Apple Service Technical Procedures Laser Printers Volume One

Apple Service Technical Procedures Laser Printers

Volume One

PN: 072-0163

April 1990

Apple Technical Procedures

LaserWriter

Technical Procedures

❑ TABLE OF CONTENTS

Section 5 – Preventive Maintenance

Section 6 – Illustrated Parts List

Section 7 – Diagnostics

Section 8 – Appendix

❑ PREFACE

IMPORTANT: *You may service LaserWriter products only after you have successfully completed the Laser Printer Service Course.*

The service procedures contained in this manual cover module-level troubleshooting and repairs for the Apple LaserWriter and LaserWriter Plus Printers. Several of the procedures are demonstrated in the videotape *LaserWriter Introductory Service Procedures,* which is included in the LaserWriter Support Kit.

Installation instructions, usage information, and operator-level maintenance for the LaserWriter and LaserWriter Plus are included in the *LaserWriter and LaserWriter Plus* user's manual. Familiarize yourself with the information there before using this manual. **The user's manual contains important information for all service personnel.**

In this manual, read section 1, Basics, before doing any work inside the printer. Basics explains how the printer works and gives diagrams locating its major assemblies. It also explains the printer's test prints and status lights and gives specifications for printer use and maintenance. Section 1 also contains important electrostatic discharge precautions that you should know before working on a LaserWriter.

Sections 2 and 3, Take-Apart and Adjustments, contain step-by-step instructions for replacements and adjustments. Section 2 also contains important safety information. **Don't ignore the safety and ESD precautions in Sections 1 and 2. The printer's laser light can damage your eyes severely unless you observe the safety precautions. Static discharge can cause real problems with expensive printed circuit boards.**

Section 4, Troubleshooting, contains a systematic troubleshooting procedure and a complete set of troubleshooting tables. In order to use the Troubleshooting section, you must know how to use a multimeter to measure voltages and resistances and to check electrical continuity.

Section 5, Preventive Maintenance, covers cleaning and lubrication procedures that are recommended each time you service a LaserWriter.

Section 6, Illustrated Parts List, includes all piece parts that can be purchased separately from Apple for the LaserWriter.

Section 7, Diagnostics, describes how to use the diagnostic program, *AppleCAT LaserWriter*. Step-by-step instructions on set-up, using the menus, and running the diagnostic are provided.

The Appendix contains photos that are referred to throughout the manual. A wiring diagram of the printer is also included.

❑ SUPPLEMENTARY SERVICE MATERIALS

The following videotapes are available to supplement the instructions in this binder:

LaserWriter Introductory Technical Procedures

LaserWriter Printer Pedestal Take-Apart

LaserWriter Printer Theory of Operations

LaserWriter Printer Troubleshooting

Besides this binder, you will need the following printed reference materials to service an Apple LaserWriter:

LaserWriter and LaserWriter Plus user's manual

AppleTalk Reference Guide: Cabling the Multiroom Office

Apple Technical Procedures

LaserWriter

Section 1 – Basics

CONTENTS

❑ PRODUCT DESCRIPTION

Parts of the Printer

The figures on the following pages point out the major assemblies in the LaserWriter printer. Refer to these figures while reading Theory of Operations.

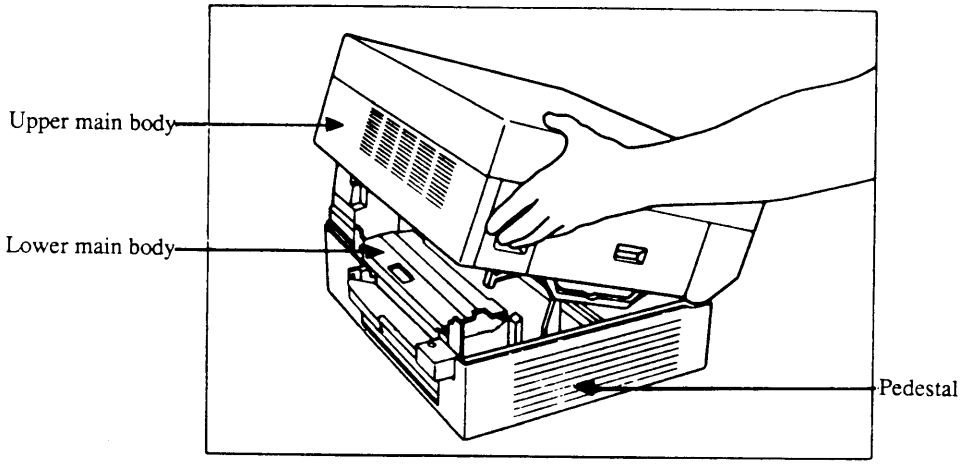


FIGURE 1-1

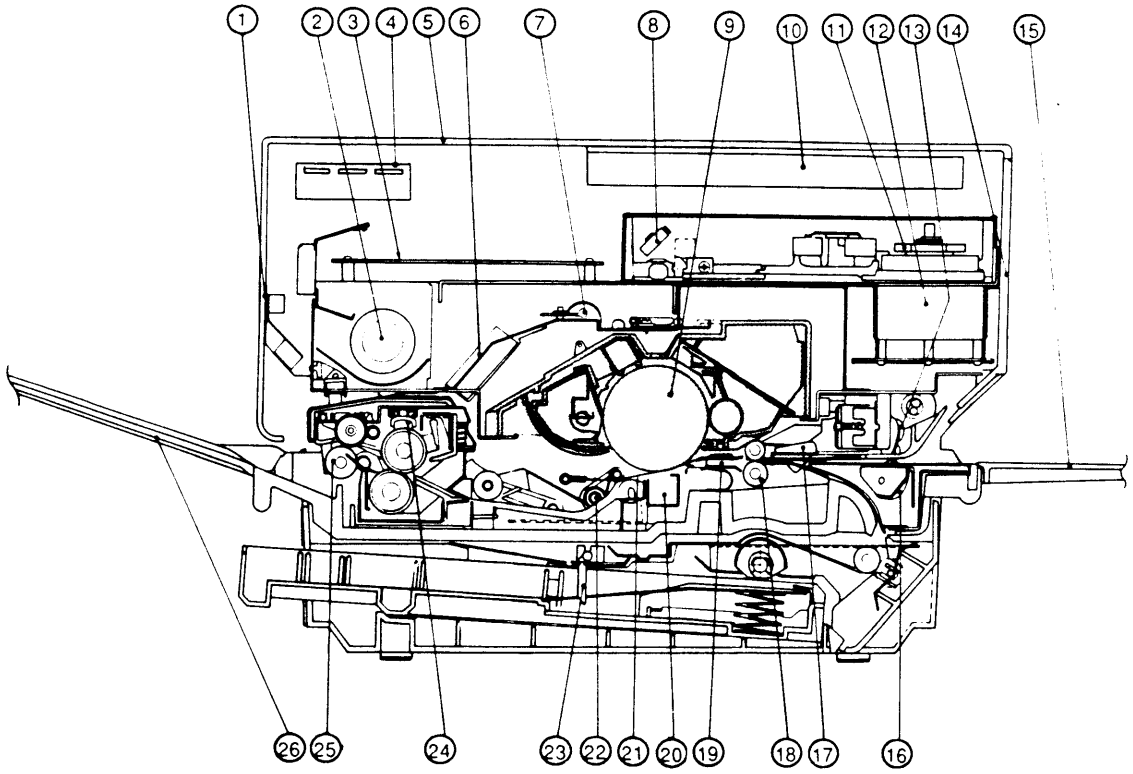


FIGURE 1-2: CROSS SECTION OF THE PRINTER (FRONT VIEW)

1. Left cover
2. Fan
3. DC controller PCB
4. Display panel
5. Top cover
6. Ozone filter
7. Preconditioning exposure lamps
8. Beam-to-drum mirror
9. Photosensitive drum
10. LaserWriter I/O board
11. Scanner mirror
12. Scanner motor
13. Upper manual pickup roller
14. Right panel
15. Manual feed tray
16. Lower manual pickup roller
17. Registration shutter
18. Feeder roller
19. Transfer guide assembly
20. Transfer corona assembly
21. Separation belt
22. Separation feeder unit
23. Paper detection arm
24. Fuser roller cleaner felt
25. Delivery roller
26. Print tray

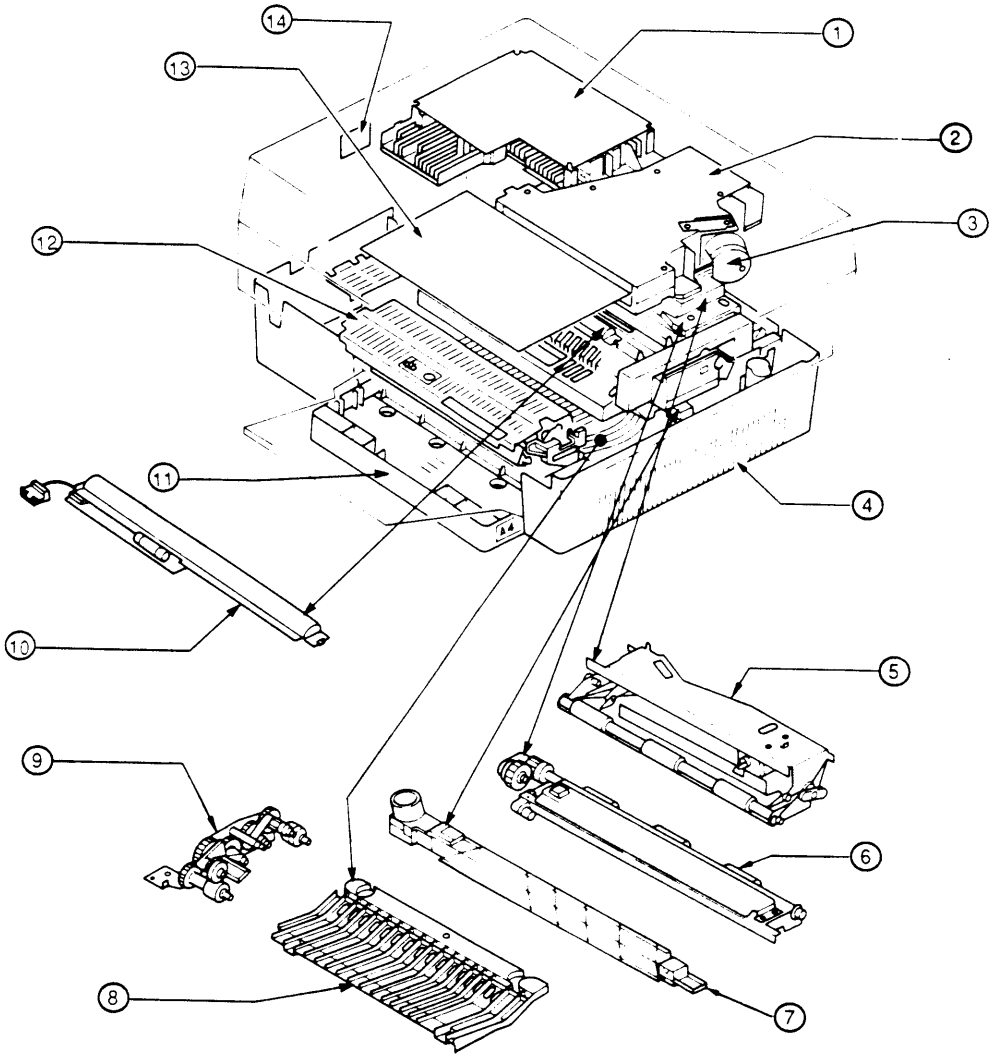


FIGURE 1-3: LOCATIONS OF MAJOR ASSEMBLIES

1. DC power supply/motor drive PCB
2. Scanner unit
3. Laser unit
4. Pedestal
5. Registration shutter assembly
6. Transfer guide assembly
7. Transfer corona assembly
8. Feeder guide assembly
9. Separation/feeder unit
10. Preconditioning exposure and print counter assembly
11. Paper cassette
12. Fuser assembly
13. DC controller PCB
14. Varistor PCB

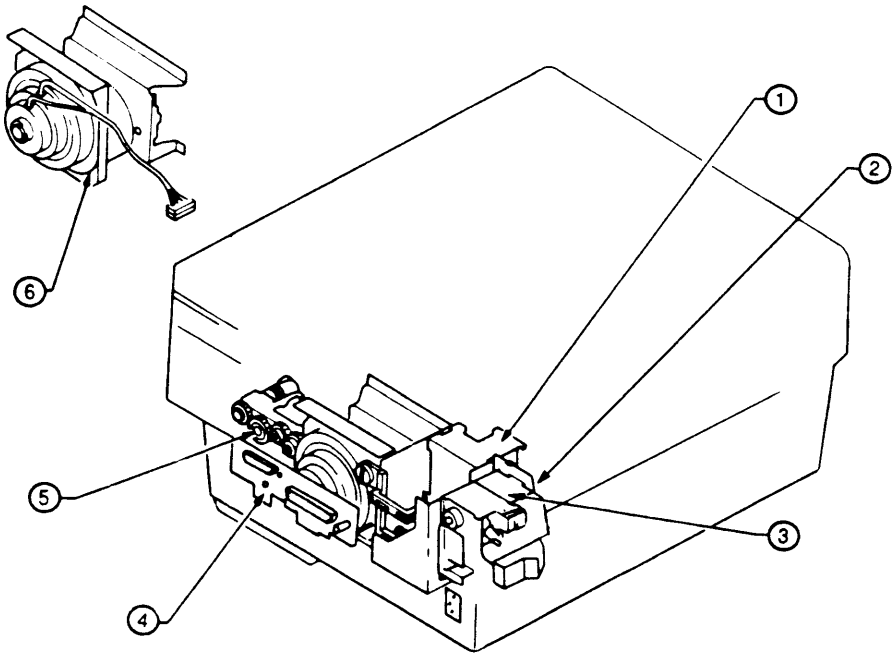


FIGURE 1-4

1. High voltage power supply
2. Power interlock assembly
3. AC driver PCB
4. Mounting connector plate (I/O connector plate)
5. Manual feed assembly
6. Main motor assembly

Specifications

The following specifications apply to both the LaserWriter and LaserWriter Plus printers (unless otherwise noted).

LaserWriter I/O Board

12 MHz 68000 microprocessor, 1.5 megabytes RAM, 512K (LaserWriter) or 1 megabyte (LaserWriter Plus) ROM, AppleTalk and RS-232-C interfaces.

Electrical Requirements

Line voltage: 115 Volts +/- 10%
(North American model)
Line frequency: 60 Hz +/- 2 Hz.
(North American model)
Power consumption:
Operating: 690 Watts (maximum)
Standby: 120 Watts (typical)

Environmental Requirements

Temperature: 50° F to 90.5° F.

Humidity: 20% to 80% relative humidity for optimum performance.

Built-in Fonts

LaserWriter:
Times®, Helvetica®, Courier, and Symbol

LaserWriter Plus:
Times, Helvetica, Courier, Symbol, Palatino®, ITC Avant Garde®, ITC Bookman®, Helvetica Narrow, ITC Zapf Chancery®, ITC Zapf Dingbats®, and New Century Schoolbook

Speed

Eight pages per minute maximum throughput. Actual performance depends on the specific application.

Recommended Weights of Paper

Cassette feed: 16-21 lb.

Manual feed: Single-sided printing: 11-33 lb.
Double-sided printing: 16-33 lb.

Cassette-Feed Information

1. Maximum paper load: 0.4 inches (approximately 100 sheets)
2. Load paper with curl-side up, as in an office photocopier. Before loading paper, fan through the stack to ensure proper feeding.
3. Store paper in its package in a dry location. Do not open a package of paper until you are ready to use it.

Manual-Feed Information

1. It is possible to use paper sizes from 4" x 5.5" to 8 1/2" x 14" in manual feed operation.
2. Do not pull the paper from the manual feed guide when the printer begins feeding paper. Pulling the paper out does not abort printing, and it can damage the printer.

Double-sided Printing

Double-sided printing is possible if manual feed is used for the second side. (Attempting to print on the second side of a printed page using cassette feed is likely to cause paper jams.) Insert paper lengthwise along the guide on the manual feed tray, with the side to be printed facing up.

❑ THEORY OF OPERATIONS

The LaserWriter printer uses laser light, a sophisticated optical system, and a plastic powder called **toner** to produce its images. Using a dot matrix of 300 dots per inch (6.8 million per page), it can produce a variety of high-quality print fonts and graphics, either separately or on the same page. Computers can be connected to the printer either through the AppleTalk network or through the RS232/422 port.

The **LaserWriter I/O board** (see figures on preceding pages to identify parts) controls communications between the printer and external computers. It contains 1.5 megabytes of RAM and either 512 kilobytes (LaserWriter) or 1 megabyte (LaserWriter Plus) of ROM, plus a 68000 microprocessor. During printing, when a document is sent to the printer from an attached computer, the I/O board receives a description of each page in a language called PostScript™. (ASCII files can also be accepted, but this discussion will be confined to normal printing from a Macintosh.) It then converts the PostScript commands into a bit image which it stores in RAM and then sends to the printer's **DC Controller board**. The DC Controller board controls the operation of the print mechanism and the **laser/scanner** unit to produce the actual printed page.

The semiconductor laser produces a beam of infrared light which is directed toward a rotating hexagonal mirror in the **scanner unit**. The scanner mirror reflects the beam across a revolving light-sensitive **drum** in the **toner cartridge**. As the drum rotates, the result is a raster scan, very much like the one that forms the picture in a television set.

The drum is given a positive charge by the **primary corona wire** inside the toner cartridge. Wherever the light beam hits the drum, it neutralizes this positive charge on a tiny "dot" on the drum's surface. The pattern of dots produced by the laser's beam forms the image.

After being exposed to the laser scan, the drum rolls through the toner powder, which is contained in the same unit (the toner cartridge). The toner is positively charged, so it avoids the positive ("white") areas of the drum surface, but is attracted to the neutral (slightly negative) dots where the laser beam has struck the drum.

The drum, with its load of toner, then comes in contact with the paper. At this point, the paper is given a strong positive charge by the **transfer corona wire**. This positive charge causes the toner to stick to the paper. As the paper travels forward, it is stripped off the drum by the **separation belt**. It then passes between two heated rollers in the **fuser assembly**, and the combination of heat and pressure fuses the toner onto the paper permanently.

Status Lights

The printer has four status lights, three on the display panel at the front of the machine and one on the rear (I/O) connector plate.

1. The TEST light on the rear (I/O) connector plate (Figure 1-5) comes on continuously (either steady or blinking) if the LaserWriter I/O board is malfunctioning. (If the board is functioning correctly, this light will blink once and then go out when the printer is turned on.)

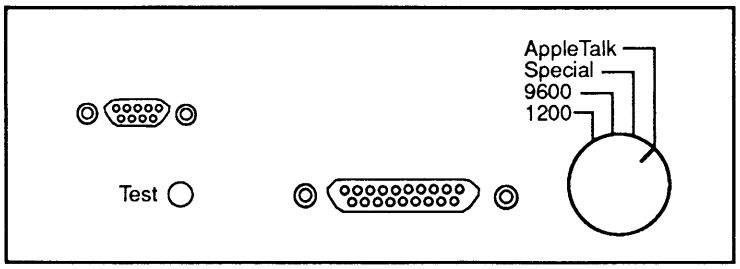


FIGURE 1-5: REAR (I/O) CONNECTOR PLATE

2. Display panel LEDs (Figure 1-6):

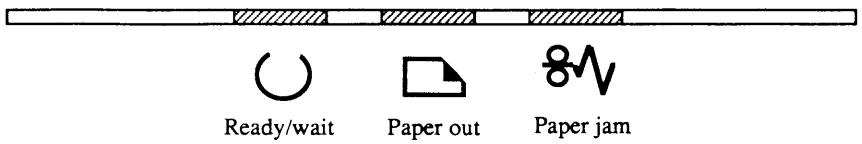


FIGURE 1-6: DISPLAY PANEL LEDs

a) The green READY light blinks while the printer is warming up and then stays on continuously when the printer is ready to operate.

b) The yellow PAPER OUT light stays on continuously when there is no paper in the paper cassette, or when the paper cassette is not installed. This light blinks when the printer is preparing to print a page. (With manual feed, this yellow LED lights steadily if there is no paper on the manual feed tray.)

c) The red PAPER JAM light stays on continuously when a paper jam occurs. Printing is not possible until the jammed paper is removed.

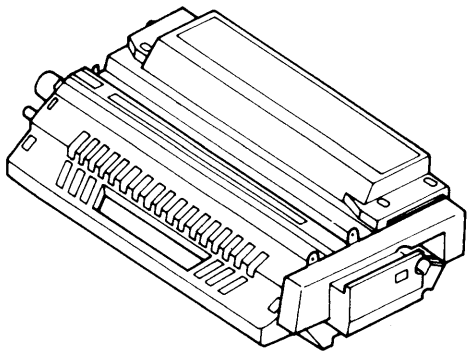


FIGURE 1-7
TONER CARTRIDGE,
EXTERNAL VIEW

Toner Cartridge

The toner cartridge (see Figure 1-7) is a self-contained unit that includes the photosensitive drum, the primary corona wire (which charges the drum), a developing unit, toner hopper, and drum cleaner (see Figure 1-8). The cartridge cannot be disassembled.

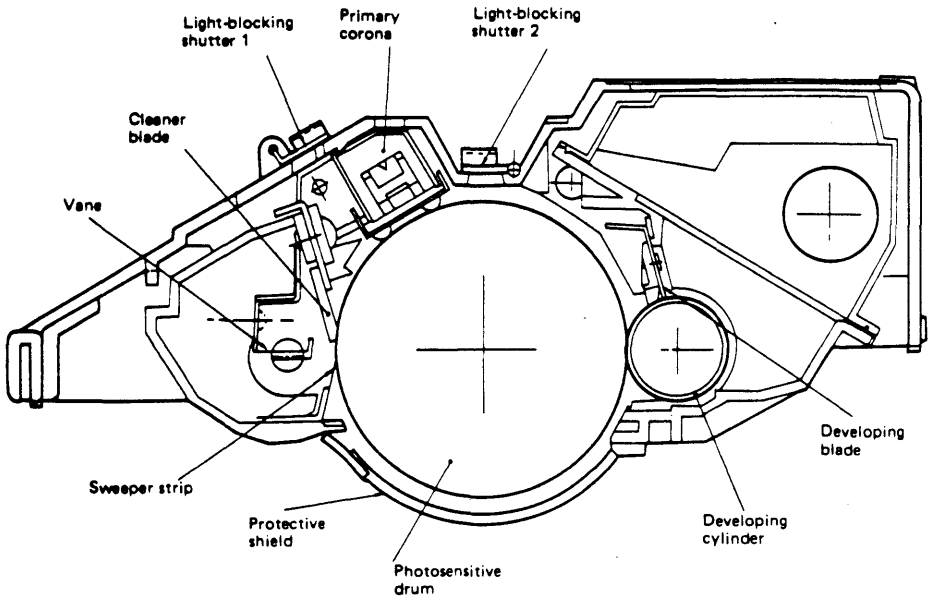


FIGURE 1-8: TONER CARTRIDGE (CROSS SECTION)

The printing life of a cartridge is approximately 3,000 pages, but may vary according to the type of printing done: for instance, graphics that include large black or shaded areas will use more toner than ordinary text.

Protective Shield

The toner cartridge has a protective shield over the area where the paper comes into contact with the drum. When the cartridge is removed from the printer, this shield shuts automatically, preventing light from entering. (If the drum is exposed to light, blank areas and faint black stripes may appear on prints.)

The shield is opened automatically when the toner cartridge is inserted into the printer and the printer is closed. Do not open the shield manually unless necessary, and do so only in dim light.

Light-blocking Shutters

The two light blocking shutters protect the areas where the preconditioning lamps "erase" the drum surface and where the laser beam "paints" the image on the drum. These shutters open automatically when the cartridge is inserted into the printer. If the shutters do not close by themselves when you remove a cartridge from the printer, close them manually.

Storage

1. The toner cartridge should be stored at a temperature between 32 and 95 degrees F in a relative humidity of 35% to 85%. Higher or lower temperatures or humidities may reduce the storage life of the cartridge, as will storage in air pressure lower than 0.6 atmospheres or higher than 1 atmosphere.

   Note: The expiration date of the cartridge is specified on the cartridge box. The usable lifetime of a toner cartridge is 2 1/2 years from the date of manufacture. Cartridges more than 2 1/2 years old may give poor print quality.

2. Do not place cartridges in direct sunlight or near a window. Do not leave them inside an automobile for a long period in warm weather, even if the cartridges are still in their storage boxes.

3. Avoid storing cartridges in places where the temperature or humidity may change suddenly (for example, near an air conditioner or heater).

4. Avoid storing cartridges in dusty locations and places where they might be exposed to ammonia fumes or organic solvents. (Inform your cleaning staff not to use ammonia near the printer or near stored cartridges.)

5. If a cartridge has been stored at a low temperature, let it come up to room temperature before installing it in a printer. Otherwise, condensation can cause print quality problems.

Handling Suggestions

1. When installing a cartridge, hold it horizontally and rock it slowly back and forth 45°, to distribute the toner. (Figure 1-9.)

2. If white areas occur on prints due to lack of toner, rock the cartridge back and forth to redistribute the toner. This can sometimes coax extra life out of a cartridge that is almost empty.

CAUTION: *To avoid toner spillage after a toner cartridge's seal is broken, hold it by the handle and rear only, as shown in Figure 1-9.*

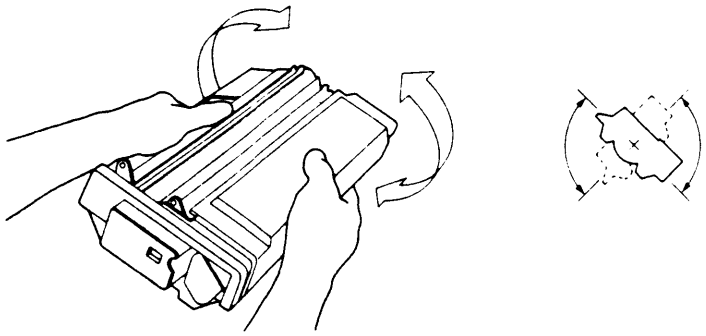


FIGURE 1-9

3. Never touch the surface of the photosensitive drum. If the surface of the drum becomes dirty, open the protective shield and wipe it clean with a piece of flannel that has been liberally sprinkled with toner. Never wipe it with a dry cloth or paper towel, and never use solvent.

4. If the cartridge is left in strong light for a long time, white blanks or white stripes will appear on prints (even if the protective shield and shutters are closed). If this happens, stop the printer and wait a few minutes: thecartridge should be able to "recover" within this time.

   Note: Normal room light, measured a few meters from a window on an average day, is about 1,500 lux. Do not expose the photosensitive drum to light of this intensity for more than 5 minutes. If the drum is placed under these conditions accidentally, the cartridge can be stored in a dark place to "recuperate," although an image may be retained on the drum for some time. Direct sunlight is 10,000 to 30,000 lux. A drum exposed to direct sunlight may be ruined.

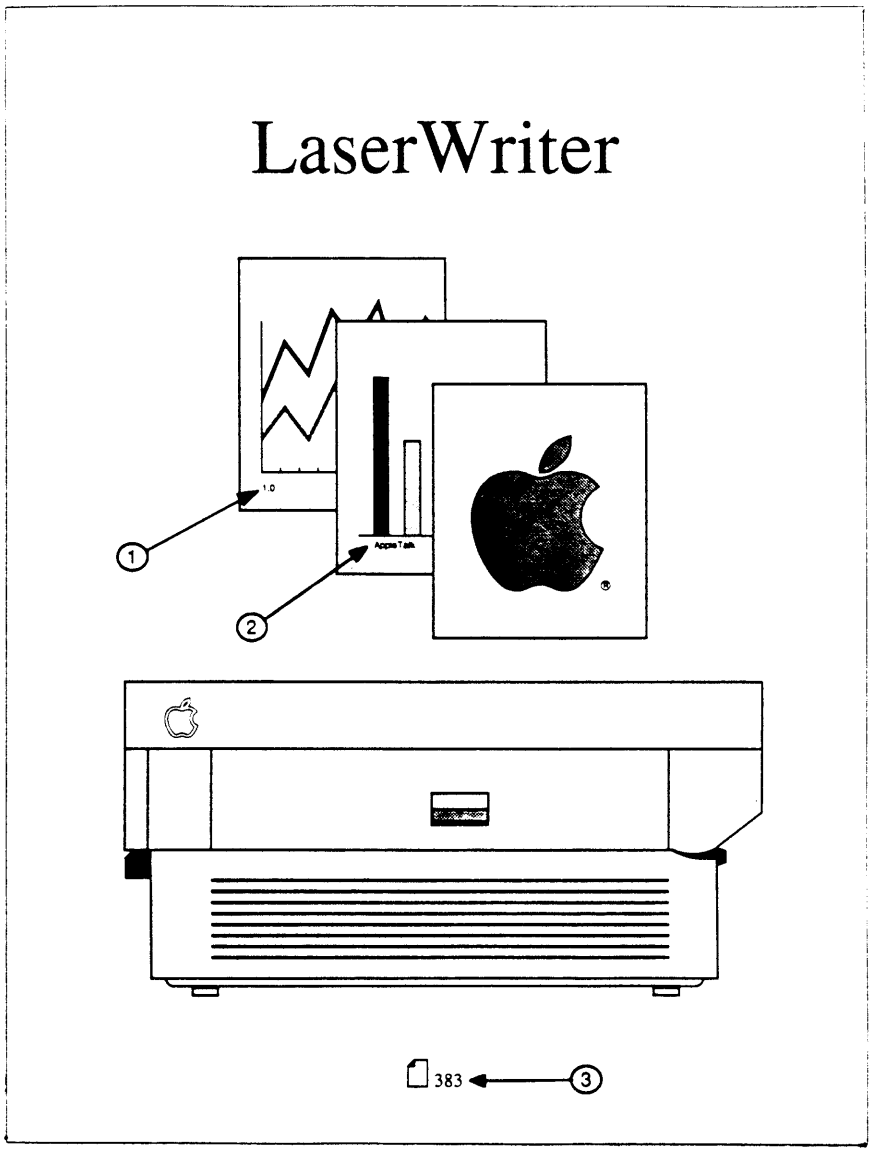


FIGURE 1-10: USER TEST PRINT

❑ PERFORMANCE EVALUATION

The LaserWriter has two test prints. The LaserWriter generates the user test print each time the printer is switched on. The service test print can be generated by the technician during maintenance or repair procedures.

Service Test Print

The service test print is produced by jumpering two pins on the DC Controller board. This print exercises the LaserWriter's printing functions but does not involve the LaserWriter I/O board. The print is useful in service situations where a test print is required but the I/O board has been removed. Instructions for generating this print are given in the Troubleshooting section of this manual. The print consists of vertical black stripes on a white background and covers the entire printing area of the page. (For further information, refer to "Image Skew Adjustments" in Section 3, Adjustments.)

User Test Print

The user test print, reproduced in Figure 1-10, is produced each time the printer is switched on (unless the protocol switch is set to "Special" or the function has been turned off with PostScript software). This test print exercises the LaserWriter I/O board and contains several types of information about the printer configuration. The numbered items below refer to the numbered arrows in Figure 1-10.

1. The number printed here indicates the revision level of the printer ROM.

2. This square indicates the setting of the mode selector switch at the rear of the printer. If the selection is not "AppleTalk," the baud rate appears at the top of the bar graph, and the I/O port being used (9-pin or 25-pin) is specified at the bottom of the graph.

3. This number represents the number of pages printed so far on this printer.

Aside from these items, the user test print can also tell you:

4. Whether the printer is functioning: If the user test print is produced without problems, the printer is working correctly.

5. Whether the image is properly aligned to the paper: by measuring from the square border to the edge of the paper, you can tell whether the image is tilted further than is acceptable according to Apple's specifications. (See "Image Skew Adjustment" in Section 3, Adjustments.)

❑ SETUP AND OPERATION

Setup and operation instructions for the LaserWriter and LaserWriter Plus are given in the *LaserWriter and LaserWriter Plus* user's manual. The manual covers the following topics:

1. LaserWriter components.
2. Setting up the LaserWriter: includes installing the toner cartridge and its cleaning pad, the paper trays, and the paper cassette.
3. Connecting the printer to the AppleTalk™ network.
4. Using the LaserWriter to print: includes installing LaserWriter software on an application disk, fixing a "disk full" condition, and printing a document.
5. Maintenance and troubleshooting procedures.
6. Print Quality Guide: a preventive maintenance and troubleshooting guide for users.

❑ ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

Electrostatic Discharge (ESD) can cause severe damage to sensitive microcircuits. Just touching a chip or brushing it with a nylon sleeve can degrade a circuit so that it never again performs to specification. Some microcircuits are sensitive to as little as 500 volts, or about one-sixth as much static electricity as you can feel.

Certain preventive measures must be taken to avoid ESD damage. When you are unwrapping, installing, or replacing any microcircuits, observe the following precautions:

Grounds

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.

Bodies

Don't touch anybody who is working on integrated circuits.

If that person is properly grounded, your "zap" may not cause any damage, but just to be on the safe side, keep your own body charge away from other technicians.

Bags

Use antistatic bags for boards and chips during handling.

Whenever you are about to leave your bench and take a board to a storage place, first put the board in an anti-static bag. Leave all Apple service exchange components in their ESD-safe packaging until needed for use.

Leads

Handle all ICs by the body, not the leads.

Also, do not touch PCB edge connectors, exposed circuitry, or printed circuits. Handle ICs and PCBs by the edges, or use extractors.

Synthetics

Do not wear polyester clothing or bring plastic, vinyl, or styrofoam into the work environment.

The electrostatic field around these nonconductors cannot be removed.

Metals

Never place components on any metal surface.

Use antistatic or conductive mats or foam.

Atmosphere

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 used routinely.

Apple Technical Procedures

LaserWriter

Section 2 – Take-Apart

❑ CONTENTS

(Items marked * are included in the videotapes that accompany this manual.)

2.66 Cassette Pickup Assembly
2.67 Lower Paper Feed Guide
2.68 Pickup Rollers
2.71 Pickup Control Clutch
2.72 Paper-out Sensor (PS2)
2.73 Upper Main Body
2.83 Manual Feed Roller Assembly

Note: If a step is underlined, detailed instructions for that step can be found elsewhere in this section.

❑ GENERAL INFORMATION

Materials Required

Phillips screwdrivers, magnetized:
#2 head, stubby (1.25-inch shaft, 3-inch maximum total length)
#2 head, medium (4-inch shaft)
#2 head, long (6- or 8-inch shaft)
Long nose pliers (preferably curved)
diagonal cutting pliers
Medium flathead screwdriver (or other tool for prying)
snap-ring pliers, external, 19-30 mm
safety goggles
cable ties
Electrostatic discharge equipment (3M Velostat 8012 Field Service Kit or equivalent)
Allen wrench (2 mm)
spring hook (optional)

Main Screw Types Used

Screws of types A, B, C, and D (Figure 2-1) occur both as "black" (anodized) and "silver" (conductive) screws in the chassis. To preserve proper grounding and continuity, replace silver screws only with other silver screws, and black screws with black screws. Whenever you remove screws from the printer, mark on the chassis which type of screw you have removed, so that you can replace it with the same type.

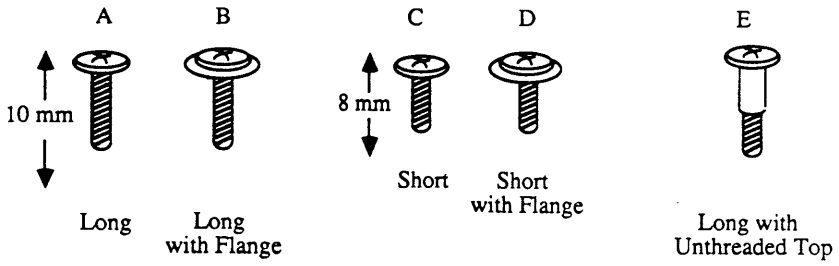
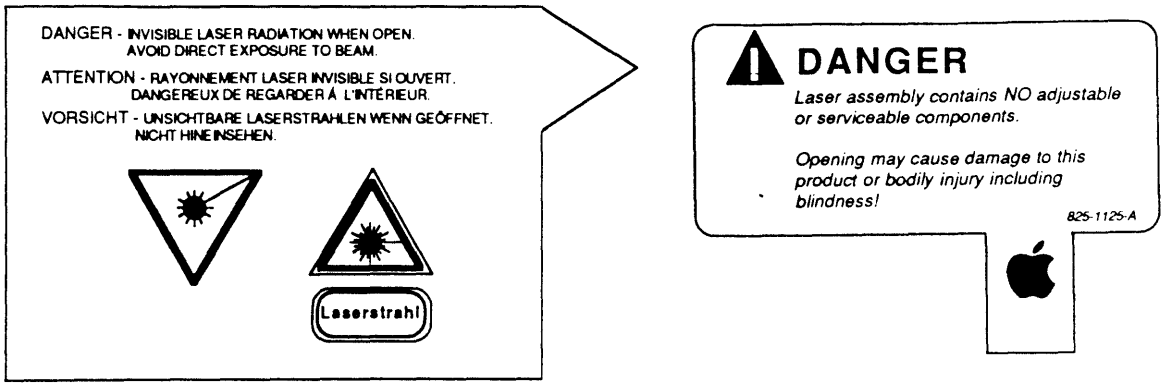
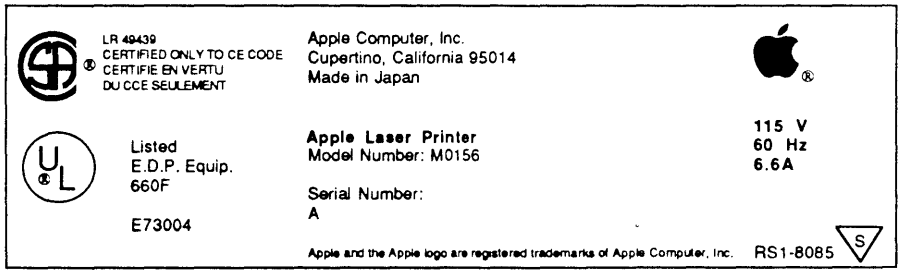


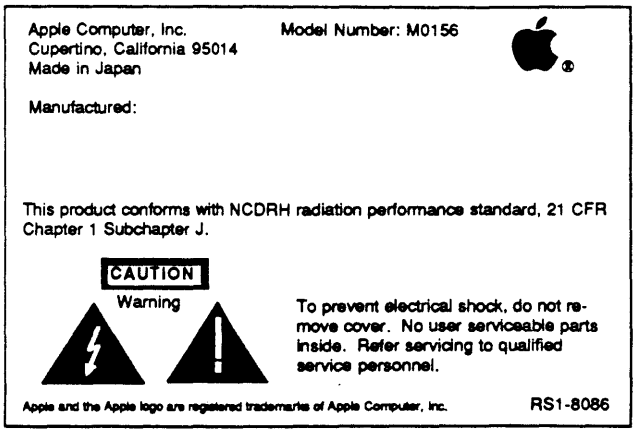
FIGURE 2-1



Safety Labels: (Scanner unit) Warn against direct exposure to laser beam.



Product Label: (Outside of printer) Includes voltage information.



Safety Label: (Bottom of printer) Cautions against opening by anyone other than qualified service personnel.

❑ SAFETY PRECAUTIONS

1. Always unplug the printer before taking it apart, unless you are testing the electronic assemblies.

2. Never disconnect the optical fiber (see Appendix, Photo 1, #4) from the DC Controller board when the printer is running. The fiber carries infra-red laser radiation, which you cannot see but which can permanently damage your eyes or your neighbor's eyes. Even if you don't look directly at the fiber, the light can enter your eyes by bouncing off reflective surfaces.

3. For the same reasons, never open the laser access hatch (see Photo 1, #9) or the scanner unit (see Photo 1, #3) when the printer is running. (Never open the scanner unit under any circumstances: it contains optical assemblies that must be protected from dust.)

4. The LaserWriter weighs over sixty pounds: Be careful in lifting it!

5. When the printer is running with its covers or panels removed, be careful where you put your hands. There are dangerous voltages on the DC Power Supply (see Photo 1, #7) and the High Voltage Power Supply (see Photo 1, #6).

6. Warning labels appear in locations on the printer wherever special service attention is needed (see illustrations at left). Obey the instructions on the labels.

❑ ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

The LaserWriter I/O board (Figure 2-2) is the most expensive single module in the printer, and its components are soldered into place. It is therefore very important to protect the chips on the board from damage. Electrostatic discharge can be an important factor in causing board failures: even if the failures are not immediate and dramatic, static zaps can degrade chips in such a way that they fail weeks or months after exposure.

Be sure to follow the ESD prevention information located in Section 1, Basics to avoid damage to any LaserWriter electronics.

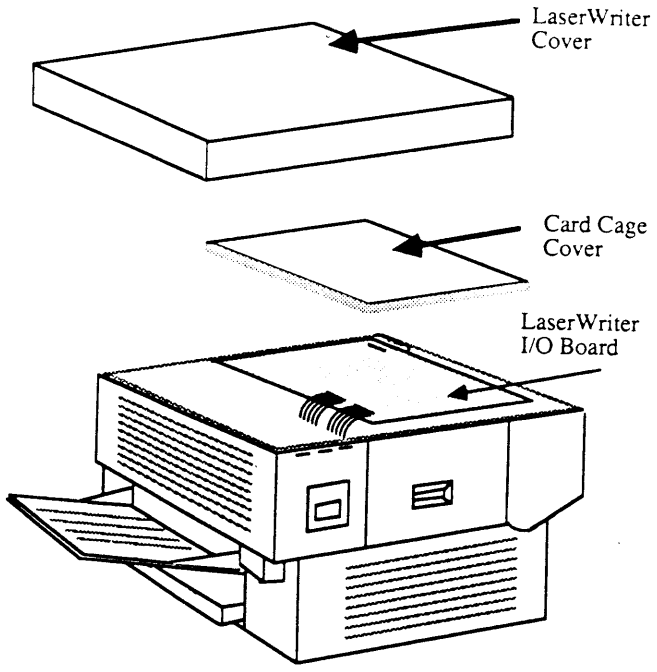


FIGURE 2-2

❑ OTHER PRECAUTIONS

1. Always remove the LaserWriter toner cartridge before removing anything else from the printer, to prevent damage to the cartridge. When you remove it, be sure the light-blocking shutters are closed, and cover the cartridge so that light will not damage it.

2. Use recommended weights and grades of paper for all tests. For best results, use 16-21 lb. paper, such as the standard paper used in office photocopiers. (See section 1.C for further paper specifications.)

3. Do not pull the paper from the manual feed guide when the printer begins feeding paper. Pulling the paper out does not abort printing, and it can damage the printer.

4. Never open the scanner unit under any circumstances: it contains optical assemblies that must be protected from dust. Apple will not accept a scanner unit for exchange if it has been opened.

❑ COVERS AND PANELS

Top Cover

To remove the Top Cover (Figure 2-3)

1. Open the printer (raise the upper main body by pressing up on the release lever).
2. Open the cartridge access door and remove the toner cartridge. Leave the cartridge access door open.
3. Remove the two top-cover screws inside the cartridge door.
4. Remove the two screws on the other side of the top cover.
5. Lift off the top cover.

Front Panel

To remove the Front Panel (Figure 2-3)

1. Remove the top cover.
2. Remove the four front panel screws.
3. Lift off the panel, carefully disengaging it from the case-opening lever.

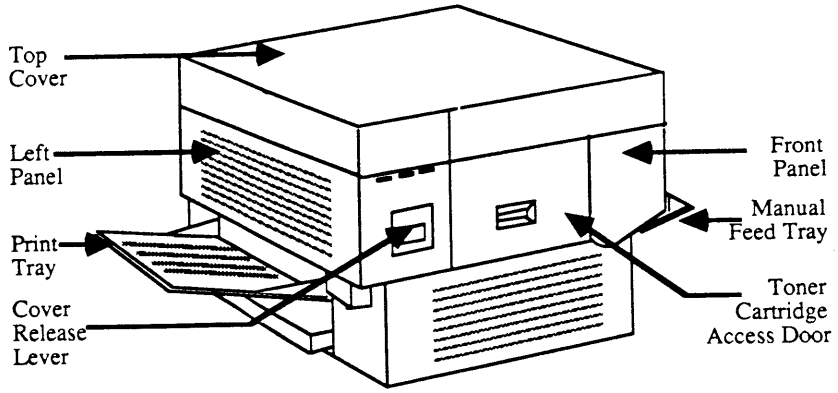


FIGURE 2-3: FRONT VIEW

Right Panel

To remove the right panel (Figure 2-4):

1. Remove the front panel.
2. Close the printer.
3. Remove the two right panel screws and lift off the panel.

Rear Panel

To remove the rear panel (Figure 2-4):

1. Remove the front panel and right panel.
2. Remove the two rear panel screws and lift off the panel.

Left Panel

To remove the left panel (see Figure 2-3):

1. Remove the front panel, right panel, and rear panel.
2. Remove the four left panel screws and lift off the panel.

Replace Panels and Cover

To replace the panels and cover:

1. Fit the left panel on the chassis and install the four screws.
2. Do likewise for the rear panel, right panel, front panel, and top cover.

