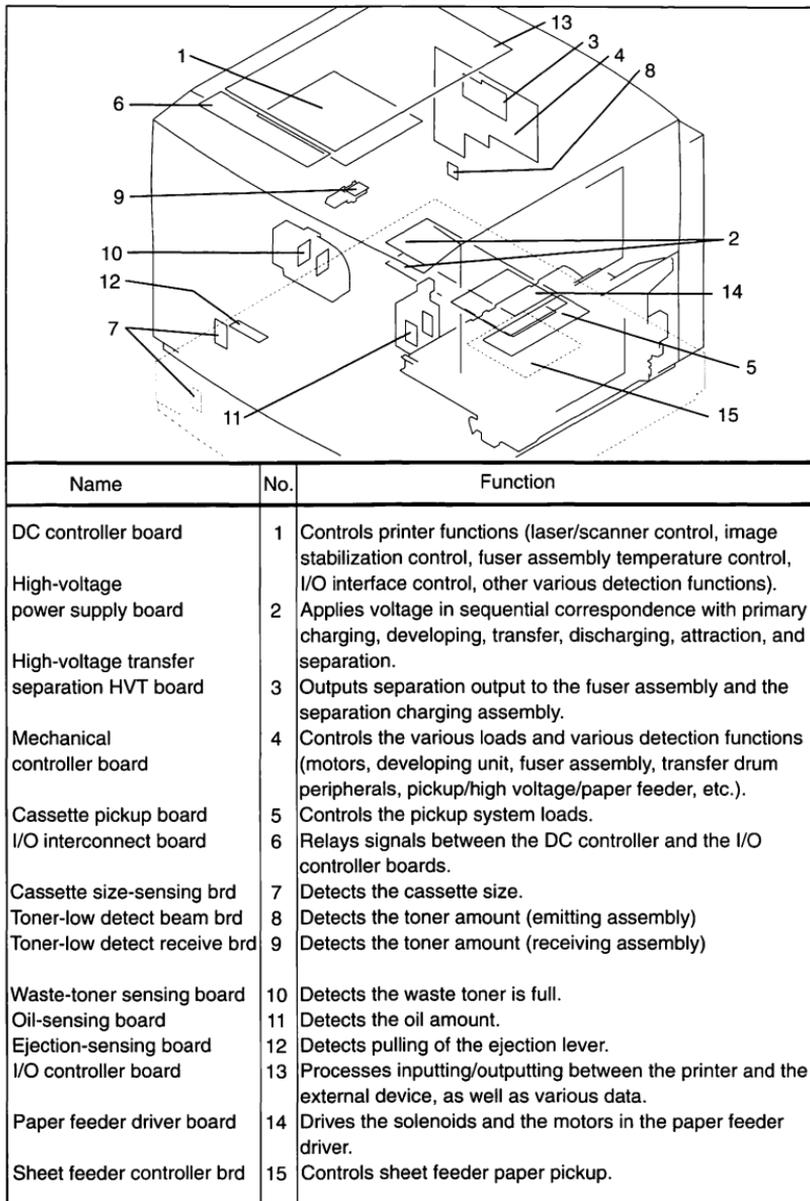
**Figure 49. Solenoid and Clutch Locations**

Figure 50 shows fan, motor, and fuser locations for the Color LaserWriter 12/600 PS and the optional sheet feeder.



**Figure 50. Motor/Fan/Heater Locations**

Figure 51 shows circuit board locations for the Color LaserWriter 12/600 PS and the optional sheet feeder.



**Figure 51. Circuit Board Locations**

## J-Connector Locators

The following illustrations show the J-connector locations for the Color LaserWriter 12/600 PS.

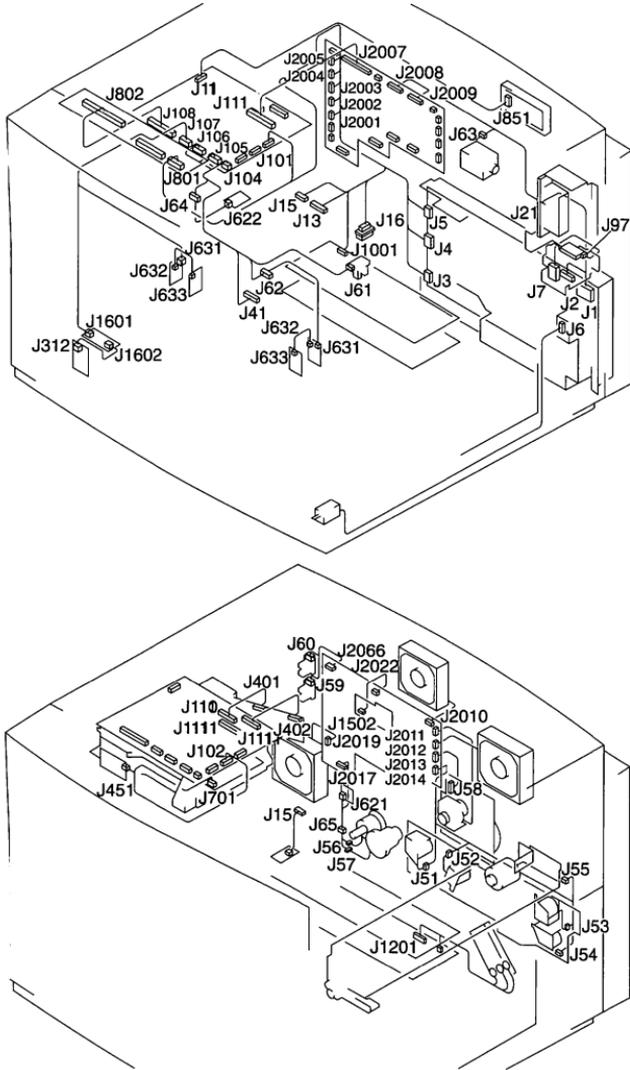
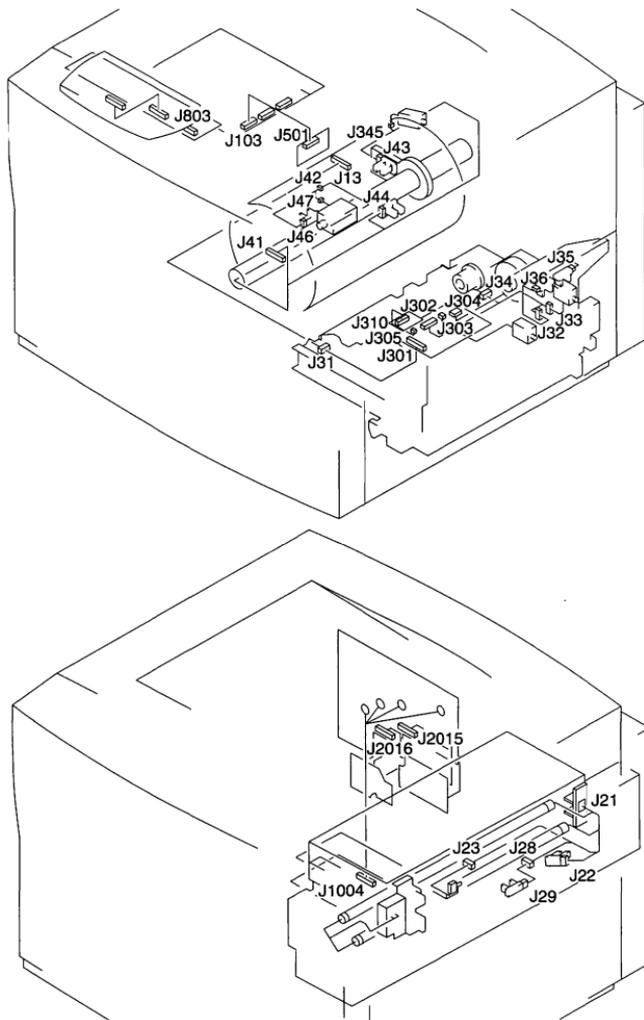


Figure 52. J-Connector Locations (1 of 2)