   Note: The Apple logo on the top cover faces the front of the printer.

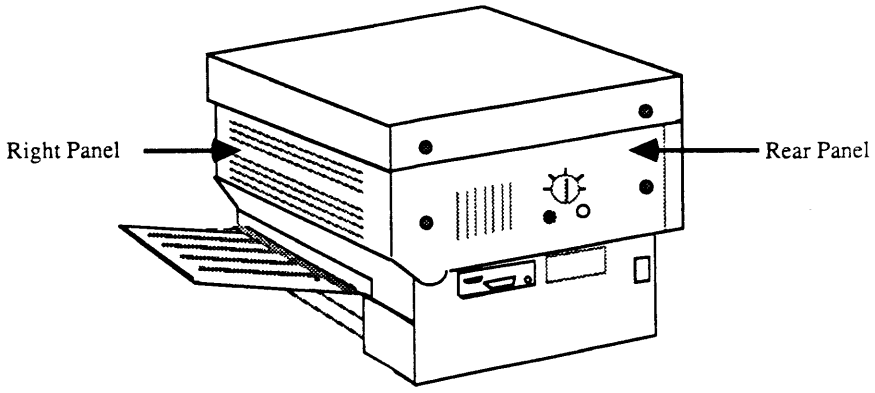


FIGURE 2-4: REAR VIEW

❑ LASERWRITER I/O BOARD

The LaserWriter I/O board (Figure 2-5) contains a 68000 microprocessor, 1.5 megabytes of RAM, and 500K bytes of ROM. It controls communications between the printer and outside devices (computers and file servers) and contains the electronics that construct the printer's fonts.

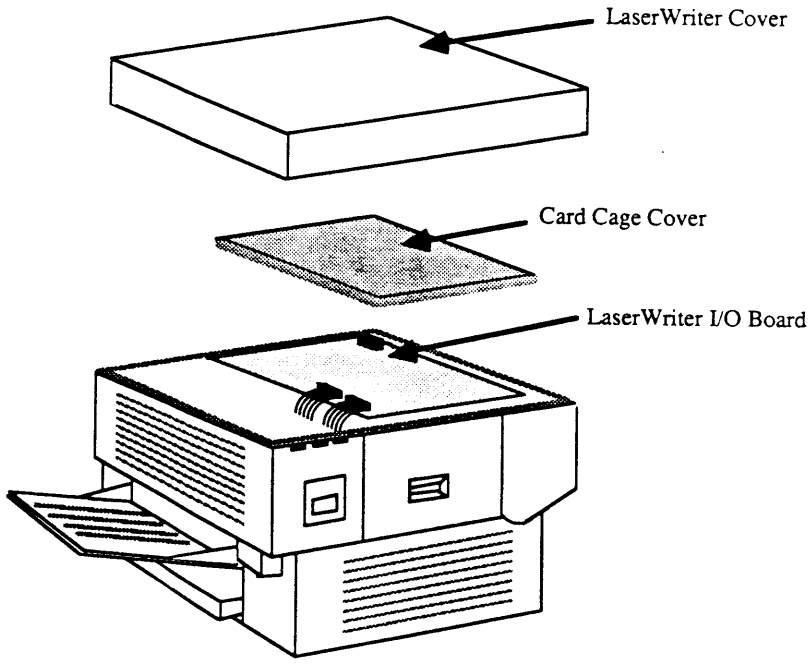


FIGURE 2-5

Note: Before replacing a customer's I/O board, run a test print. Then compare the print count on the test print to the count shown on the print counter fuse on the preconditioning exposure assembly. (You do not have to remove the assembly to view the counter; you can see it if you remove the DC controller board, as directed in this Take-Apart section.) If the numbers match, note the count in the printer's record. If the numbers do not match, record the count shown on the fuse.

Remove

1. Remove the top cover.
2. Remove the screws that hold the top of the card cage in place.
3. Lift off the card cage cover.

CAUTION: *Before touching any board, make sure you are properly grounded. Static electricity can destroy expensive boards in an instant.*

4. Disconnect the three cables. **Pull on the connectors only**, not on the cables.

If you are replacing the I/O board, go to "Replace." If you are removing the I/O board to gain access to other parts of the printer, skip to "Remove to Gain Access."

Replace

To replace the I/O board:

Note: The I/O board is held down by plastic standoffs. On later versions of the LaserWriter, some plastic standoffs may be replaced by metal fasteners. Remove any metal fasteners before trying to lift the board.

1. Pinch the plastic standoffs to disengage the board.

2. Lift the board out, holding it by the edges only, and place it in a static-protective bag or on a workpad grounded to the LaserWriter. Always make sure you are grounded to the LaserWriter before touching this board.

3. Put the new I/O board into place, push it down so that the standoffs engage, refasten any metal fasteners, and reconnect the three cables.

Note: Inform the customer that replacing the I/O board causes the test print count to be inaccurate. You can run a test print from the replacement I/O board and suggest that the customer record the difference between this test print count and the figure you earlier recorded in the printer's record.

Remove to Gain Access

To remove the I/O board assembly to gain access to other parts of the printer:

1. Remove the screws that hold the card cage to the chassis.

2. Lift the board and card cage out carefully.

❑ DC CONTROLLER PCB

The DC controller board (Figure 2-6) controls most of the print functions in the LaserWriter.

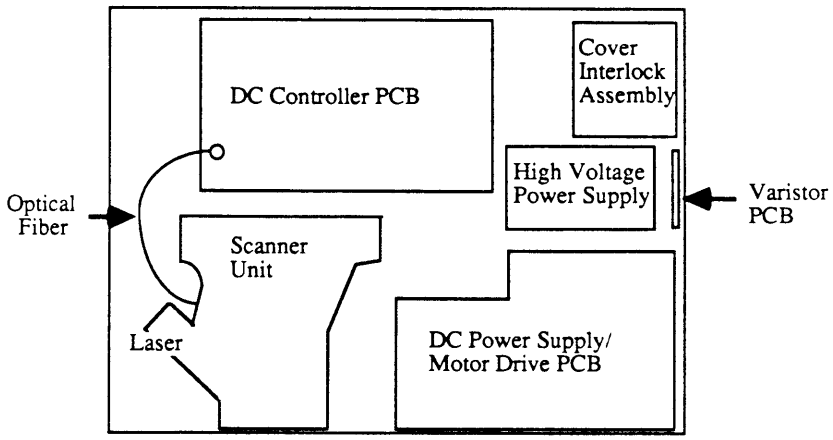


FIGURE 2-6: TOP VIEW WITH LASERWRITER I/O BOARD REMOVED

Remove

1. Remove top cover and LaserWriter I/O board.

CAUTION: *In the next step, do not bend the optical fiber that comes from the laser. The fiber is part of the left-margin-detect circuitry. If bent, the fiber can break, and the printer will not be able to detect when the laser has reached the left margin of the page.*

2. Disconnect all the connectors on the DC controller PCB.

3. Release the board from its five nylon standoffs and remove it.

Replace

IMPORTANT: *Replace the DC Controller board only with another Apple DC Controller board.*

1. Place the board on its five nylon connectors and push it down until they hold it in place.

2. Connect all cables to the board. The connectors are of different sizes: if you match them to their sockets exactly, you will have no problem. (The sockets labelled J213 and J205 are not used at this time.)

3. Reconnect the laser optical fiber and the eight-wire laser cable to the DC Controller board.

4. Replace the LaserWriter I/O Board and the top cover.

   Note: When you install a new DC Controller Board in a printer, you must adjust the laser power. See the Laser Power Adjustment in Section 3.

❑ DC POWER SUPPLY/MOTOR DRIVE PCB

The DC Power Supply/Motor Drive PCB (see Appendix, Photo 1, #7) has two major components. The Motor Drive circuit turns the main motor on and off according to a command from IC 208 on the DC Controller board. The DC Power Supply generates and outputs DC voltages and sequence control signals.

Remove

1. Remove the top cover, the right and rear panel, and the LaserWriter I/O Board.

2. Disconnect the three connectors from the DC Power Supply/Motor Drive PCB.

   Note: If necessary, use a flatblade screwdriver to help pry off the connectors, but do not pull on the wires.

5. Remove the five mounting screws on the metallic part of the assembly (see Figure 2-7; **do not** remove the five screws on the PCB). Lift the unit off the printer.

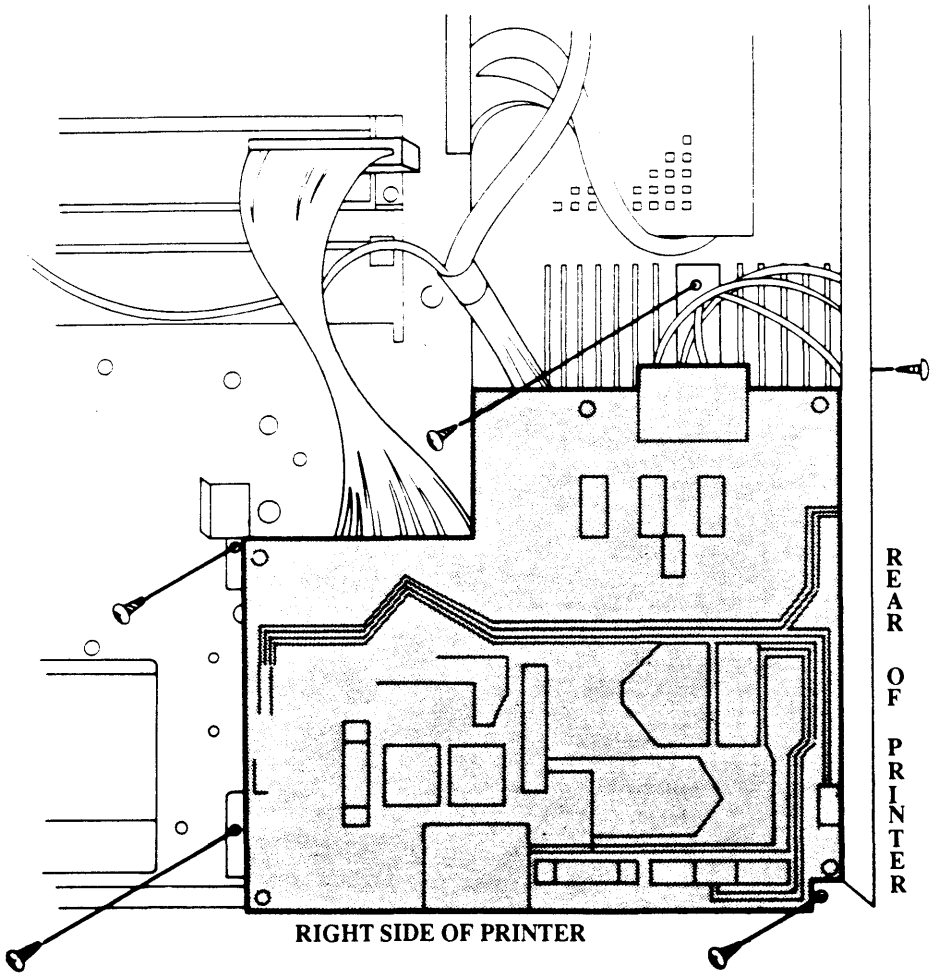


FIGURE 2-7: DC POWER SUPPLY MOTOR DRIVE PCE

Replace

IMPORTANT: *In step 1, take care not to pinch the motor cable.*

1. Put the unit in position and replace the five long black mounting screws.
2. Connect the three cables to the unit. Make sure to connect the large cable to the DC Controller board.
3. Replace the LaserWriter I/O board, the panels and cover.

❑ LASER/SCANNER UNIT

The laser unit (see Appendix, Photo 1, #1) produces the infrared laser beam. The scanner unit (Photo 1, #3) contains a rotating hexagonal mirror that directs the beam along the length of the photosensitive drum in the toner cartridge.

Remove

1. Remove the top cover and the LaserWriter I/O Board.
2. Unplug connectors J203 (the optical fiber), J204, and J206 from the DC Controller board (Figure 2-8).
3. Disconnect the ground cable (Figure 2-8, #1). Make sure to capture the star washer under the lug.
4. Remove the four large mounting screws (Figure 2-8, #2). Make sure to remove the spacer and washers with the long screw nearest the laser (Figure 2-8, #3).

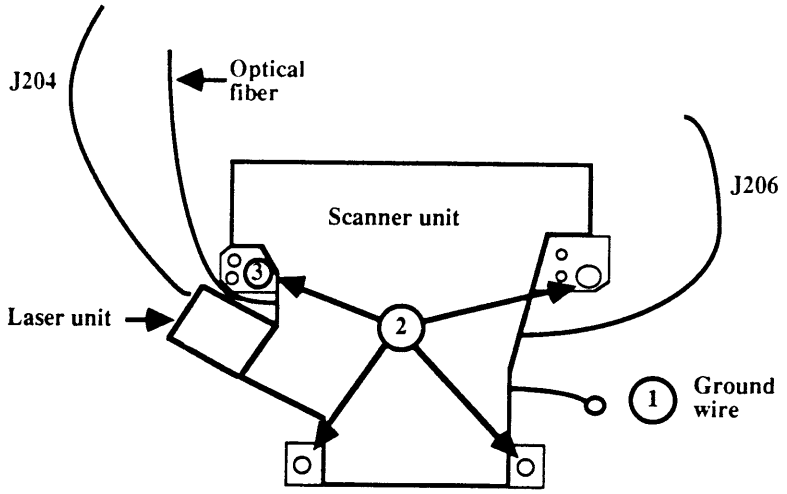


FIGURE 2-8

5. **Very carefully** lift the laser and scanner unit straight up and out of the printer. Rest it upside down on a stable, static-free surface.

IMPORTANT: *When you receive a new laser/scanner unit from Apple, it will be shipped with a laser shorting connector on the end of the laser cable. Install this connector on the old laser unit before shipping it back to Apple for repair. Be sure pin 4 is shorted to pin 6. Shorting these two pins prevents static electricity from damaging the laser unit.*

Replace

1. Put the laser/scanner unit back into place. Make sure no cables are trapped beneath the unit.
2. Connect the ground cable to the hole nearest the right panel.
3. Replace the four large mounting screws. NOTE: The long screw goes through the spacer and washers in the hole nearest the laser unit (Figure 2-8, #3).
4. Reconnect the cables to DC Controller Board jacks J203, J204, and J206.
5. If this is a replacement unit, perform the Laser Power Adjustment (see Section 3, Adjustments).

Separate Laser from Scanner

1. Remove the Laser/Scanner Unit.
2. Pull back the rubber cap on the laser unit and remove the two 2mm Allen screws.
3. Pull the laser unit free.

Reinstall Laser on Scanner

1. Put the laser unit into position on the scanner unit; make sure the cable marked TB3 comes out on the same side as the optical fiber.
2. Put the two Allen screws in loosely, and then tighten them alternately so that the unit fits firmly into place.
3. Replace the Laser/Scanner Unit.

❑ LASER BEAM BLOCKING SHUTTER

This shutter (Figure 2-9, #27) is located beneath the laser and scanner units. It is opened mechanically when the toner cartridge is inserted into the printer, and should not need repair. To check it for cleaning and/or lubrication, remove the laser/scanner unit, locate the shutter and make sure that it moves freely.

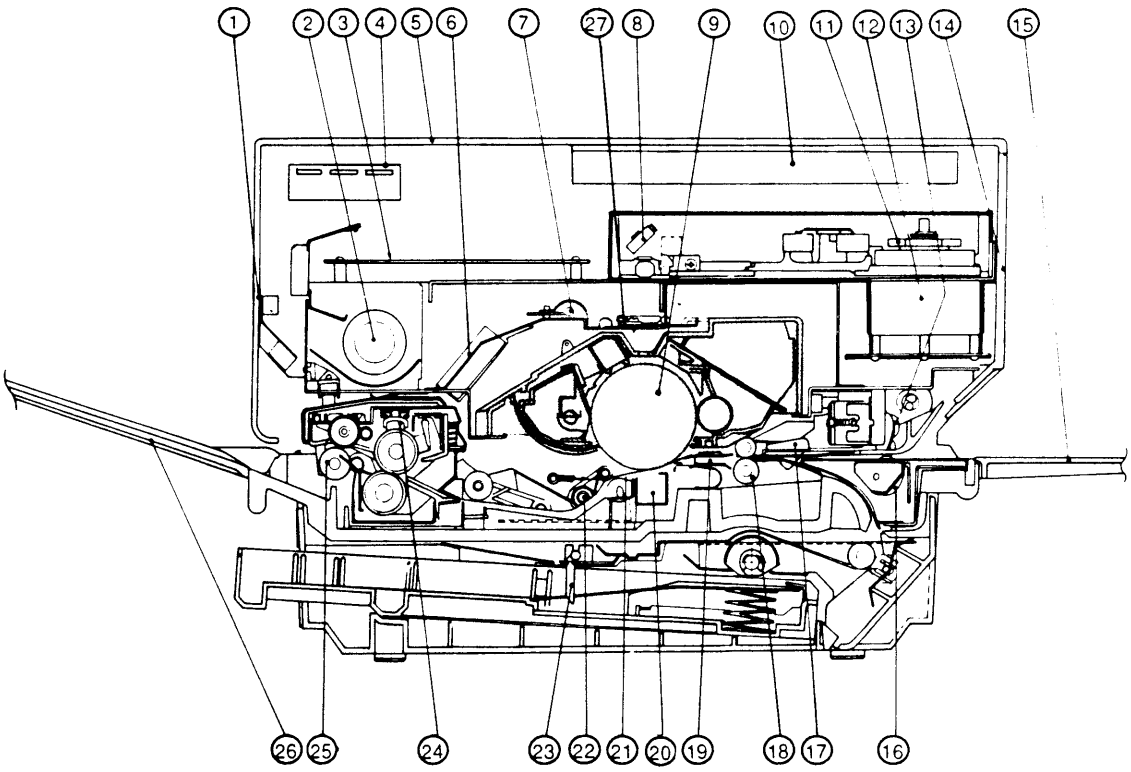


FIGURE 2-9

Remove

1. Remove the Laser/Scanner Unit.
2. Remove the two screws that hold the ozone seal plate in place.
3. Unhook the two tension springs from the Laser Beam Blocking Shutter.
4. Remove the two screws holding the shutter in place.
5. Lift the edge of the shutter closest to the DC Controller PCB and simultaneously remove the shutter from the unit.

Replace

1. Put the shutter in place.
2. Replace the two screws and plastic bushings.
3. Re-hook the two tension springs on the shutter.
4. Put the ozone seal in place and replace the two mounting screws.

❑ REGISTRATION SHUTTER ASSEMBLY

The registration shutter assembly is located in the upper "jaw" of the printer, near the hinges. When paper is fed into the paper path, either from the cassette or from the manual feed tray, the registration shutter stops the paper until all systems are synchronized and the edge of the paper is straight. Then the printer energizes the registration solenoid, which lifts the shutter and allows the paper to pass on to the toner cartridge.

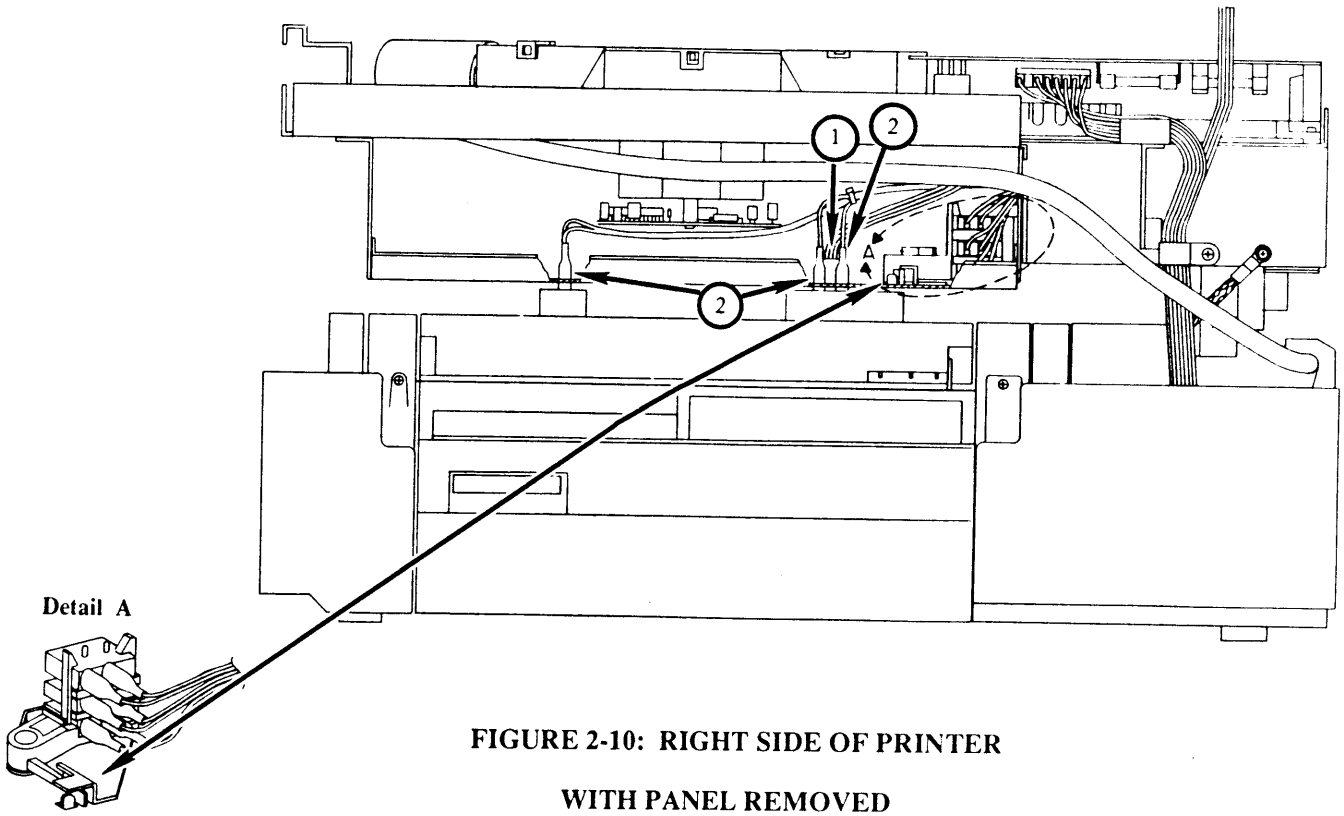


FIGURE 2-10: RIGHT SIDE OF PRINTER WITH PANEL REMOVED

Remove

IMPORTANT: *Before starting, locate the cartridge-detect microswitch assembly and note how the white plastic arm is seated between two metal tabs (Figure 2-10, Detail A). This is your test for whether the assembly has been replaced correctly. If the white plastic arm is not properly seated, the printer will not function: it will "think" that the toner cartridge is not installed and the green READY light on the front panel will not come on.*

1. Remove the Laser/Scanner Unit.
2. Remove the DC Power Supply/Motor Drive PCB Assembly.
3. Using long-nose pliers, remove the three-wire connector (see Figure 2-10, #1) and the four fast-on connectors (see Figure 2-10, #2).
4. Remove the two silver screws visible from the top through the two access slots (one on either side of the assembly).
5. Open the printer. The registration shutter assembly should be resting on the lower body of the printer.
6. Remove the green ground wire from the front side of the registration shutter, and lift the assembly out of the printer.

Replace

1. Put the shutter assembly in place on the lower body of the printer, and reconnect the ground wire.
2. Lift the shutter assembly into its place in the top of the printer. Check the white plastic arm of the microswitch unit to make sure it is correctly seated. (Figure 2-10, detail A.)

3. Holding the assembly in place with one hand, replace the two short flanged silver screws.

CAUTION: *You should not have to force the assembly into position. If the screw holes are not aligned correctly, reposition the whole unit.*

4. Test for correct installation by closing and opening the printer. There should be no binding.

5. Replace the cable connector and the fast-on connectors.

6. Replace the DC Power/Motor Drive PCB.

7. Replace the Laser/Scanner Unit and all panels and covers.

❑ PRECONDITIONING EXPOSURE ASSEMBLY

The preconditioning exposure assembly (Figure 2-11, #1) prepares the print drum in the toner cartridge for a new image. The lamps expose the print drum to a uniform light that neutralizes any leftover charges from the last print cycle, thus "erasing" the previous image from the drum.

The print counter (Figure 2-11, #2, a fuse-like component that is part of the assembly) shows how many prints have been made on the printer since the counter was installed. Each numbered mark on the counter represents approximately 10,000 pages. When the mercury bubble in the counter reaches "10," the counter should be replaced.

It is not necessary to remove the assembly to view the counter; you can see it if you remove the ozone filter (see instructions for removing the ozone filter).

In these instructions, right and left are used with reference to Figure 2-11.

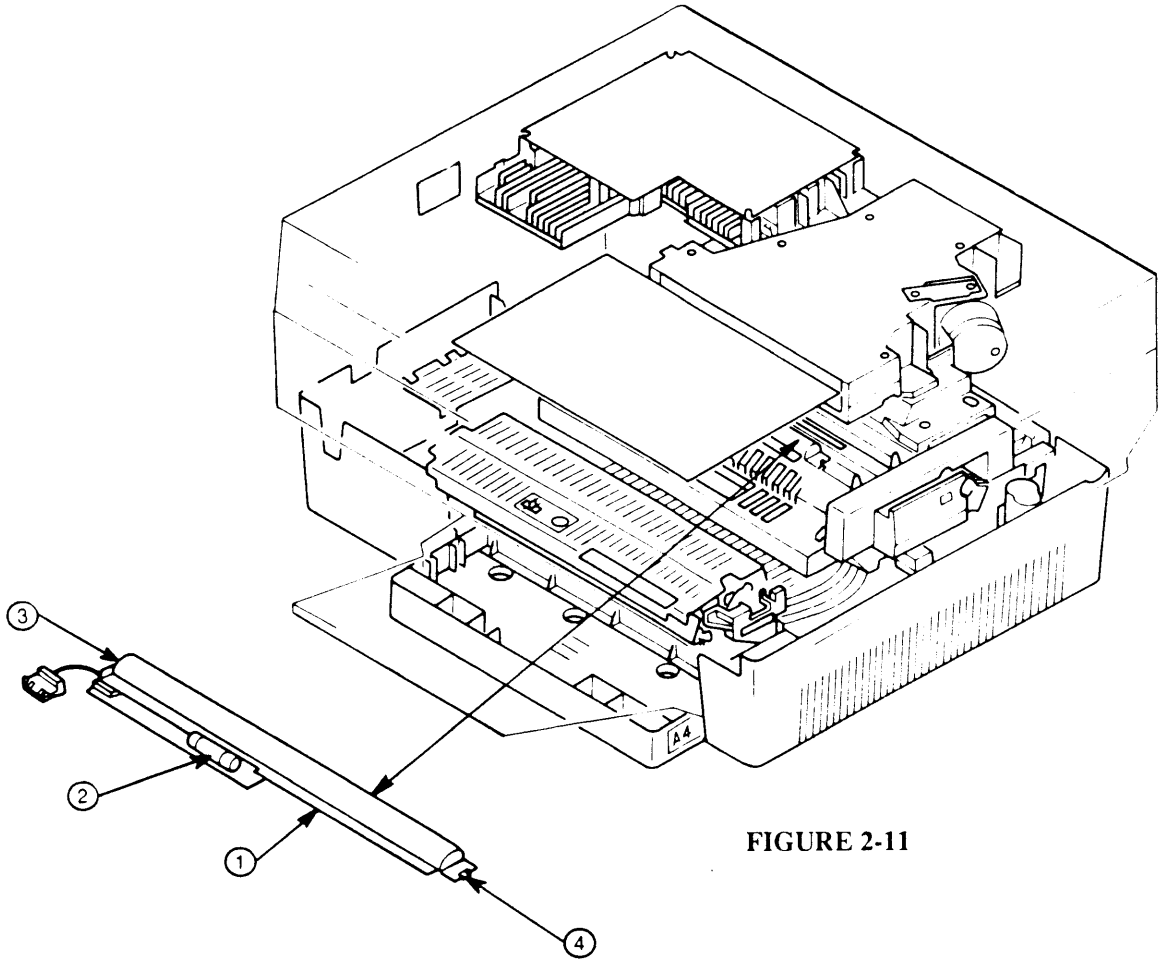


FIGURE 2-11

Remove

1. Remove the DC Controller PCB.
2. Remove the single mounting screw at the left of the assembly (see Figure 2-11, #3).
3. To remove the assembly, put one finger on the right side of the assembly and push to the left until the tab at the right (see Figure 2-11, #4) comes free.
4. Lift the assembly out of the printer.

Replace

When replacing this assembly, transfer the old print counter (which looks like a fuse) from the old assembly to the new, unless the old print counter reads "10." If the print counter reads "10," replace it.

1. Put the assembly in place. To seat it, gently push down on the tab at the right (using a pencil or similar pointed tool) while pushing the assembly to the right.
2. When the assembly is properly seated, replace the mounting screw.
3. Replace the DC Controller PCB.

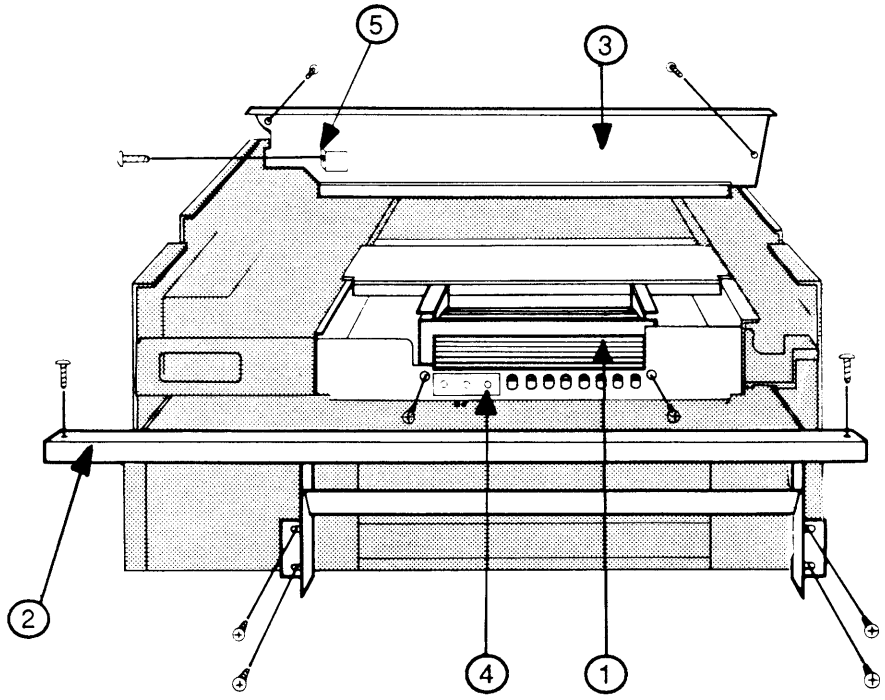


FIGURE 2-12

❑ FAN

The fan is located along the left side of the upper main body (see Figure 2-12).

Remove

1. Remove the top cover, front panel, right panel, rear panel, and left panel.
2. Remove the LaserWriter I/O board and the DC Controller PCB.
3. Remove the left side-frame (see Figure 2-12, #2) by removing its six silver screws.
4. To remove the fan cover (the metal plate above the fan, see Figure 2-12, #3), remove the three screws and lift the fan cover out of the chassis.
5. Unplug the two-wire white fan cable and free it from its clamp.
6. Remove the two fastening screws and take out the fan.

Replace

1. Put the fan into place.
2. Put the fan cable into its clamp and reconnect it to its mate.
3. Install and tighten the two fastening screws.
4. Put the fan cover (see Figure 2-12, #3) into place (try different positions until you are sure it fits correctly: the tab for the side screw (Figure 2-12, #5) fits outside the chassis frame) and install the three screws.

   Note: The screw on the side is easy to drop into the mechanism. To avoid that, start the screw by hand.
5. Replace the side frame and its six short silver screws.
6. Replace the DC Controller board, the LaserWriter I/O board, and all panels and covers.

❑ PAPER DETECT OPTICAL SENSOR

Remove

1. Remove the fan.
2. Free the sensor cable from its clamp.
3. Open the printer.
4. The optical sensor assembly is attached to the center of the left side of the printer (Figure 2-13, #4). Remove the single screw and the small metal plate, press the plastic clips together, and lift the assembly out.

Replace

1. With the printer open, place the sensor assembly in its slot so that the plastic clips snap into place.
2. Put the small metal plate in place (the tab points toward the rear of the printer), and install the screw.
3. Replace the fan.

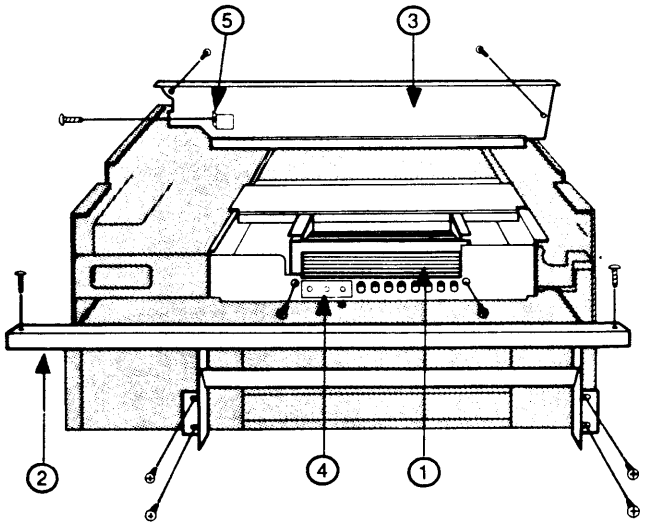


FIGURE 2-13

❑ OZONE FILTER

The ozone filter sits below and behind the fan, just forward of the preconditioning exposure lamps and above the toner cartridge.

Remove

1. Open the printer and remove the toner cartridge.
2. Locate the ozone filter: it is a gray plastic piece located just above the toner cartridge, between the fan and the red plastic preconditioning exposure window (Figure 2-14). You have to look and reach under the fan to find it.
3. Remove the fastening screw, move the ozone filter slightly up, and pull it out.

Replace

Put the ozone filter in place and install the single screw.

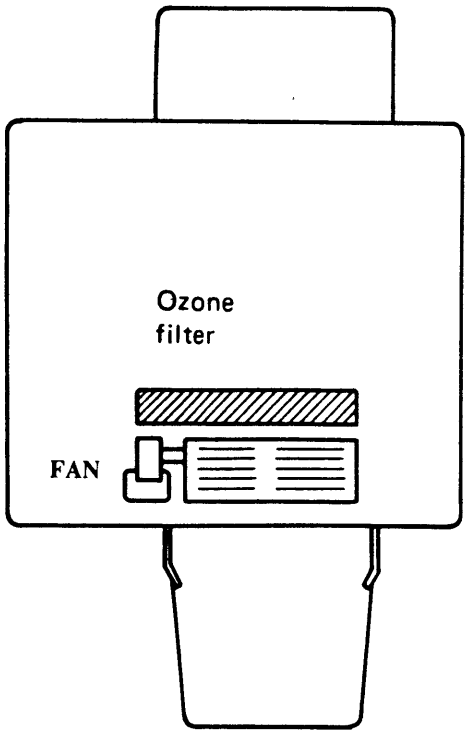


FIGURE 2-14

❑ HIGH VOLTAGE POWER SUPPLY

The high voltage power supply (see Appendix, Photo 1, #6 for location) generates high voltage for the transfer corona wire and also for two elements in the toner cartridge: the primary corona wire and the developing assembly.

Remove

1. Remove the top cover, front panel, right panel, left panel, rear panel, and LaserWriter I/O board.

2. Remove the rear chassis frame as follows:

   a) Remove the three connectors from the varistor PCB (Figure 2-15, #1, and Photo 1, #10).

   b) Mark the type of screw at each location on the frame with a pencil (for example, "short silver" or "long black"). Then remove screws and lift off the frame piece (Figure 2-15).

3. Open the printer.

4. Remove the black, flanged, fastening screw from the high voltage power supply cover and remove the cover—wiggle it off: it's held on by friction from the wires trapped beneath it.

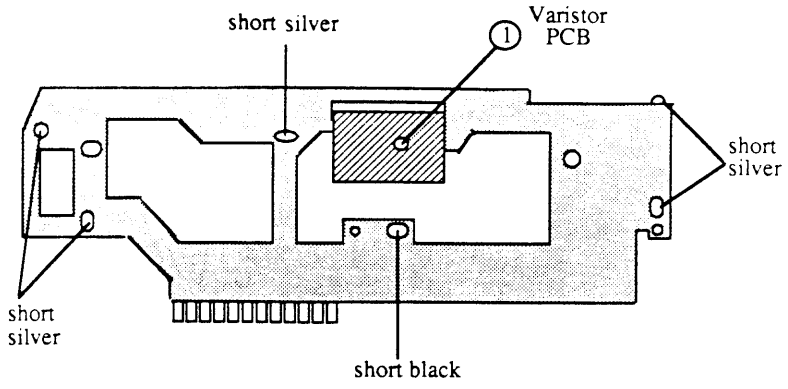


FIGURE 2-15

5. Disconnect the two connectors with thick red wires (Figure 2-16, #1 and #2) from the high voltage power supply—one connector has two wires, the other has one. Use a screwdriver to help pry off the connectors.

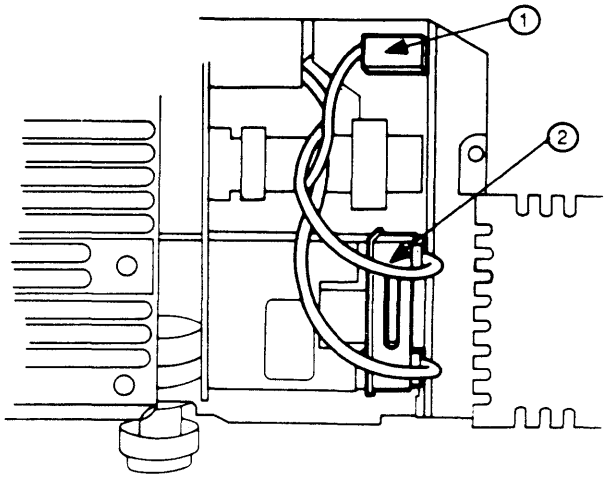


FIGURE 2-16: HIGH VOLTAGE POWER SUPPLY

6. Disconnect J211 from the DC controller board.

7. With the printer open, remove the single mounting screw and remove the power supply.

Note: If practicing these procedures, go to Main Motor removal before replacing the high voltage power supply.

Replace

1. Attach the power supply to the chassis using a short black screw.

2. Attach the two large connectors to the power supply, and attach the eight-pin connector to J211 on the DC controller board.

3. Put the power supply's cover into place. The edge of the cover fits into the white plastic guides on the chassis, and the two-wire varistor cable fits beneath the cover. (The single green wire should not be beneath the cover.)

4. Replace the cover screw (short, black, with flange).

5. Replace the rear chassis frame, using the correct screws as you noted them on the frame.

   Note: The white plastic stud on the high voltage power supply fits through a hole on the frame. This stud helps to position the frame.

6. Reconnect the three connectors to the varistor PCB.

7. Replace the LaserWriter I/O board, and the panels and covers.

❑ DRIVE GEAR GROUNDING SPRING

Remove

1. Open the printer.

2. Remove the toner cartridge.

3. Locate the drive gear grounding spring, which is in the center of the largest drive gear. (See Illustrated Parts List.)

4. Lift out the spring using needlenose pliers or tweezers.

Replace

1. Replace the drive gear grounding spring, wide end first, in the center of the largest drive gear. Push on the spring to make sure it is firmly seated.

2. Replace the toner catridge.

3. Close the printer.

❑ MAIN MOTOR

The main motor (Figure 2-17) turns the paper feed mechanism gears and the toner cartridge drum gear.

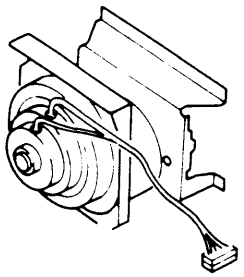


FIGURE 2-17

Remove

1. Remove the high voltage power supply.
2. Unplug the motor connector from the DC power supply/motor drive PCB.
3. Remove the four large screws that secure the main motor to the chassis.
4. Hold the motor as you remove the one small screw from the metal plate above the motor. Using needle-nose pliers, remove the cable clamp from the motor, and lift the motor out of the printer.
5. Using a 2 mm Allen wrench, remove the set screw(s) that secure the main gear to the motor, and set the gear and set screw(s) aside.

Replace

1. Replace the main gear on the motor, using a 2 mm Allen wrench to replace the set screw(s).
2. Replace the motor (be careful not to catch any wires beneath the motor), attach the cable clamp, and install the screw that secures the motor to the metal plate.
3. Install the four large screws that secure the main motor to the chassis.
4. Reconnect the motor cable to the DC power supply/ motor drive PCB.
5. Replace the high voltage power supply.

❑ POWER INTERLOCK ASSEMBLY

The power interlock assembly consists of the AC driver PCB, which is a two-board assembly (Figure 2-18, #3 and #4); the main power switch (Figure 2-18, #5); and the two microswitches (Figure 2-18, #6), which cut off power to the printer when the printer is opened (upper main body raised). The procedures below cover the removal and replacement of the AC driver PCB.

Remove

1. Remove the black, flanged screw near the circuit breaker (Figure 2-18, #1) and lift off the plastic assembly cover. The cover swings up and to the rear in an awkward manner, but don't worry—just keep gently working at it, and it will come off.

2. Remove the two fastening screws (Figure 2-18, #2).

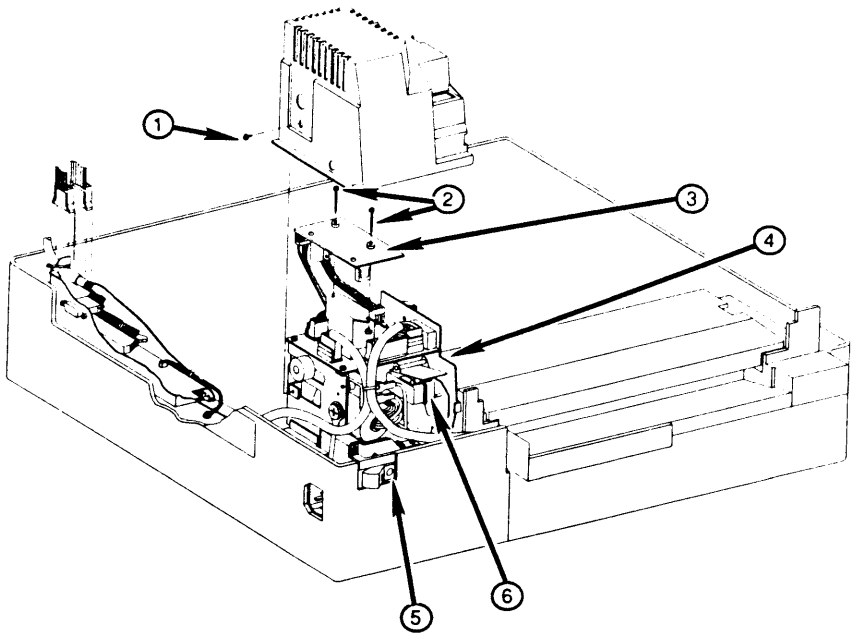


FIGURE 2-18

3. Lift off the upper PCB and unplug connectors J104, on the upper PCB, and J106, on the lower PCB.

4. Remove the cable tie that holds the cables that come from the upper PCB, and take the upper PCB out of the printer.

   Note: The 47-ohm resistor at position J107 on the upper PCB (the Fuser Heater Safety PCB) is mounted in a four-pin connector for easy replacement. This resistor acts as a fuse: if the heater bulb is defective (or seated improperly), or if there are excessive current requirements, this resistor opens (blows) to protect the board.

5. Unplug the four remaining connectors to the lower PCB.

6. Remove the two screws from the lower board, and slide the lower board out of its slot.

Replace

1. Put the lower PCB in place, inserting the appropriate side of the board into the slot in the chassis.

2. Install the two lower-board screws (black).

3. Plug in the four connectors from the lower pedestal (J101, J102, J103, and J105) to the lower PCB.

4. Plug in the connection from the upper PCB to the lower PCB (J106).

5. Plug in the connector from the lower pedestal to J104 on the upper PCB.

6. With a cable tie, tie together the cables to J106, J102, and the connector that goes to the upper board.

7. Slide the plastic assembly cover over the assembly, making sure that all cables are beneath the cover. Make sure that the cover fits under the four metal tabs on the chassis and under the harness cover tab, and that it is properly seated (see Appendix, Photo 6).

8. Install the short, black, flanged screw in the cover.

❑ FUSER ASSEMBLY

The Fuser Assembly (Figure 2-19) consists mainly of two rollers and a heater bulb. The combination of heat and pressure provided by this assembly fuses the toner onto the paper. This assembly also contains two sensors (the thermistor and the thermoprotector) that allow the printer to regulate the temperature of the rollers.

Remove

***WARNING:** If the printer has been in use, the fuser assembly will be very hot. Wait until it cools down before working with it.*

1. Open the printer. Open the green cover of the fuser assembly and remove the cleaning felt by sliding it out to the right.

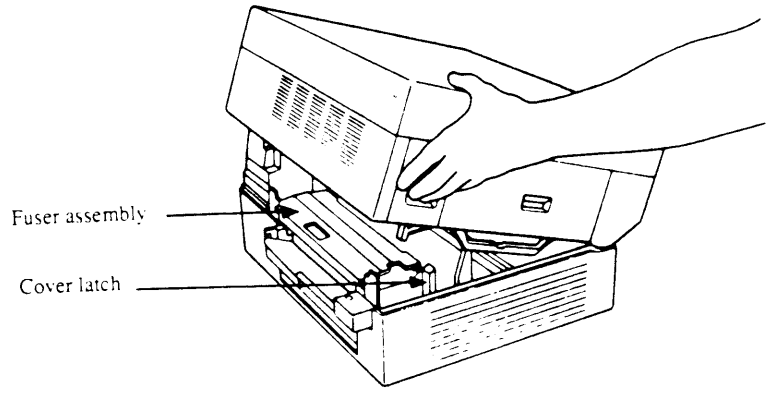


FIGURE 2-19

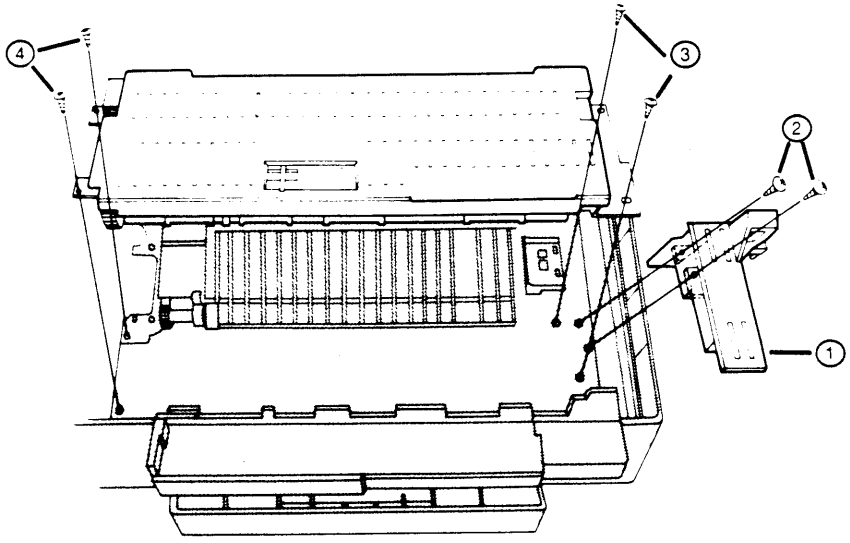


FIGURE 2-20

2. Locate the cover latch unit, a gray plastic piece at the front end of the assembly (Figure 2-19 and Figure 2-20, #1). Remove the two black screws at the base of the cover latch unit (Figure 2-20, #2), and lift the unit out of the printer.

3. Remove the two black screws at the front end of the fuser assembly (Figure 2-20, #3).

4. Remove the harness cover, a flat gray plastic piece (see Appendix, Photo 6, #3), by removing the single screw and prying back on the plastic tab next to the Power Interlock Assembly (see Appendix, Photo 6, #4).

5. Pull out and disconnect the fuser assembly connector from beneath the Power Interlock Assembly.

6. Remove the two screws from the brass-colored tabs at the rear end of the fuser assembly (Figure 2-20, #4).

7. Lift the assembly up high enough to remove the spade connector on the rear end.

8. Disconnect the spade connector at the front, which comes from the white plastic-sheathed wire. (It is connected to a double lug that holds a spade connector from another wire. If the lug itself comes off, work the connector from the white plastic-sheathed wire free of the lug and replace the lug on its brass lug.)

9. Lift the assembly out of the printer.

Replace

1. Put the assembly into place.

2. Attach the spade connectors (one at either end). Make sure to tuck the wires at the front end under the lip of the assembly so that they do not interfere with installation of the cover latch unit in step 6.

3. Reconnect the cable and tuck it beneath the Power Interlock Assembly.

4. Reinstall the harness cover and its short black screw.

5. Reinstall the two long black screws at the rear of the assembly.

6. Put the cover latch unit back in place, and reinstall the four long black screws at the front of the assembly.

7. Install the cleaning felt.

❑ HEATER BULB – FUSER ROLLER HEATER

When handling the heater bulb, do not touch the body of the bulb with your fingers: oil from your fingers can cause hot spots and weaken the bulb.

WARNING: *When removing a heater bulb, be careful. If the bulb has broken, there will be sharp glass shards in the upper roller.*

Remove

1. Remove the Fuser Assembly.
2. Remove the black plastic end-piece from the front end of the fuser assembly by removing its two screws.
3. **Carefully** remove the bulb.

Replace

1. Holding the bulb by the end with the manufacturer's name (Figure 2-21), insert it into the roller tube. Make sure that the leading end is seated on the small copper electrode at the far end of the assembly and the glass nipple on the bulb is facing downward, away from the cover of the assembly.

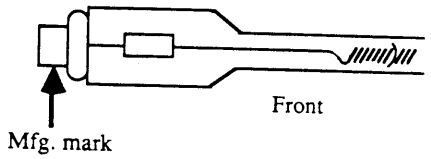


FIGURE 2-21

2. Replace the black plastic end-piece, seating its copper electrode in the end of the heater bulb. Replace the two short black screws in the end-piece.

IMPORTANT: *The bulb must be securely seated on the copper electrodes at both ends. Otherwise, the 47-ohm resistor-fuse at position J107 on the Fuser Heater Safety PCB (the upper board of the AC Driver PCB) will open (blow) when you turn on the printer.*

3. Replace the Fuser Assembly.

❑ FUSER ROLLERS

The rollers in the fuser assembly may need replacement after long service. To check for roller wear, perform the Nip Width Measurement, Section 4, Troubleshooting.

Remove Upper Roller

1. Remove the fuser assembly.
2. Remove the black plastic end-piece (right fuser bracket) from the front end of the fuser assembly by removing its two screws.
3. Remove the heater bulb.
4. Remove the green cover by removing the two hinge-screws that hold the cover to the fuser (Figure 2-22).

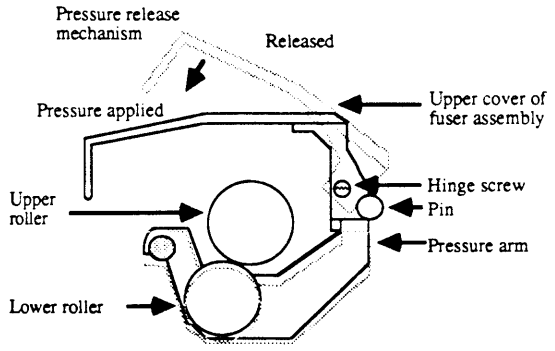


FIGURE 2-22
CROSS SECTION OF FUSER ASSEMBLY, SIMPLIFIED

5. Remove the screws that hold the two pressure spring assemblies at each end of the fuser assembly. (Each spring assembly contains a white nylon bushing and a small metal sleeve.) Remove the spring assemblies and screw (see Figure 2-23).

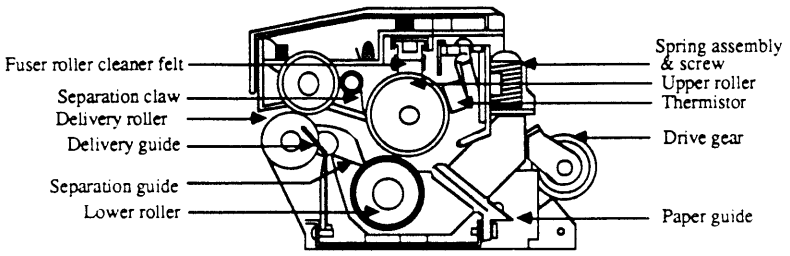


FIGURE 2-23
CROSS SECTION OF FUSER ASSEMBLY

6. Remove the steel plate from the rear of the fuser as follows:

   a) Loosen but do not remove the screw that clamps the white cable to the plate. Free the cable.

   b) Remove the spring from the steel plate. (To avoid losing it, remove it entirely from the assembly and put it aside.)

   c) Remove the two screws that attach the steel plate to the rear of the fuser, and remove the plate.

7. Using needlenose pliers, remove the grip ring from the geared end of the roller. (The gear teeth are plastic; do not push against them when prying the ring off.)

8. Remove the gear from the tube.

9. Remove the two screws from the roller bushing at the other end of the fuser assembly. Pull out the roller, being extremely careful not to scratch any of the exposed surfaces.

10. If the replacement roller does not have a bushing attached, remove the bushing on the old roller by carefully prying off the grip ring. Then install the bushing and the grip ring on the new roller.

Replace Upper Roller

1. Carefully install the roller in the fuser assembly, inserting the side without the bushing first. (If there is no front bushing on the replacement roller, transfer the bushing and grip ring from the old roller to the new.)

   When replacing the roller, check that the thermistor and thermoprotector (the two gold-colored components on the top bar of the assembly) touch the tube evenly when the tube is rotated (see Figure 2-24). If the contact is not even, check to see if the springs on the thermistor or thermoprotector are bent or broken, and adjust them if possible; otherwise, replace the thermistor or thermoprotector.

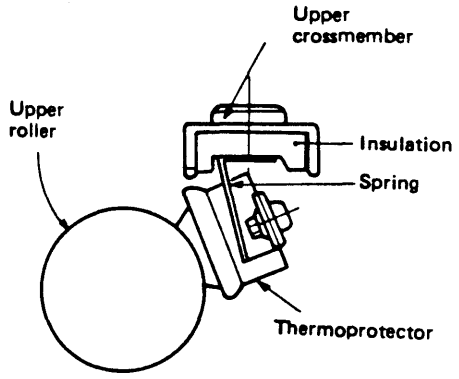


FIGURE 2-24

2. Align the screw holes on the roller bushing with the holes in the fuser. Install the two short black screws.

3. Replace the gear on the roller so that the inner tooth on the gear lines up with the slot in the tube. Make sure the outer side of the gear (where the tooth is flush with the surface of the gear) faces outward. Replace the grip ring to hold the gear in place.

4. Replace the steel plate on the end of the fuser assembly as follows:

   a) Place the plate on the assembly so that the two screw slots line up with the screw holes on the assembly, and install the screws.

   b) Attach one end of the steel spring to the tiny hole in the plate (from below); attach the other end to the hole in the lower gear plate. Make sure that the ends of the spring are securely seated in the holes.

   c) Clamp the white plastic cable under the small cable clamp on the plate, pulling the cable so that there is very little slack, and tighten the screw.

5. Reinstall the two spring assemblies, one at each end of the fuser. Make sure that the small metal sleeve and nylon bushing are on the screw before you install it.

6. Replace the green cover and its two short black hinge-screws (Figure 2-25). Check for free motion of the cover and loosen screws if necessary.

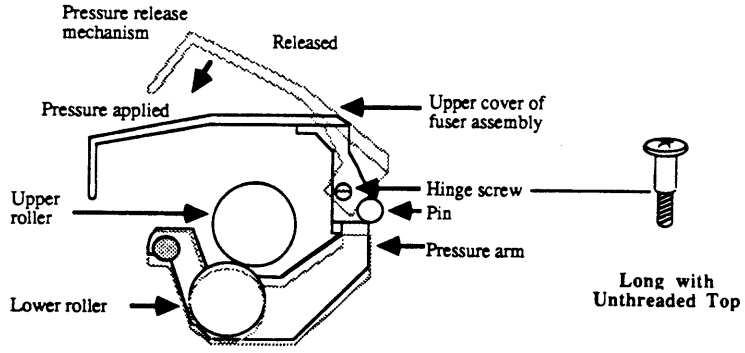


FIGURE 2-25

7. Replace the heater bulb.

8. Place the black plastic end-piece (bracket) over the front end of the tube, being especially careful to seat the copper electrode in the end of the heater bulb. Replace the two short black screws in the end piece.

9. Replace the fuser assembly.

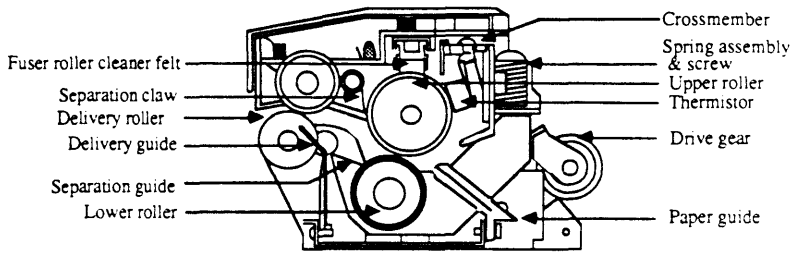
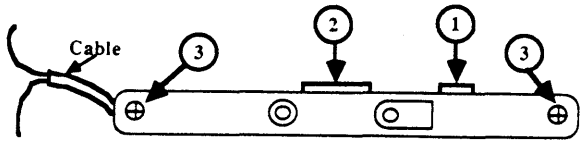
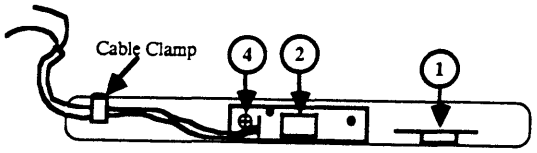


FIGURE 2-26
CROSS SECTION OF FUSER ASSEMBLY



Crossmember Assembly: Top View



Crossmember Assembly: Bottom View

FIGURE 2-27

Remove Lower Roller

1. Remove the upper roller.

2. Remove the upper crossmember assembly (Figure 2-26 and Figure 2-27) as follows:

   a) Remove the two screws (one at each end).

   b) Disengage the white cable from the fuser assembly and lift out the crossmember assembly.

3. Remove the lower paper delivery guide (gray plastic) by removing the two screws holding it to the fuser assembly. (One of the screws has a small copper washer under it: make sure to capture it.)

***WARNING:** In the next step take care not to cut your fingers on the sharp edges of the separation plate.*

4. To remove the lower roller, lift the roller, the two pressure arms (one at each end—see Figure 2-28), and the shiny separation plate up out of the assembly. (This is not easy: be prepared to fumble with it a bit.)

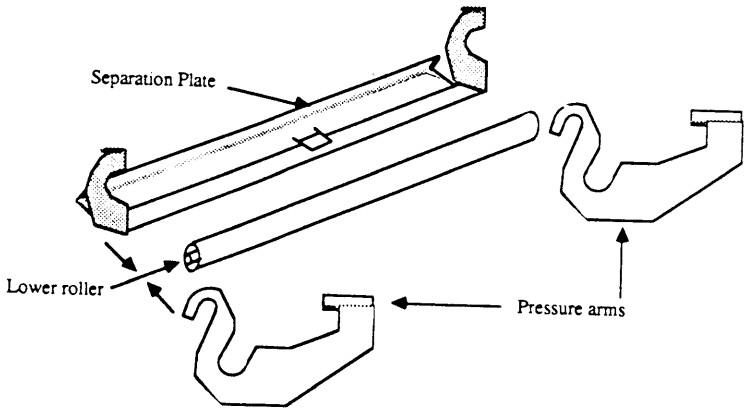


FIGURE 2-28

Replace Lower Roller

1. Make sure the small plastic bushings are in place at each end of the lower roller, with the flange end toward the roller. Place the two metal pressure arms (one at each end) on the bushings, in the direction shown in Figure 2-29.

WARNING: *In the next step take care not to cut your fingers on the sharp edges of the separation plate.*

2. Hook the separation plate onto the bushing shaft at each end of the lower roller, in the position shown in Figure 2-29.

3. Place the roller assembly into the fuser assembly as follows:

   a) Use a piece of masking tape to hold the roller assembly together.

   b) Move it under the metal arms on the fuser assembly.

   c) Insert the tab on the back of the separation plate (Figure 2-29, #1) into the slot in the center of the fuser assembly plate (between the central black rollers).

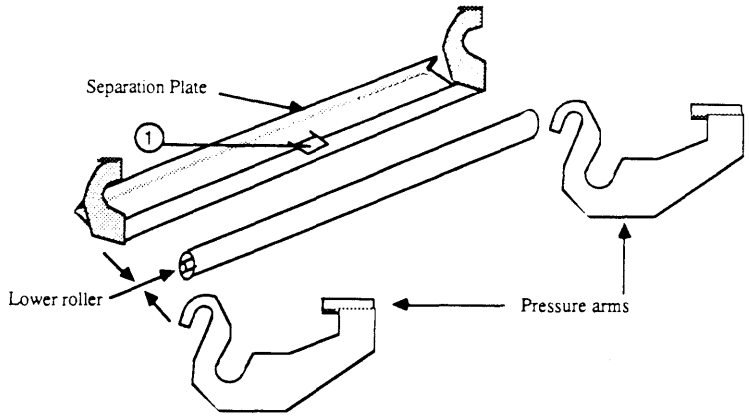


FIGURE 2-29

   d) Hook the ends of the pressure arms on the two slotted bushings at each end of the fuser assembly.

   e) Remove the masking tape.

4. Reinstall the gray plastic lower delivery guide and the two small screws. Do not forget to place the copper washer under the screw closest to the geared end of the fuser.

5. Reinstall the upper crossmember assembly by its two black screws, making sure that the front white plastic cable is routed through the small slot between the pressure arm and the fuser chassis. The rear white plastic cable is routed below the small curved flange on the upper crossmember.

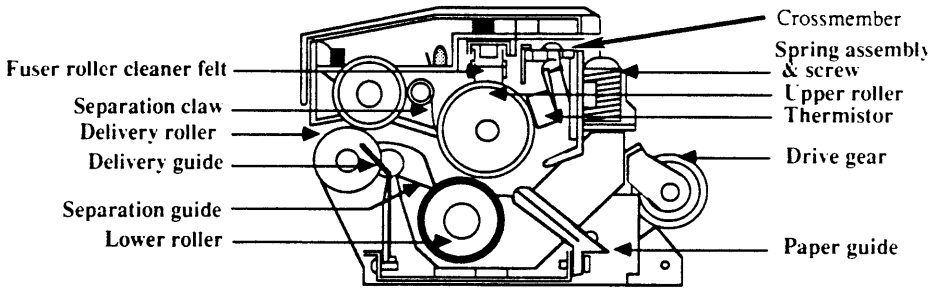
6. Reinstall the upper roller.

❑ THERMISTOR AND THERMOPROTECTOR

The thermistor and thermoprotector are small sensors contained on the upper crossmember of the fuser assembly, touching the upper roller. They are just visible when you open the fuser assembly's green cover and look behind the upper roller (Figures 2-30 and 2-31).

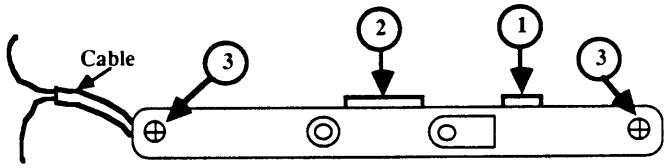
The thermistor (Figure 2-31, #1) senses the upper fuser roller's surface temperature. This allows the DC Controller board to regulate the heater bulb.

The thermoprotector (Figure 2-31, #2) protects the fuser assembly from high temperatures (over 245° C) by acting as a thermostat for the unit, shutting off the current to the heater bulb when the assembly gets too hot.

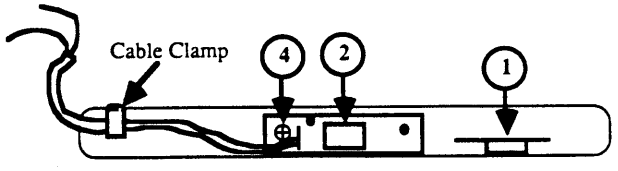


CROSS SECTION OF FUSER ASSEMBLY

FIGURE 2-30



Crossmember Assembly: Top View



Crossmember Assembly: Bottom View

FIGURE 2-31

If the thermoprotector is incorrectly positioned (Figure 2-32), prints may show smearing or a vertical fogged line at 80-90 mm from the left side of the page. (See also Section 4, Troubleshooting.) To correct this problem, the thermoprotector must be cleaned or replaced and repositioned correctly.

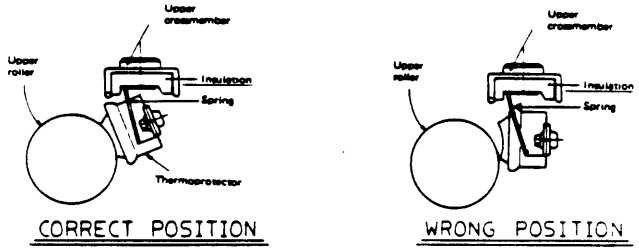


FIGURE 2-32

Remove

1. Remove the upper roller.

2. Locate the upper crossmember assembly (Figure 2-30 and 2-31). The crossmember contains thermistor and thermoprotector (Figure 2-31, #1 and 2). Remove the crossmember as follows:

   a) Remove the two screws—one at each end (Figure 2-31, #3).

   b) Disengage the white cable from the fuser assembly, and lift out the crossmember assembly.

3. Remove the black cover of the crossmember assembly by removing its two screws.

4. To remove the thermistor, use needlenose pliers to disengage one of its two tabs from its hole.

5. To remove the thermoprotector, remove the screw farthest from the thermistor (Figure 2-31, #4), and lift the thermoprotector assembly out of the crossmember assembly.

Replace

1. To install a new thermistor:

   Seat the thermistor gently, using needlenose pliers to help seat its tabs in their holes.

2. To install a new thermoprotector:

   a) Seat the new thermoprotector assembly in the crossmember, and install the single short black screw.

   b) Attach the cable connector to the last screw hole in the crossmember so that it holds the cable in place.

3. Replace the black cover on the crossmember assembly and install its two screws (black screws with unthreaded top).

4. Reinstall the crossmember assembly as follows:

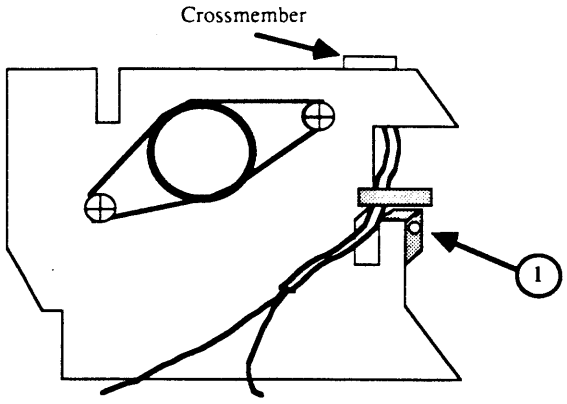
   a) Seat the assembly on the fuser assembly.

   b) Route the small cable under the small half-clamp at the gear-end of the crossmember assembly.

   c) Route the large cable attached to the black plastic end-piece as shown in Figure 2-33, #1.

   d) Install the two small black screws, one at either end of the crossmember.

5. Replace the upper roller.



Fuser Assembly: Front View

FIGURE 2-33

❑ TRANSFER CORONA ASSEMBLY

As the paper passes over the transfer corona (see Appendix, Photo 5, #6), the corona wire gives the paper a static charge that attracts the toner from the print drum. If the corona wire breaks, the printing will be too light across the entire page. You can replace the entire assembly or just the wire.

Remove

1. Open the printer.
2. Remove the separation belt (see Appendix, Photo 5, #1).
3. Remove the transfer roller (see Appendix, Photo 5, #2) by removing its one screw (Figure 2-34) and lifting out the transfer roller.

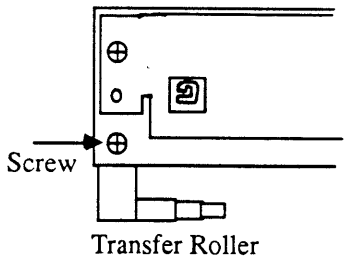


FIGURE 2-34

4. Remove the screw at the front end of the assembly (see Appendix, Photo 5, #3). Lift the assembly toward the front of the printer and out.

Replace

1. Put the assembly back into place and install the long black screw.

***WARNING:** Be careful not to cut your fingers on the antistatic teeth next to the assembly: they are sharp!*

2. Put the transfer roller in position (its two studs fit into holes in the brass-colored plate above it). Install its black self-tapping screw.
3. Reinstall the separation belt.

❑ RESTRING CORONA WIRE

You will need corona wire and nylon wire, for the guide wire. You will also need a spring hook, needlenose pliers, and diagonal cutters.

1. Remove the transfer corona assembly.
2. Place the unit in front of you so that the corona terminal (see Appendix, Photo 5, #5) is on the right hand side.
3. Remove both the corona wire termination covers (see Appendix, Photo 5, #4 and #5) by unsnapping them and lifting them clear of the assembly.
4. Remove the tension spring from the end of the broken corona wire and set it aside.
5. Remove the guide wire (nylon wire) by loosening the screws that hold it to the corona assembly.
6. Remove the broken corona wire from the corona assembly.
7. Take the new corona wire, fold back approximately a 1/4" length, and make six to eight half-turns to form a loop at the end of the wire.
8. Hook the loop over the plastic retaining pin at the left end of the assembly (Figure 2-35).

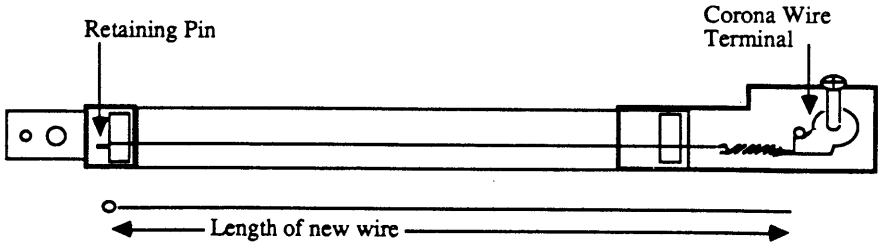


FIGURE 2-35

9. Stretch the wire along the length of the corona assembly until it just reaches the leftmost brass-colored part of the corona wire terminal, and cut off any excess wire.

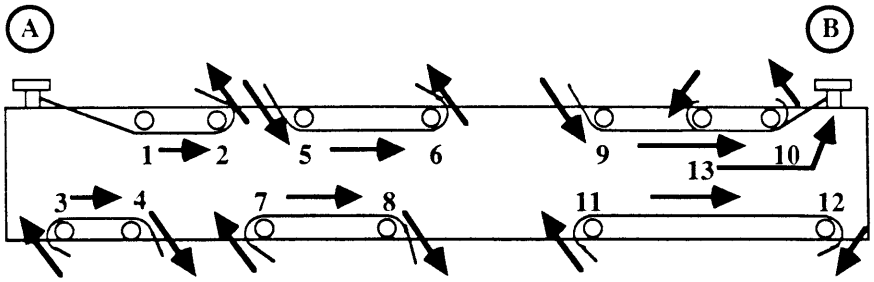
10. Using the same procedure as in step #7 above, form a loop at the end of the corona wire.

11. Hook one end of the spring onto the loop and the other end onto the corona wire terminal (see Figure 2-35). The wire should have no kinks and be taut enough to remain straight.

12. Replace the corona wire termination covers. (The small cover has a lip that fits under the lip of the assembly.)

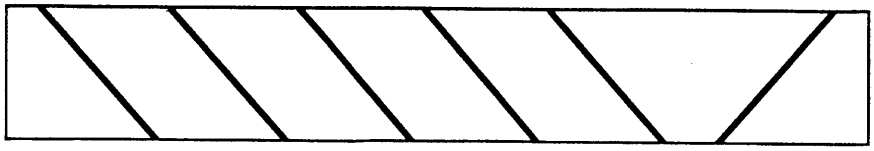
13. Restring the guide wire as shown in Figure 2-36.

14. Replace the transfer corona assembly.



BOTTOM VIEW

1. Fasten the guide wire with screw A.
2. Pass wire around pin 1 and pin 2 to pin 3.
3. Continue routing the guide wire as shown in the diagram.
4. Pass the wire from pin 13 to screw B, and tighten screw B.



TOP VIEW AFTER GUIDE WIRE RESTRINGING;
TERMINAL END IS ON RIGHT HAND SIDE

FIGURE 2-36: CORONA ASSEMBLY

❑ TRANSFER GUIDES

The transfer guides (see Appendix, Photo 2, #1) consist of plates and rollers that guide the paper toward and between the toner cartridge drum and transfer corona assembly. If the transfer guides are bent, print may be light on some areas of the page (because the paper will be too far from the transfer corona wire).

> ***Note:*** If you do not have a stubby screwdriver, you will have to remove all panels, the rear frame, the high-voltage power supply, and the main motor before performing this removal and replacement.

Remove

1. Open the printer and remove the toner cartridge.
2. Remove the separation belt.
3. To allow the printer to open wider, remove the two retaining pins, one at each side of the cover (Figure 2-37).

   Hint: Push down on the upper main body while removing the pins, to relieve pressure on them.

4. Remove the two screws and lift out the lower guide plate (see Appendix, Photo 2, #2). The roller pressure spring (see Appendix, Photo 2, #3) comes off when you do this.
5. Loosen the screw on the bearing holder (see Photo 3, #1), move the bearing holder to the side, and lift out the transfer guide.

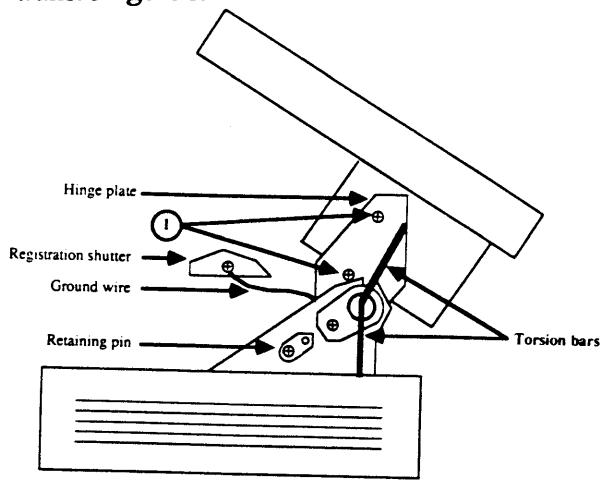


FIGURE 2-37

Replace

1. Put the transfer guide back into place, reposition the bearing holder, and tighten the screw on the bearing holder.

2. Put the lower guide plate back into place. Reinstall the roller pressure spring and the ground wire above it, and then the screw.

   Note: There are two important grounding elements for the transfer guides:

   a) The roller pressure spring and the ground wire that connects to it (see Photo 2, #3).

   b) The ground wire that connects (via a faston connector) to the lug just behind the transfer corona (see Photo 3, #3).

3. Restore the two retaining pins to their places.

   Hint: Push down on the upper main body while replacing the pins.

4. Install the separation belt.

❑ FEEDER GUIDE

The feeder guide (see Appendix, Photo 2, #6) is a piece of ridged metal that guides paper from the transfer corona to the fuser assembly. At one end of the feeder guide is the static eliminator (see Photo 2, #5), a row of sharp metal teeth that removes excess static charge from the print material.

For example, some highly resistant print materials, such as Mylar transparencies, develop a high electric charge on their rear surfaces during transfer. When the print separates from the drum at a high speed, this charge can be rearranged, causing toner particles on the other side to move around, producing what look like "water spots" on the print. The static eliminator prevents this.

Note: There are two versions of the feeder guide assembly that can be used in the LaserWriter. One version is secured to the print engine with four Phillips screws. The other version is held by two Phillips screws and a positioning plate that slides under the transfer corona assembly.

Remove

1. Open the printer and remove the toner cartridge.
2. Remove the two or four Phillips screws that secure the feeder guide to the print engine. Lift out the feeder guide.

Replace

1. If the feeder guide is a new version with a positioning plate and two Phillips screws:

   a) Remove the screw at the front end of the transfer corona assembly (see Appendix, Photo 5, #3) to allow clearance for the positioning plate of the new feeder guide.

   b) Insert the positioning plate of the new feeder guide beneath the transfer corona assembly.

   c) Replace the screw that holds the transfer corona assembly in place, and the two Phillips screws that secure the feeder guide to the print engine.

2. If the feeder guide is an old version with four Phillips screws, position the feeder guide inside the printer, and replace the four Phillips screws.

3. Loosen the screws one-eighth to one-fourth of a turn. (If the screws are too tight, the feeder guide may warp, which will smear the print.)

❑ SEPARATION/FEEDER UNIT

The Separation/Feeder Unit (see Appendix, Photo 2, #8) separates the paper from the toner cartridge print drum and guides the paper to the Fuser Assembly.

Remove

1. Open the printer and remove the toner cartridge and the separation belt.

2. Remove the harness cover (see Photo 4, #1).

3. Remove the fuser assembly.

4. Remove the feeder guide.

5. Remove the ground wire from the separation/feeder unit (short, flanged, silver screw).

6. Remove the two large black screws; then remove the separation/feeder unit.

Replace

Replacement is the reverse of removal. Take care not to damage the separation belt when installing it.

❑ PRINTER PEDESTAL

The printer pedestal contains the automatic paper-feed mechanism (Cassette Pickup Assembly - see Appendix, Photo 7, #1), two transformers (Photo 7, #2 and 3), the Interface (I/F) Regulator (Photo 7, #4), and the paper-out sensor assembly (Photo 7, #5).

Remove

1. Make sure that the printer is unplugged and that the toner cartridge, paper trays, and paper cassette are removed.
2. Remove the top cover and the front, right, rear, and left panels.
3. Ground yourself and remove the LaserWriter I/O board.
4. Disconnect the cable from J501 on the DC Power Supply/Motor Drive PCB (Figure 2-38, #1).
5. Remove the plastic clamp that holds the cables from the last two steps (Figure 2-38, #2).
6. Disconnect the silver-braided ground wire from the upper main body (Figure 2-38, #3).

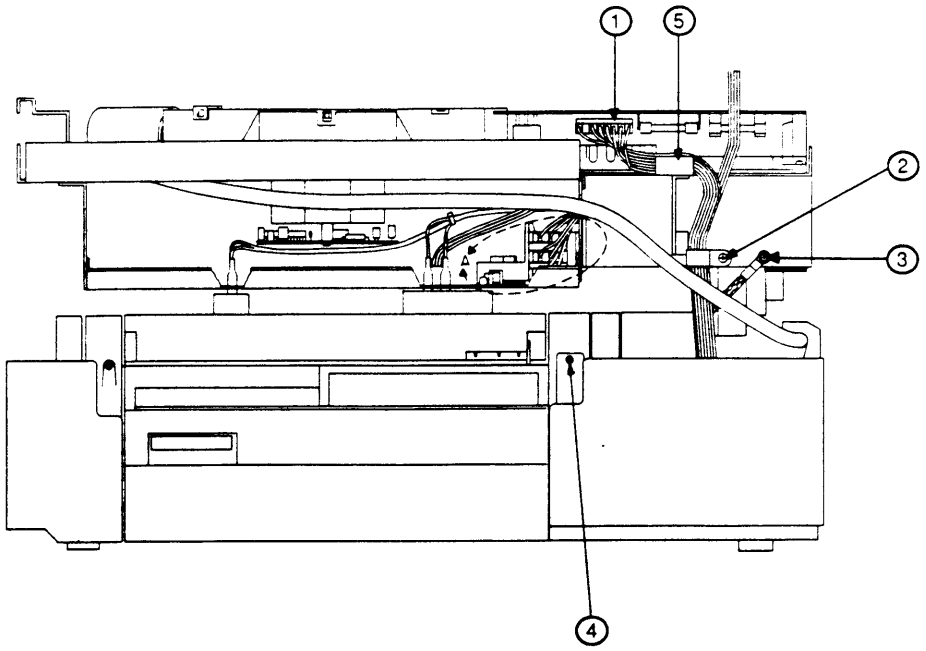


FIGURE 2-38

7. Open the printer and remove the power interlock assembly cover (Figure 2-39, #1).

8. Clip the cable tie that holds the three large cables together (Figure 2-39, #2).

9. Unplug the large black cable from J103 (Figure 2-39, #3). (You may need to pry it up with a screwdriver blade.)

10. Above the power switch you will find four black wires that attach by spade connectors to the power interlock assembly (Figure 2-39, #4). Disconnect the two upper wires.

11. Remove the screw and wedge at the base of the power interlock assembly (Figure 2-39, #5).

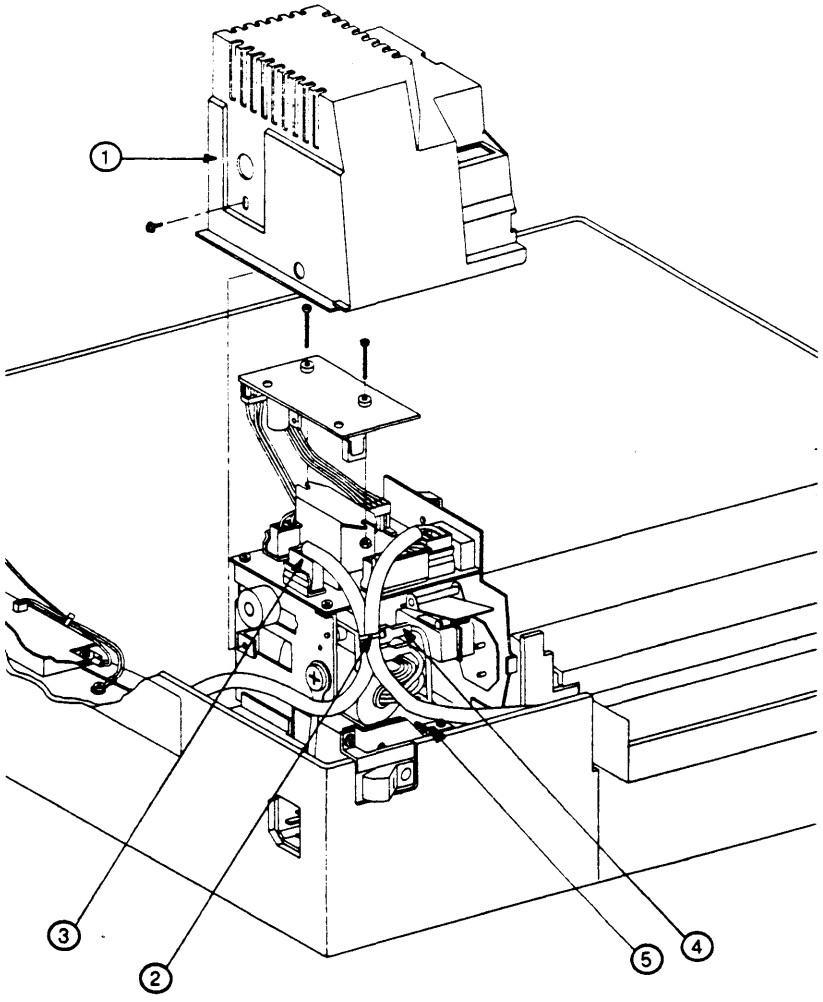


FIGURE 2-39

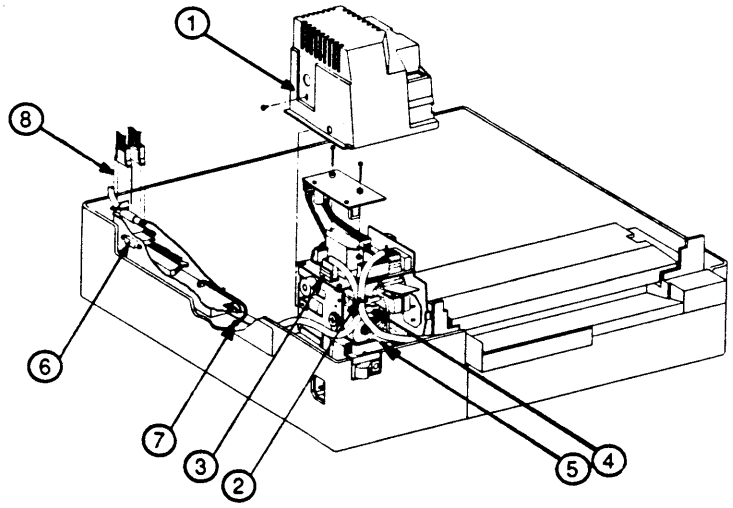


FIGURE 2-40

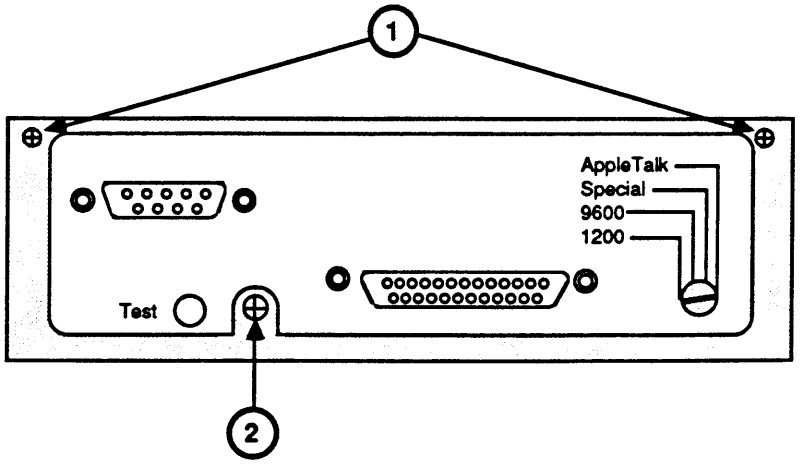


FIGURE 2-41

12. Remove the silver screw from the metal tab next to the Power Interlock Assembly. (See Appendix, Photo 6, #10.)

13. Remove the mounting connector plate (Figure 2-40, #6) as follows:

    a) Disconnect the grey-and-white ground wire that comes from the mounting connector plate (Figure 2-40, #7) by removing its grey screw.

    b) Clip off the cable tie that holds the large cable (I/O cable) to the mounting connector plate.

    c) Remove the two silver mounting screws (Figure 2-41, #1) and loosen the screw at the bottom of the plate (Figure 2-41, #2).

    d) Lift the connector plate out. Leave it connected to its cable and push it out the hinged side of the printer so that you can close the printer cover without damaging it.

14. Unplug the two white-and-black cables from the connectors behind the mounting connector plate (Figure 2-40, #8).

15. Remove the screw from the metal tab at the rear of the manual feed assembly (Figure 2-42, #4).

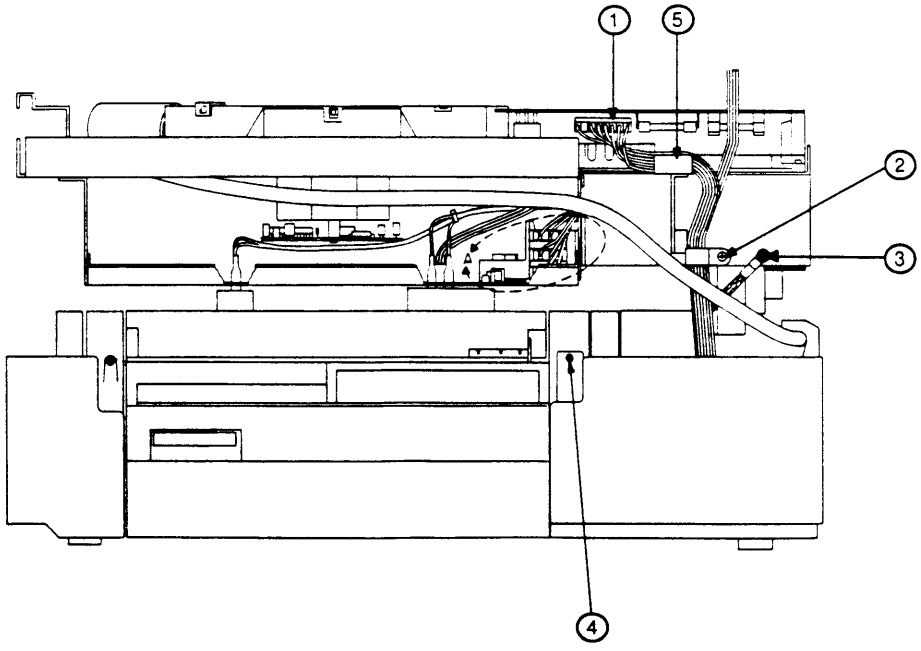


FIGURE 2-42

16. Open the printer and remove the two main pedestal screws (Appendix, Photo 4, #5).

CAUTION: *Make sure that you have disconnected all cables and screws mentioned in the preceding steps before you continue.*

---

17. Taking care not to damage any components, close the printer.

WARNING: *Be careful not to strain your back while performing step 18.*

---

18. Locate the hand-holds at the left and right sides of the printer (on the plastic by the manual feed entrance and the paper exit). Grasping the top part of the printer at these areas, carefully lift the printer out of the pedestal and set it down on a stable work surface.