**Figure 52. J-Connector Locations (2 of 2)**

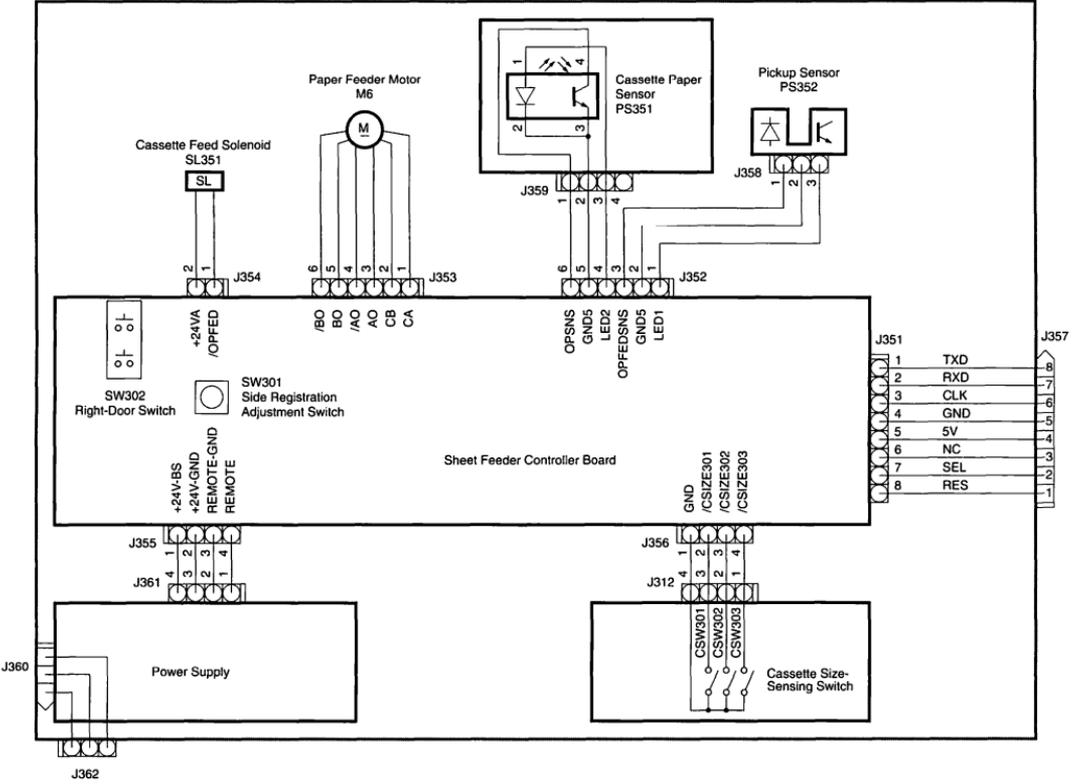


Figure 53. Sheet Feeder Wiring Diagram

# Color LaserWriter 12/600 PS Wiring Diagram

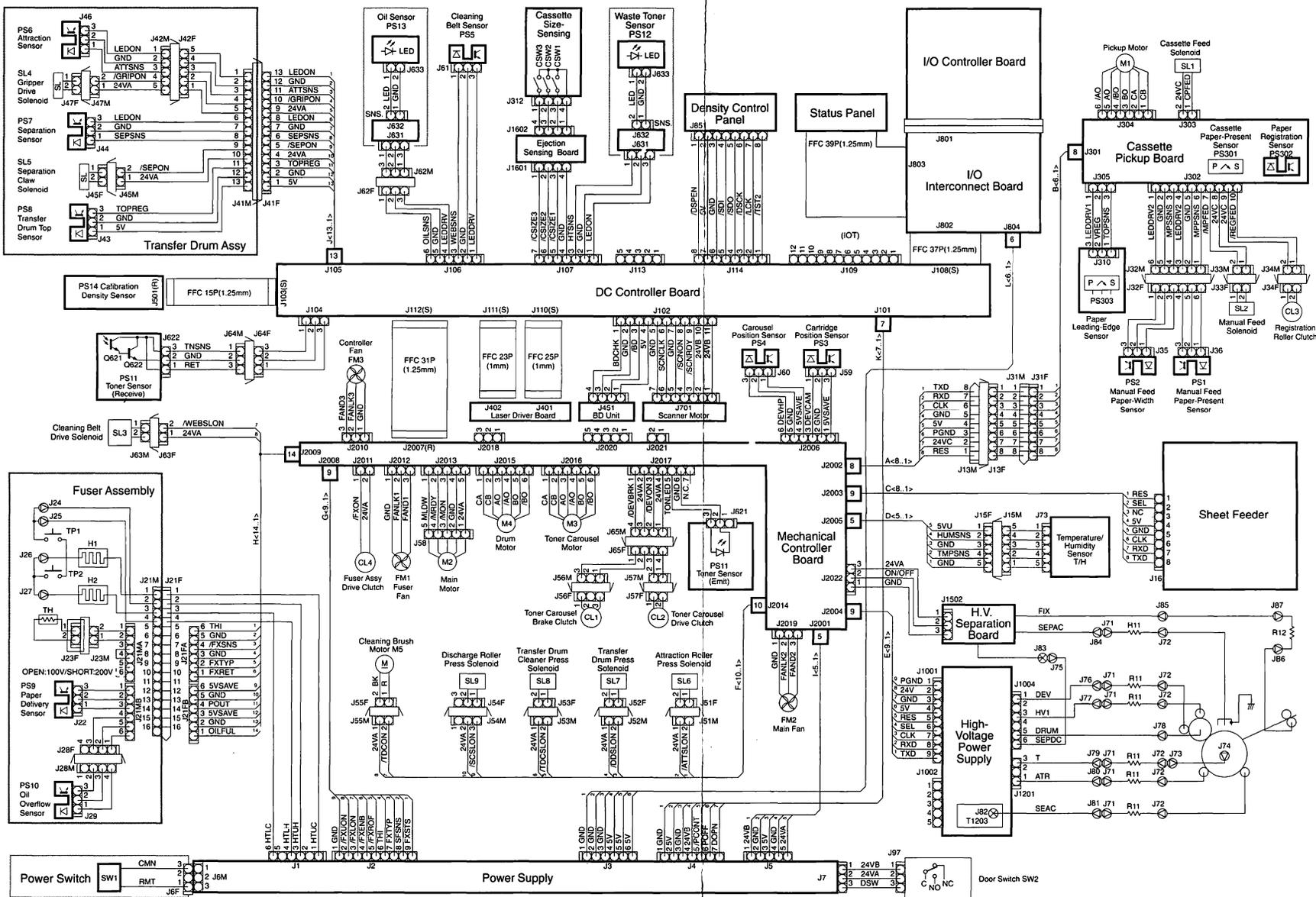
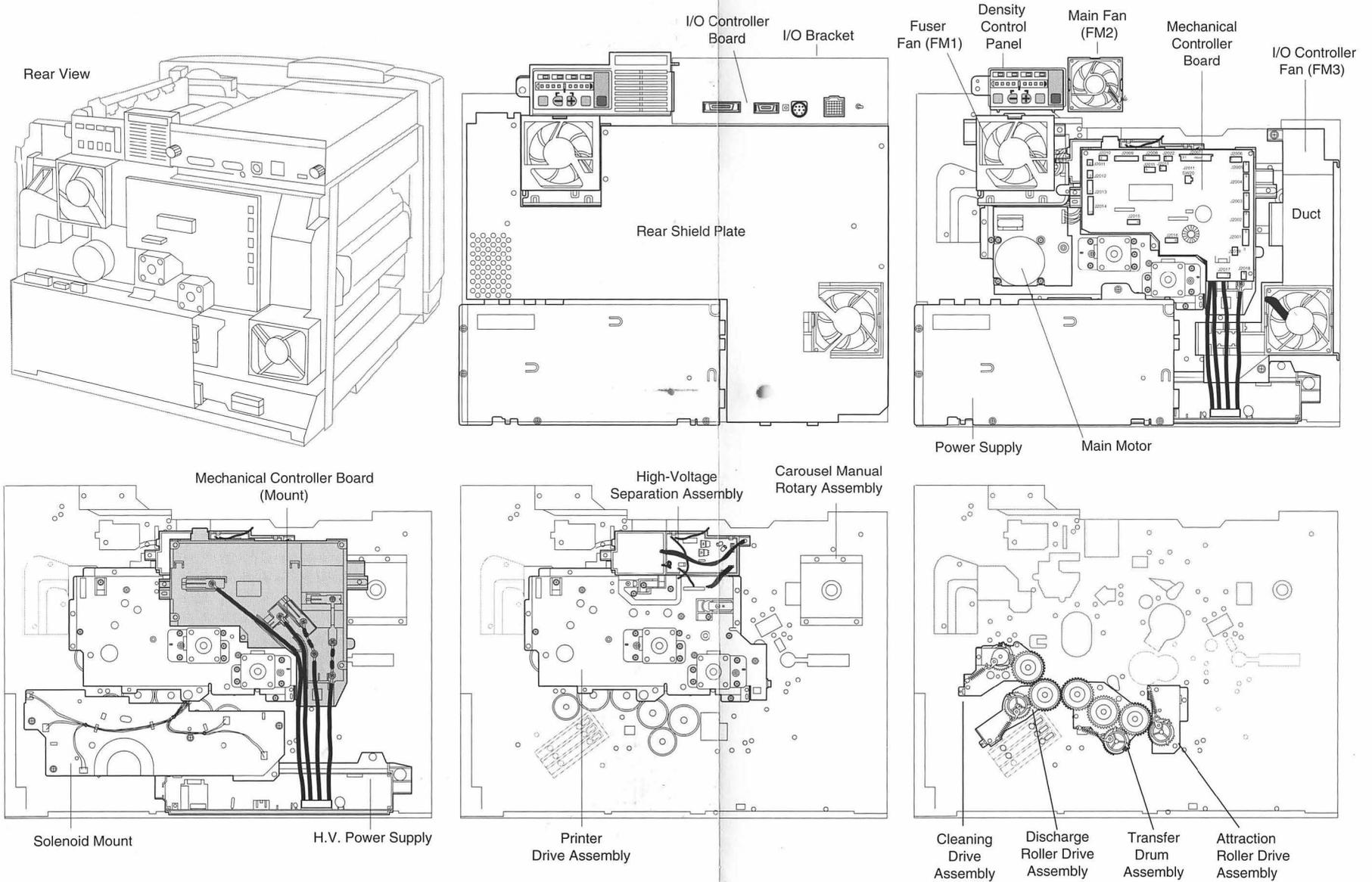


Figure 54. Color LaserWriter 12/600 PS Wiring Diagram

**Power and Drive Train Views/ Disassembly**

Figure 55 shows a layered tear down of the power and drive assemblies on the Color LaserWriter 12/600 PS.



**Figure 55. Color LaserWriter 12/600 PS Power and Drive Assemblies**



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