Replace

1. Check to see that all components in the pedestal have been replaced.

2. Arrange the pedestal cables as follows, and use masking tape to hold them in place:

   a) The two black wires with spade connectors should be between the power switch slot and the metal tab to the right of the slot (as you face the slot), (See Appendix, Photo 7, #10).

   b) The large black-sheathed wire should exit above the Apple logo on the metallic printer label (see Appendix, Photo 7, #11).

   c) The other cables should hang over the right side of the printer (see Appendix, Photo 7, #12).

   Make sure all wires inside the pedestal are routed so as to avoid being pinched when the printer is replaced on the pedestal.

3. Lift the printer back into position on the pedestal and carefully lower it into place. **Do not pinch any cables**!

4. Make sure the printer is correctly seated, as follows:

   a) Check that each cable is routed as described above. Make sure that it can reach its connector and move it around a little—you should be able to move all cables easily.

   b) Make sure that the power switch is fully seated, and that the power cord can be inserted in its connector (but do not leave the power cord inserted).

5. Open the printer.

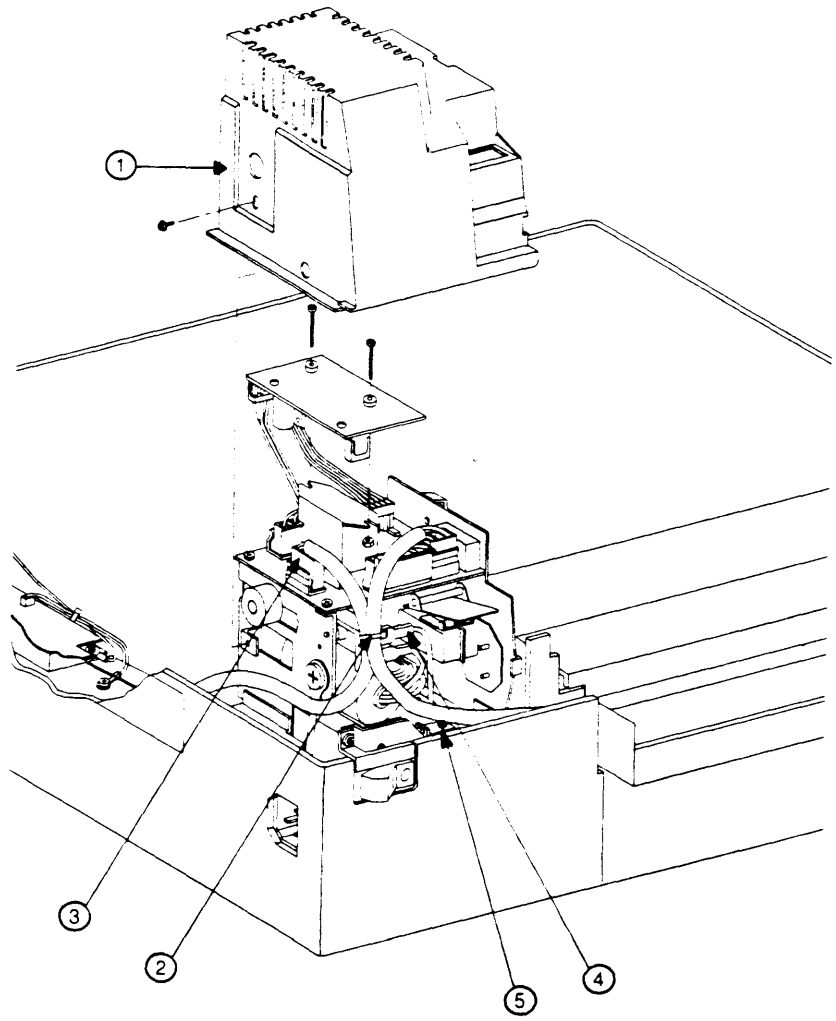


FIGURE 2-43

6. Replace the wedge at the base of the Power Interlock Assembly and install its long black screw (Figure 2-43, #5).

7. Connect the two black wires with spade connectors to their terminals on the Power Interlock Assembly (Figure 2-43, #4).

CAUTION: *There are two double-pronged connectors for these wires. Attach one wire to each connector—not both wires to the two prongs of a single connector. Make sure you are using the upper connectors.*

---

8. Attach the large black cable to J103 on the Power Interlock Assembly.

9. Using a cable tie, tie together the three cables to the Power Interlock Assembly, as they were before (Figure 2-43, #2).

10. Install the Power Interlock Assembly cover and its single black flanged screw. (Make sure the cover fits under the four metal tabs at its sides and the plastic tab on the harness cover.)

11. Replace the short silver screw in the metal tab next to the power interlock assembly (Appendix, Photo 6, #10).

12. Replace the mounting connector plate as follows:

    a) Open the printer and put the plate back into place.

    b) Install the two short silver mounting screws and tighten the screw at the bottom of the plate.

    c) Route the large cable under the corner of the mounting connector plate and fasten it there with a cable tie. (Figure 2-44, #6.)

    d) Connect the ground wire to the printer chassis (chrome plate) with the short thick black screw.

13. Connect the two white-and-black cables to the sockets near the mounting connector plate.

14. Close the printer and connect the silver-braided ground wire to the second hole from the end of the hinged side of the printer (Figure 2-44, #3), using a short silver flanged screw.

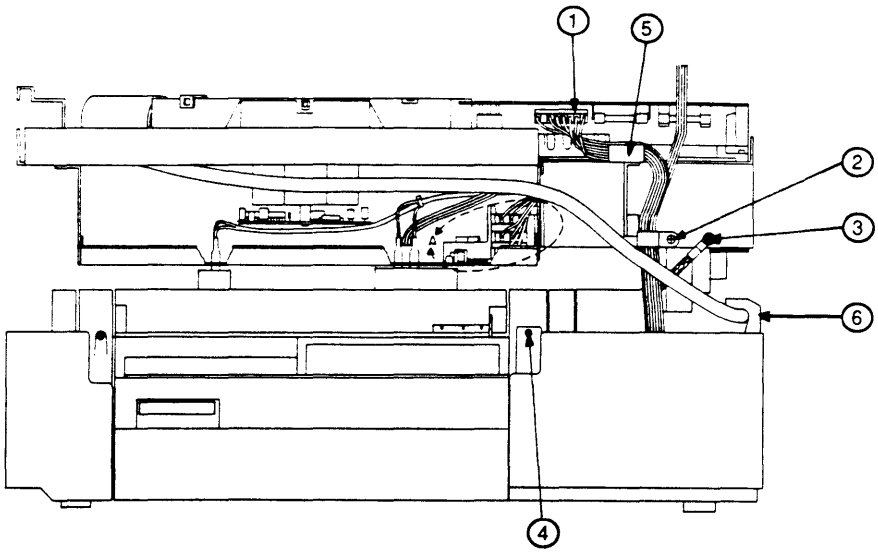


FIGURE 2-44

15. Connect the cable to the DC Power Supply board (route it over the silver arm, Figure 2-44, #5).

16. Tie together the cables to the LaserWriter I/O board and the DC Power Supply board with the large cable clamp, which attaches to the third hole from the end of the hinged side of the chassis. (Use a long flanged black screw.)

17. Replace the extra-long black screw in the tab at the rear of the Manual Feed Assembly (Figure 2-44, #4).

18. Replace the two main pedestal screws.

19. Ground yourself and replace the LaserWriter I/O board. Make sure to reconnect the three cables to the board.

20. Replace the panels and covers.

21. Apply power to the printer and make a test print.

❑ LASERWRITER I/O POWER SUPPLY (INTERFACE REGULATOR)

The LaserWriter I/O Power Supply (formerly called the Interface Regulator—see Appendix, Photo 7, #4) is located at the opposite end of the pedestal from the two transformers. It supplies voltage for the LaserWriter I/O board.

Remove

1. Remove the printer from the pedestal.
2. Remove the two silver screws from the I/O Power Supply. Lift up the power supply. The replaceable fuse will be clearly visible. In 110 volt LaserWriters, the fuse is 5 amp, 125 v; in 220 volt LaserWriters, the fuse is 5 amp, 250 v.

Replace

1. Put the power supply back into place and replace the screws (long silver flanged screws).
2. Reinstall the printer into the pedestal.

❑ CASSETTE PICKUP ASSEMBLY

Remove

1. Remove the printer from the pedestal.
2. Remove the four screws from the large copper grounding strip and remove the strip.
3. Locate the four screws (Appendix, Photo 7, #6) on the cassette pickup assembly. Mark the type of each screw on the assembly, and then remove the screws and the manual feed guide tab (Appendix, Photo 7, #7).

***IMPORTANT:** Locate the solenoid (Appendix, Photo 7, #8) and mark one of the solenoid lead wires and its connector, so that you can connect the leads to the correct poles when reinstalling. (Polarity matters.)*

4. Disconnect the solenoid leads carefully.
5. Lift the six long wires out of the way, and lift the assembly up and out of the printer.

Replace

1. Put the assembly back into place.

   Note: The brass-colored tab on the cassette pickup assembly goes under the metal plate (Appendix, Photo 7, #9).

2. Reconnect the solenoid leads to the proper terminals.

CAUTION: *The terminals break easily. Don't force them!*

3. Route the solenoid lead wires so that they will not be caught in the gears.

4. Replace the manual feed guide tab (Appendix, Photo 7, #7).

5. Replace the four screws (Appendix, Photo 7, #6).

6. Route the red, blue, and brown wires over the tape on the assembly, and press the wires down until the tape holds them in place.

7. Replace the copper ground strip and its four short silver screws.

❑ LOWER PAPER FEED GUIDE

Remove

1. Remove the printer from the pedestal, and remove the cassette pickup assembly.

2. The two end tabs on the plastic lower paper feed guide fit into holes on the cassette pickup assembly, and each connection is secured by a spring. **Before you remove the lower paper feed guide, observe how the springs fit.**

3. Pull slightly on the ends of the cassette pickup assembly to free the lower paper feed guide tabs.

4. Remove the springs and set them aside.

Replace

1. Replace the springs on the plastic lower paper feed guide tabs, fit the tabs into the cassette pickup assembly, and attach the spring leads.

2. Replace the cassette pickup assembly, and replace the printer on the pedestal.

❑ PICKUP ROLLERS

The pickup rollers are the half-moon-shaped rollers that pick up the paper (Figure 2-45, 2-46, 2-47).

Remove

1. Remove the cassette pickup assembly.
2. Turn the cassette pickup assembly so that the pickup rollers are facing you.

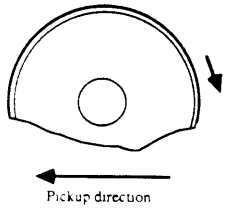


FIGURE 2-45: PICKUP ROLLER

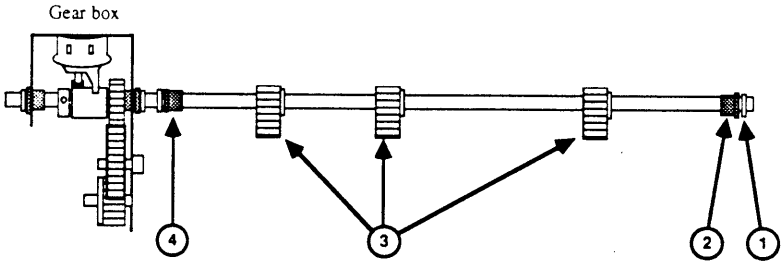


FIGURE 2-46: ROLLER SHAFT

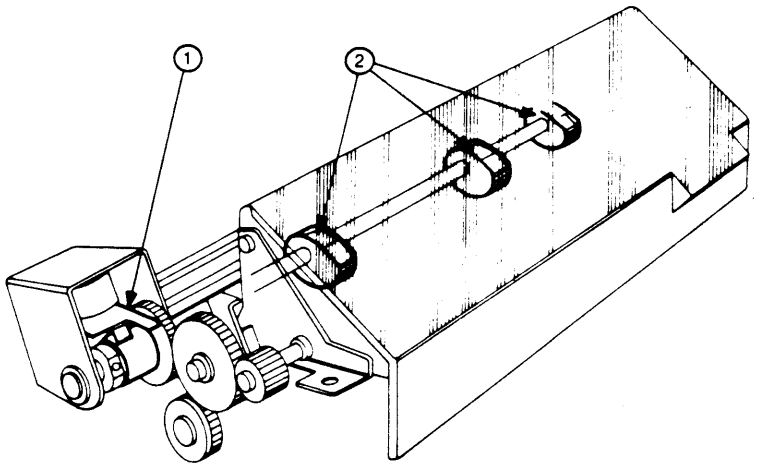


FIGURE 2-47

3. Using grip ring pliers and safety goggles, remove the grip-ring at the end of the roller shaft (Figure 2-46, #1); then slide off the bushing (Figure 2-46, #2).

4. On the other side of the roller shaft, slide the bushing (Figure 2-46, #4) out of its slot in the frame, and lift up the roller shaft part way. Unhook the spring that holds it to the other side of the assembly, and lift it free.

5. Remove the three E-rings and pickup rollers (Figure 2-46, #3).

IMPORTANT: *Do not lose the small metal rods that keep the rollers in place.*

Replace

1. Put the new rollers in place, as follows:

   a) Make sure the side of the roller with the slot and the part number is facing the gear assembly.

IMPORTANT: *Make sure the projection on the white plastic gear is engaging the pawl (gear-stop) on the solenoid (see Figure 2-47, #1). With the gears in that position, turn the roller so that the FLAT side faces up (see Figure 2-47, #2).*

   b) Reinstall the metal rod and E-ring.

2. Put the roller shaft back into place, making sure the bushing (Figure 2-46, #4) is fully inserted in its slot, so that it holds the shaft in place. (The bushing has a small tooth that must be positioned in the slot opening.)

3. Reattach the spring.

4. On the other end of the shaft, reinstall the bushing and the grip ring.

IMPORTANT: *Do not install the grip ring too snugly: it will prevent the roller shaft from turning freely. Leave a little play (about 1/2 mm) between the ring and the bushing.*

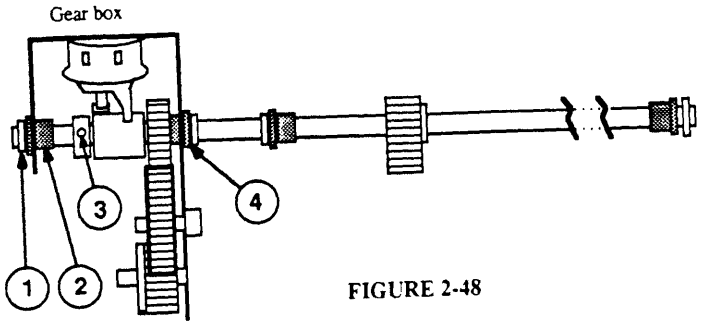


FIGURE 2-48

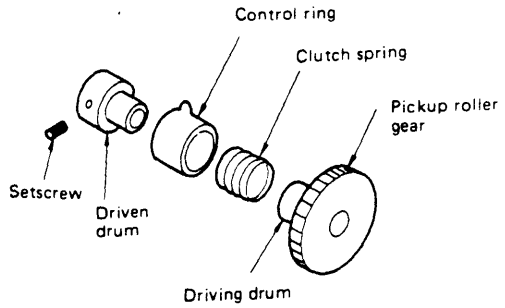


FIGURE 2-49

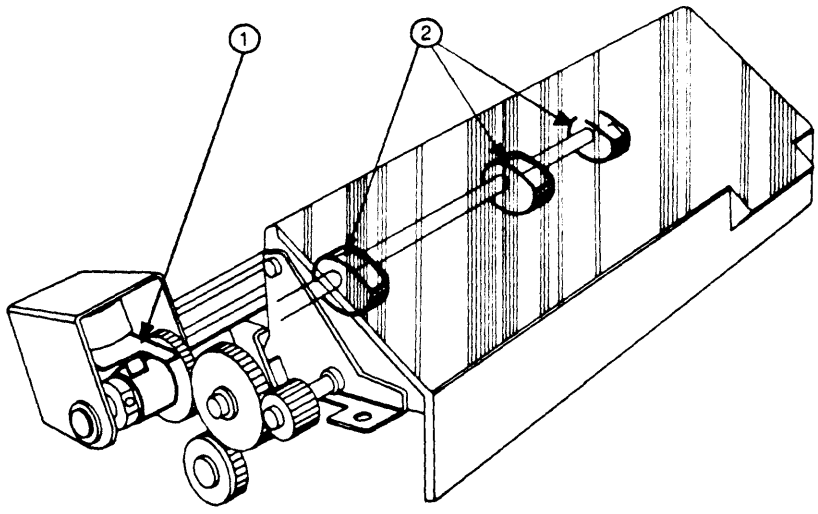


FIGURE 2-50

❑ PICKUP CONTROL CLUTCH

Remove

1. Remove the pickup rollers (steps 1 through 3 only).

2. Remove the E-ring and black bushing from the end of the clutch assembly (Figure 2-48, #1 and 2); then remove the 2 mm setscrew (Figure 2-48, #3) and pull the roller shaft out to free the clutch.

   Note: Make sure to capture the thin brass washer next to the pickup roller gear.

Lubrication

The clutch comes apart as shown in Figure 2-49. To lubricate, remove the spring and oil the inside of the spring thoroughly with tellus oil (P/N 970-0006). Then reassemble.

Replace

1. Start the roller shaft through the hole in the large side of the gear box. Install the thin brass washer, then the clutch assembly, facing as in Figure 2-50.

2. Make sure the black bushing (Figure 2-48, #4) is fully seated in its slot in the gear casing (note the tooth on the bushing). Then install the other bushing (Figure 2-48, #2) and its E-ring.

3. Hold the control ring (Figure 2-49) so that its tooth firmly engages the pawl on the solenoid and the gears mesh (Figure 2-50, #1). Turn the pickup roller shaft so that the flat side of the pickup rollers is facing up (Figure 2-50, #2). Tighten the setscrew to hold this position.

❑ PAPER-OUT SENSOR (PS2)

Overview

When the paper in the cassette runs out, the paper detection arm (Appendix, Photo 7, #5) descends and blocks the light from the paper-out photosensor (PS2). This tells the printer that there is no more paper, and the PAPER OUT indicator on the display panel lights.

Remove

1. Remove the printer from the pedestal.
2. Point the black plastic arm upwards (Appendix, Photo 7, #5) and slide it out of its groove.
3. The plastic piece immediately beneath the arm you removed is the sensor. Disconnect the cable connector from the sensor.
4. Remove the sensor's mounting screw and lift the sensor out.

Replace

1. Put the new sensor in place and install the mounting screw.
2. Connect the cable connector to the sensor.
3. Restore the black plastic arm to the sensor assembly.
4. Replace the printer in the pedestal.

❑ UPPER MAIN BODY

Remove

1. Remove the top cover, the right, left, and rear panels, and the LaserWriter I/O Board.

2. Remove the DC Power Supply/Motor Drive PCB Assembly.

3. Open the printer (raise the upper main body by pressing up on the release lever).

4. Remove the harness cover (Appendix, Photo 6, #3) by removing the single screw and prying back on the plastic tab (Appendix, Photo 6, #4) next to the Power Interlock Assembly (Appendix, Photo 6, #8).

5. Remove the mounting connector plate cover (Figure 2-51, #1), if one is present, by removing the single screw holding it in place (Figure 2-51, #2).

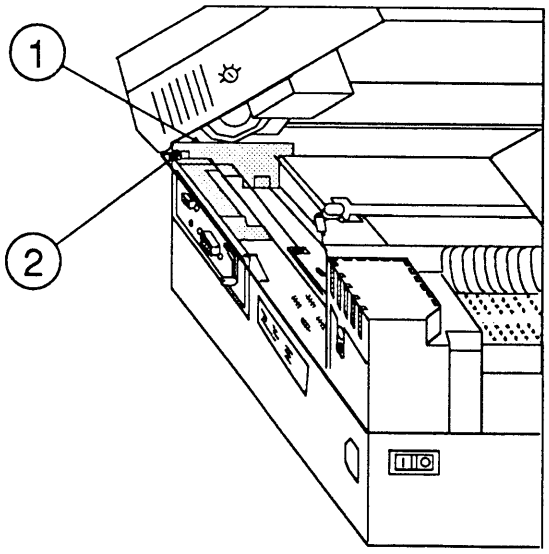


FIGURE 2-51

6. Disconnect the green grounding wire (Appendix, Photo 8, #9) from the ground lug near the Transfer Corona Assembly.

7. Remove the Power Interlock Assembly cover (Appendix, Photo 6, #8) by removing the black, flanged screw (Appendix, Photo 6, #2) and lifting off the plastic assembly cover.

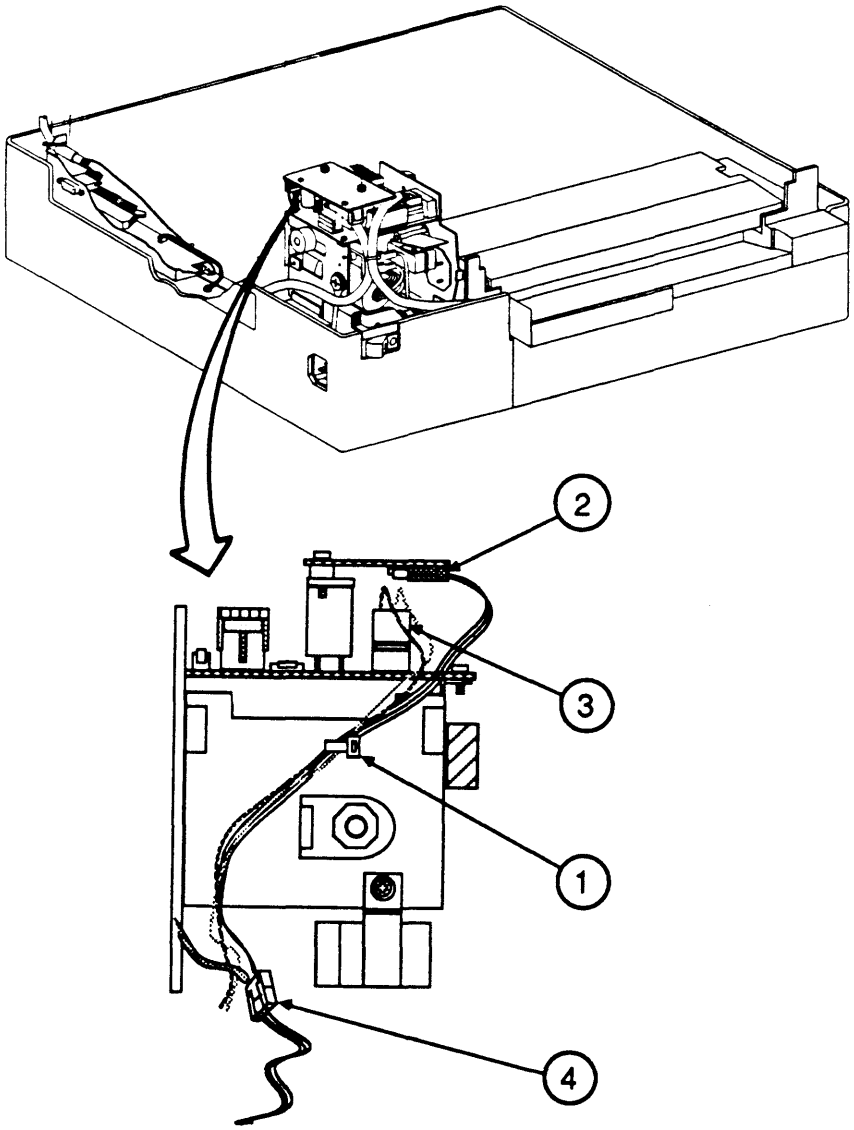


FIGURE 2-52

8. Beneath the Power Interlock Assembly cover is a two-board AC Driver PCB (Appendix, Photo 8, #1). Remove the cable tie (Figure 2-52, #1) that holds the cables to J102 and J104 on the two-board AC Driver PCB.

9. Disconnect the cable to J104 (Figure 2-52, #2) on the upper PC board.

10. Disconnect the cable to J102 (Figure 2-52, #3) on the lower PC board.

11. Disconnect the black-and-white fuser assembly connector (Figure 2-52, #4) from beneath the Power Interlock Assembly.

12. On the right, hinged side of the printer, remove the black flanged screw (Figure 2-53, #1) that secures the plastic cable clamp to the upper main body.

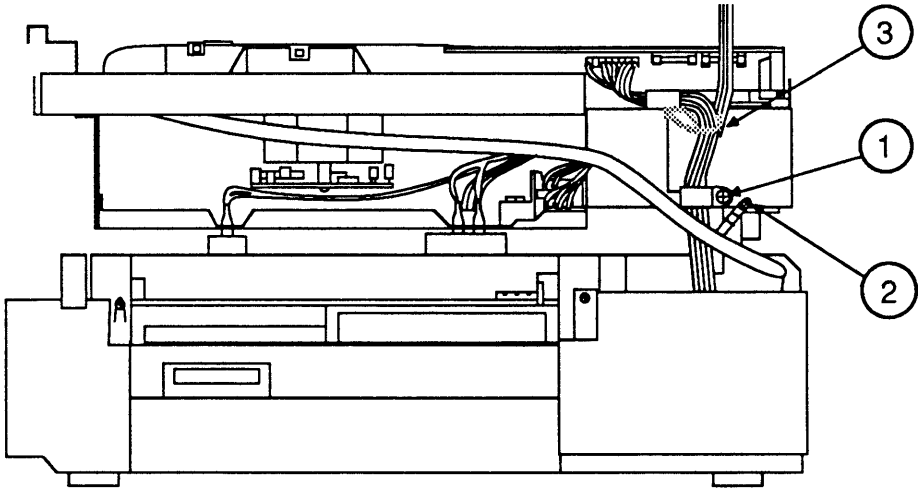


FIGURE 2-53

13. Remove the silver-colored flanged screw that connects the silver braided grounding wire to the upper main body (Figure 2-53, #2).

14. Clip off the cable tie (Figure 2-53, #3) that attaches the LaserWriter I/O Board cable and the DC Power Supply Board cable to the upper main body.

15. Remove the mounting connector plate (Figure 2-54, #1) as follows:

    a) Remove the large, black screw (Figure 2-54, #2) that secures the grey-and-white grounding wire to the lower main body.

    b) Remove the two silver-colored mounting screws (Figure 2-55, #1) that connect the mounting connector plate to the printer chassis.

    c) Lift out the mounting connector plate. Leave it connected to its cable and push it out the hinged side of the printer so that you can close the printer without damaging the cable.

16. Disconnect the two black-and-white cables from the connectors behind the mounting connector plate (Figure 2-54, #3).

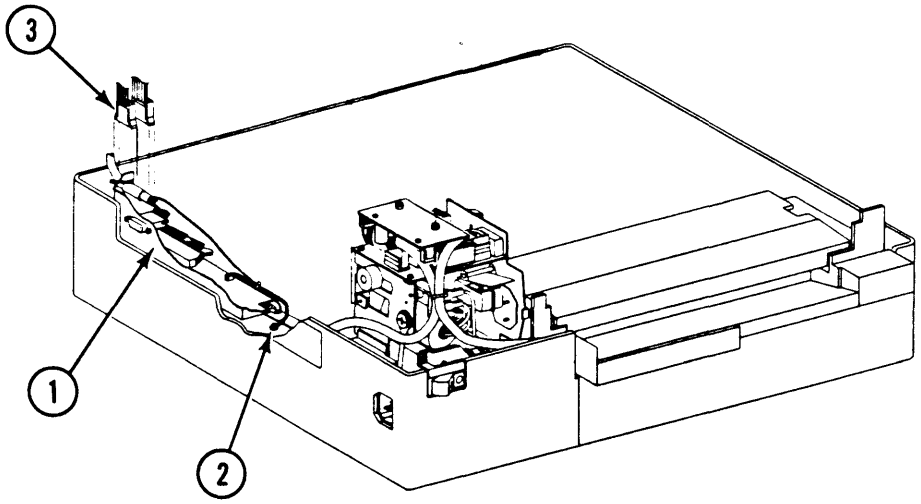


FIGURE 2-54

17. Remove the large, black screw that connects the green grounding wire to the roller pressure spring (Appendix, Photo 2, #3).

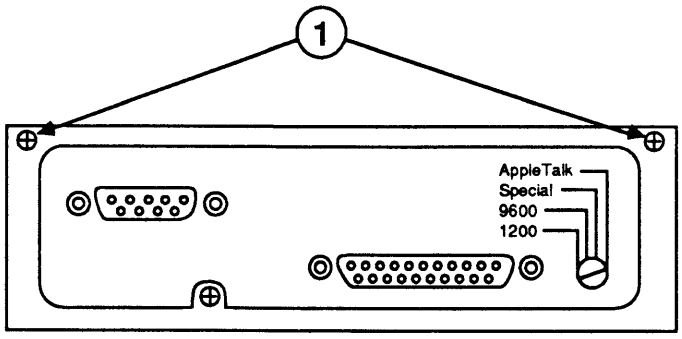


FIGURE 2-55

IMPORTANT: *It is strongly recommended that two persons perform the following steps!*

18. While one person supports the upper main body of the printer, the other removes the four to six hinge-plate screws (two or three on each side) that secure the upper main body to the lower main body (Figure 2-56, #1).

19. Carefully lift the upper main body from its hinges, and rest it upside down behind the printer.

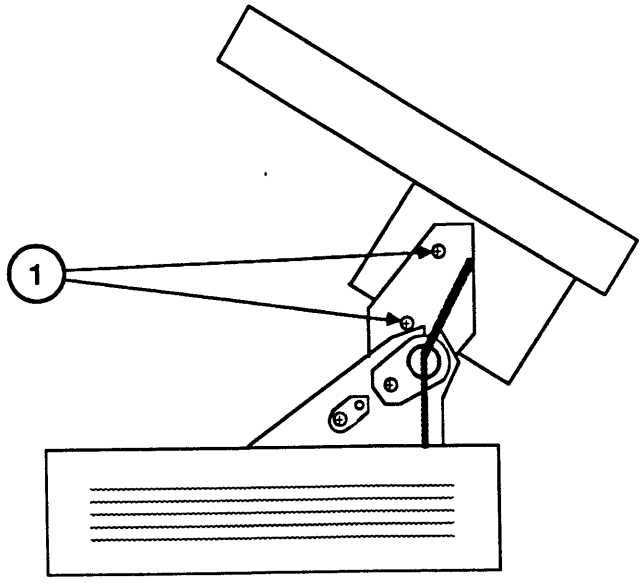


FIGURE 2-56

***IMPORTANT:** It is strongly recommended that two persons perform the first two steps of this procedure.*

Replace

1. Carefully lift the upper main body into position, so that:
   - the green grounding wire is pulled **around and under** the torsion bars (Figure 2-57, #1)
   - the screw holes are properly aligned on both sides
2. While one person holds the upper main body in place, the other should replace the four to six screws (two or three on each side) that secure the upper main body to the lower main body (Figure 2-57, #2).

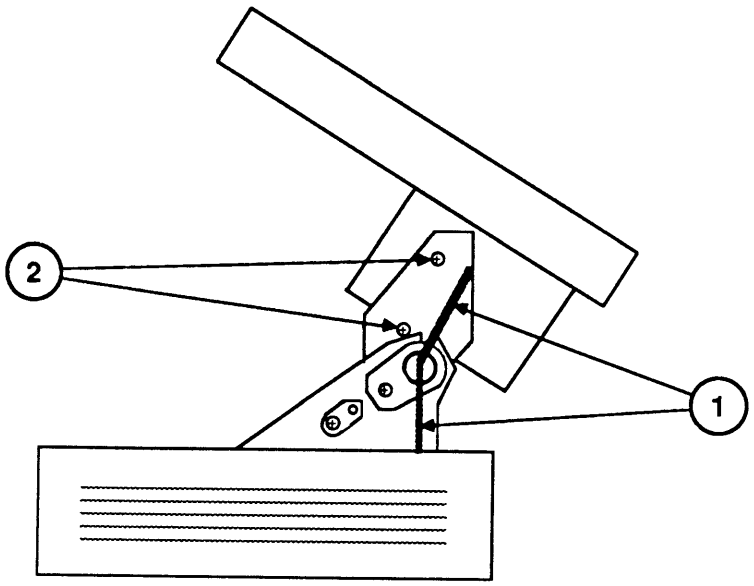


FIGURE 2-57

3. Replace the large, black screw that secures the green grounding wire to the roller pressure spring (Appendix, Photo 2, #3).
4. Reconnect the two black-and-white cables to the connectors behind the I/O connector plate (Figure 2-58, #3).

5. Replace the mounting connector plate (Figure 2-58, #1) as follows:

   a) Position the mounting connector plate inside the printer.

   b) Replace the two silver-colored mounting screws (Figure 2-59, #1) that connect the mounting connector plate to the printer chassis.

   c) Replace the large, black screw (Figure 2-58, #2) that secures the grey-and-white grounding wire to the lower main body.

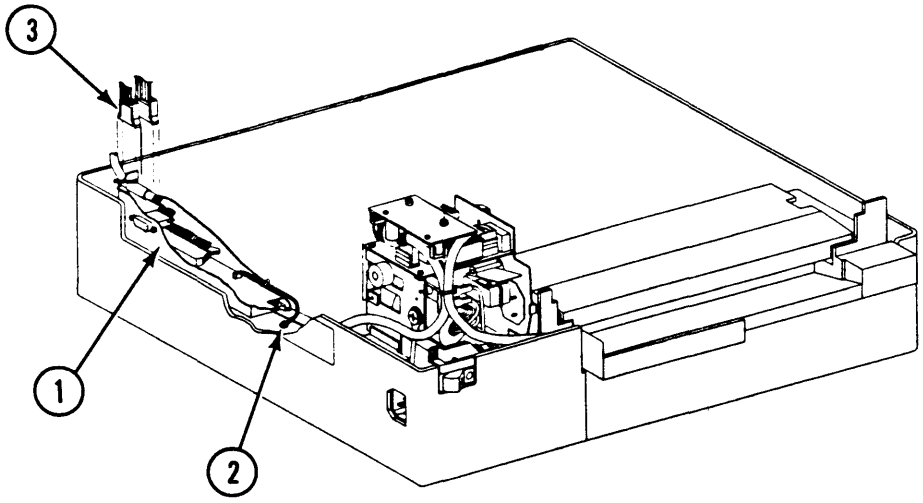


FIGURE 2-58

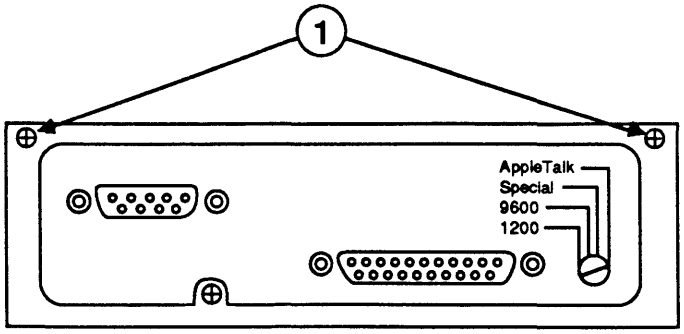


FIGURE 2-59

6. On the two-board AC Driver PCB (Appendix, Photo 8, #1), reconnect the cable to J104 on the upper PC board (Figure 2-60, #2) and the cable to J102 on the lower PC board (Figure 2-60, #3). Tie the cables together with a cable tie (Figure 2-60, #1).

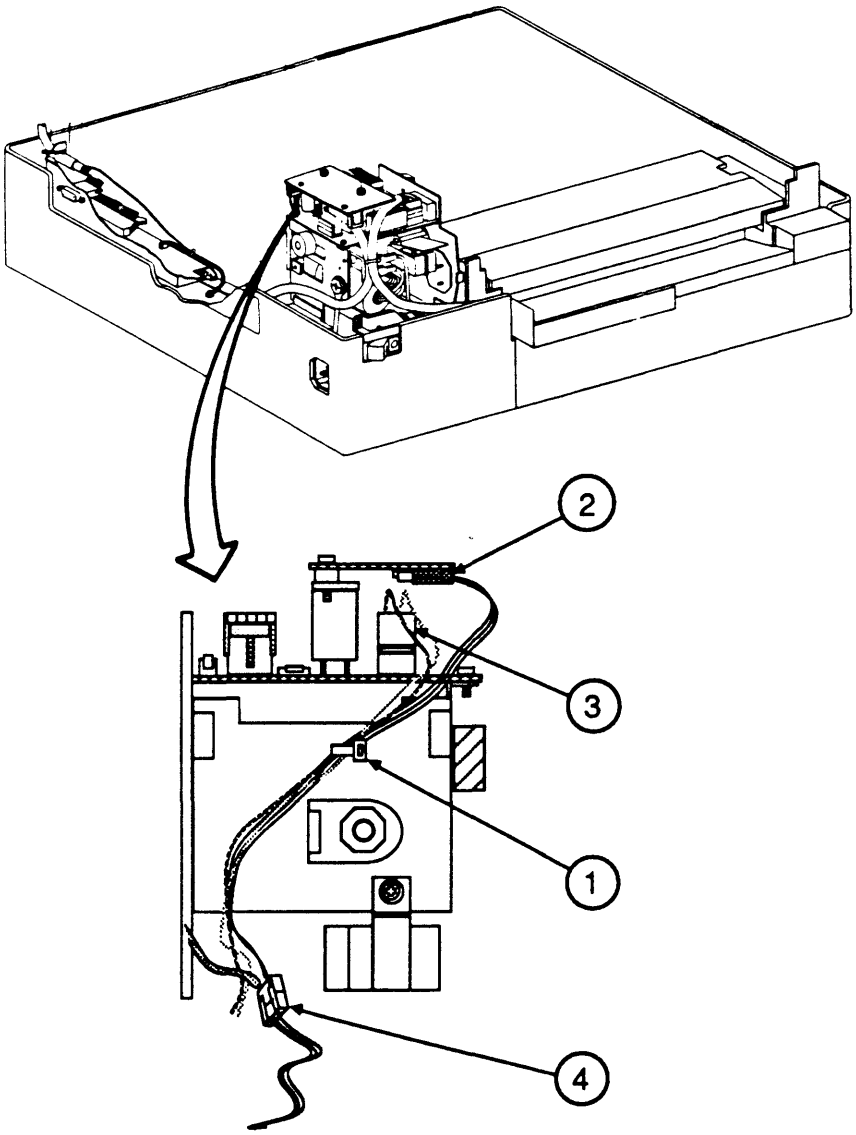


FIGURE 2-60

7. Reconnect the black-and-white fuser assembly connector (Figure 2-60, #4) to its mate.

8. Replace the Power Interlock Assembly cover (Appendix, Photo 6, #8), making sure the cover fits under the four metal tabs along the sides of the assembly.

9. Replace the single black flanged screw (Appendix, Photo 6, #2) that secures the cover to the Power Interlock Assembly.

10. Push the black-and-white fuser assembly connector cables underneath the Power Interlock Assembly cover.

11. Reconnect the green grounding wire (Appendix, Photo 8, #9) to the ground lug near the Transfer Corona Assembly.

12. If you removed the mounting connector plate cover, install the cover (Figure 2-61, #1) and replace the single screw holding it in place (Figure 2-61, #2).

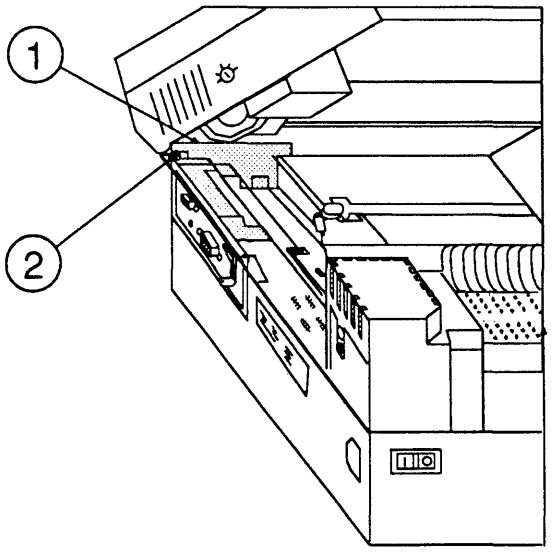


FIGURE 2-61

13. Install the harness cover (Appendix, Photo 6, #3) and replace the single screw that secures it to the lower main body.

14. On the right, hinged side of the printer, place the cables to the LaserWriter I/O board and the DC Power Supply board inside the plastic cable clamp, and replace the black, flanged screw that secures the cable clamp to the upper main body (Figure 2-62, #1).

15. Replace the silver-colored flanged screw that secures the silver braided grounding wire to the upper main body (Figure 2-62, #2).

16. Tie the LaserWriter I/O Board cable and the DC Power Supply/Motor Drive cable to the upper main body with a cable tie (Figure 2-62, #3).

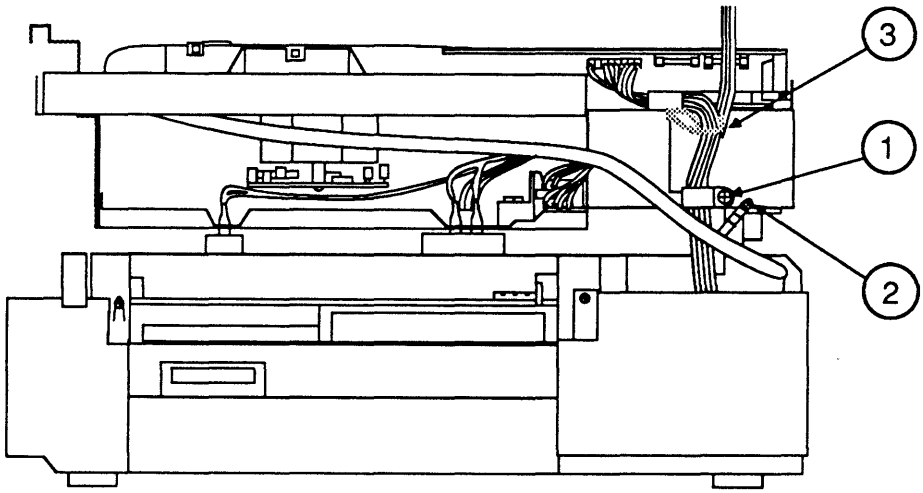


FIGURE 2-62

17. Close the printer.

18. Replace the DC Power Supply/Motor Drive PCB Assembly and the LaserWriter I/O Board.

19. Replace the right, left, and rear panels, and the top cover.

❑ MANUAL FEED ROLLER ASSEMBLY

Remove

1. Remove the top cover, the right, left, and rear panels, and the LaserWriter I/O Board.

2. Remove the DC Power Supply/Motor Drive PCB Assembly.

3. Remove the Upper Main Body.

4. Remove the two screws on either side of the manual feed entrance (Figure 2-63, #1).

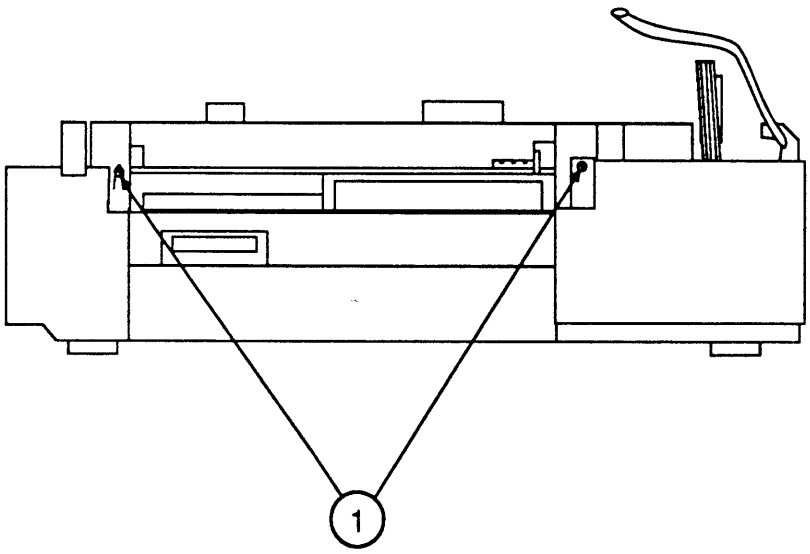


FIGURE 2-63

5. Remove the roller pressure spring (Appendix, Photo 4, #2).

6. Mark the four screws that secure the manual feed guide (Appendix, Photo 4, #3) to the lower main body, so that you will know where to replace them. Then, lift out the manual feed guide.

7. Remove the two screws that hold the manual feed roller assembly in place (Appendix, Photo 4, #4), and lift out the roller assembly.

Replace

1. Install the roller assembly inside the printer and replace the two screws that hold the roller assembly in place (Appendix, Photo 4, #4).

2. Install the manual feed guide and replace the four screws that secure the manual feed guide to the lower main body (Appendix, Photo 4, #3).

3. Replace the roller pressure spring (Appendix, Photo 4, #2).

4. Replace the the two screws on either side of the manual feed entrance (Figure 2-64, #1). Install the longer screw on the side nearest to the rear panel.

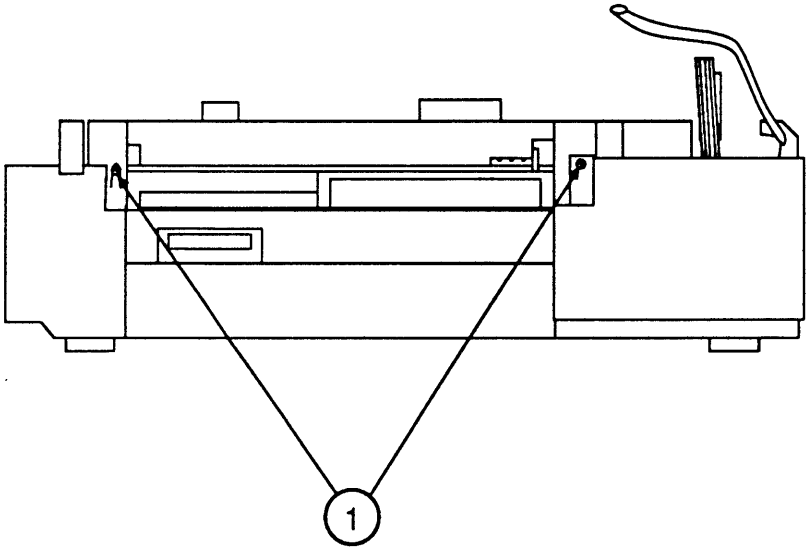


FIGURE 2-64

5. Replace the Upper Main Body.

6. Replace the DC Power Supply/Motor Drive PCB Assembly.

7. Replace the LaserWriter I/O Board and the right, left, and rear panels, and the top cover.

Apple Technical Procedures

LaserWriter

Section 3 – Adjustments

❑ CONTENTS

Note: For part numbers of the adjustments, see the Price pages of your *Apple Service Programs Manual.*

❑ LASER POWER ADJUSTMENT

Laser power should be adjusted after replacing the DC Controller board or the laser unit (see Appendix, Photo 1, #1 and #5). It should also be adjusted if the image is consistently too light or too dark and if that problem cannot be fixed by using the print density adjustment dial or changing the toner cartridge. (In general, however, adjust laser power as seldom as possible. Frequent adjustment increases the chances of damaging the laser chip.)

This procedure requires a multimeter and the laser power checker (Figure 3-2), which comes in your LaserWriter Spares Kit.

***WARNING:** Review the safety procedures in Section 2, Take-Apart, before continuing, and remove all jewelry (including dangling necklaces) before performing this adjustment.*

1. **Important: Switch the power off.**

2. Remove the top cover and the LaserWriter I/O board and card cage.

3. Open the laser access hatch on the scanner unit. (See Figure 3-1.)

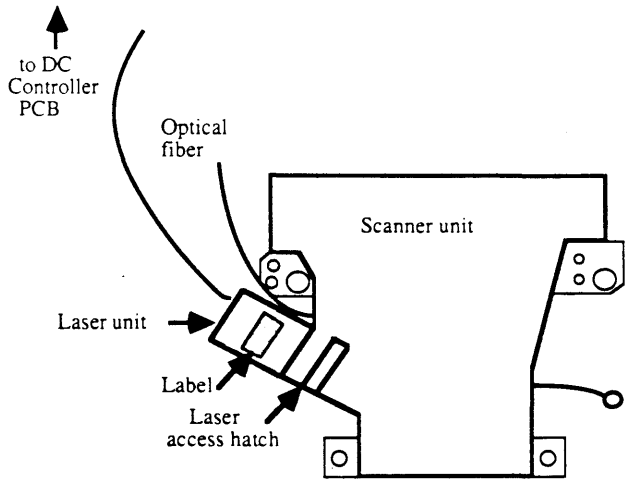


FIGURE 3-1

4. Insert the Laser Power Checker (Figure 3-2) into the access hatch with the detector (Figure 3-2, #1) facing the laser.

WARNING: *Make sure the Laser Power Checker is fully inserted so that none of the laser light can escape from the access hatch.*

5. Connect the Laser Power Checker to a digital multimeter as follows:

   a) Connect the black lead from the Laser Power Checker to the multimeter socket marked "Common."

   b) Connect the red lead from the checker to the multimeter socket marked "Volts" or "V."

   c) Select the Volts button on the multimeter, set the multimeter range to 200mv, and turn the multimeter on.

   Note: If the multimeter does not make good contact, or if the meter range is wrong, the power of the laser cannot be measured accurately. Be sure the leads are plugged in correctly.

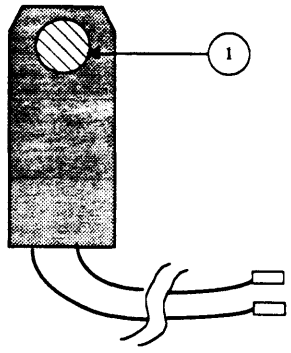


FIGURE 3-2

6. Disconnect the cable from J209 on the DC Controller board (Figure 3-3).

7. Connect a jumper between pins 5 and 6 on J209.

8. If a new DC Controller board is being installed, turn VR202 (Figure 3-3) all the way counterclockwise, to start with the lowest possible setting.

9. Switch the power on and wait about one and a half minutes for the printer to warm up. The green power light should flash during the warm-up period. You may proceed to the next step when the green light stays on steadily.

10. Momentarily connect a jumper between J209 pin 7 and pin 6; record the reading on the meter and remove the jumper.

***CAUTION:** Leaving the jumper on too long may burn out the laser.*

---

11. Repeat step 10 two more times. Calculate the average of the three readings to determine the laser power output.

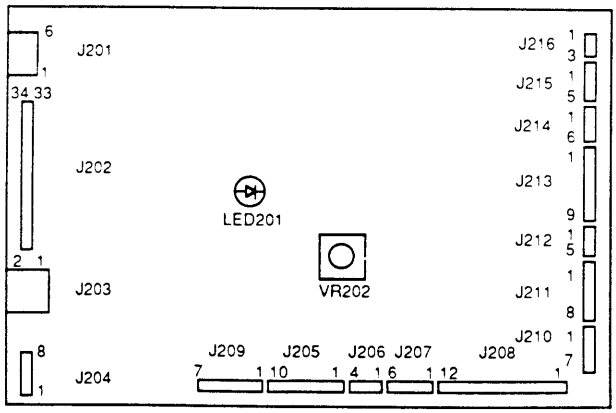


FIGURE 3-3: CONNECTOR LOCATIONS ON THE DC CONTROLLER PCB

12. Compare the averaged reading to the reading shown on the laser label (Figure 3-4).

13. If the laser output is within the range indicated on its label (the voltage indicated next to the figure "300," plus or minus 1 millivolt), no adjustment is necessary, so you may skip the next three steps (step 14, 15, and 16) and continue with step 17.

14. Before making any adjustment, make sure that the jumper between J209 pin 7 and pin 6 is removed. Then, if the laser output is too high, turn VR202 a little counterclockwise. If the laser output is too low, turn VR202 a little clockwise. Move the resistor in very small increments.

15. Install the jumper and measure the laser output as before (steps 10, 11, and 12).

16. If the laser output is now within the range indicated, no further adjustment is required. If it is not, repeat steps 14 and 15 until the adjustment is within the indicated range.

17. **Turn power off** and remove all jumper wires.

18. Remove the Laser Power Checker and **close the access hatch securely**.

19. Reconnect J209 to the DC Controller board.

20. Reinstall the LaserWriter I/O board and the top cover.

21. Turn the printer on and verify correct operation by waiting for the automatic test print to be generated.

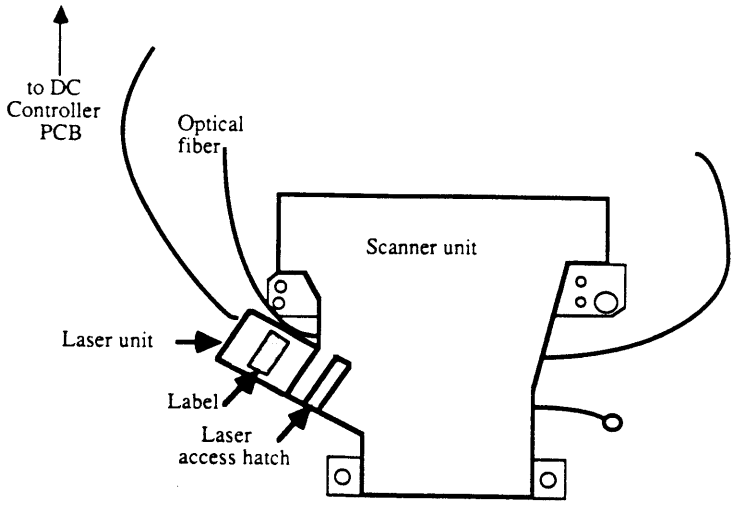


FIGURE 3-4

❑ IMAGE SKEW ADJUSTMENTS

If there is a large registration problem—that is, if the image on the page looks very skewed—the cause is probably the paper cassette or some other part of the paper feed path (worn or dirty rollers can cause registration problems). But if it is a small skew in the position of the horizontal lines of print—just a millimeter or two—you can fix it by adjusting the position of either the laser/scanner unit or the Registration Shutter Assembly.. Changing the position of the unit changes the angle of the horizontal lines on the printed page with respect to the vertical lines. **Only horizontal skews can be corrected by this procedure.**

If skewing problems occur when using the types and weights of paper recommended for the LaserWriter, the adjustment will be covered as long as the LaserWriter is within the warranty period. If the problem occurs only when using paper that is outside the recommended types or weights, be sure to warn the owner that adjusting the printer for unusual weights of paper is not covered under warranty and that it may cause skewing problems when the recommended types of paper are used.

Check the Print Alignment

1. Make sure the type of paper recommended by the user's guide is loaded into the paper cassette (ordinary duplicator paper is acceptable). Then generate a user test print by turning the printer off and then on again.

   Note: If you are adjusting the printer to work with a specific type of paper that is outside the printer's usual paper specifications, be sure to use that paper for the test.

2. Horizontal line specifications: Measure the distance from the top left and right corners of the image to the top edge of the paper (Figure 3-5). The difference between the two measurements (left and right) should be no more than 1 millimeter.

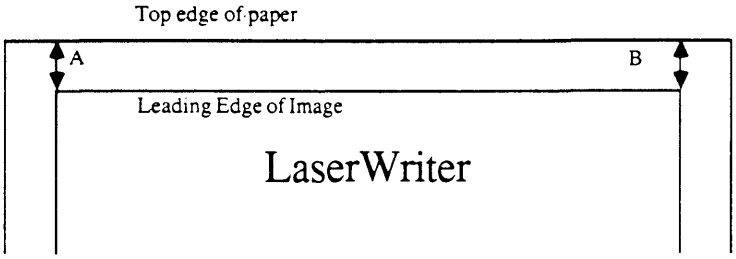


FIGURE 3-5

If the difference is greater than specified, or if the customer wants a more exact adjustment, perform the adjustment procedure until the print is satisfactory.

To Adjust the Image

Note: The order of steps given below differs from the order shown in the videotape *LaserWriter Introductory Service Procedures*. Either order will work, but for best results, follow these written procedures, which match the videotape *LaserWriter Adjustments*.

1. Switch the printer **off** and remove the top cover.

2. Remove the LaserWriter I/O board.

***WARNING**: Make sure the laser access hatch (Figure 3-6) is securely closed and the optical fiber is attached to the DC Controller board (see Appendix, Photo 1, #4) before continuing. When the power is on, remember not to touch the DC Power Supply board or the High Voltage Power Supply area (see Photo 1, #6 and #7).*

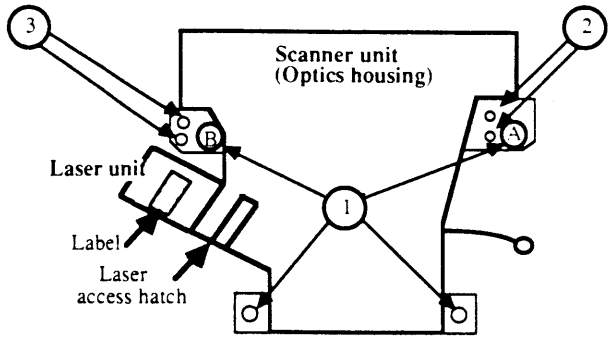


FIGURE 3-6

3. Turn on the power and wait until the green ready light comes on steadily.

4. Make a service test print by momentarily jumpering pins 1 and 2 on J205 on the DC Controller board—just touch the two pins together with the end of an insulated screwdriver. Only do this for an instant: otherwise the prints will keep coming out.

5. To make the scanner unit movable, loosen the four large mounting screws (Figure 3-7, #1) and the two sealed screws closest to the laser (Figure 3-7, #3).

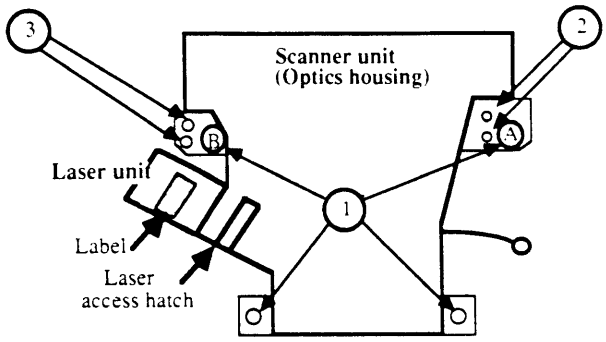


FIGURE 3-7

Note: On newer LaserWriters, an adjustable positioning plate has been added to permit further adjustment for image skew. **This second adjustment should not be performed in the field.**

6. Rotate the scanner unit around screw A (Figure 3-7): rotating the unit clockwise makes the horizontal line incline counterclockwise, and vice versa.

7. Make another service test print by jumpering pins 1 and 2 on J205. Then measure the image skew as directed above.

Repeat steps 6-7 until the adjustment is satisfactory or until you are unable to move the unit any farther.

Stage Two

If you cannot achieve optimum adjustment using steps 1-7, continue with the following steps.

8. Tighten the two sealed screws you had loosened earlier (Figure 3-7, #3) and loosen the two sealed screws on the other side of the scanner unit (Figure 3-7, #2).

9. Rotate the scanner unit around screw B (Figure 3-7): rotating the unit clockwise makes the horizontal line incline counterclockwise, and vice versa.

10. Make another service test print by jumpering pins 1 and 2 on J205. Then measure the image skew as directed above.

Repeat steps 9-10 until the adjustment is satisfactory. If necessary, return to steps 5-7 for further adjustments.

Final Check

When the adjustment is satisfactory, carefully tighten all screws. Turn off the power to the printer and put back the LaserWriter I/O board. To verify your adjustment, generate a user test print by turning on the power, and measure the image skew as directed above.

Be sure to confirm that no part of the image is missing. The adjustment procedure shifts the position of the leading edge of the picture, and if it is shifted too far, the leading edge of the image may be moved entirely off the page.

Apple Technical Procedures

LaserWriter

Section 4 – Troubleshooting

❑ CONTENTS

❑ HOW TO USE THE TROUBLESHOOTING SECTION

Introduction

Use this section, along with your knowledge of Theory of Operations, as a guide in diagnosing and repairing LaserWriter printer failures.

Three Check Procedures

1. **Pre-Power-On Check** - This check procedure should be done first. It is a checklist of important items to check before beginning to troubleshoot the printer.

2. **LaserWriter Functional Check** - This check procedure should be done after the Pre-Power-On Check. It is a ***brief*** comprehensive check of the LaserWriter. If the problem is in the print engine (everything on the printer except the LaserWriter I/O PCB) this check will refer you to the Print Engine Check.

3. **Print Engine Check** - This procedure should be done only if referred to by the LaserWriter Functional Check. It takes you through a step by step check of each function on the printer. When the malfunction is observed, the procedure will branch you to one of the troubleshooting tables. These tables are actually independent procedures to help you troubleshoot specific functions of the machine.

Materials Required

Multimeter
LaserWriter Spares Kit
All of the equipment listed in the Take-Apart section under General Information.

Skills Needed

1. You must be able to use the voltmeter and ohmmeter functions of the multimeter.

2. You must be able to use your knowledge of the LaserWriter to recognize and interpret abnormal operation. For more information on the operation of the LaserWriter, see the Theory of Operations materials.

3. You must be able to find connectors and pins on the LaserWriter Wiring Diagram (found in the pocket at the end of this manual) and then locate those items on the printer.

4. You must be able to follow basic electrical safety precautions for working with AC line voltage in power supplies.

To Troubleshoot

To troubleshoot the printer, follow these steps:

1. Check for proper installation and functioning by following:

   a) the **Pre-Power-On Checklist** and
   b) the **LaserWriter Functional Check.**

   If a problem is observed, the Functional Check will refer you to:

   c) the **Print Engine Check**, or directly to one of the **Troubleshooting Tables**. The Print Engine Check will further define the problem to the specific function that is failing and refer you to the appropriate Troubleshooting Table to isolate the problem to a replaceable part.

2. **When the printer is repaired,** perform the Service Technician Maintenance procedure found in the Preventive Maintenance section of this manual.

❑ HOW TO USE THE PROCEDURES IN THIS SECTION

The following example explains how to read the Troubleshooting Tables.

A- THERE IS NO POWER: (Procedure)

Step	Check	Result	Action	Explanation
1	Is the printer plugged in?	NO	Plug in the printer.	An explanation for each troubleshooting step is located on the page facing that step.
2	Is the printer firmly closed?	NO	Close the printer.	
3	Is the required voltage supplied at the AC outlet?	NO	Nothing is wrong with the printer. Take steps to provide an adequate power supply.	

To solve a problem, begin at step one and perform the check explained there.

If the result is **not** as indicated in the "Result" column, go to the next step. If the result **is** as indicated in the "Result" column, perform the action indicated in the "Action" column and observe what happens.

If you have a question about the step (why it's being done, how the machine is supposed to behave, etc.), refer to the explanation for that step on the opposite page. If the problem is not eliminated, continue to the next step.

Test Prints

There are two test prints produced by the LaserWriter:

User Test Print

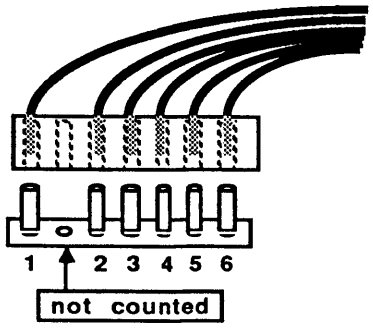
If the LaserWriter I/O PCB is installed, this test print is automatically produced when the power is switched on (unless the protocol switch is set to "Special" or the function has been turned off with PostScript software).

Service Test Print

This test print is produced when pins 1 and 2 of J205 on the DC controller PCB are jumpered. The service test print is sometimes called the internal or print engine test print.

Pin Numbering

The pin-numbering system used on the LaserWriter's printed circuit boards has one potentially confusing feature: blank pin positions, which occur on several jacks, are not counted in numbering the pins. This system is followed consistently throughout the printer, so the following example illustrates the general rule and applies to all jacks with blank pin positions.



❑ CHECK PROCEDURES

(1) Pre-Power-On Check

_____ Line Voltage OK (115 VAC plus or minus 10%)

_____ Printer installed on solid level surface

_____ Room temperature between 50 - 90° F (10 - 32.5° C)

_____ Humidity between 20% and 80%

_____ Printer not located near: water tap
boiler
humidifier
open flame
dusty location

_____ Printer not exposed to ammonia gas (produced by Diazo copiers or cleaning solutions)

_____ Printer not exposed to direct sunlight

_____ Printer is installed in a well-ventilated area

_____ Cables and connectors OK

_____ Toner cartridge is installed and OK (replace if indicator is red)

_____ Fuser roller cleaner felt in place and not dirty

_____ Print density adjustment dial set to center

_____ Protocol selector switch (on back of printer) set to ***AppleTalk***

_____ Paper cassette properly loaded with paper (not more than 10mm high)

_____ Paper is 16-21 lb. standard photocopier paper

_____ Transfer corona wire OK (check for broken or dirty wire)

_____ Separation belt OK (check for nicks or broken belt)

_____ No visible problems

(2) LaserWriter Functional Check: (Procedure)

Step	Check	Result	Action
1	**PRINTER SETUP** Is the printer properly set up as listed in the Pre-Power-On Checklist?	NO	Properly set up the printer.
2	**USER TEST PRINT** Turn the printer off and wait one minute. Then turn the printer on and wait three minutes. **If the I/O PCB has been upgraded with the LaserWriter Plus ROMs, refer to *Section 3, Troubleshooting* of the *LaserWriter Plus Technical Procedures* (behind the *LaserWriter Plus* tab) before continuing.**		
	a. Is the Apple user test print produced, and is print quality OK?	YES	Go to step 4 of this procedure.
	b. Is the Apple user test print produced but the print quality defective?	YES	Try several more prints to see if the problem persists. If it does, replace the toner cartridge, turn off the printer for one minute, and turn it back on to obtain another test print. If the problem is still there, go to table Q.
	c. Is an Apple user test print produced at all?	NO	Turn off the printer. Remove the LaserWriter I/O PCB and jumper pins 1 and 2 of J205 on the DC controller PCB to produce the service print. If the service test print is not produced, go to the Print Engine Check procedure. If the service print is produced, go to step 3.
3	**LASERWRITER I/O PCB** Reinstall the LaserWriter I/O PCB. On the LaserWriter I/O PCB, disconnect P3 from J3 (the power input to the LaserWriter I/O PCB), and turn on the printer and check for +5 volts between pins 1 and 3 of P3. Check for +5 volts between pins 2 and 4. Is there +5 volts between both sets of pins?	YES	Perform the following actions, repeating the Functional Check after each step: 1. Check the gray, 34-pin cable between the I/O PCB and DC Controller for poor contact or damage. 2. Replace the I/O PCB with a known-good one.
		NO	Go to table S.
4	**APPLETALK COMMUNICATION** Connect the LaserWriter to a Macintosh via AppleTalk. Load the LaserWriter Test disk into the Macintosh and send its file to the printer. Is the LaserWriter test print successful?	NO	Go to table P.
5	**MANUAL FEED** Select Manual Feed at the Macintosh and resend the test file to the LaserWriter. Is the LaserWriter Manual Feed test print successful?	NO	Go to table R.1.
		YES	The LaserWriter is fully functional. Perform the Service Technician Maintenance Procedure located in the Preventive Maintenance Section.

(2) LaserWriter Functional Check: (Explanation)

NOTE: "Print engine" refers to everything on the printer except the LaserWriter I/O PCB.

Step	Explanation
1	Self explanatory.
2	a. For a user test print to occur, the print engine must be functional, and everything on the LaserWriter I/O PCB except the network interface circuitry must have functioned. b. Table Q contains examples of print image defects. c. The service test print is a functional test of the print engine. If the service test print is produced and the quality is good, that means that the print engine must be working properly. The print engine and the LaserWriter I/O PCB work together to produce the user test print. If the user test print didn't occur but the service test print did, that indicates a problem with the LaserWriter I/O PCB.
3	In order to arrive at this point in the procedure, you have determined that the printer will not produce the user test print but the print engine is functional. This points to a LaserWriter I/O PCB failure. Step 3 checks to see if the problem lies with the LaserWriter I/O PCB or its power supply. The power supply (Interface Regulator) is located in the base of the printer.
4	The LaserWriter user test print checks all functions on the printer except the network interface functions of the LaserWriter I/O PCB and the manual feed operation of the print engine. Step 4 checks the AppleTalk network communications functions of the LaserWriter I/O PCB.
5	Step 5 checks the only remaining function, that of the manual feed operation of the print engine.

(3) Print Engine Check: (Procedure)

Step	Check	Result	Action
1	**PREPARATION FOR PROCEDURE** Turn off the printer and remove: a. LaserWriter cover and panels b. LaserWriter I/O PCB c. any paper jams		
2	**VISUAL INSPECTION** Open the printer and perform visual inspection of the printer.		Clean or repair as necessary.
3	**FAN POWER** Close and turn on the printer. does the fan come on?	NO	Go to table A.
4	**"POWER-ON" DISPLAY LED STATUS** Observe the LEDs on the display panel. a. Is the Paper Out LED on? b. Is the Paper Jam LED on? c. Does the Ready/Wait LED begin flashing?	 YES YES NO	 Go to table I. Go to table G. Go to step 7 of table A.
5	**DELIVERY ROLLERS** Turn off the printer. Observe the delivery rollers at the front of the fuser as you turn it back on. Do the rollers rotate as the main motor finds home position?	NO	Go to table B.
6	**FUSER HEATER BULB** Observe the printer cover door latch. Do you see light from the fuser heater bulb (through the latch) going on and off every 5 to 10 seconds?	NO	Go to table D.
7	**PRECONDITIONING EXPOSURE LAMPS** Take out the toner cartridge (reinstall when this step is finished). Turn the printer on and activate the door switch using a screwdriver while you observe the red lens inside the toner cartridge cavity. Do all five of the preconditioning exposure lamps behind the red lens come on with the proper intensity immediately after you activate the door switch? (Reinstall cartridge.)	NO	Replace the assembly with a known good one and try this step again. If the problem remains, go to table K.
8	**PAPER OUT DETECTION** Remove the paper cassette from the printer. Does the Paper Out LED come on? NOTE: the Ready/Wait LED may continue to flash. (Reinstall the cassette when finished with this step.)	NO	Go to table J.

(3) Print Engine Check: (Explanation)

Step	Explanation
1	Self explanatory.
2	Self explanatory.
3	The fan is connected to line voltage very early in the power distribution system. It is more likely that this is a symptom of a power problem than an actual fan problem.
4	a. Since you checked that the paper cassette is installed and properly loaded with paper during the Pre-Power-On Check, a lighted Paper Out LED at this point is not really an indication that there is no paper. b. Since the printer hasn't had a chance to process any paper, a paper jam could not possibly have occurred yet, so a lighted paper jam LED at this point is not really an indication of a paper jam. c. If the Ready/Wait LED does not begin flashing, it is a good possibility that there may be a power problem.
5	One of the first things that the DC controller PCB does after power becomes stable is to issue a command to the motor driver circuits in the DC power supply/motor driver PCB to rotate the main motor to its home position.
6	Upon power up, the DC controller PCB immediately begins monitoring the temperature of the fuser. If the fuser is initially cold, the DC controller will send the command to turn it on right away.
7	Self explanatory.
8	Step 8 checks the ability of the paper-out sensor to detect a paper-out condition.

(3) Print Engine Check: (Procedure)

Step	Check	Result	Action
9	**"READY" DISPLAY PANEL STATUS** After the printer has been on for about three minutes, observe the Ready/Wait LED. Does the Ready/Wait LED ***stop*** flashing and stay on?	NO	Go to table O.
10	**SERVICE TEST PRINT** Check for the following as you momentarily jumper pins 1 and 2 on J205 of the DC controller PCB to initiate a service test print.		
	a. Does the DC controller PCB LED light during the test print?	NO	Replace the DC controller PCB. If the problem remains, go to table L.
	b. Does the laser/scanner unit LED light during the test print?	NO	Go to step 3 of table L.
	c. Does the DC power supply/motor drive LED light during the test print?	NO	Go to table B.
11	**PRINT PROCESS COMPLETION** At the completion of the print process, the paper should be delivered and the Ready/Wait LED should come on steadily. Is the print delivered?	NO	Go to step 14.
12	**FAULTY PAPER JAM DETECT** Does the Paper Jam LED light even though print was delivered?	YES	A true paper jam has not occurred but one has erroneously been detected. Go to table G.
		NO	LED is OK; go to step 13.
13	**PRINT QUALITY CHECK** Is the print quality good?	YES	Print engine is functional; go to step 3 of the LaserWriter Functional Check.
		NO	Try several more prints. If the problem persists, replace the toner cartridge. If the problem still remains, go to table Q.
14	**PRINT IS NOT DELIVERED** Does the paper jam LED light?	YES	Go to table R to solve the paper jam problem.
		NO	A true paper jam has occurred and has not been detected. Go to table H.

(3) Print Engine Check: (Explanation)

Step	Explanation
9	The DC controller PCB monitors the conditions of the print engine to determine when to put it into the ready state. One of these conditions is the fuser temperature. If the fuser is cold when the power is turned on, it can take up to three minutes to reach operating temperature. Once the DC controller PCB detects that fuser temperature and the other conditions are met, it will activate the ready signal which lights the Ready/Wait LED and notifies the LaserWriter I/O PCB that the print engine is ready for a print command. If the Ready/Wait LED never stops flashing, it indicates that one of the conditions necessary for the ready state is not occurring. Table O will help you isolate that condition
10	a. This LED is an indication that laser power is on. If a print is performed where there is relatively little print in the print image, this LED can be seen to flicker as laser power goes on and off. b. The Scanner LED lights when the scanner servo detects that the scanner motor is rotating at the correct frequency. c. The DC power supply/motor drive LED lights when the motor driver servo detects that the main motor is rotating at the correct frequency.
11	Self-explanatory. Steps 12 and 14 check whether the Paper Jam LED is functioning correctly. Step 13 checks print quality.
12	If the paper is delivered then there is no jam and of course the Paper Jam LED should not light. If it does light, table G will help you determine why a paper jam has been detected when one has not occurred.
13	By arriving at this point, you have proven that all of the functions of the print engine are operational. Go back to the LaserWriter Functional Check to check the remaining functions of the LaserWriter. Table Q will refer you to the proper Image Defect table.
14	Arriving at this point means that paper was not delivered during the print process. This means that there is a paper jam. Step 14 checks to see that the paper jam was properly detected. If the Paper Jam LED does not come on when it should, it indicates a problem that is probably separate from the paper jam itself, and one which should be taken care of first. Table H will help you find the cause of this problem. Table R will help you select the proper Paper Jam table.

TROUBLESHOOTING TABLES

NOTE: Refer to the 110/115 Volt LaserWriter Wiring Diagram in the back pocket of this manual when using these procedures.

A - THERE IS NO POWER —110/115 VOLT (Procedure)

NOTE: To troubleshoot a No Power symptom in a 220/240 volt LaserWriter, refer to Table T, "THERE IS NO POWER — 220/240 VOLT."

WARNING: There are dangerous voltages present at many of the locations called out in the following procedure. Be sure to follow all appropriate electrical safety precautions when performing this procedure.

(If air is blowing through the louver when the power is switched on, start at step 7.)

Step	Check	Result	Action
1	Is the printer plugged in?	NO	Plug in the printer.
2	If the printer firmly closed?	NO	Close the printer.
3	Is the required voltage supplied at the AC outlet?	NO	Nothing is wrong with the printer. Take steps to provide an adequate power supply.
4	Is circuit breaker CB1 open?	YES	Reset the circuit breaker. If the breaker trips as soon as it is reset, there is a short that will have to be located.
		NO	Make sure the power is off. Unplug the printer. Open the printer and disconnect J105 on the AC driver PCB. Make sure that circuit breaker CB1 is reset and has continuity. If the circuit breaker is defective, replace it.

CAUTION: For the following step be sure to set the multimeter to the correct voltage range, or it may be destroyed.

5	Disconnect J105 on the AC driver PCB. Connect the multimeter across terminal blocks TB101-1 and TB102-1. (TB101 and TB102 are located above noise filter NF1 in the power interlock assembly. TB101 is located toward the back of the printer, and TB102 is next to the on/off switch.) Plug the printer in and turn the power on. Is AC voltage supplied between TB101 and TB102?	NO	Check noise filter NF1, main switch SW1, and the power cord and plug. Replace as necessary.

A - THERE IS NO POWER —110/115 VOLT (Explanation)

Step	Explanation
1	Self-explanatory.
2	If the printer is not closed, interlocks MS1 and MS2 in the power interlock assembly will block the AC line voltage almost at its entrance into the printer.
3	Try plugging a lamp into the outlet to see if the line current is on. If you suspect that the line voltage may not be at the proper level, check it with a voltmeter.
4	The circuit breaker will trip if it detects too much line current being drawn by the printer. This protects the printer's sensitive electronics. If the circuit breaker trips, it is possible that a part of the printer is shorting the current to ground. The best way to troubleshoot this kind of problem is to disconnect all channels into the printer that the line current can possibly take, and reconnect them one at a time. When you reconnect the channel leading to the module that is shorting the line current, the circuit breaker will trip. The next step is to disconnect all the modules along that channel, and reconnect them one at a time. When the faulty module is connected, the circuit breaker will trip again. If CB1 keeps tripping after being reset, use the 110/115 volt LaserWriter Wiring Diagram to identify the channels the AC line current takes when it leaves CB1. Then follow the procedure described above to locate the short.
5	Step 4 checked for a short circuit. Getting to step 5 indicates that a short was not the problem. Step 5 checks to see if line current is getting at least as far as noise filter NF1. If it isn't, the problem could be with any of the components through which the line current must flow before it can get to NF1. Disconnecting J105 prevents a possible problem beyond NF1 from affecting this check.

A - THERE IS NO POWER —110/115 VOLT (Procedure)

NOTE: When locating pins to check signals, do not count blank pin positions. (See "Pin Numbering on the LaserWriter" on page 4.5 of this section.)

Step	Check	Result	Action
6	Switch the power off and unplug the printer. Reconnect J105 on the AC driver PCB. Plug the printer in and turn it on. Is AC voltage supplied between J105-1 and J105-2 when the door switch is activated with a screwdriver?	NO	Replace MS1 and/or MS2 (the door switch interlocks in the power interlock assembly).
7	Is AC voltage supplied between J103-1 and J103-2 when the door switch is activated with a screwdriver?	NO	Replace the AC driver PCB.
8	Are the DC voltages listed below supplied between the J502 pins on the DC power supply/motor drive PCB? 1) J502-4 and J502-8(GND) 24-35VDC 2) J502-9 and J502-8(GND) 24VDC 3) J502-7 and J502-6(GND) 5VDC 4) J502-5 and J502-6(GND) -5VDC 5) J502-2 and J502-3(GND) 20-30VDC	YES	Go to step 21.
9	Switch the printer off and disconnect P501 (the plug connected to J501 on the DC power supply/motor drive PCB). Turn on the printer. Are the AC voltages listed below supplied between the pins on P501? (CAUTION: Set the multimeter to the correct voltage range or it will be destroyed.) 1) P501-1 and P501-2 29-37VAC 2) P501-3 and P501-4 10-14VAC 3) P501-4 and P501-5 10-14VAC 4) P501-6 and P501-7 18-24VAC	NO	Transformer PT1 is probably faulty. Remove the printer from its pedestal and replace transformer PT1. If the problem remains, recheck TB 102.
10	Switch the printer off. Disconnect J502 on the DC power supply/motor drive PCB and reconnect P501. Turn the printer on. Are the DC voltages shown below supplied at J502 on the DC power supply/motor drive PCB? 1) J502-4 and J502-8(GND) 24-35VDC 2) J502-9 and J502-8(GND) 24VDC 3) J502-7 and J502-6(GND) 5VDC 4) J502-5 and J502-6(GND) -5VDC 5) J502-2 and J502-3(GND) 20-30VDC	NO	Replace the DC power supply/motor drive PCB.

A - THERE IS NO POWER —110/115 VOLT (Explanation)

Step	Explanation
6	If there is no short and there is line current at TB101 and 102, then interlocks MS1 and MS2, when activated, should allow line current to J105 pins 1 and 2.
7	Line current enters the AC controller PCB (the lower board of the AC driver PCB assembly) at J105 pins 1 and 2 and from there is split into three different channels. One of the channels is through J103 pins 1 and 2 to the DC power supply in the DC power supply/motor drive PCB. If there is line voltage at J105 but not at J103, then there could be a broken trace on the AC controller PCB.
8	Step 7 confirmed that line current was available at J103 pins 1 and 2 leaving the AC controller PCB. From there, the current goes through transformer PT1, where it is stepped down to three AC voltages: 12 volts, 33 volts, and 21 volts. These three AC voltages are sent to the DC power supply, where they are rectified and regulated into the various DC voltages needed by different modules in the printer. These DC voltages are sent via J502 over to the DC controller PCB, which distributes them to their proper destinations. Step 8 ensures that the DC voltages are being produced by the DC power supply/motor drive PCB. **Remember not to count the blank pin positions on J502 or J208.**
9	The line current was good at the AC controller PCB, so if the DC voltages are not being produced by the DC power supply, the problem can be with either the DC power supply/motor drive PCB (the line current shorted through the DC controller PCB or one of the modules connected to it), or the transformer PT1 in the base of the printer. This step checks to see if power is coming from the transformer. If it isn't, the problem is probably with a pinched/broken cable or the transformer.
10	This step first eliminates the DC controller PCB (and its connected modules) as a possibility by disconnecting it from the DC power supply. The step then checks again for the DC voltages. Step 9 proved whether or not the transformer was supplying the AC voltages needed by the DC power supply to produce the DC voltages. If the DC voltages are still not being produced when the DC controller is disconnected, then the DC power supply must not be functioning.

A - THERE IS NO POWER —110/115 VOLT (Procedure)

Step	Check	Result	Action
	CAUTION: Disconnect all power from the printer for steps 11 through 20. These steps are resistance checks. If power is applied to the printer during their performance, it could damage the ohmmeter.		
11	TURN THE PRINTER OFF. Make sure that J502 is connected to the DC power supply/motor drive PCB. Disconnect all connectors on the DC controller PCB except J208. Are any of the J502 pins listed below shorted to ground? (Measure resistance on connector pins on the power supply/motor drive board.) 1) J502-4 (+30v) and J502-8 (GND) 2) J502-9 (+24v) and J502-8 (GND) 3) J502-7 (+5v) and J502-6 (GND) 4) J502-5 (-5v) and J502-6 (GND) 5) J502-2 (+24v) and J502-3 (GND)	YES	Check the wiring between J502 and J208 for a short. If the wiring is OK, replace the DC controller PCB.
12	Reconnect all connectors on the DC controller PCB. Are any of the J502 pins on the DC power supply/ motor drive PCB shorted now? 1) J502-4 (+30v) and J502-8 (GND) 2) J502-9 (+24v) and J502-8 (GND) 3) J502-7 (+5v) and J502-6 (GND) 4) J502-5 (-5v) and J502-6 (GND) 5) J502-2 (+24v) and J502-3 (GND)	NO	Go to step 21.
13	Were J502-4 (+30v) and J502-8 shorted?	NO	Go to next step.
		YES	Check the wiring between J207 and TB5 on the preconditioning assembly for a short. If the wiring is good, replace the preconditioning exposure assembly.
14	Were J502-9 and J502-8 shorted?	NO	Go to step 17.

A - THERE IS NO POWER —110/115 VOLT (Explanation)

Step	Explanation
11	Step 10 checked that the DC power supply was producing the necessary DC voltages, and so eliminated that module as a possibility. Step 11 checks to see whether any of the DC voltages are being shorted to ground on the DC controller PCB alone (the rest of the modules are disconnected from the DC controller and so are prevented from affecting this check). NOTE: Steps 11 through 20 are all resistance checks and require that no power be applied to the printer during their performance.
12	Step 11 checked that the DC controller PCB was not shorting any DC power line to ground. Step 12 checks to see if any of the modules connected to the DC controller PCB are causing the problem.
13	This step checks to see if the +30-volt channel is being shorted. Since the only module using +30 volts is the preconditioning assembly, then that would be a likely source of such a problem.
14	This step checks to see if the +24 volt (R) channel is being shorted.

A - THERE IS NO POWER —110/115 VOLT (Procedure)

Step	Check	Result	Action
15	Disconnect all +24v connectors (J215, J212, J210, J216, J213, J211, J208, J204, and J206). Reconnect them in the sequence shown below. After each connector is replaced, check for shorts between the pins shown below. Are any shorts found? J215-3 and J215-1 (GND) J215-5 and J215-1 (GND) J210-1 and J210-5 (GND) J210-3 and J210-5 (GND) J210-7 and J210-5 (GND) J216-3 and J216-1 (GND) J211-6 and J211-1 (GND) J206-1 and J206-2 (GND) J204-1 and J208-3 (GND)	YES	Replace the load attached to the shorted connector.
16	Reconnect J212. Are J212-2 and J212-3 shorted?	YES	Disconnect J104 on the fuser safety PCB (upper board of the AC driver PCB). Check the wiring from pins 2 and 3 of J104 to pins 2 and 3 of J212 on the DC controller PCB for a short. If the wiring is good, replace the AC driver PCB.
17	Are J502-7 and J502-6 shorted?	NO	Go to step 19.
18	Disconnect J201 and J204 on the DC controller PCB. Are J201-1 and J208-8 shorted, or are J204-4 and J204-5 shorted?	YES	If the circuit between J201-1 and J208-8 is shorted, check the wiring between J201 and TB18 on the display PCB for a short. If OK, replace the display PCB. If the circuit between J204-4 and J204-5 is shorted, check the wiring between J204 and TB3 and TB4 on the laser unit for a short. If the wiring is good, replace the laser unit.
19	Are J502-2 and J502-3 shorted?	NO	Go to step 21.
20	Disconnect J204 on the DC controller PCB. Are J204-1 and J208-8, or J204-1 and J204-4 of the connector on the cable shorted?	YES	Check the wiring between J204 and TB3 and TB4 for a short. If the wiring is good, replace the laser unit.

A - THERE IS NO POWER —110/115 VOLT (Explanation)

Step	Explanation
15	Getting to step 15 indicates a short in the +24-volt (R) power channel. If you look at the 110/115 Volt LaserWriter Wiring Diagram, you can see that there are many modules that use +24 volts (R).
16	The fuser safety PCB (the upper board of the AC driver PCB assembly) is another module that uses +24 volts. This step checks to see if it is causing a short.
17	This step checks to see if the +5-volt channel is being shorted.
18	Getting to step 18 indicates a short in the +5-volt power channel.
19	This step checks to see if the +24-volt (UA) channel is being shorted.
20	Getting to step 20 indicates a short in the +24-volt (UA) power channel.

A - THERE IS NO POWER —110/115 VOLT (Procedure)

Step	Check	Result	Action
21	If all of the connectors on the DC power supply/motor drive PCB and DC controller PCB are not plugged in, plug them in. Check that the circuit breaker has been reset and the printer is closed. Switch the printer on. Are the DC voltages shown in the table below supplied between the pins on the DC controller PCB? 1) J208-4 and J208-8(GND) 24-35VDC 2) J208-9 and J208-8(GND) 24VDC 3) J208-7 and J208-6(GND) 5VDC 4) J208-5 and J208-6(GND) -5VDC 5) J208-2 and J208-8(GND) 20-30VDC	NO	Check wiring between J502 (on DC power supply motor drive PCB) and J208 (on the DC controller PCB) for poor contact or wiring damage.
		YES	Replace the DC controller PCB.

A - THERE IS NO POWER —110/115 VOLT (Explanation)

Step	Explanation
21	The power distribution system appears to be OK, but this step reconnects everything and then applies power for one last check under load. If a problem is found, it is probably an electronic failure on the DC controller PCB.

B - THE MAIN MOTOR DOES NOT ROTATE (Procedure)

Step	Check	Result	Action
1	Open the printer, remove the toner cartridge, defeat the cover open interlock (MS1 and MS2) with a screwdriver, and turn on the printer. Does the main motor begin to rotate when the printer is turned on?	NO	Check that all gears mesh correctly. Check the connection between J503 on the DC power supply/motor drive PCB and the main motor. Check cabling between the DC power supply/motor drive PCB and the DC controller (J502 - J208). If the cabling is OK, replace the DC controller PCB.
2	Disconnect J503 from the DC power supply/motor drive PCB and check the voltage between pins 5 and 6 while you perform a test print. Is there +24 volts between pins 5 and 6 of J503 while the printer is performing a test print?	NO	Go to step 3.
		YES	Replace the main motor.
3	Remove the DC power supply/motor drive PCB. Check fuse FU504. Is FU504 blown?	NO	Replace the DC power supply/motor drive PCB.
		YES	Replace FU504 and reinstall the DC power supply/motor drive PCB. If the fuse blows again, replace the main motor. If the problem still remains, go to step 14 of table A.

B - THE MAIN MOTOR DOES NOT ROTATE (Explanation)

Step	Explanation
1	Main motor movement is under the control of the DC controller PCB, which passes control signals to the DC power supply/motor drive PCB, which in turn activates the motor. The DC power supply/motor drive PCB contains the circuits that control the speed of the main motor. Upon power up, the DC controller PCB sends a control signal to the DC power supply/ motor drive circuits to rotate the main motor to its home position. The main drum drive gear turns the big brass toner cartridge drive gear, which then turns the idler gear. The idler gear turns the gears that power the fuser assembly.
2	The power-on rotation (described in the explanation of step 1) is done as a result of a command from the DC controller PCB. If it fails, the possibilities are the DC controller PCB, the DC power supply/motor drive PCB, and the main motor. Step 1 eliminates the DC controller PCB as a possibility confirming that the necessary control signals are being sent to the motor drive circuits. The motor driver circuits should respond to the control signal by applying approximately +24 volts to the main motor. This step checks to see if the motor driver circuits are reacting in this way. If they are, then the motor must be defective. If they aren't, then the motor driver circuits are at fault.
3	As the motor turns, it sends tacho-generator pulses back to the motor drive circuits. The motor drive circuits relay these pulses to the DC controller PCB. The DC controller counts the number of pulses to determine if the proper amount of move has occurred. If the DC controller gets no pulses or the wrong number for a move, it will assume that a paper jam has occurred and light the Paper Jam LED in the display panel. If the problem hasn't been found by this step and the fuse on the DC power supply/motor drive module is not blown, then it's possible that the motor drive circuits may not be relaying the tacho-generator pulses back to the DC controller. By replacing the DC power supply/motor driver module you will eliminate this as a possibility. If the FU504 fuse in the motor driver circuitry blows consistently, the main motor is drawing too much current. See the explanation for step 2.

C - HIGH VOLTAGE POWER SUPPLY DOES NOT PROVIDE POWER (Procedure)

Step	Check	Result	Action
1	Initiate a service test print while you check for +24 volts between pins 1 (GND) and 6 of J601. Is the voltage there during a test print?	NO	Go to step 14 of table A.
2	Do the voltages between the J211 pins on the DC controller PCB vary as follows when making a test print?	NO	Replace the DC controller PCB. If the problem remains, replace the high voltage power supply.
	a) J211-8 and J211-1(GND) from about +18VDC to about +1VD immediately after making a test print?	YES	Visually inspect J1 (shown as J601 on the LaserWriter Wiring Diagram), J3, J4, and J5 on the high voltage power supply for good contact. Repair any problems. If the high voltage power supply still does not function, replace the high voltage power supply.
	b) J211-2 and J211-1(GND) and between J211-4 and J211-1(GND) from about +20VDC to about 0 VDC a few seconds after making a test print?		
	c) J211-5 and J211-1(GND) from about +17VDC to about 0 VDC a few seconds after making a test print?		

C - HIGH VOLTAGE POWER SUPPLY DOES NOT PROVIDE POWER (Explanation)

Step	Explanation
1	Step 1 checks for the +24 volts required for the high voltage power supply to operate. There are many possible causes of a failure such as this. Table A will help you sort through them.
2	The high voltage power supply develops the voltages for the primary and transfer coronas and the developing cylinder in the toner cartridge.

a) This step checks J211 pin 8, which conveys the primary corona enable signal.

b) This step checks J211 pin 2, which conveys the transfer corona enable signal, and also checks J211 pin 4, which conveys one of the density adjust/enable signals. These signals enable the adjustment made at the print density dial to affect the potential on the developing cylinder. This determines how much negative charge is put on the toner, affecting how much toner is attracted to the relatively positive laser scanned image on the drum. The more toner attracted, the darker the image, and vice versa.

c) This step checks J211 pin 5, which conveys the other density adjust enable signal (see explanation for 1.b).

❑ D - THE FUSER ROLLER HEATER DOES NOT OPERATE (PROCEDURE)

***WARNING:** In the following procedure, you must depress cover interlocks MS1 and MS2 in order to produce the electrical signals to be checked. To avoid electrical shock, do not touch any of the power interlock assembly components that carry line current.*

STEP	CHECK	RESULT	ACTION
1	Turn the printer off. Unplug J101 on the AC driver PCB. Measure the resistance between J101-1 and J101-2 of the connector on the cable. Is it between 1-5 ohms? (Reconnect J101 after measurement.)	NO	Check for continuity at both ends of the thermoprotector TP1, by connecting the multimeter to the spade connectors located on each side of the fuser assembly. If TP1 does not have continuity, replace the thermoprotector. If TP1 has continuity, replace the fuser roller heater bulb H1 and the 47-ohm resistor assembly at J107 on the fuser heater safety PCB (upper board of the AC driver PCB). Then, go to step 3. (You may have to wait 15 minutes, until all the capacitors discharge, before continuing.)
2	Measure the resistance of the 47-ohm resistor assembly at J107 on the fuser safety PCB. Does the resistance measure between 46.5 and 47.5 ohms?	NO	Replace the resistor assembly. If the problem remains, replace the AC driver PCB.
3	Unplug J212 on the DC controller PCB. Measure the thermistor resistance between J212-5 and J212-4 of the connector. Is it in the range of 100-400 K ohms at room temperature? (Reconnect J212 after measurement.)	NO	Check the wiring between thermistor TH1 in the fuser assembly and the DC controller PCB. Clean the thermistor if it is dirty. If the problem persists, replace the thermistor. If the problem remains, go to step 4.
4	Does the voltage between J212-1 and J212-3 on the DC controller PCB go from between +22 and 24 VDC to between +20 and 22 VDC approximately one second after power is turned on and then again every time the heater in the fuser assembly is to be turned on?	NO	Check the wiring between J212 on the DC controller PCB and J104 on the AC driver PCB. If the problem still exits, replace the DC controller PCB.
5	Perform the following checks. Do the voltages listed below change about one second after the printer is switched on and every time the heater in the fuser assembly is activated?	NO	Replace triac Q1 (located on the power interlock assembly: see Section 6, Illustrated Parts List, for location). If the problem remains, replace the AC driver PCB and reinstall triac Q1.

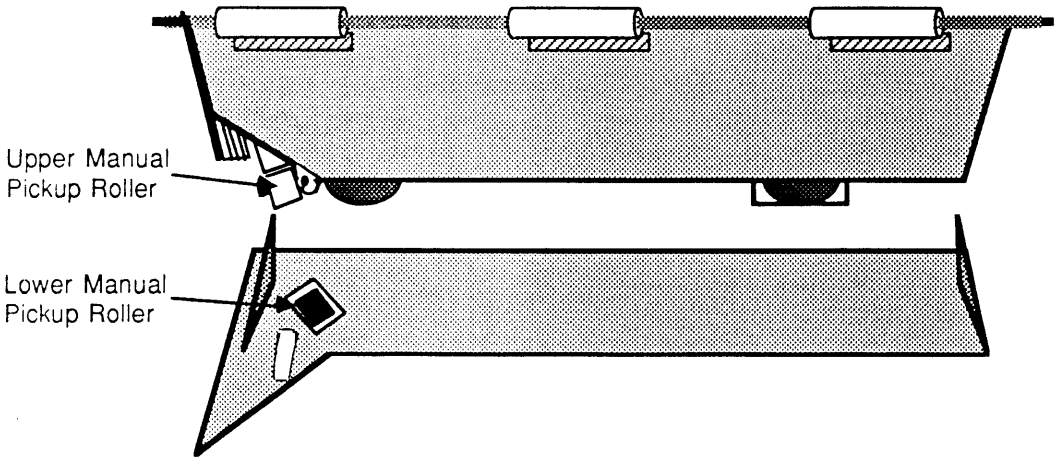
a) *AC CHECK*—between J105-7 and J105-3 should go from line voltage to 0 VAC
b) *DC CHECK*—between J104-3 (ground) and J105-5 should go from approximately .03 VDC to .1 VDC
c) *AC CHECK*—between J101-1 and J101-2 should go from 0 VAC to line voltage

D - THE FUSER ROLLER HEATER DOES NOT OPERATE (Explanation)

Step	Explanation
1	This step checks the total resistance of the thermoprotector and the element in the heater bulb. If the heating element or anything else in that circuit opens, the resistor fuse attached to J107 on the fuser safety PCB (the upper board of the AC driver PCB assembly) will blow to protect the circuitry on the AC controller PCB (lower board).
2	If the resistance of the thermoprotector and the heater bulb element proves to be OK but the resistor fuse is blown, the resistor may simply have failed. However, if it blows again, odds are that something on the AC driver PCB caused it to blow.
3	If the thermistor is dirty or defective, or if the wiring is faulty, the temperature of the upper fuser roller will not be accurately measured, and the DC controller PCB will not activate the heater at the proper time, or perhaps not at all. At room temperature, the thermistor should have a resistance of 100-400 k-ohms. That resistance varies with the temperature of the roller: the greater the heat, the less the resistance. If the thermistor is coated with toner, the toner might prevent it from accurately measuring the roller temperature.
4	J212 pin 1 conveys the fuser heater bulb enable signal (FSRD). It is sent to the the fuser assembly by the microprocessor on the DC controller PCB when the thermistor voltage from J212 pin 4 gets too low. This happens when the operating temperature in the fuser's upper roller falls too low to properly fuse the toner onto the paper.
5	The triac acts as a switch activated by the DC controller board signal FSRD, which becomes active (low) when the temperature of the heater element falls below threshold. When the triac switch is activated, it passes voltage to the protection circuitry on the fuser heater safety PCB. If the protection circuitry senses that the heating circuit has continuity, it will then pass the line voltage to the heating circuit. If the triac fails, the voltage will never reach the protection circuitry.

E - CANNOT FEED PAPER MANUALLY (Procedure)

Step	Check	Result	Action
1	Has a manual feed command been sent to the printer?	NO	Send a manual feed command to the printer from the attached computer.
2	Insert paper into the manual feed entrance far enough to trip pickup sensor PS1. Turn on the printer and allow it to become ready. Does the voltage between J210-4 and J210-5(GND) on the DC controller PCB go from about +24VDC to about 0 VDC approx. 8 seconds after the main motor begins to rotate, and does it remain at 0 volts for about 1 second?	NO	Replace the DC controller PCB.
3	Does the upper manual pickup roller (shown below) descend and feed the paper about 8 seconds after the main motor begins to rotate?	YES	Check the lower roller for wear and rotation. Check that the upper roller presses against the paper firmly. If the lower roller is worn, replace the manual feed assembly.



4	Does the voltage between J210-6 and J210-5 (GND) on the DC controller PCB go from about 0 VDC to +5 VDC when paper is inserted into the manual feed entrance?	NO	Check J4 of the pickup sensor PS1 and J210 on the DC controller PCB for poor contact. If no problems are found, replace the registration shutter assembly.
5	Unplug J210 on the DC controller PCB. Is there continuity between J210-4 and J210-3 on the connector attached to the cable?	NO	Check the wiring and connectors for the manual pickup roller solenoid SL2 on the registration shutter assembly. If the problem still exists, replace the registration shutter assembly.

E - CANNOT FEED PAPER MANUALLY (Explanation)

Step	Explanation
1	Self explanatory.
2	J210 pin 4 carries the manual pickup solenoid SL2 enable signal generated by the DC controller PCB. This step checks to see if the DC controller actually generates the signal.
3	Self explanatory.
4	When the printer is ready to perform the manual feed, the sheet to be printed on should be inserted into the manual feed entrance of the printer far enough to trip PS1. The DC controller J210 pin 6 carries the signal generated by the pickup sensor when the sensor detects the inserted sheet at the registration shutter assembly. The DC controller must detect this signal before it will start the manual print cycle. If it doesn't detect this signal, it will never perform a manual print.
5	This step checks the continuity of the winding on the manual pickup solenoid. (There are two solenoids on the registration shutter assembly. This is the one on your left as you face the open printer.)

F - PAPER PICKUP ROLLERS DO NOT ROTATE (Procedure)

Step	Check	Result	Action
1	Are the following wiring connections secure? a) J502 on DC power supply/motor drive PCB b) J208 on the DC controller PCB c) J215 on the DC controller PCB d) J10 and J11 on the lower main body, near the hinges (black & white cables).	NO	Make connections secure.
2	Disconnect J214 from the DC controller. Remove the paper cassette and manually actuate the cassette size microswitches MS5 (upper), MS6 (middle), and MS7 (lower), in that order, while checking the resistance between the cable connector pins listed below. Does the resistance drop from infinity to 0 ohms? 1) J214-1 to J214-2 (MS5) 2) J214-3 to J214-4 (MS6) 3) J214-5 to J214-6 (MS7)	NO	Check for wiring or connector problems between the DC controller PCB and the microswitches. If none, replace the appropriate microswitches.
		YES	Replace the DC controller PCB.
3	Initiate a test print. Does the voltage between J215-4 and J215-1(GND) on the DC controller PCB drop from +24VDC to 0 VDC when a test print is executed from the READY state?	NO	Replace the DC controller PCB. If no effect, remove the printer from its pedestal and replace the cassette pickup assembly.
		YES	The fault is probably in the cassette pickup assembly. Replace the appropriate part of the cassette pickup assembly.

F - PAPER PICKUP ROLLERS DO NOT ROTATE (Explanation)

Step	Explanation
1	Self explanatory.
2	The cassette size microswitches tell the DC controller PCB how big the paper is. This can affect several things in the print process, such as how many tacho-generator pulses the DC controller PCB expects to see before the paper is delivered. The longer the paper is, the longer it will take to print and be delivered. If the DC controller PCB gets erroneous cassette size information from the cassette size microswitches, it will be expecting the wrong number of tacho-generator pulses during a print.
3	This step checks to make sure the DC controller is generating the cassette pickup solenoid enable signal. You know that the main motor is operating from the first part of the print engine check. You also know that the pickup rollers are not actuating. If the solenoid enable signal is being generated by the DC controller PCB and the main motor is turning but the pickup rollers are not actuating, that leaves as the source of the problem only electromechanical parts that are not actuating. These parts are located in the base of the printer.

G - JAMS ARE DETECTED WHEN THERE ARE NO JAMS (Procedure)

Step	Check	Result	Action
1	Does the PAPER JAM indicator immediately light on the display unit when the printer is switched on?	YES	Check the wiring between J201 on the DC controller PCB and TB18 on the display unit. Then check J10 and J11 (inside the printer towards the hinges, with black and white cable connected). If the cabling is OK, replace the DC controller PCB.
2	Is a paper fragment or some other obstacle caught in the delivery unit?	YES	Remove the obstruction.
3	Does the voltage between J210-6 and J210-5(GND) on the DC controller PCB go from about 0 VDC to +5VDC when a piece of paper is inserted far enough into the manual feed entrance to trip pickup sensor PS1?	NO	Check J4 of the pickup sensor PS1 and J210 on the DC controller PCB for poor contact. Also check that the paper detection arm functions smoothly. If no problems are found, replace the registration shutter assembly.
4	Open the upper half of the printer and activate the door switch with a screwdriver. Insert paper into delivery sensor PS3 on upper body (below fan) to block its light transfer. Does the voltage between J216-2 and J216-1(GND) on the DC controller PCB vary from about 0 VDC to +5VDC?	NO	Check J5 of the delivery sensor PS3 and J216 on the DC Controller PCB for poor contact. Also check that the paper delivery sensor arm functions smoothly. If there are no problems, replace delivery sensor PS3.

G - JAMS ARE DETECTED WHEN THERE ARE NO JAMS (Explanation)

Step	Explanation
1	The DC controller PCB issues commands and monitors sensor inputs to interpret a paper jam condition. When it detects such a condition, the DC controller lights the Paper Jam LED. If jams are detected when there are none, it could be the result of a faulty sensor or DC controller PCB. This step eliminates the DC controller PCB as a possibility.
2	Self explanatory.
3	Pickup sensor PS1 senses when paper has arrived at the registration shutter assembly. After the DC controller PCB actuates the cassette pickup solenoid, it expects to see a response from pickup sensor PS1. If it doesn't see the response within a specified time, it will assume a paper jam and light the Paper Jam LED on the display panel. Of course, a defective sensor will never provide the expected response.
4	Delivery sensor PS3 senses when paper leaves the printer through the fuser assembly. When the DC controller PCB actuates the registration shutter solenoid to lift the registration shutter, it also turns on the motor to motivate the rollers and drums which guide the paper through a print process. As the motor turns it generates pulses. The DC controller PCB expects to see the input from the delivery sensor PS3 within a certain number of these pulses. If it doesn't, the DC controller PCB assumes a paper jam and lights the Paper Jam LED on the display panel. Of course, a defective sensor will never provide the expected response.

H - JAMS ARE NOT DETECTED (Procedure)

Step	Check	Result	Action
1	Does the JAM indicator on the display unit light when the circuit between J201-4 and J208-6(GND) on the DC controller PCB is shorted?	NO	Check J201 on the DC controller PCB and TB18 on the display unit for good contact, Check whether +5VDC is supplied between J201-4 and J208-6(GND) on the DC controller PCB. If +5VDC is there, replace the display unit. If it is not there, go to step 17 of table A.
		YES	Replace the DC controller PCB with a known good one.
2	Insert paper into the manual feed entrance to trip pickup sensor PS1. Does voltage between J210-6 and J210-5 (GND) on the DC controller PCB go from about 0 VDC to +5VDC when paper is inserted (pickup sensor PS1 is tripped)?	NO	Check J4 of the pickup sensor PS1 and J210 on the DC controller PCB for poor contact. Also check that the paper detection arm functions smoothly. If no problems are found, replace the registration shutter assembly.
3	Open the upper half of the printer and activate the door switch with a screw-driver. Block the light transition in delivery sensor PS3 (below fan) with paper. Does the voltage between J216-2 and J216-1 (GND) on the DC controller PCB vary from about 0 VDC to +5VDC?	NO	Check J6 of delivery sensor PS3 and J216 on the DC controller PCB for poor contact. Also check that the paper delivery sensor arm (on the top cover of the fuser assembly) functions smoothly. If there are no problems, replace the paper delivery sensor.

H - JAMS ARE NOT DETECTED (Explanation)

Step	Explanation
1	Look at the LaserWriter Wiring Diagram for this explanation. If LEDs 5 and 6 (Paper Jam LEDs) in the display unit are functional, they should turn on when the ground on J208 pin 6 is connected to one side and the + 5 volts to the other side. If they do not come on, they may not be functional or the + 5 volts may not be available. The DC controller PCB issues commands and monitors sensor inputs to interpret a paper jam condition. When it detects such a condition, the DC controller lights the Paper Jam LED. If jams are not being detected, it could be the result of a faulty sensor or DC controller PCB. Step 1 eliminates the DC controller PCB as a possibility.
2	Pickup sensor PS1 senses when paper has arrived at the registration shutter assembly. After the DC controller PCB actuates the cassette pickup solenoid, it expects a response from pickup sensor PS1. If it does not receive the response within a specified time, it should assume a paper jam and light the Paper Jam LED on the display panel. A sensor may be defective in such a way that it is always providing a signal even though the condition is not there.
3	Delivery sensor PS3 senses when paper leaves the printer through the fuser assembly. When the DC controller PCB actuates the registration shutter solenoid to lift the registration shutter, it also turns on the motor to motivate the rollers and drums which guide the paper through the print process. As the motor turns it generates pulses. These pulses are counted by the DC controller PCB, which expects to receive the input from the delivery sensor PS3 within a certain number of pulses. If the DC controller does not receive the expected response, it should assume a paper jam and light the Paper Jam LED on the display panel. A sensor may be defective in such a way that it is always providing a signal even though the condition is not there.

I - THE PAPER OUT INDICATOR LIGHTS WHEN THERE IS STILL PAPER (Procedure)

Step	Check	Result	Action
1	Insert and remove the paper cassette a few times while you measure the voltage between J215-1 and J215-2 on the DC controller PCB. Does the voltage between J215-2 and J215-1 (GND) on the DC controller vary from about +5VDC to 0 VDC when the paper cassette is inserted?	NO	Check that the paper detection sensor arm moves freely. Check the wiring from J10 in the lower main body, near the rear hinges (black & white cables) to J215 on the DC controller PCB. If the problem is still there, remove the printer from its pedestal and replace the paper out sensor.
		YES	Replace the DC controller PCB.
2	Disconnect J214 from the DC controller. Remove the paper cassette, and then, manually (with a a screwdriver, pencil, or the like) actuate the cassette size microswitches MS5 (upper), MS6 (middle) and MS7 (lower), in that order. While you are doing this, check the resistance between the connector pins on J214 (connector and cable attached) listed below. Does the resistance drop from infinity to 0 ohms? 1) J214-1 to J214-2 (MS5) 2) J214-3 to J214-4 (MS6) 3) J214-5 to J214-6 (MS7)	NO	Check the wiring from J11 on the lower main body of the printer, near the rear hinges (black & white cables), to J21 on the DC controller PCB. If the problem is still there, remove the printer from its pedestal and replace the appropriate cassette size microswitch.

I - THE PAPER OUT INDICATOR LIGHTS WHEN THERE IS STILL PAPER (Explanation)

Step	Explanation
1	When the cassette is out of paper, the black paper detection arm should be hanging loosely. At such times, a part of the arm is blocking light conduction in the paper out sensor. In this condition, the phototransistor in the sensor will not receive light so the transistor conducts +5 volts to J215 pin 2. When you insert paper, the arm lifts and the phototransistor receives light, putting 0 volts to J215 pin 2. If the signal at J215 pin 2 is correct but the Paper Out LED lights when there is still paper, the DC controller PCB is not processing the signal correctly.
2	MS5, MS6, and MS7 are the cassette size microswitches. They tell the DC controller PCB what type of paper cassette is inserted (and therefore, what size paper is being used).

J- THE PAPER OUT INDICATOR DOES NOT LIGHT WHEN THERE IS NO PAPER (Procedure)

Step	Check	Result	Action
1	Does the PAPER OUT indicator on the display unit light up when the circuit between J201-3 and J208-6 (GND) on the DC controller PCB is shorted?	NO	Check J201 on the DC controller PCB and TB18 on the display unit for good contact. If the contact is good, check whether +5VDC is supplied between J201-1 and J208-6(GND) on the DC controller PCB. If +5VDC is there, replace the display unit. If it is not there, go to step 17 of table A.
2	Insert and remove the paper cassette a few times while you measure the voltage between J215-1 and J215-2 on the DC controller PCB. Does the voltage between J215-2 and J215-1 (GND) on the DC controller vary from about +5VDC to 0VDC when the paper detection arm lifts?	NO	Check that the paper detection sensor arm moves freely. Check the wiring from J10 on the lower main body of the printer,by the hinges (black & white cables), to J215 on the DC controller PCB. If the problem is still there, replace the paper-out sensor in the pedestal.
		YES	Replace the DC controller PCB.
3	Disconnect J214 from the DC controller. Remove the paper cassette, manually (with a screw-driver, pencil, or the like) actuate the cassette size microswitches MS5 (upper), MS6 (middle) and MS7 (lower), in that order. While you are doing this, check the resistance between the connector pins on J214 (connector and cable attached) listed below. Does the resistance drop from infinity to 0 ohms? 1) J214-1 to J214-2 (MS5) 2) J214-3 to J214-4 (MS6) 3) J214-5 to J214-6 (MS7)	NO	Check the wiring from J11 on the lower main body of the printer, by the hinges (black & white cables), to J215 on the DC controller PCB. If the problem is still there, remove the printer from its pedestal and replace the appropriate cassette size microswitch.

J - THE PAPER OUT LED DOES NOT LIGHT WHEN THERE IS NO PAPER (Explanation)

Step	Explanation
1	Look at the LaserWriter Wiring Diagram for this explanation. If LEDs 3 and 4 (Paper Out LEDs) in the display unit are functional, they should turn on when the ground on J208 pin 6 is connected to one side of them and the +5 volts to the other side. If they do not come on, it may be they are not functional or the + 5 volts is not available.
2	When the cassette is out of paper, the black paper detection arm should be hanging loosely. At such times, part of the arm is blocking light conduction in the paper out sensor. In this condition, the phototransistor in the sensor does not receive light, so the transistor conducts +5 volts to J215 pin 2. When you insert paper, the arm lifts and the phototransistor receives light, putting 0 volts to J215 pin 2. If the signal at J215 pin 2 is correct but the Paper Out LED lights when there is still paper, the DC controller PCB is not processing the signal correctly.
3	MS5, MS6, and MS7 are the cassette size microswitches. They tell the DC controller PCB what type of paper cassette is installed (and therefore what size paper is being used).

K - THE PRECONDITIONING EXPOSURE LAMPS DO NOT LIGHT (Procedure)

Step	Check	Result	Action
1	Execute a test print from the ready state. Does the voltage between J207-1 (+24 to +30VDC) and J207-2 on the DC controller vary from 0 V to between +24VDC and +35VDC? (Attach common lead to J207-2.)	YES	Check J207 on the DC controller PCB for good contact.
2	Is the voltage between J207-1 and J208-6 (GND) on the DC controller PCB within the range of +24-30 VDC and is the voltage between J208-7 and J208-8(GND) on the DC controller PCB at +5 VDC?	YES	Replace the DC controller PCB.
		NO	Check J502 on the DC power supply/ motor drive PCB and J208 on the DC controller PCB for good contact. If OK, replace the DC power supply/motor drive PCB. If the problem is not solved, replace the DC controller PCB.

K - THE PRECONDITIONING EXPOSURE LAMPS DO NOT LIGHT (Explanation)

Step	Explanation
1	Self explanatory.
2	The DC controller PCB should turn on the preconditioning exposure lamps whenever the main motor is turned on. J207 pin 2 is the signal used to activate the lamps. If the voltage on J207 pin 2 is OK but the lamps do not light when they should, it may be the DC controller is not providing the necessary enable signal on J207 pin 2. The +30 volts needed by the preconditioning exposure lamp and the +5 volts needed by the logic on the DC controller PCB are generated by the DC power supply/motor drive PCB.

L - LASER OR SCANNER MALFUNCTION (Procedure)

Step	Check	Result	Action
1	Are the following connections secure? a) DC controller J204 to TB3&4 of the laser/scanner unit. b) DC controller J206 to J401 of the laser/scanner unit.	NO	Make the connections secure.
2	Measure the laser power output using the first part of the laser power adjustment in the Adjustments section of this manual. Is the laser power set properly?	NO	Adjust laser power to the proper level. If this can't be done, replace the laser unit. If this does not repair the problem, replace the DC controller PCB.
3	Is +24VDC supplied between J401-1 and J401-2 (GND) on the scanner driver PCB?	NO	Check J502 on the DC power supply and J208 on the DC controller board for secure contact. If contact is good, replace the DC power supply/ motor drive PCB.
4	Initiate a test print. Does the voltage between J206-4 and J206-2 (GND) vary from about +7VDC to about 0 VDC?	NO YES	Replace the DC controller PCB. Replace the scanner unit. If this does not correct the problem, go to step 5.
5	Initiate a test print. Does the voltage between J401-3 and J401-2 (GND) on the scanner driver PCB vary from about +3VDC to about 0 VDC?	YES NO	Replace the DC controller PCB. If the problem is not solved, put the old PCB back in the printer and replace the scanner unit. Replace the scanner unit.

L - LASER OR SCANNER MALFUNCTION (Explanation)

Step	Explanation
1	Self explanatory.
2	Self explanatory.
3	The + 24 volts is used to power the scanner unit. It is generated by the DC power supply/motor drive unit.
4	J206 pin 2 carries the SCNON (scanner on) command from the DC controller PCB to the scanner unit. It should be generated by the DC controller PCB whenever the main motor is turned on.
5	The SCNON (scanner on) command from the DC controller PCB should cause the scanner servo loop to activate. After the scanner motor has achieved the correct velocity, the scanner unit generates the SCNRDY (scanner ready) command from J401 pin 3 to J206 pin 3 of the DC controller PCB.

M - LASER OR FUSER HEATER MALFUNCTION (Procedure)

Step	Check	Result	Action
1	Switch the printer on and wait one minute. Open the printer and lift the cover of the fuser assembly. Has the temperature of the upper roller increased?	NO	Go to "THE FUSER ROLLER HEATER DOES NOT OPERATE."
2	Is the voltage between J204-1 and J204-4 (GND) in the range of +20 to 30VDC and is the voltage between J204-5 and J204-4 (GND) in the laser unit +5VDC?	NO	Check that the voltage between J208-2 and J208-3 (GND) is +20-30VDC, and +5VDC between J208-7 and J208-6 (GND). If not, check the wiring between J502 on the DC power supply/motor drive PCB and J208 for poor contact. If contact is good, replace the DC power supply/ motor drive PCB.
3	Switch the printer off. Disconnect J204 on the DC controller PCB. Measure the resistance between J204-1 and J204-2 of the connector on the cable. Is it 40-55 ohms?	NO	Replace the laser unit.
4	Measure the resistance between J204-3 and J204-4 of the connector on the cable. Is it 5-15 k-ohms when the laser is at room temperature?	YES	Replace the DC controller PCB.
		NO	Replace the laser unit.

N - THE READY/WAIT INDICATOR DOES NOT STOP FLASHING (Procedure)

Step	Check	Result	Action
1	Does the rear (I/O) connector plate's test light blink continuously or stay on?	YES	Replace the LaserWriter I/O board.
		NO	Replace the DC controller PCB.

M - LASER OR SCANNER HEATER MALFUNCTION (Explanation)

Step	Explanation
1	One of the first things the printer should do upon power up is heat up the fuser assembly. You can usually check to make sure that the fuser heater bulb is going on and off by watching through the cover latch, but if there is a high level of ambient light in the room, it may be necessary to open the door and check the temperature of the fuser assembly.
2	This step checks to see that the two voltages (+24 volts and +5 volts) needed by the laser unit are being produced by the DC power supply/motor drive PCB.
3	The DC controller PCB is constantly monitoring the temperature in the laser chip. It accomplishes this with the use of a thermistor on the laser chip. The voltage from the thermistor tells the DC controller PCB the temperature of the laser chip. To enable the laser chip to heat up, the DC controller activates J204 pin 2, allowing current to flow through a heating element on the chip. Step 3 checks the resistance of the laser heater element in the laser unit.
4	This step checks the resistance of the thermistor in the laser unit. See the explanation for step 3.

N - THE READY/WAIT INDICATOR DOES NOT STOP FLASHING (Explanation)

Step	Explanation
1	The LaserWriter I/O PCB communicates with the print engine through the DC controller PCB. If there is a problem on the LaserWriter I/O PCB, it is possible that the I/O PCB and the DC controller PCB could be caught in a loop. In this case, the printer will never come ready, so the Ready/Wait indicator on the display panel will never stop flashing. If the green Test LED on the mounting connector comes on steadily or blinks continually, that indicates that the problem relates to the I/O Board.

O - THE READY/WAIT INDICATOR DOES NOT LIGHT (Procedure)

Step	Check	Result	Action
1	Is a toner cartridge installed in the printer?	NO	Install a toner cartridge.
2	Turn the printer off and then on again. Is the problem solved?	YES	Finished.
3	Are the wiring connections OK between J502 on DC power supply/ motor drive PCB and J208?	NO	Make connections secure.
4	Is +5VDC supplied between J201-1 and J208-6 (GND) on the DC controller PCB?	NO	Go to "THERE IS NO POWER."
5	Does the READY/WAIT indicator light steadily when the circuit between J201-2 and J208-6 (GND) on the DC controller PCB is shorted?	YES NO	Replace the DC controller PCB. Check J201 on the DC controller PCB and TB18 on the display PCB for good contact. If contact is good, check whether +5VDC is supplied between TB18 and J208-6 (GND) on the DC controller PCB. If so, replace the display PCB. If not, go to "THERE IS NO POWER."
6	Go to table M (Laser or Fuser Heater Malfunction). If that doesn't help, go to table B (The Main Motor Does Not Rotate).		

O - THE READY/WAIT INDICATOR DOES NOT LIGHT (Explanation)

Step	Explanation
1	If the toner cartridge is not installed, the DC controller PCB will never activate the ready condition and light the Ready/Wait LED.
2	Occasionally, a momentary flicker will cause a beam detect signal malfunction. Turning the power off and then on again re-initializes the circuit and solves the problem. If this problem occurs to frequently, go "LASER OR SCANNER MALFUNCTION".
3	Self explanatory.
4	Step 4 checks to make sure that there is power for the logic on the DC controller PCB.
5	Step 5 checks to see if the Ready/Wait LED will work properly if it is given a correct enable signal. The DC controller PCB requires eight conditions to exist in the printer before it will put the printer into the ready condition and light the green Ready/Wait LED. These conditions are: (1) Proper laser chip temperature (2) Proper fuser temperature (3) Toner cartridge installed (4) Paper loaded (5) No jams (6) Pickup sensor PS1 does not sense paper (7) Printer not in Pause mode (can only be caused by an external device) (8) Main motor producing tachogenerator pulses If the printer is not entering the Ready state, it can be caused by a real condition as listed above, or by a faulty detection of one of the conditions above. The faulty detection of one of these conditions may be caused by a bad sensor or by malfunctioning logic on the DC controller PCB. Step 5 eliminates the DC controller PCB as a possibility. If the printer still will not enter the Ready condition, the problem is probably in a sensor.
6	Table M checks the possibility that the temperature of the laser or fuser may be causing the printer not to go into the Ready condition. Table B checks the possibility that the main motor tachogenerator pulses (generated whenever the main motor rotates) are not getting to the DC controller PCB.

P - PRINTING DOES NOT START WHEN A FILE IS SENT TO THE PRINTER (Procedure)

Step	Check	Result	Action
1	Is the protocol selector switch on back of the printer set correctly?	NO	Set the switch to correct position.
2	Is appropriate network software and printer software installed on the application disk?	NO	Install the correct software.
3	Is the Macintosh defective? (Run MacTest.).	YES	Repair the defective Macintosh.
4	Is there a network problem? (Run test disk supplied with laser printer).	YES	Refer to AppleTalk troubleshooting material.
5	Does the green test light on the rear (I/O) plate blink continuously or stay on when printer power is turned on?	YES	Turn the printer off for one minute then on. Then if the problem remains, replace the LaserWriter I/O PCB.

P- PRINTING DOES NOT START WHEN A FILE IS SENT TO THE PRINTER (Explanation)

Arriving at this troubleshooting table means that you have determined that the print engine is functional and the LaserWriter I/O PCB's processing and communications functions are capable of producing the user test print. The failure must have occurred when a print was attempted by a node on the network.

Step	Explanation
1	If the protocol selector switch is not set to AppleTalk, the printer won't be able to communicate with the other nodes on the AppleTalk Personal Network.
2	Self explanatory.
3	Self explanatory.
4	Self explanatory.
5	The nodes on the AppleTalk network communicate with the print engine through the LaserWriter I/O PCB. It is possible for the processor on the I/O PCB to be caught in a software loop. If the green test LED on the mounting connector plate comes on steadily or blinks continually, that indicates that the problem relates to the I/O board.

TABLE Q: IMAGE DEFECTS

Compare your printer's images to the ones shown on these two pages.
Determine which image it most nearly resembles.

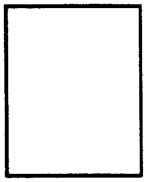
Light Image

All printed areas are light
Go to Table Q1

Dark Image

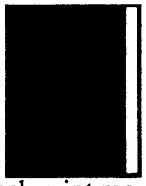
All printed areas and possibly the background area are dark
Go to Table Q2

Blank Print



Look closely to make sure that this is not an exceptionally light image
Go to Table Q3.

Black Image

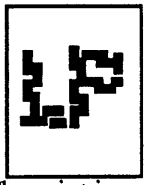


A black print may have a white bar on the right.
Go to Table Q4

Stained Separation Strip

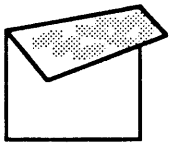
Go to Table Q5

Scrambled Image



The print image looks as if it has been cut and rearranged.
Go to Table Q6

Stains On Back of Paper



Go to Table Q7

Dark Vertical Lines

Go to Table Q8

Sharp Horizontal Black Lines

Go to Table Q9

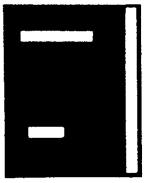
Vertical Fogged Stripes

Go to Table Q10

Horizontal Fogged Stripes

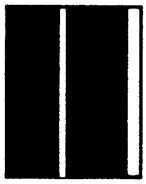
Go to Table Q11

White Horizontal Lines/ Other Shapes On A Black Image



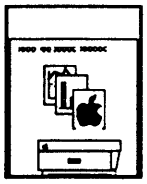
Go to Table Q12

Thin Vertical White Lines/Stripes



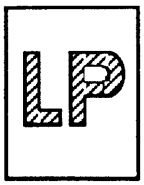
Go to Table Q13

Faulty Registration



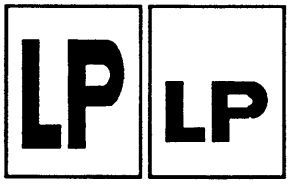
Go to Table Q14

Poor Fusing



Go to Table Q15

Distortion

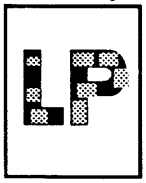


Go to Table Q16

Waviness

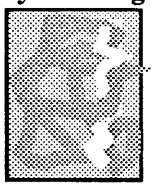
Go to Table Q17

Uneven Print Density



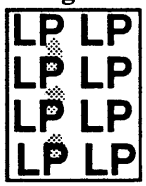
Go to Table Q18

Gray Cloud/Big Blur Totally Unrecognizable



Go to Table Q19

Smearing 80-90 mm from Left Edge of Page



Go to Table Q20

Q.1 - LIGHT IMAGE - WHOLE PRINT (Procedure)

Step	Check	Result	Action
1	Is the print density adjustment dial set with its dot at the top?	NO	Set the dial so that its dot is at the top.
2	Is the toner cartridge indicator red?	YES	Replace the toner cartridge.
3	Is this a "new" toner cartridge?	YES	Hold the toner cartridge horizontally by its ends and slowly rock it from side to side.
4	Do prints improve when new paper is used?	YES	Replace the paper with approved paper (16-21 lb. standard photocopier paper).
5	Is the transfer corona wire broken?	YES	Replace the transfer corona wire.
6	Is connector J211 on the DC controller board securely connected?	YES	Replace the DC controller board.
7	Measure the voltage between J209-1 and J209-2 (GND) on the DC controller, while pressing microswitch MS3 (the middle one). Measure the voltage between J209-3 and J209-4 (GND) on the DC controller, while pressing microswitch MS4 (the lower one). Does the voltage of each pair of pins vary from +5VDC to 0V when the microswitch is pressed?	NO	Replace the faulty microswitch.
8	Insert a toner cartridge in the printer. Does the voltage between J209-1 and J209-2 (GND) on the DC controller measure at +5VDC? Does the voltage between J209-3 and J209-4 (GND) measure at 0V?	NO	Reposition the microswitch holder.
9	Is the print still light?	YES	Replace the high voltage power supply.
10	Measure the laser power output, using the first part of the Laser Power adjustment procedure, to determine if adjustment is necessary. Was the laser out of adjustment and *not able* to be adjusted?	YES	Replace the following modules. Retry the adjustment after each replacement to determine if the next replacement is necessary. * DC controller PCB * laser unit
		NO	Replace the varistor PCB.

Q.1 - LIGHT IMAGE - WHOLE PRINT (Explanation)

Step	Explanation
1	The print density adjustment dial is connected to a variable resistor on the varistor PCB. This adjustment varies the voltage potential on the developing cylinder, thereby adjusting the amount of the toner from the toner bin that will be attracted to the surface of the photosensitive drum. The more toner attracted, the darker the print image.
2	If the cartridge indicator is red, the cartridge is empty.
3	Some cartridges print with a lighter print density for the first 100-200 pages. If the print is still too light after adjusting the print density dial, "rocking" the toner cartridge helps to distribute the toner.
4	Self-explanatory.
5	The transfer corona puts the charge on the paper, which attracts the toner from the drum onto the paper. Refer to the LaserWriter Circuit Diagram for the following explanation. The transfer corona is supplied with power at its power terminal (visible when you open the printer). This power comes from the high voltage power supply. The high voltage power supply gets its power from the DC controller PCB in the form of +24 volts DC. The DC controller gets the +24 volts from the DC power supply. The DC power supply gets its power from transformer PT1 in the base of the printer. Transformer PT1 is fed power from the power interlock assembly (through the circuit breaker CB1, the ON/OFF switch, the cover open interlocks MS1 and 2, etc.).
6	This connector is used to communicate control signals and the +24 volt power source from the controller PCB to the high voltage power supply to activate the coronas and the developing cylinders. This should happen when the DC controller PCB activates the main motor. See the explanation for step 4.
7	Microswitches MS3 and MS4 are used to indicate the sensitivity of the photosensitive drum to the DC controller PCB. The DC controller uses these inputs to adjust the laser intensity.
8	Microswitches MS3 and MS4 are used to indicate the sensitivity of the photosensitive drum to the DC controller PCB. The DC controller uses these inputs to adjust the laser intensity.
9	The high voltage power supply provides the voltages for the primary and transfer coronas and the developing cylinder. See the explanation for step 4.
10	If the laser is weak, it might not fully neutralize the areas that correspond to the print on the surface of the photosensitive drum. If the varistor PCB failed in such a way as to cause less of a charge on the developing cylinder, then less toner would be attracted to the drum and the print image would be light. See the explanation for step 1.

Q.2 - DARK IMAGE - WHOLE PRINT (Procedure)

Step	Check	Result	Action
1	Is the print density adjustment dial set with its dot at the top?	NO	Set the dial so that its dot is at the top.
2	With the toner cartridge removed, check continuity between the grounding spring in the middle of the drum drive gear and the frame of the upper main body. Is there continuity?	NO	Check whether the grounding spring is broken or out of place. Reseat or replace the spring.
3	Measure the voltage betwen J209-1 and J209-2 (GND) on the DC controller, while pressing microswitch MS3 (the middle one). Measure the voltage between J209-3 and J209-4 (GND) on the DC controller, while pressing microswitch MS4 (the lower one). Does the voltage of each pair of pins vary from +5VDC to 0V when the microswitch is pressed?	NO	Replace the faulty microswitch.
4	Insert a toner cartridge in the printer. Does the voltage between J209-1 and J209-2 (GND) on the DC controller measure at +5VDC? Does the voltage between J209-3 and J209-4 (GND) measure at 0V?	NO	Reposition the microswitch holder.
5	Measure the laser power output, using the first part of the laser power adjustment procedure, to determine if adjustment is necessary. Adjust if necessary. Was the laser out of adjustment and *not able* to be adjusted?	YES	Replace the following modules. Retry a print after each replacement to determine if the next replacement is necessary. * DC controller PCB * laser unit
		NO	Replace the varistor PCB.

Q.2 - DARK IMAGE - WHOLE PRINT (Explanation)

Step	Explanation
1	The print density adjustment dial is connected to a variable resistor on the varistor PCB. This adjustment varies the voltage potential on the developing cylinder, thereby adjusting the amount of the toner from the toner bin that will be attracted to the surface of the photosensitive drum. The more toner attracted, the darker the print image.
2	The spring provides a ground for the primary corona and the photosensitive drum in the toner cartridge.
3	Microswitches MS3 and MS4 are used to indicate the sensitivity of the photosensitive drum to the DC controller PCB. The DC controller uses these inputs to adjust the laser intensity.
4	Microswitches MS3 and MS4 are used to indicate the sensitivity of the photosensitive drum to the DC controller PCB. The DC controller uses these inputs to adjust the laser intensity.
5	If the varistor PCB failed in such a way as to cause more of a charge on the developing cylinder, then more toner would be attracted to the drum and the print image would be dark. See the explanation for step 1.

❑ Q.3 - BLANK PRINT (PROCEDURE)

STEP	CHECK	RESULT	ACTION
1	Is the toner cartridge indicator red?	YES	Replace the toner cartridge.
2	Has the sealing tape been removed?	NO	Remove it.
3	Do the toner cartridge protective shield and the light-blocking shutters open when a toner cartridge is inserted? Does the laser-beam-blocking shutter open?	NO	Locate the cause of the trouble and repair. If the cause is in the toner cartridge, replace the cartridge.
4	Does the green test light on the rear (I/O) connector plate blink continuously or stay on when the printer power is turned on?	YES	Replace the LaserWriter I/O board.
5	Is connector J211 on the DC controller board securely connected?	YES	Replace the DC controller board.
6	Using the first part of the Laser Power adjustment procedure, measure the laser power output to determine if adjustment is necessary. Was the laser power output greater than zero?	NO	Replace the following modules. Perform a laser adjustment after each replacement to determine if the next replacement is necessary. * DC controller PCB * Laser unit
7	If the laser was out of adjustment, was it possible to adjust it?	NO	Replace the following modules. Generate a test print after each replacement to determine if the next replacement is necessary. * DC controller PCB * Laser unit
8	Initiate a service test print. Does the laser/scanner LED 401 light during the test print?	NO	Replace the scanner unit.
9	Is the print still blank?	YES	Replace the following modules. Check for the problem after each replacement to see if the next replacement is necessary. * High-voltage power supply * Varistor PCB

❑ Q.3 - BLANK PRINT (EXPLANATION)

STEP	EXPLANATION
1	If the indicator is red, the cartridge is out of toner.
2	The toner will not be released in the toner cartridge until the sealing tape has been removed.
3	The shield and shutters allow the laser beam access to the photosensitive drum in the toner cartridge.
4	The green test LED should light briefly when the LaserWriter is first turned on. After a moment, the LED should go out and stay out.
5	J211 on the DC controller PCB provides control signals and power to the high-voltage power supply, which in turn activates and provides power to the coronas and the developing cylinder. The DC controller PCB should activate these signals at the same time it activates the main motor to rotate.
6	Self-explanatory.
7	If the laser power cannot be adjusted, the laser unit may be faulty, or the DC controller PCB may not be sending the proper signals to the laser unit.
8	The scanner LED lights when the scanner servo detects that the scanner motor is rotating at the correct frequency.
9	The high-voltage power supply provides the voltages for the primary and transfer coronas and the developing cylinder. If the varistor PCB failed in such a way as to cause less of a charge on the developing cylinder, then less toner would be attracted to the drum and the print image would be light.

Q.4 - BLACK IMAGE (Procedure)

Step	Check	Result	Action
1	Is the primary corona wire inside the toner cartridge broken?	YES	Replace the toner cartridge.
2	Is connector J211 on the DC controller board securely connected?	YES	Replace the DC controller board.
3	Is the print still black?	YES	Replace the high voltage power supply.
4	Does the green test light on the rear (I/O) connector plate blink continuously or stay on when the printer power is turned on?	YES	Replace the LaserWriter I/O board.
		NO	Replace the laser unit.

Q.5 - STAINED SEPARATION STRIP (Procedure)

Step	Check	Result	Action
1	Is the separation belt, separation roller, or pinch roller (near the separation belt) dirty?	YES	Clean any that are dirty.
		NO	Replace the toner cartridge.

Q.6 - SCRAMBLED USER TEST PRINT IMAGE - "GARBAGE" (Procedure)

Step	Check	Result	Action
1	Turn printer off and then on again. Does green test light on rear (I/O) connector plate blink continuously or stay on and/or is self-test printout scrambled?	YES	Replace LaserWriter I/O board.

Q.4 - BLACK IMAGE (Explanation)

Step	Explanation
1	The primary corona lays down the base negative charge on the surface of the photosensitive drum. The negatively charged toner particles are attracted to the areas of the drum that have been neutralized by the laser because those areas are more positive. If the primary corona were to fail to lay down the base charge, the entire surface of the drum would be more positive and the toner would be attracted to the entire surface of the drum, resulting in a black print.
2	J211 on the DC controller PCB provides control signals and power to the high voltage power supply, which in turn activates and provides power to the coronas. The DC controller PCB should activate these signals at the same time it activates the main motor to rotate.
3	See explanation for Step 2.
4	The green test LED should light briefly when the LaserWriter is first turned on. After a moment, the LED should go out and stay out.

Q.5 - STAINED SEPARATION STRIP (Explanation)

Step	Explanation
1	The separation belt peels the left side of the paper away from the drum in the toner cartridge. If the separation belt, separation roller, or pinch roller is dirty, the area of the paper contacted by the dirty component would be stained. The stain would probably appear as an irregular vertical line. If none of these components is dirty, the problem is probably in the toner cartridge.

Q.6 - SCRAMBLED USER TEST PRINT IMAGE - "GARBAGE" (Explanation)

Step	Explanation
1	If the LaserWriter I/O PCB is operating correctly, the green test LED should light briefly when the LaserWriter is first turned on. After a moment, the LED should go out and stay out.

Q.7 - STAINS ON BACK OF PAPER (Procedure)

Step	Check	Result	Action
1	Is the fuser roller cleaner felt dirty?	YES	Replace the fuser roller cleaner felt.
2	Check for the following:		
	a. Is there any toner on the underside of the toner cartridge?	YES	Clean with a damp cloth, then with a dry cloth.
	b. Is there toner on the transfer guides or are the guides dirty?	YES	Clean with a damp cloth, then with a dry cloth.
	c. Is there any toner on the transfer corona assembly feeder guides?	YES	Clean with a damp cloth, then with a dry cloth.
	d. Is there any toner on the separation belt, separation roller, or pinch roller?	YES	Clean with a damp cloth, then with a dry cloth.
	e. Is the manual paper feed guide dirty or not grounded?	YES	Clean with a damp cloth, then with a dry cloth. Ground it if it is not correctly grounded.
3	Does the leading-edge blank area on printed pages measure about 5mm?	NO	Replace the DC controller PCB.
4	Are the transfer guides correctly grounded via 15MΩ resistance when the printer upper unit is closed?	NO	Ground them correctly.
5	Is the fuser assembly correctly grounded?	NO	Ground it correctly.

Q.8 - DARK VERTICAL LINES - PAPER FEED DIRECTION (Procedure)

Step	Check	Result	Action
1	Is the fuser roller cleaner felt dirty?	YES	Replace the fuser roller cleaner felt.
2	Turn the printer off in the middle of printing and open the upper half of the printer. Open the protective shield on the toner cartridge. Can you see a vertical line on the drum? (Make this check as quickly as possible and in dim light to prevent light from damaging the drum.)	YES	Clean the surface of the photosensitive drum as described in the Service Technician Maintenance Procedure of the Preventive Maintenance section in this manual. Then try about fifteen prints. If the problem persists, replace the toner cartridge.

Q.7 - STAINS ON BACK OF PAPER (Explanation)

Step	Explanation
1	If the fuser roller cleaner felt becomes exceptionally dirty, it will no longer clean the upper fuser pressure roller, which may then transfer its contaminants to the lower pressure roller. This may then cause stains on the back of any paper passed through the fuser.
2	Self explanatory.
3	The DC controller PCB determines when in the print sequence the laser begins scanning the print image onto the drum. If the controller PCB is out of sync with the paper's position relative to the drum, the laser scanning might begin too late, causing the toner image on the drum to be positioned lower on the paper. If the image is positioned too low, the lower part of the toner image on the drum will not be transferred to the paper, but will instead have to be scraped off by the sweeper strip and cleaner blade. The excess toner could then fall down onto the separation area and possibly adhere to the back of the paper on any copies made thereafter.
4	If the transfer guide is not properly grounded, it may develop a positive static charge which could attract toner.
5	See explanation for step 4.

Q.8 - DARK VERTICAL LINES - PAPER FEED DIRECTION (Explanation)

Step	Explanation
1	If the fuser roller cleaner felt becomes exceptionally dirty, it will no longer clean the upper fuser pressure roller, which may then transfer its contaminants to the lower pressure roller. Either roller may then transfer streaks or lines to the paper.
2	The photosensitive drum in the toner cartridge will rotate several times during the print of one piece of paper. For the drum to be causing a line the length of paper, the dirt or defect must stretch around the entire circumference of the drum. If the dirt or defect does not completely circle the drum, the resulting line will not be continuous for the length of the paper.

Q.9 - SHARP HORIZONTAL BLACK LINES - CROSS FEED DIRECTION (Procedure)

Step	Check	Result	Action
1	Measure the laser power output, using the first part of the Laser Power adjustment procedure, to determine if adjustment is necessary. Was the laser out of adjustment and *not able* to be adjusted?	YES	Replace the following modules. Check the laser power output after each replacement to determine if the next replacement is necessary. * DC controller PCB * laser unit
2	Initiate a test print by jumpering pins 1 and 2 on J205 on the DC controller board. Does the scanner motor start and LED401 on the scanner driver PCB light continuously during the print process?	YES	Proceed to step 6.
3	Are J401 on the scanner driver PCB and J206 on the DC controller board securely connected?	NO	Connect J401 or J206.
4	Is +24VDC supplied between J401-1 and J401-2(GND) on the scanner driver PCB?	NO	Check J502 on the DC power supply and J208 on the DC controller board for secure contact. If contact is good, replace the DC power supply/motor drive PCB.
5	Does the voltage between J206-4 and J206-2(GND) vary from about +7VDC to about 0 VDC when a test print is initiated?	NO	Replace the DC controller PCB.
		YES	Replace the scanner unit. If this does not correct the problem, go step 7.
6	Initiate a test print. Does the voltage between J401-3 and J401-2(GND) on the scanner driver PCB vary from about 0 VDC to +3 VDC and then 3 minutes later back to 0 VDC?	YES	Replace the DC controller PCB. If the problem is not solved, put the old PCB back in the printer and replace the scanner unit.
		NO	Replace the following. Check for the problem after each replacement to see if the next replacement is necessary. * DC controller PCB * scanner unit * laser unit * high voltage power supply * varistor PCB

Q.9 - SHARP HORIZONTAL BLACK LINES - (CROSS FEED DIRECTION (Explanation)

This kind of problem is usually caused by the laser/scanner unit in the image formation system. There are two functions to the laser/scanner unit. They are:

1) Producing the laser beam to be reflected by the optics assembly onto the surface of the photo-sensitive drum in the toner cartridge;

2) Rotating the hexagonal mirror at exactly the correct speed to scan (reflect) the laser beam across the drum in sync with the main motor as it turns the drum.

Step	Explanation
1	Step 1 confirms that there is a laser beam being produced and that it is the right intensity.
2	Step 2 confirms that the hexagonal mirror is being rotated at the correct speed to maintain sync with the main motor as it turns the drum in the toner cartridge. Steps 3 and 4 check for things that might interfere with the proper operation of the laser/scanner motor.
3	J206 of the DC controller PCB communicates control (ON/OFF) and power (+24 volts) to the scanner unit.
4	The +24 volt power for the laser/scanner unit comes from J401 of the DC controller PCB. The DC controller gets its power from J502 of the DC power supply. If the DC power supply is not producing the voltage, then it should be replaced. If the DC power supply is producing the voltage but the laser/scanner unit is not receiving it, then that means that the DC controller PCB is probably the problem.
5	J206 pin 4 from the DC controller PCB carries the signal that turns on the laser/scanner motor. The DC controller PCB should turn on this signal at the same time that it activates the signal to rotate the main motor.
6	When the scanner motor achieves the correct velocity, the scanner servo circuitry should notify the DC controller with the signal on pin 3 of J401. If the DC controller cannot properly sense this signal, then it is probably faulty.

Q.10 - VERTICAL FOGGED STRIPES - PAPER FEED DIRECTION (Procedure)

Step	Check	Result	Action
1	Clean the primary corona wire. Does the print image improve?	YES	Finished.
2	Replace the toner cartridge. Does the print image improve?	YES	Finished.
3	Feeder guide warped?	YES	Tighten the feeder guide screws fully and then loosen each screw 1/8 to 1/4 turn. If warpage remains, replace feeder guide.
4	Stripe appears 80-90 mm from left side of page?	YES	Go to Table Q 20.

Q.11 - HORIZONTAL FOGGED STRIPES - CROSS FEED DIRECTION (Procedure)

Step	Check	Result	Action
1	Check the distance of the stripes from the leading edge. Are they about 188mm or 66mm from the leading edge of the prints? (The circumference of the drum is 188.5mm, that of the developing cylinder, 66mm.)	YES	Replace the toner cartridge.

Q.12- WHITE HORIZONTAL LINES OR OTHER SHAPES ON A BLACK PRINT (Procedure)

Step	Check	Result	Action
1	Is approved paper being used?	NO	Replace with approved paper (16-21 lb. standard photocopier paper). Explain to user that use of non-approved paper may cause poor quality prints.
2	Is the paper damp?	YES	Replace the paper. Instruct the user to store paper in its package in a dry place and not to open the packages before they are ready to be used.

Q.10 - VERTICAL FOGGED STRIPES - PAPER FEED DIRECTION (Explanation)

Step	Explanation
1	The primary corona lays a negative base charge down on the surface of the photosensitive drum in the toner cartridge. Wherever the laser beam strikes the drum, the negative charge is removed. The negatively charged toner is attracted to the relatively positive areas hit by the laser, forming a visible image of the print on the drum. The paper is charged more positively than the areas hit by the laser, and is then put into contact with the drum. The toner is attracted away from the drum by the more positively charged paper, transferring the print image from the drum to the paper. If the primary corona fails, there will be no difference in charge potential after the laser has struck the drum. This will result in no print image (or a very cloudy image if the performance of the corona is degraded).
2	Self-explanatory
4	If the problem appears 80-90 mm from the left edge of the paper, it may be caused by an improperly seated thermistor. See table Q20.

Q.11 - HORIZONTAL FOGGED STRIPES - CROSS FEED DIRECTION (Explanation)

Step	Explanation
1	The photosensitive drum and the developing cylinder must rotate several times for each length of paper that is printed. If there is a flaw on either of these components, the print problem will be repeated whenever the flawed area rolls into contact with the paper. Because the circumference of the drum is 188.5mm, a fogged stripe caused by a flaw on the drum may be seen at multiples of that distance. The circumference of the developing cylinder is 66mm, so a flaw there would cause a fogged stripe at multiples of that measurement.

Q.12 - WHITE HORIZONTAL LINES OR OTHER SHAPES ON A BLACK PRINT (Explanation)

Step	Explanation
1	If the proper thickness of paper is not used, the mechanical components of the paper transport system may have difficulty moving the paper at a consistent speed through the paper feed path. The inconsistent speed may result in white lines or other shapes, caused by the paper slipping or skipping in its contact with the drum in the toner cartridge.
2	Damp paper increases in thickness, causing the problem described in the explanation for step 1.

Q.13 - THIN VERTICAL LINES OR STRIPES - PAPER FEED DIRECTION (Procedure)

Step	Check	Result	Action
1	Are white stripes being produced?	YES	If the toner cartridge indicator is green, rock the cartridge to spread the toner evenly. If the indicator is red, replace the toner cartridge.
2	Is the fuser roller cleaner felt dirty?	YES	Replace the fuser roller cleaner felt.
3	Do prints improve after the transfer corona wire is cleaned?	YES	Finished.
		NO	Replace the toner cartridge. If that does not work, replace the original cartridge and go to next step.
4	Remove the toner cartridge and manually open the laser beam blocking shutter in the printer (above the cartridge). Check the area for obstacles or blockages. Are there any?	YES	Remove the obstacles or clean the area with a fine brush.
5	Remove the laser/scanner unit. Examine the dustproofing glass on the bottom of the laser/scanner unit.Is it cracked or dirty?	YES	If the glass is cracked, replace the scanner unit. If dirty, clean the dustproofing glass with lint-free cloth. Dust should not be the left on glass.
		NO	Replace the scanner unit.

Q.13 - THIN VERTICAL LINES OR STRIPES - PAPER FEED DIRECTION (Explanation)

Step	Explanation
1	Self explanatory.
2	The fuser roller cleaner felt is impregnated with a silicon oil. As the upper pressure roller in the fuser assembly turns, the silicon is applied to the roller. The silicon keeps the toner (in powder form as it enters the fuser) from sticking to the pressure roller. When the felt's supply of silicon is depleted, the toner may stick to the pressure roller, causing vertical lines or stripes.
3	The transfer corona charges the paper more positively than the areas hit by the laser. The paper is then put into contact with the drum. The toner is attracted away from the drum by the more positively charged paper, transferring the print image from the drum to the paper. If dirt builds up on the transfer corona, the area of paper passing over the buildup may receive a less positive charge. This will result in no toner transfer to that area for the length of the paper, resulting in thin vertical lines or stripes.
4	Self explanatory.
5	The stationary laser beam is reflected from the hexagonal mirror as it rotates, creating horizontal scans across the printed page. The scans from the hexagonal mirror are reflected by the beam-to-drum mirror in the laser/scanner unit, out of the laser/scanner unit through the dustproofing glass (in the laser escape aperture) down through the beam access door in the upper body of the printer, through light blocking shutter number 2 in the toner cartridge, and onto the surface of the drum in the toner cartridge. If there is a piece of dust or a crack in the dustproofing glass or beam-to-drum mirror, the laser beam will be blocked at that point in its scans across the drum, resulting in white vertical lines or stripes on the print image.

Q.14 - FAULTY REGISTRATION (Procedure)

(NOTE: For small horizontal registration problems, see the Image Skew Adjustment in the Adjustments section of this manual.)

Step	Check	Result	Action
1	Is the paper cassette loaded with too much paper (more than 10mm high)?	YES	Remove the excess paper.
2	Has either shutter loading spring (located at ends of the feed roller shaft on the registration shutter assembly) come loose?	YES	Reinstall the shutter loading springs.
3	Is the leading edge of the paper showing excessive curl?	YES	Straighten paper edges or replace paper.
4	Is approved paper being used?	NO	Replace with approved paper (16-21 Lb. standard photocopier paper).
5	Is the paper cassette deformed in any manner?	YES	Replace the paper cassette.
6	Are the feed rollers dirty? (cassette pickup assembly)	YES	Clean with a damp cloth, then with a dry cloth. *Hint:* You can turn the rollers as you are cleaning them by opening the printer and rotating the gears in the bottom of the printer .
7	Disconnect J214 from the DC controller. Actuate the cassette size microswitches MS5 (upper), MS6 (middle), and MS7 (lower) manually in that order while checking the resistance between the connector pin listed below. Does the resistance drop from infinity to 0 ohms? 1) J214-1 to J214-2 (MS5) 2) J214-3 to J214-4 (MS6) 3) J214-5 to J214-6 (MS7)	NO	Check for wiring or connector problems between the DC controller PCB and the microswitches. If none, remove the printer from its pedestal and replace any microswitch that didn't drop to 0 ohms on activation.
8	Is the problem still there?	YES	Replace the DC controller board.

Q.14 - FAULTY REGISTRATION (Explanation)

Step	Explanation
1	The springs in the paper cassette must have the required amount of space in which to compress when the paper pickup rollers in the lower half of the printer rotate and contact the paper. If there is too much paper in the cassette, the springs cannot compress and the pickup rollers may pick up more than one sheet of paper or exhibit other problems as a result of improper registration.
2	Self explanatory.
3	Self explanatory.
4	If the proper thickness of paper is not used, the mechanical components of the paper transport system may have difficulty moving the paper through the paper feed path. This can result in paper jams or skewed prints caused by improper registration of the paper at the registration shutter assembly.
5	Microswitches MS5, MS6 and MS7 are used to detect the size of paper cassette which has been inserted. If the paper cassette is warped or deformed in any way, the microswitches may be activated incorrectly and cause registration problems.
6	Self explanatory.
7	The number of turns taken by the pickup rollers, feed rollers, main motor, etc., is determined by the length of the paper cassette. The length of the cassette is sensed by MS5, MS6, and MS7. If any of these microswitches do not work, the rollers will turn more or less than they should, resulting in improper registration.
8	The DC controller PCB determines when in the print process the pickup rollers actuate, checks the pickup sensor, and controls nearly every other aspect of the paper's progress through the print process. Replacing the DC controller PCB with a known good one eliminates a number of potential problems.

Q.15 - POOR FUSING - IMAGE SMEARS EASILY (Procedure)

Step	Check	Result	Action
1	Is approved paper being used?	NO	Replace paper with approved paper (16-21 lb.standard photocopier paper).
2	Are the upper and lower fuser rollers worn?	YES	Replace as necessary.
3	Refer to the Nip Width procedure at the end of this section. Use the procedure to determine if the nip width on the fuser assembly is correct. Is the nip width correct?	NO	Replace the fuser assembly.

Q.16 - DISTORTION (Procedure)

Step	Check	Result	Action
1	Perform a test print by jumpering pins 1 and 2 on J205 of the DC controller PCB. Does LED 501 on the DC power supply/motor drive PCB stay on steadily with out flashing or going out during the print process?	NO	Perform each of the following actions, generating a test print after each step to see if the problem is solved: 1) Check all parts of the drive mechanism. 2) Replace the DC power supply/motor drive PCB. 3) Reinstall the original DC power supply/motor drive PCB in the printer and replace the main motor.

Q.17 - WAVINESS (Procedure)

Step	Check	Result	Action
1	Perform a test print by jumpering pins 1 and 2 on J205 of the DC controller PCB. Does LED 401 on the scanner driver PCB light continuously?	NO	Replace the scanner unit. If the problem is not solved, reinstall the original scanner unit and replace the DC controller PCB.

Q.15 - POOR FIXING - IMAGE SMEARS EASILY (Explanation)

Step	Explanation
1	It is very important that the upper and lower pressure rollers in the fuser exert the proper amount of pressure on the paper. Paper other than that approved for the Apple LaserWriter may not be of the correct thickness. The wrong thickness of paper will cause an improper amount of pressure from the pressure rollers.
2	Worn rollers can cause too little pressure on the paper as it rolls through the fuser. See the explanation for step 1.
3	If the pressure rollers in the fuser assembly are too far apart or poorly adjusted, there will not be enough heat or pressure to fuse the toner into the paper. The nip width procedure checks for proper and uniform pressure between the upper and lower fuser rollers. See the explanation for step 1.

Q.16 - DISTORTION (Explanation)

Step	Explanation
1	The laser scanning action and the main motor revolutions must be in exact sync or the image will be vertically compacted or lengthened. If the main motor is turning too fast, the image will be lengthened. If it is turning too slowly, the image will be compacted. LED 501 on the DC power supply/motor drive PCB lights when the main motor is turning at the proper speed.

Q.17 - WAVINESS (Explanation)

Step	Explanation
1	The hexagonal mirror and the laser ON/OFF action must be in exact sync or the image may be wavy and distorted. During the service test print, the laser ON/OFF signal is controlled by the DC controller PCB, and the speed of the hexagonal mirror by servo loop circuitry on the laser/scanner unit. LED 401 lights when the hexagonal mirror is rotating at the correct speed.

Q.18 - UNEVEN PRINT DENSITY (Procedure)

Step	Check	Result	Action
1	Rock the toner cartridge to distribute the toner; then try several test prints. Does the problem go away?	YES	Finished.
2	Is the transfer guide bent?	YES	Replace the transfer guide.

Q.19 - GRAY IMAGE - NO PART OF THE IMAGE IS RECOGNIZABLE (Procedure)

Step	Check	Result	Action
1	Does the problem go away when you replace the toner cartridge?	YES	Finished.
2	Clean the transfer corona. Does the problem go away?	YES	Finished.
		NO	Go to table C (High Voltage Power Supply Does Not Provide Power).

Q.20 - SMEARING 80-90 mm FROM LEFT EDGE OF PAGE (Procedure)

Step	Check	Result	Action
1	Feeder guide warped?	YES	Tighten the feeder guide screws fully and then loosen each screw 1/8-1/4 turn. If warpage remains, replace feeder guide, carefully following directions for tightening and loosening screws.
2	Locate the thermoprotector in the fuser assembly. Is the thermoprotector properly seated?	NO	Clean the thermoprotector with MEK (methyl ethyl ketone) and seat it properly (see Section **2, Take-Apart**), or install a new thermoprotector.

Q.18 - UNEVEN PRINT DENSITY (Explanation)

Step	Explanation
1	If the toner becomes clumped in the toner bin, it will not be able to move freely around the developing cylinder. The developing cylinder puts the charge onto the toner so that it can be attracted to the surface of the photosensitive drum. Clumping of the toner can cause insufficient toner to be attracted to the surface of the photosensitive drum, affecting the density of the print. When the toner cartridge is rocked, the toner in the toner bin is shaken up, restoring its free access to the developing cylinder.
2	If the transfer guide is bent, it can affect the movement of the paper as it is brought into contact with the toner image on the drum. If there is slippage during this contact, uneven print density can occur. A bent transfer guide can cause such slippage. A bent transfer guide can also cause an uneven distance between the paper and the transfer corona, causing a varying charge and uneven print density.

Q.19 - GRAY IMAGE - NO PART OF THE PRINT IMAGE IS RECOGNIZABLE (Explanation)

Step	Explanation
1	This problem is usually caused by a faulty primary corona, developing cylinder, or transfer corona. Since the toner cartridge contains the first two possibilities, replacing it helps narrow down the problem.
2	The high voltage power supply provides the electrical charges required for the operation of the primary corona, developing cylinder, and transfer corona. If the problem was not found in this table, it may be found in table C, which is concerned with troubleshooting the high voltage power supply.

Q.20 - SMEARING 80-90 mm FROM LEFT EDGE OF PAGE (Explanation)

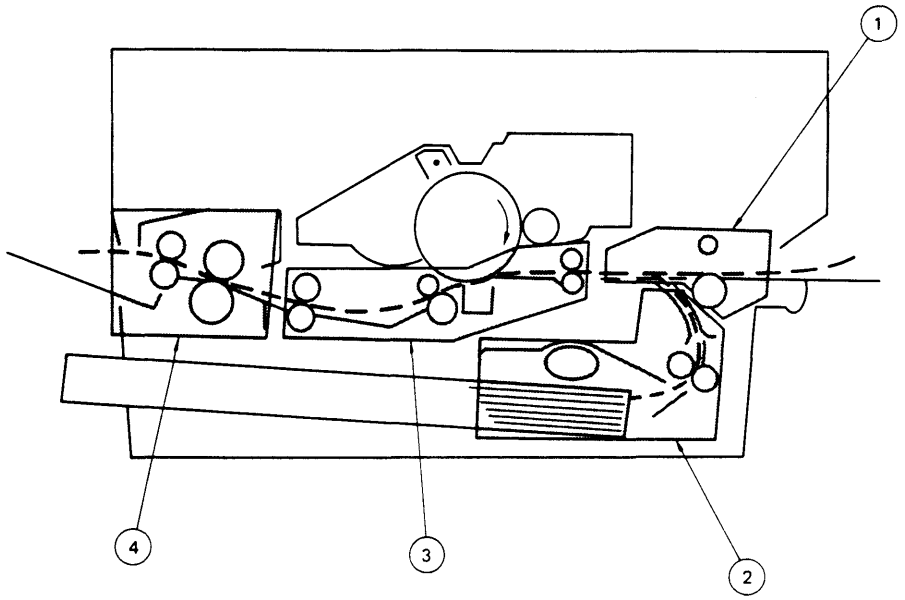
Step	Explanation
1	Feeder guide warpage seems to be the most common cause of this problem. If this is the cause of the problem, the smearing may also occur at other positions. See also table Q10.
2	If the thermoprotector is not correctly seated, toner will build up on its surface and cause smearing on prints. The location of the smear in this case is the same as the location of the thermoprotector.

R - PAPER JAMS (Procedure)

Paper in the printer passes through four main areas (see the diagram below):

(1) manual feed area
(2) cassette feed area
(3) separation/feed area and
(4) fuser/delivery area.

Frequent jams in any area indicates that the area should be checked and repaired or cleaned and lubricated.



R - PAPER JAM TABLE (Procedure)

NOTE: If a step doesn't solve the problem, turn off the printer, remove the paper jam, and go on to the next step.

Step	Check	Result	Action
1	Turn off the printer and replace the DC controller PCB with a known good one. Then turn on the printer and retry the test print.		
	Does the problem recur?	NO	Finished. The DC controller PCB was the problem.
2	Jumper pins 1 and 2 of J205 to initiate a test print. After a jam occurs, open the printer to observe the location of the paper. Refer to the diagram on the opposite page for location reference.		
	Did the paper make it up from the cassette feed area to the printer's upper body?	NO	Go to step 3 of this procedure.
	Are there any sheets of paper stuck together in the paper path?	YES	Go to table R.5.
	Is the paper jam in the fuser/delivery area?	YES	Go to table R.4.
	Is the paper jam in the separation/ feeder area?	YES	Go to table R.3.
3	Lower the door beneath the manual feed tray to shed light into the paper cassette area. Then look into the cassette paper pickup area as you initiate a test print. **NOTE:** It is normal for the Paper Jam LED to come on for this step.		
	Do the pickup rollers rotate completely at the beginning of the test print?	NO	Go to table F.
	Did a jam occur down in the cassette paper guide/feed roller area even though the pickup rollers rotated?	YES	Go to table R.2.

R.1 - MANUAL FEED UNIT (Procedure)

Step	Check	Result	Action
1	Is approved print paper being used?	NO	Use approved paper (16-21 lb. standard photocopier paper).
2	Is the paper wrinkled or curled?	YES	Replace the paper and make sure that the paper is stored correctly.
3	Does the paper detection arm on the registration shutter move smoothly?	NO	Adjust the arm motion until it is smooth.
4	Are the paper guides deformed?	YES	Replace deformed guides as necessary.
5	Open the upper half of the printer and switch the power on. Actuate the door switch with a screwdriver. Short together J210 pins 2 and 5 on the DC controller PCB. Does Registration Shutter Solenoid SL1 activate?	NO	Check the wiring between J210 on the DC controller PCB and the registration shutter solenoid SL1 for continuity. Also check the connectors. If no problems are found, replace the registration shutter assembly.
		YES	Go to Table E (Cannot Feed Paper Manually).

R.2 - CASSETTE PICKUP ASSEMBLY (Procedure)

Step	Check	Result	Action
1	Is the paper cassette loaded with more than 10mm of paper?	YES	Remove the excess paper.
2	Is approved print paper being used?	NO	Use approved paper (16-21 lb. standard photocopier paper).
3	Is the paper wrinkled or curled?	YES	Replace the paper and make sure that the paper is stored correctly.
4	Is the paper cassette installed properly in the printer?	NO	Install the paper cassette properly.
5	Is the cassette spring lifting force OK?	NO	Check the movement of the cassette plate. If OK, replace the paper cassette.
6	Is the right or left cassette hold-down tab deformed?	YES	Repair or replace the paper cassette.
7	Does the door beneath the manual feed tray (lower paper feed guide) close firmly?	NO	Replace the paper cassette.
8	Open the door beneath the manual feed tray (lower paper feed guide) and examine the feed rollers. Are any of the feed rollers dirty?	YES	Clean with a damp cloth, then with a dry cloth. *Hint:* you can turn the rollers by rotating a gear in the lower half of the printer.
9	Are any pickup rollers dirty, deformed, or worn?	YES	Clean the rollers with alcohol. If rollers are worn, replace as necessary.

R.3 - SEPARATION/FEEDER UNIT (Procedure)

Step	Check	Result	Action
1	Is the separation belt damaged or twisted?	YES	Replace the separation belt.
2	Is the separation belt inside out?	YES	Reinstall correctly. The notched side of the belt should be facing away from the I/O connector plate.
3	Is any roller dirty or worn?	YES	Clean dirty rollers as necessary. Replace separation/feeder unit if rollers are badly worn. *Hint:* You can turn the rollers by rotating a gear in the lower half of the printer.
4	Do pinch rollers press firmly against separation and feeder rollers?	NO	Replace the separation/feeder unit.
5	Are the feeder rollers dirty or worn?	YES	Clean with alcohol if dirty. If worn, replace separation/feeder unit.
6	Are the transfer guides deformed in any way?	YES	Replace the transfer guides.
7	Is the guide wire on the transfer corona assembly broken?	YES	Restring the guide wire.
8	Are the two strips of mylar tape located on the transfer corona wire termination covers loose or missing?	YES	Replace the corona assembly wire termination covers as necessary.
9	Replace the registration shutter assembly.		

R.4 - FUSER/DELIVERY AREA (Procedure)

Step	Check	Result	Action
1	Is the fuser roller cleaner felt dirty?	YES	Replace the fuser roller cleaner felt.
2	Are the entrance guides dirty?	YES	Clean the guides.
3	Are the separation claws worn?	YES	Replace claws as necessary.
4	Are the lower delivery guides dirty?	YES	Clean the guides.
5	Are the upper delivery guides dirty?	YES	Clean the guides.
6	Does the paper delivery sensor arm PS3 move freely?	NO	Repair to restore free motion.

R.5 - INCOMPLETE FEED-SHEETS STUCK TOGETHER (Procedure)

Step	Check	Result	Action
1	Is approved print paper being used?	NO	Use approved paper (16-21 lb. standard photocopier paper).
2	Is the cassette spring lifting force as specified?	NO	Check the movement of the cassette plate. If OK, replace the cassette springs.
3	Are the cassette side plates worn?	YES	Replace paper cassette.

S - LASERWRITER I/O PCB POWER PROBLEMS (Procedure)

Step	Check	Result	Action
1	Remove the printer from its pedestal and visually inspect the cabling from the power interlock assembly to transformer PT2 to the I/F regulator to P3 of the LaserWriter I/O PCB. Are there any cabling problems?	YES	Repair as necessary.
2	Remove the I/F regulator assembly. Check the fuse on the I/F regulator assembly. Is the fuse blown?	NO	Replace the I/F regulator with a known good one, reinstall the printer into its pedestal, then recheck power at P3. If there is still no power at the LaserWriter I/O PCB, replace transformer PT2. If the problem still remains, replace noise filter NF2.
		YES	Replace the fuse, reinstall the printer into its pedestal, and recheck for power at P3. Then if there is still no power at the Laser Writer I/O PCB, replace the I/F regulator with a known good one. If there is still no power at the LaserWriter I/O PCB, replace transformer PT2. If the problem still remains replace noise filter NF2.

S - LASERWRITER I/O PCB POWER PROBLEMS (Explanation)

NOTE: Refer to the LaserWriter Wiring Diagram in the back pocket of this manual for the following explanation.

Step	Explanation
1	Power for the LaserWriter I/O PCB originates at TB 101 (terminal block) in the power interlock assembly. Both terminal blocks (101 and 102) are located just above NF1 (the noise filter in the power interlock assembly). TB 101 is towards the inner part of the printer and TB 102 is towards the on/off switch. From TB 101, power for the LaserWriter I/O PCB goes down into the pedestal to noise filter NF2 and then to transformer PT2. From PT2, the power goes to the I/F regulator. From the I/F regulator the power goes up to P3, which connects power to J3 of the LaserWriter I/O PCB.
2	See the explanation for step 1.

T - THERE IS NO POWER —220/240 VOLT (Procedure)

NOTE: Refer to the 220/240 Volt LaserWriter Wiring Diagram in the back pocket of this manual when using this procedure.

WARNING: There are dangerous voltages present at many of the locations called out in the following procedure. Be sure to follow all appropriate electrical safety precautions when performing this procedure.

(If air is blowing through the louver when the power is switched on, start at step 7.)

Step	Check	Result	Action
1	Is the printer plugged in?	NO	Plug in the printer.
2	If the printer firmly closed?	NO	Close the printer.
3	Is the required 220/240 voltage supplied at the AC outlet?	NO	Nothing is wrong with the printer. Take steps to provide an adequate power source.
4	Is circuit breaker CB1 open?	YES	Reset the circuit breaker. If the breaker trips as soon as it is reset, there is an internal short that will have to be located.
		NO	Turn the power off. Unplug and open the printer. Make sure that circuit breaker CB1 is reset and has continuity. If the circuit breaker has no continuity, replace CB1.

CAUTION: For the following step be sure to set the multimeter to the correct voltage range, or it may be destroyed.

5	Open the printer. Disconnect connector J105 on the AC driver PCB. Connect the multimeter across the door interlock switches MS1 and MS2. (MS1 and MS2 are located directly below the metal door interlock plate. The terminals facing the front of the printer are the input side of the switches.) Plug in the printer and turn the power on. Is AC voltage supplied across MS1 and MS2?	NO	Check the main switch SW1, noise filter NF1, and the power cord and plug. Replace as necessary.

T - THERE IS NO POWER —220/240 VOLT (Explanation)

Step	Explanation
1	Self-explanatory.
2	If the printer is not closed, interlocks MS1 and MS2 in the power interlock assembly will block the AC line voltage almost at its entrance into the printer.
3	Try plugging a lamp into the outlet to see if the line current is on. If you suspect that the line voltage may not be at the proper level, check it with a voltmeter.
4	The circuit breaker will trip if it detects too much line current being drawn by the printer. This protects the printer's sensitive electronics. If the circuit breaker trips, it is possible that a part of the printer is shorting the current to ground. The best way to troubleshoot this kind of problem is to disconnect all channels into the printer that the line current can possibly take, and reconnect them one at a time. When you reconnect the channel leading to the module that is shorting the line current, the circuit breaker will trip. The next step is to disconnect all the modules along that channel, and reconnect them one at a time. When the faulty module is connected, the circuit breaker will trip again. If CB1 has no continuity after being reset, replace CB1.
5	Step 4 checked for a short circuit. Getting to step 5 indicates that a short was not the problem. Step 5 checks to see if line current is getting at least as far as noise filter NF1. If it isn't, the problem could be with any of the components through which the line current must flow before it can get to NF1. Disconnecting J105 prevents a possible problem beyond NF1 from affecting this check.

T - THERE IS NO POWER —220/240 VOLT (Procedure)

NOTE: When locating pins to check signals, do not count blank pin positions. (See "Pin Numbering on the LaserWriter" on page 4.5 of this section.)

Step	Check	Result	Action
6	Switch off the power, and reconnect J105 on the AC driver PCB. Carefully connect the multimeter across J105-1 and J105-2. (Be extremely careful when connecting the meter to the pins because there could be 220-240 VAC between the two pins.) Turn the power on and depress (activate) the door switch with a screwdriver. Is AC voltage supplied between J105-1 and J105-2?	NO	Replace MS1 and/or MS2 (the door interlock switches in the power interlock assembly).
7	Connect the multimeter across J103-1 and J108-2. Is AC voltage supplied when the door switch is activated with a screwdriver?	NO	Replace the AC driver PCB.
8	Check the LaserWriter voltage selection switch. If the voltage selection switch is set to 220 volts, connect a multimeter across J103-1 and J103-2. If the LaserWriter voltage selection switch is set to 240 volts, connect a multimeter across J103-1 and J103-3. Is AC voltage supplied when the door switch is activated with a screwdriver?	NO	Replace the power interlock assembly.
9	Are the DC voltages listed below supplied between the J502 pins on the DC power supply/motor drive PCB? 1) J502-4 and J502-8(GND) 24-35VDC 2) J502-9 and J502-8(GND) 24VDC 3) J502-7 and J502-6(GND) 5VDC 4) J502-5 and J502-6(GND) -5VDC 5) J502-2 and J502-3(GND) 20-30VDC	YES	Go to step 22.
10	Switch the printer off and disconnect P501 (the plug connected to J501 on the DC power supply/motor drive PCB). Turn on the printer. Are the AC voltages listed below supplied between the pins on P501? (CAUTION: Set the multimeter to the correct voltage range or it will be destroyed.) 1) P501-1 and P501-2 29-37VAC 2) P501-3 and P501-4 10-14VAC 3) P501-4 and P501-5 10-14VAC 4) P501-6 and P501-7 18-24VAC	NO	Check the wiring between J501 and transformer PT1, and also between the transformer and J103. If the wiring is OK, then transformer PT1 is faulty. Remove the printer from the pedestal and replace the transformer.

T - THERE IS NO POWER —220/240 VOLT (Explanation)

Step	Explanation
6	If there is no short and there is line current coming into MS1 and MS2 (the door switch interlocks), then MS1 and MS2, when activated, should allow current to flow to J105 pins 1 and 2.
7	Line current enters the AC controller PCB (the lower board of the AC driver PCB assembly) at J105 pins 1 and 2. The line current output from the AC driver PCB is through J103 pin 1 and J108 pin 2. If there is line voltage at J105 pins 1 and 2, but not at J103 pin 1 and J108 pin 2, then there could be a broken trace on the AC driver PCB.
8	The line current output from the AC driver PCB passes through the voltage selector switch on the way to transformer PT1. If there is no line voltage at J103 pins 1 and 2, or J103 pins 1 and 3, the voltage selector switch may be bad. Replace the power interlock assembly.
9	Step 8 confirmed that line current was available at either J103 pins 1 and 2, or J103 pins 1 and 3 leaving the AC controller PCB. From there, the current goes through transformer PT1, where it is stepped down to three AC voltages: 12 volts, 33 volts, and 21 volts. These three AC voltages are sent to the DC power supply, where they are rectified and regulated into the various DC voltages needed by different modules in the printer. These DC voltages are sent via J502 over to the DC controller PCB, which distributes them to their proper destinations. Step 9 ensures that the DC voltages are being produced by the DC power supply/motor drive PCB. **Remember not to count the blank pin positions on J502 or J208.**
10	The line current was good at the AC controller PCB, so if the correct DC voltages are not being produced by the DC power supply, the problem can be with either the DC power supply/motor drive PCB, or the transformer PT1 in the base of the printer. This step checks to see if power is coming from the transformer. If it isn't, the problem is probably with a pinched/broken cable or the transformer PT1.

T - THERE IS NO POWER —220/240 VOLT (Procedure)

Step	Check	Result	Action
11	Switch the printer off. Disconnect J502 on the DC power supply/motor drive PCB and reconnect P501. Turn the printer on. Are the DC voltages shown below supplied at J502 on the DC power supply/motor drive PCB? 1) J502-4 and J502-8(GND) 24-35VDC 2) J502-9 and J502-8(GND) 24VDC 3) J502-7 and J502-6(GND) 5VDC 4) J502-5 and J502-6(GND) -5VDC 5) J502-2 and J502-3(GND) 20-30VDC	NO	Replace the DC power supply/motor drive PCB.

CAUTION: Disconnect all power from the printer for steps 12 through 20. These steps are resistance checks. If power is applied to the printer during their performance, it could damage the ohmmeter.

12	TURN THE PRINTER OFF. Make sure that J502 is connected to the DC power supply/motor drive PCB. Disconnect all connectors on the DC Controller PCB except J208. Are any of the J502 pins listed below shorted to ground? (Measure resistance on connector pins on the power supply/motor drive board.) 1) J502-4 (+30v) and J502-8 (GND) 2) J502-9 (+24v) and J502-8 (GND) 3) J502-7 (+5v) and J502-6 (GND) 4) J502-5 (-5v) and J502-6 (GND) 5) J502-2 (+24v) and J502-3 (GND)	YES	Check the wiring between J502 and J208 for a short. If the wiring is OK, replace the DC controller PCB.
13	Reconnect all connectors on the DC Controller PCB. Are any of the J502 pins on the DC power supply/motor drive PCB shorted now? 1) J502-4 (+30v) and J502-8 (GND) 2) J502-9 (+24v) and J502-8 (GND) 3) J502-7 (+5v) and J502-6 (GND) 4) J502-5 (-5v) and J502-6 (GND) 5) J502-2 (+24v) and J502-3 (GND)	NO	Go to step 22.
14	Were J502-4 (+30v) and J502-8 shorted?	NO	Go to next step.
		YES	Check the wiring between J207 and TB5 on the preconditioning assembly for a short. If the wiring is good, replace the preconditioning exposure assembly.

T - THERE IS NO POWER —220/240 VOLT (Explanation)

Step	Explanation
11	This step first eliminates the DC controller PCB (and its connected modules) as a possibility by disconnecting it from the DC power supply. The step then checks again for the DC voltages. Step 10 proved whether or not the transformer was supplying the AC voltages needed by the DC power supply to produce the DC voltages. If the DC voltages are still not being produced when the DC controller is disconnected, then the DC power supply is not functioning.
12	Step 11 checked that the DC power supply was producing the necessary DC voltages, and so eliminated that module as a possibility. Step 12 checks to see whether any of the DC voltages are being shorted to ground on the DC controller PCB alone (the rest of the modules are disconnected from the DC controller and so are prevented from affecting this check). **NOTE:** Steps 12 through 21 are all resistance checks and require that no power be applied to the printer during their performance.
13	Step 12 checked that the DC controller PCB was not shorting any DC power line to ground. Step 13 checks to see if any of the modules connected to the DC controller PCB are causing the problem.
14	This step checks to see if the +30-volt channel is being shorted. Since the only module using +30 volts is the preconditioning assembly, then that would be a likely source of such a problem.

T - THERE IS NO POWER—220/240 VOLT (Procedure)

Step	Check	Result	Action
15	Were J502-9 and J502-8 shorted?	NO	Go to step 17.
16	Disconnect all +24v connectors (J215, J212, J210, J216, J213, J211, J208, J204, and J206). Reconnect them in the sequence shown below. After each connector is replaced, check for shorts between the pins shown below. Are any shorts found?	YES	Replace the load attached to the shorted connector.
	J215-3 and J215-1 (GND)		Paper sensor PS2
	J215-5 and J215-1 (GND)		Cassette pickup roller clutch solenoid
	J210-1 and J210-5 (GND)		Registration shutter solenoid
	J210-3 and J210-5 (GND)		Manual pickup roller solenoid
	J210-7 and J210-5 (GND)		Pickup sensor PS1
	J216-3 and J216-1 (GND)		Delivery sensor
	J211-6 and J211-1 (GND)		High voltage power supply (or VR2 print density adjustment variable resistor)
	J206-1 and J206-2 (GND)		Scanner unit
	J204-1 and J208-3 (GND)		Laser unit
17	Reconnect J212. Are J212-2 and J212-3 shorted?	YES	Disconnect J104 on the fuser safety PCB (upper board of the AC Driver PCB). Check the wiring from pins 2 and 3 of J104 to pins 2 and 3 of J212 on the DC controller PCB for a short. If the wiring is good, replace the AC driver PCB.
18	Are J502-7 and J502-6 shorted?	NO	Go to step 20.
19	Disconnect J204 on the DC controller PCB. Are J204-4 and J204-5 shorted?	YES	Check the wiring between J204 and TB3 and TB4 on the laser unit for a short. If the wiring is good, replace the laser unit.
20	Are J502-2 and J502-3 shorted?	NO	Go to step 22.
21	Disconnect J204 on the DC controller PCB. Are either J204-1 and J208-8, or J204-1 and J204-4 of the connector on the cable shorted?	YES	Check the wiring between J204 and TB3 and TB4 for a short. If the wiring is good, replace the laser unit.

T - THERE IS NO POWER —220/240 VOLT (Explanation)

Step	Explanation
15	This step checks to see if the +24-volt (R) channel is being shorted.
16	Getting to step 16 indicates a short in the +24-volt (R) power channel. If you look at the LaserWriter wiring diagram, you can see that there are many modules that use +24 volts (R).
17	The fuser safety PCB (the upper board of the AC driver PCB assembly) is another module that uses +24 volts. This step checks to see if it is causing a short.
18	This step checks to see if the +5-volt channel is being shorted.
19	Getting to step 19 indicates a short in the +5-volt power channel.
20	This step checks to see if the +24-volt (UA) channel is being shorted.
21	Getting to step 21 indicates a short in the +24-volt (UA) power channel.

T - THERE IS NO POWER —220/240 VOLT (Procedure)

Step	Check	Result	Action
22	If all of the connectors on the DC power supply/motor drive PCB and DC controller PCB are not plugged in, plug them in. Check that the circuit breaker has been reset and the printer is closed. Switch the printer on. Are the DC voltages shown in the table below supplied between the pins on the DC controller PCB? 1) J208-4 and J208-8(GND) 24-35VDC 2) J208-9 and J208-8(GND) 24VDC 3) J208-7 and J208-6(GND) 5VDC 4) J208-5 and J208-6(GND) -5VDC 5) J208-2 and J208-8(GND) 20-30VDC	NO	Check wiring between J502 on DC power supply/ motor drive PCB and J208 on the DC controller PCB for poor contact or wiring damage.
		YES	Replace the DC controller PCB.

T - THERE IS NO POWER —220/240 VOLT (Explanation)

Step	Explanation
22	The power distribution system appears to be OK, but this step reconnects everything and then applies power for one last check under load. If no problem is found, it is probably an electronic failure on the DC controller PCB.

❑ NIP WIDTH MEASUREMENT

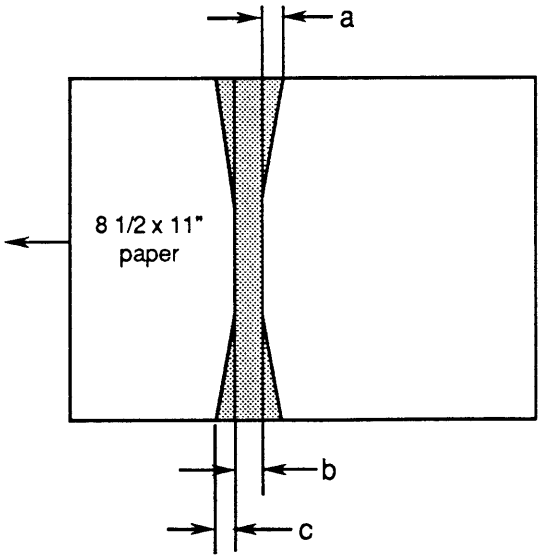
The nip width measurement should be performed when irregular fusing is a problem. The measurement shows whether the fuser assembly rollers are exerting uniform pressure on the prints. If they are not, the lower roller should be replaced. If that fails to fix the problem, the pressure springs should be replaced.

Note: Turn the power on and wait 15 minutes before taking a measurement, so that the rollers are hot.

To Measure

1. Start a service test print by momentarily shorting J205 pins 1 and 2 on the DC controller PCB.
2. Switch off the power when the leading edge of the print appears at the paper delivery port.
3. Pull the leading edge forward slightly and wait 10 seconds; then pull the print completely from the fuser assembly.

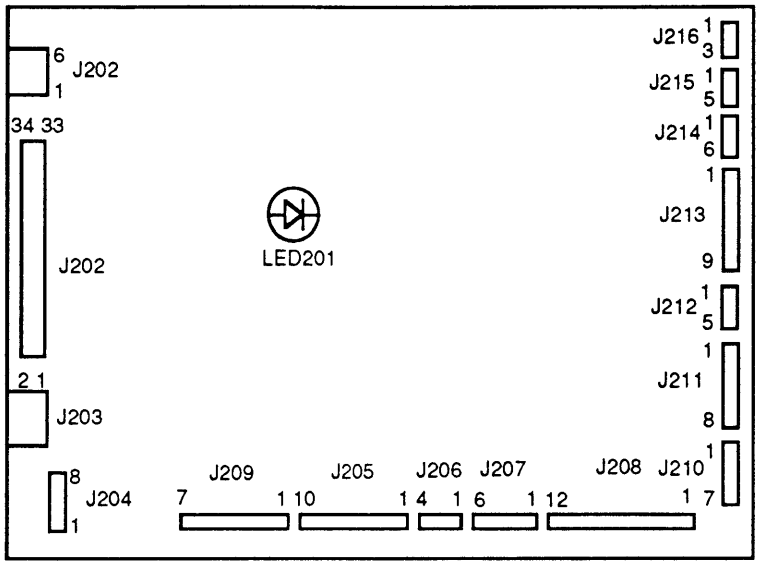
   The result of this procedure is a glossy strip on the paper where the rollers rested. The strip should be 2 to 3 mm wide at its center (see figure below, measurement b) and should spread out no more than .5 mm at either edge (see figure below, measurements a and c).



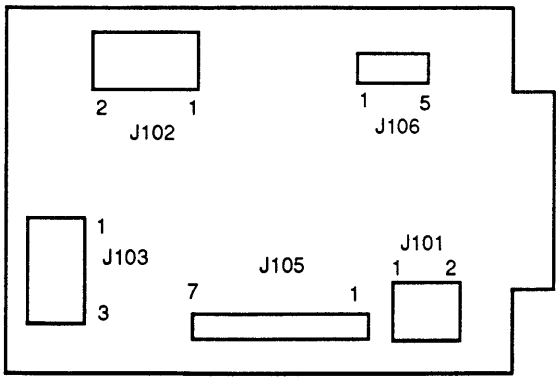
Width	Measure when upper and lower rollers are hot.
b	2-3 mm
a-b	Under 0.5 mm
b-c	Under 0.5 mm

4. Measure the width of the strip section where the rollers were pressing on the paper (see figure on preceding page). If the measurement meets specifications, the rollers are acceptable. If the measurement fails, replace the lower roller and measure the nip width again. If the nip width is still outside specification, replace the pressure springs at each end of the fuser assembly.

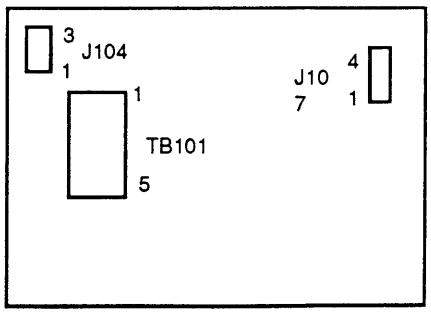
❑ CONNECTOR LOCATIONS: DC CONTROLLER PCB AND AC DRIVER PCB



CONNECTOR LOCATIONS ON THE DC CONTROLLER PCB



LOWER BOARD
(AC Controller PCB)



UPPERBOARD
(Fuser Heater Safety PCB)

CONNECTOR LOCATIONS ON THE AC DRIVER PCB

Apple Technical Procedures

LaserWriter

Section 5 – Preventive Maintenance

❑ CONTENTS

Note: Underlined steps refer to detailed removal and replacement procedures in Section 2, Take-Apart.

❑ INTRODUCTION

This section contains five parts:

1. **Maintenance Setup and Schedule:** Instructions on preparing a customer's site for LaserWriter service and preventive maintenance, plus a schedule of maintenance procedures.

2. **Standard Maintenance Procedure:** The procedure to be performed at the end of every LaserWriter service call.

3. **100,000-Copy Service (Refurbishment):** Instructions for procedures to be performed after the printer has produced 100,000 prints.

4. **End-User Maintenance Procedures:** Procedures that end users are expected to perform, but technicians must also be aware of. If you suspect that the user is unfamiliar with these procedures, teach them before you finish the service call.

5. **Job Aids:** The Preventive Maintenance Checklist and the Repair Log Label.

   The Preventive Maintenance Checklist is a reminder for the technician who is already familiar with the procedure. Take a copy of the Checklist on every service call. (If you're not familiar with the procedures, take this manual with you.)

   The Repair Log Label helps you keep a service maintenance record for each printer. This record can be very important, especially when a problem recurs. The Repair Log Label should be afffixed to the bottom panel of every LaserWriter/LaserWriter Plus, and should be updated after performing any repair or preventive maintenance on the printer.

   When troubleshooting a printer, check the Repair Log Label to see if a similar problem has occurred in the past. This may help you diagnose the cause of the problem.

❑ MAINTENANCE SETUP AND SCHEDULE

Materials Required

4' x 4' dropcloth (for toner spillage)
Magnetized stubby #2 Phillips screwdriver
Tweezers
Soft lint-free cloth (for cleaning)
Cotton-tipped swabs
Isopropyl alcohol
Portable electrostatic discharge (ESD) prevention kit
Ground/polarity tester

Setting Up for Preventive Maintenance

Before performing any on-site LaserWriter maintenance, set up your work area to be static-safe and neat, as follows.

1. The customer's site may or may not be adequately wired. Before attempting to set up your ESD-prevention equipment, check the outlet with the ground/polarity tester to make sure that it is correctly grounded. Then, if the outlet is correctly grounded, ground your workpad to the outlet ground line. If the outlet is not correctly grounded, move your equipment to a properly grounded outlet. Read the ESD-prevention section of the *Apple Service Technical Procedures* (under the tab *You Oughta Know*) before continuing.

2. Set the LaserWriter on or next to your grounded workpad.

3. Put on your wriststrap and connect it to your workpad. (While performing these procedures, place any removed electronic parts on the workpad.)

4. To protect the customer's floor from grease and spilled toner, spread the drop cloth under your work area. Always hold the toner cartridge over the drop cloth to catch any toner that might spill. Place all tools and removed *nonelectronic* parts on the drop cloth to keep them and the customer's area clean.

Check the Print Count

Check the print count to determine what items to service (see "Recommended Maintenance Schedule," next page). The print count can be checked in two ways:

1. When the printer is powered on, it produces a test print. On the bottom of the test print is the number of prints that have occurred since the LaserWriter I/O board was installed. **If the I/O Board has never been repaired or upgraded**, that number should be accurate.

2. **If the I/O board has been repaired or upgraded**, you will have to judge the number of prints by reading the print counter, a fuse-like component in the preconditioning exposure assembly. The print counter shows how many prints have been made on the printer since the counter was installed.

   To read the print counter,

   a) Remove the top cover, the LaserWriter I/O board, and the DC controller board. Place them on your grounded workpad. For extra protection, leave the LaserWriter I/O board in its metal cage after you remove it; place the metal cage on the grounded workpad.

   b) Locate the preconditioning exposure assembly in the body of the printer (just below where the DC controller board sits).

   c) Locate the print counter in the middle of the preconditioning exposure assembly; the counter looks like a small thermometer.

   d) Determine the print count. Each mark on the counter represents approximately 10,000 prints.

3. Consult with the customer and review the Repair Log Label to see if your estimate of the print count is accurate. Then, follow the instructions in "Recommended Maintenance Schedule" on the next page.

Recommended Maintenance Schedule

According to the print count, inspect, clean, and if necessary, replace the items listed below. Detailed instructions are given under "Standard Maintenance Procedure," later in this section.

- **0 to 50,000 copies**—Perform the Standard Maintenance Procedure (next section).

- **50,000 to 100,000 copies**—

  a) Replace the separation belt.

  b) Perform the Standard Maintenance Procedure (next section).

- **100,000-150,000 copies**—Perform the "100,000-Copy Service" (see instructions later in this section).

❑ STANDARD MAINTENANCE PROCEDURE

Introduction: Toner Spills

The best method for cleaning toner spilled on any surface is vacuuming. Carry a small vacuum cleaner in your car for on-site use. If toner spills on carpets or other cloth items, use a vacuum—**never** use water or alcohol.

For minor spills and accumulations on plastic or metal surfaces, use a soft cotton cloth, slightly dampened with cool water. **Do not use *warm* water**: the heat might melt the toner. Discard the cloth when dirty.

Toner Cartridge

The toner cartridge should be routinely inspected and serviced as specified below. If there are specific print quality problems associated with the toner cartridge, and if the simple maintenance procedures below do not solve them, the cartridge should be replaced.

Light-Blocking Shutters

Inspect the light-blocking shutters (Figure 1, #1 and #2). Open and close them a few times in a low-light area to make sure they are not jammed or broken.

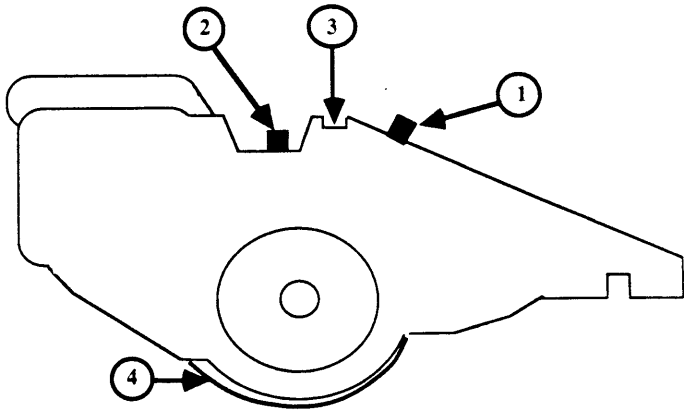


FIGURE 1

Primary Corona Wire

To clean the primary corona wire (Figure 1, #3):

1. Open the printer and pull out the toner cartridge. Locate the wire cleaner inside the lower half of the printer. (Figure 2).

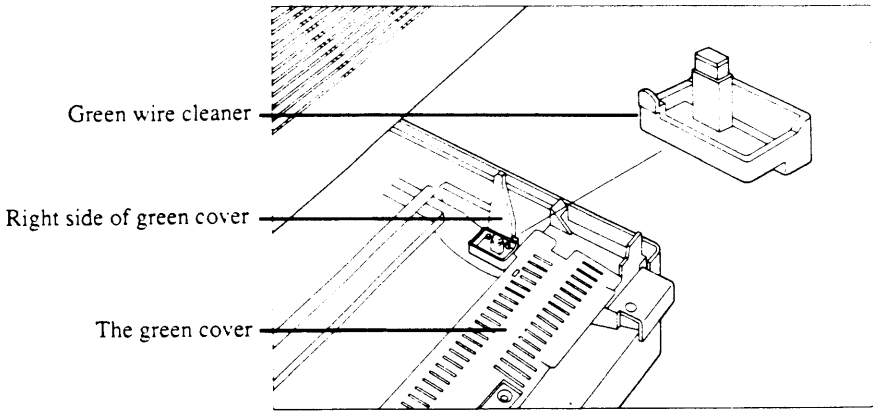


FIGURE 2

2. Insert the wire cleaner into the long slot of the toner cartridge (between the two shutters), and move it back and forth in the slot (Figure 1, #3).

Protective Shield

The photosensitive drum is protected by a shield (Figure 1, #4) that closes when the cartridge is removed from the printer. Toner buildup on the shield may cause smudging on prints.

1. Turn over the toner cartridge. Open and close the protective shield a few times in a low-light area to make sure the shield is not jammed or broken.

2. Clean the shield with a damp cloth. (But be careful not to touch the surface of the photosensitive drum!)

3. Check to see if foam on the shutter edge is peeling. If it is, glue the foam back on with a glue for porous materials (white glue, for example).

Photosensitive Drum

Do not clean the surface of the photosensitive drum unless it is absolutely necessary. Inspect it as follows, but clean it only if you find clearly excessive toner buildup or obvious fingerprints, etc., on the drum.

If you must clean the drum:

1. Hold the protective shield open in a low-light area, and examine the surface of the photosensitive drum while you turn the drum with the large-toothed gear on the left of the cartridge. Look for fingerprints, toner buildup, etc.

   Note: The following step will cause toner spillage from the cartridge. Perform the cleaning procedure only if absolutely necessary.

2. If you find an area that needs to be cleaned, collect a small amount of toner on the drop cloth by holding the toner cartridge on end and turning the drum. Then rub a soft cloth into the toner powder until the cloth is saturated. Hold the shield open and clean the soiled area using long strokes with medium-to-light pressure.

Fuser Assembly

The fuser assembly (the green, felt-covered mechanism on the bottom half of the printer) is used to melt the plastic toner powder onto the paper. For this reason the fuser assembly gets very hot.

CAUTION: *Before servicing the fuser assembly, make sure that the LaserWriter has been off at least five minutes to allow the fuser assembly to cool. Once the service is completed, allow a few minutes for the alcohol to dry before turning on the LaserWriter.*

Fuser Roller Cleaner Felt

The fuser roller cleaner felt (Figure 3) is impregnated with a special fluid to collect contaminants from the upper fuser roller.

To inspect the cleaner felt, raise the top of the fuser assembly, and slide the felt out. If the felt is exceptionally dirty, replace the felt rather than cleaning it. (A new piece of felt is packed with every toner cartridge.)

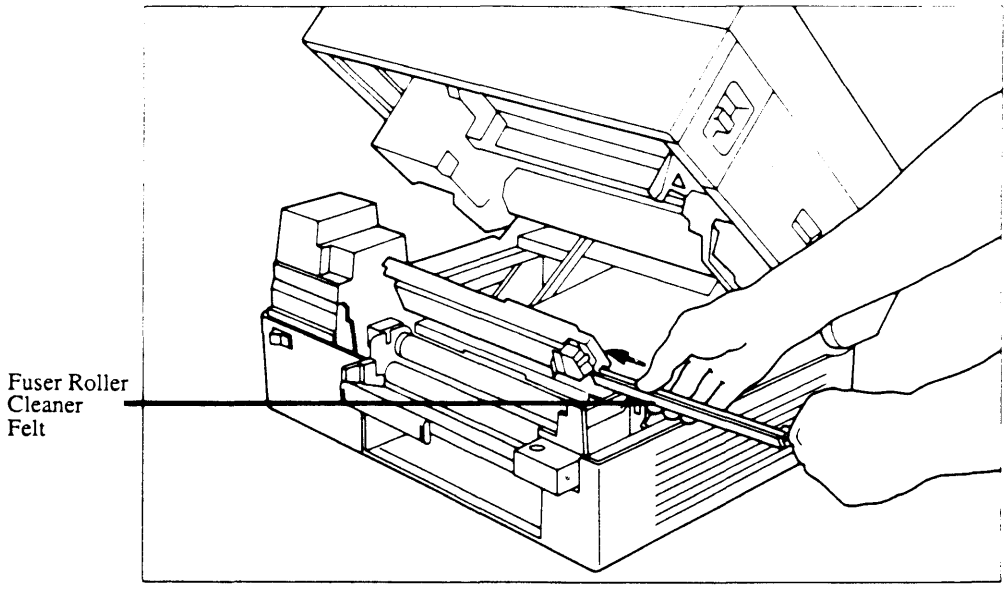


FIGURE 3

Separation Claws

The separation claws (Figure 4, #1) skim the paper from the fuser pressure roller after the plastic toner has been fused onto the paper. It is important that the claw tips remain smooth and sharp.

Clean the separation claws with your fingernail, being careful not to damage the leading edge.

Delivery Guide, Separation Guide, and Paper Guide

The delivery (Figure 4, #2), separation (Figure 4, #3), and paper (Figure 4, #4) guides keep the paper from getting jammed in the delivery roller as the fuser assembly puts paper out. Over time these guides can collect dirt from the paper.

The paper guide is the small gray plastic tray that guides the paper between the upper and lower fuser pressure rollers.

To service the delivery, separation, and paper guides, clean each of them with a soft cloth dampened with alcohol.

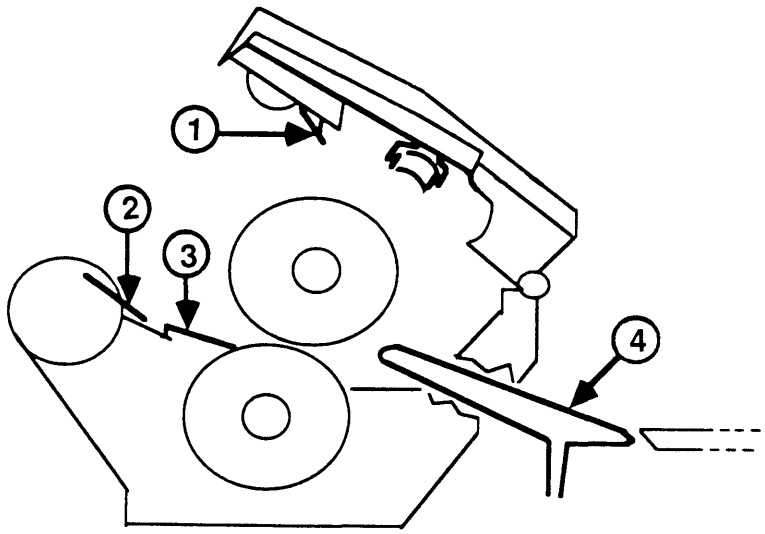


FIGURE 4

Transfer Corona Assembly

As a regular part of any service call, clean the transfer corona wire by gently drawing a cotton swab up and down the corona wire.

In addition, if the entire transfer corona assembly is dirty and if the vacuum does not clean the assembly thoroughly, proceed as follows:

1. Remove the transfer corona assembly from the printer.
2. Shake excess toner into a wastebasket.
3. Use cotton swabs moistened with water or alcohol to clean the inside of the assembly, being careful not to damage the corona wire.
4. Reinstall the transfer corona assembly in the printer.

Paper Path

Figure 5 below shows the paper path components that require periodic cleaning. Clean them with a soft cloth dampened in alcohol.

Hint: Here's an easy way to access the cassette pickup rollers and paper feed rollers in the pedestal of the printer: **With the power off**, remove the paper cassette and pull down the plastic door under the manual-feed entrance. You will be able to see and reach the rollers easily for inspection and cleaning.

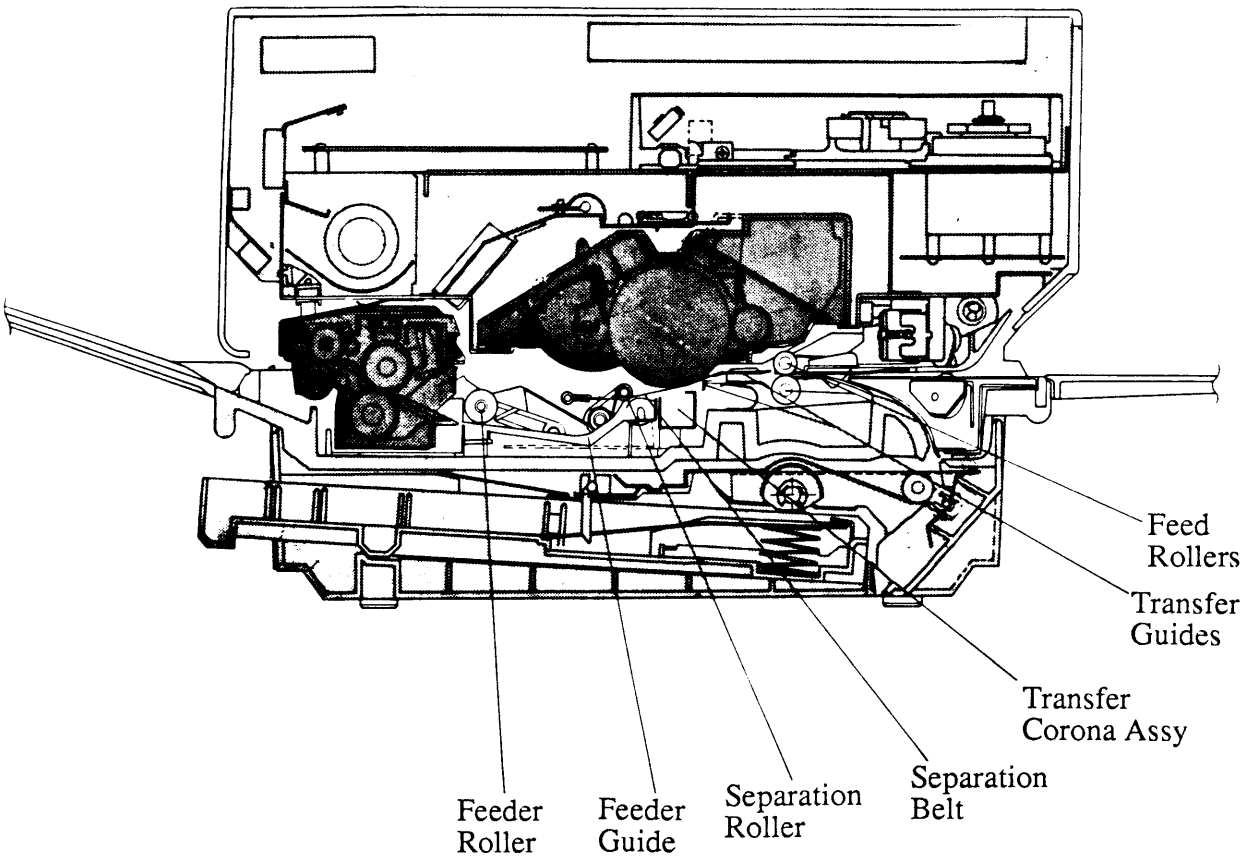


FIGURE 5

Ozone Filter

Replace the ozone filter once a year as part of the regular maintenance. (Do not knock the filter against a hard surface to clean it; the filter could break.)

Repair Log Label

Record the date and type of preventive maintenance performed on the Repair Log Label on the bottom panel. **If a Repair Log Label is not affixed to the bottom panel**, place one there.

❑ 100,000-COPY SERVICE (REFURBISHMENT)

When a LaserWriter has reached 100,000 copies, certain items can be expected to be near the end of their life cycles. Follow the directions below to inspect, clean, or replace those items.

Replace Preconditioning Exposure Assembly

Replace the preconditioning exposure assembly using the instructions in Section 2, Take-Apart.

Replace Grounding Spring

When you open the printer and remove the toner cartridge, you can see the *grounding spring* in the middle of the 60-tooth brass gear that moves the toner cartridge. At 100,000 copies, the grounding spring should be replaced, as follows:

Remove

To remove the old grounding spring:

1. Make sure the printer is powered off and unplugged.
2. Open the printer and remove the toner cartridge.
3. Locate the grounding spring in the middle of the 60-tooth brass gear.

CAUTION: *Be careful not to drop the grounding spring into the printer, where it could cause a short circuit.*

4. Use a magnetized spring hook or tweezers to pluck out the spring.

Replace

To install the new grounding spring:

1. Using a vacuum, a cotton swab, or a brush, clean any loose toner from the cavity in the middle of the large brass gear.
2. Use tweezers to insert the new spring. Make sure it is firmly seated.
3. Insert and then remove the toner cartridge. Inspect the grounding spring once more to make sure it is properly seated.

Clean Fan

The fan can be cleaned without being removed, as follows:

1. Remove the front panel.
2. Use a brush to clean the fan blades.
3. After brushing, remove loose toner by vacuuming.

Note: Leave the outer panels off the printer until finished with the entire maintenance procedure.

Replace Paper Pickup Assembly Parts

Following the directions in Section 2, Take-Apart, replace the paper pickup rollers, the paper feed rollers, and the lower paper feed guide.

Replace Fuser Assembly

Replace the entire fuser assembly by following the instructions in Section 2, Take-Apart.

Replace Separation Belt

After everything else has been replaced, replace the separation belt.

Clean Registration Shutter Assembly Rollers

Clean the plastic rollers on the registration shutter assembly with a soft cloth and alcohol.

Replace Ozone Filter

Check the Repair Log Label and see if 100,000 copies have been printed since the ozone filter was last replaced. If at least this number of copies has been printed, replace the ozone filter by following the instructions in Section 2, Take-Apart.

...Continued on next page

Check Printer Operation

When you have reassembled the LaserWriter, power up the unit to see if it produces a test print. If the printer does not operate after reassembly, retrace your steps through the Section 2, Take-Apart, replacement procedures for the cassette pickup assembly, the printer pedestal, and the LaserWriter I/O board.

The most likely explanation for a nonfunctional state is a forgotten cable connection. Be sure you have connected the following cables:

- The two solenoid leads on the cassette pickup assembly (be sure each lead is connected to its proper pole)
- The two white-and-black cables to their sockets near the mounting connector plate
- The two black wires with spade connectors to their terminals on the power interlock assembly
- The large black cable to connector J103 on the power interlock assembly
- The cable to connector J501 on the DC power supply/motor drive PCB
- The three LaserWriter I/O board cables

Repair Log Label

Record the date and type of service performed on the Repair Log Label on the bottom panel. **If a Repair Log Label is not affixed to the bottom panel,** place one there at this time.

> ***Note:*** The next refurbishment should take place after an additional 80,000 copies have been run.

❑ END-USER MAINTENANCE PROCEDURES

Check Toner Cartridge

To determine whether the toner cartridge needs to be replaced, look at the color of the indicator (see Figure 6) visible through the window on the right. As the drum rotates, the color of the indicator changes to indicate the usable service life of the cartridge. The cartridge indicator changes from green to yellow when the cartridge is about half used, and finally turns red when the cartridge is ready to be replaced.

Each cartridge contains enough toner to make approximately 3,000 letter-size prints. If many originals with high toner-to-image ratios (that is, dense graphics) are printed, toner is used more quickly, and white stripes may appear on prints before the printing capacity indicator turns red.

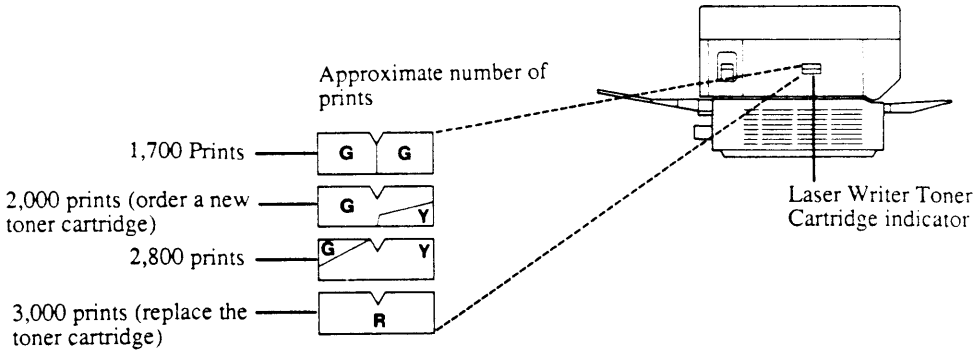


FIGURE 6

Remove Toner Cartridge

CAUTION: *Don't hold the cartridge on end; the toner will spill out (Figure 5).*

1. Lift the release and raise the upper half of the printer.

2. Open the door on the release side of the printer and pull out the used toner cartridge.

   Note: The right door can be opened only after the upper main body has been raised.

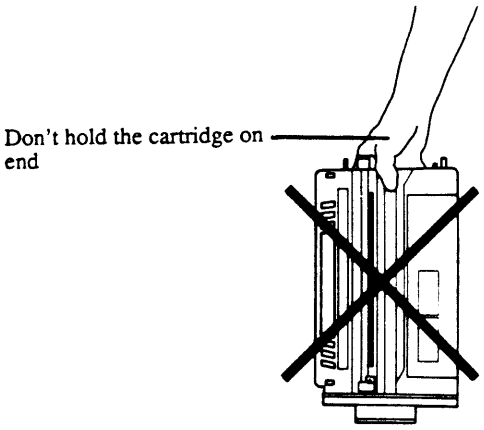


FIGURE 7

Distribute Toner in Cartridge

Hold the new toner cartridge horizontally, and rock it 45 degrees slowly back and forth about five times (with the drum as the center of rotation; Figure 8). Do this if white stripes appear on the finished paper.

CAUTION: *Hold the toner cartridge horizontally to distribute toner. Don't hold the cartridge on end; the toner will spill out.*

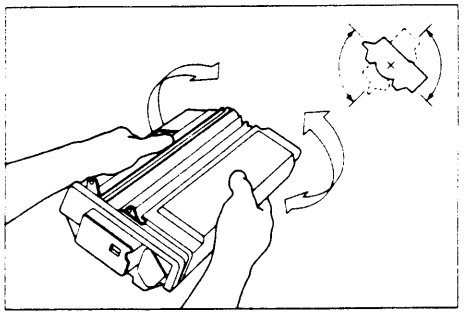


FIGURE 8

Install a Toner Cartridge

CAUTION: *Don't hold the cartridge on end; the toner will spill out.*

1. Fully insert the new toner cartridge into the printer (Figure 9).

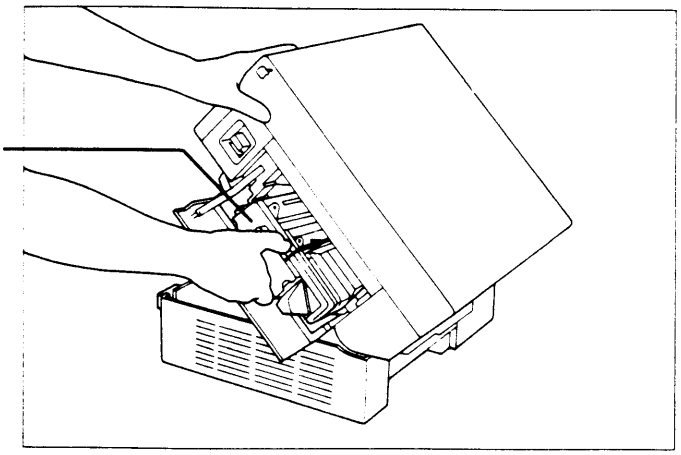


FIGURE 9

2. Flex the black tab on the toner cartridge until it breaks loose. (Be careful not to break the attached sealing tape before pulling the tab out; see Figure 10.) Hold the cartridge steady and pull the tab completely out to remove the attached sealing tapes.

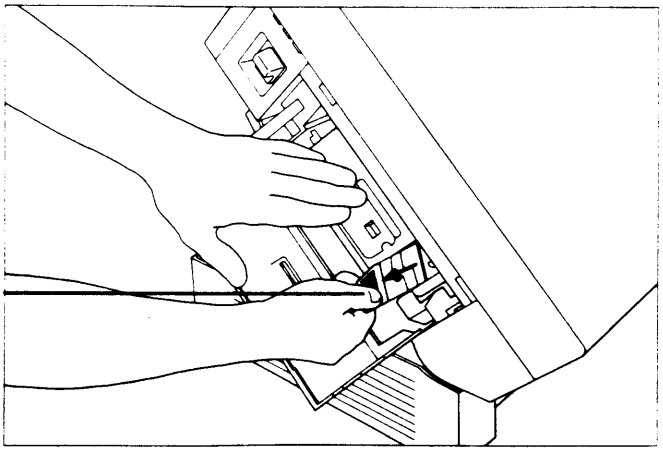


FIGURE 10

3. Raise the top of the fuser assembly and replace the fuser roller cleaner felt with a new one (Figure 11). Lower the top of the fuser assembly.

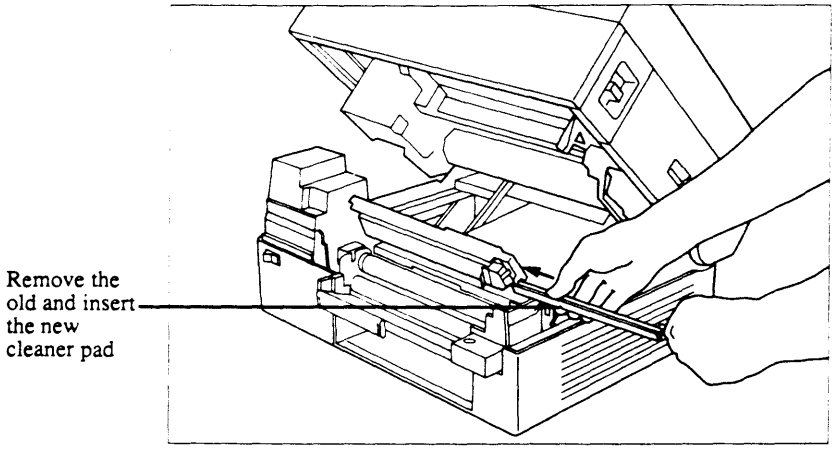


FIGURE 11

4. Close the upper half of the printer. Turn the printer on and make 10 prints. If white lines show, remove the cartridge and try the "Distribute Toner in a Cartridge" procedure in this section. If white lines still show, try a new toner cartridge.

Replace Separation Belt

If the separation belt breaks, use the following procedure to replace it.

Note: There is a replacement belt provided with each machine.

1. Push the release lever up and open the upper half of the printer.

2. Locate the separation belt (Figure 12).

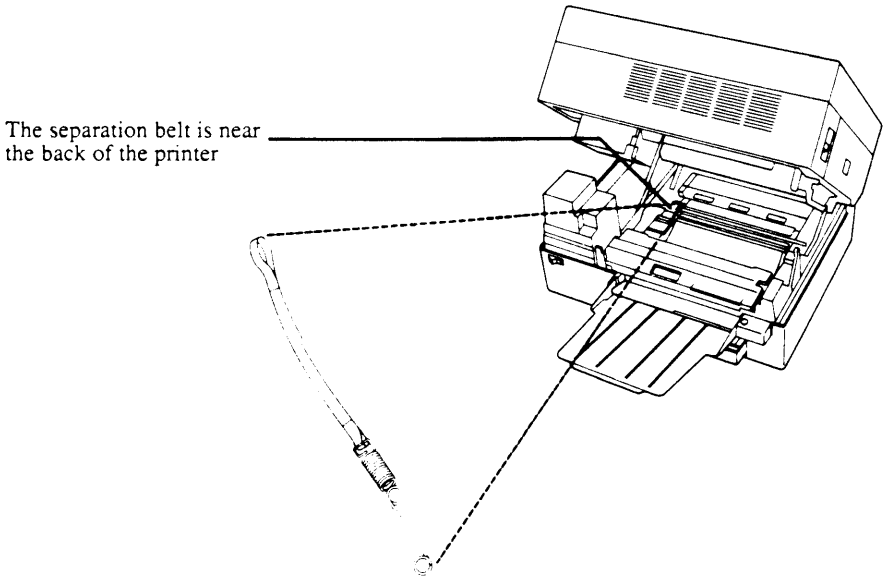


FIGURE 12

3. With a screwdriver, open loop A on the separation belt (Figure 13).

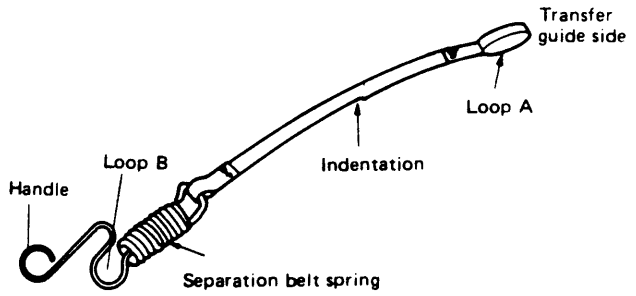


FIGURE 13

4. Hang loop A from the tab on the upper transfer guide (Figure 14). The indentation on the separation belt belongs on the right side.

5. Pass the separation belt over the transfer roller, and under the separation pinch roller (Figure 14).

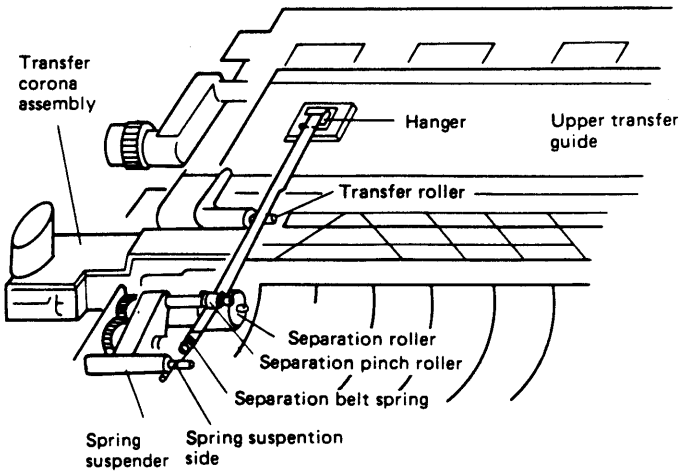


FIGURE 14

6. Hook loop B on the separation belt to the underside of the spring suspension side of the spring suspender.

7. Check the following items after installing the separation belt (Figure 15).

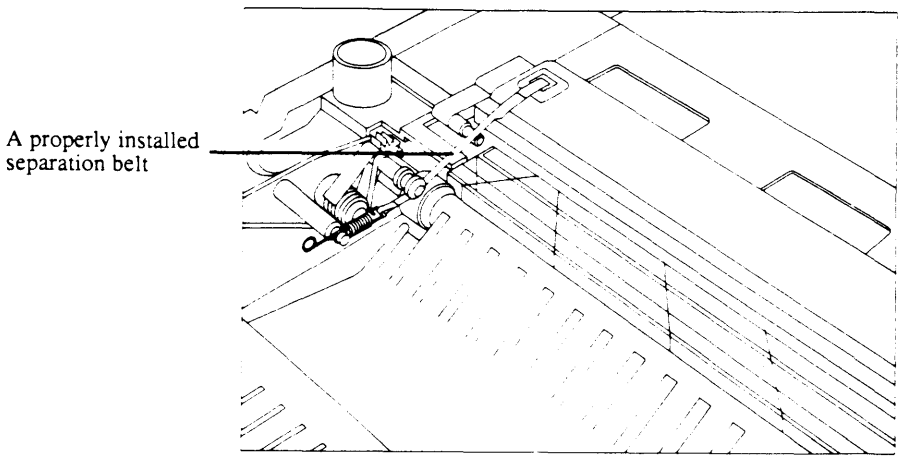


FIGURE 15

___ Is the belt twisted or cut?

___ Is the indentation on the right side?

___ Is loop A securely hung from the upper transfer guide?

___ Does the belt pass over the transfer roller?

___ Does the belt pass between the separation roller and the separation pinch roller?

___ Is the separation belt spring hooked securely to the underside of the spring suspension side of the spring suspender?

8. Close the upper main body.

Clean Primary Corona Wire

To service the primary corona wire:

1. Open the printer and pull out the toner cartridge. Locate the wire cleaner inside the lower half of the printer. (Figure 16).

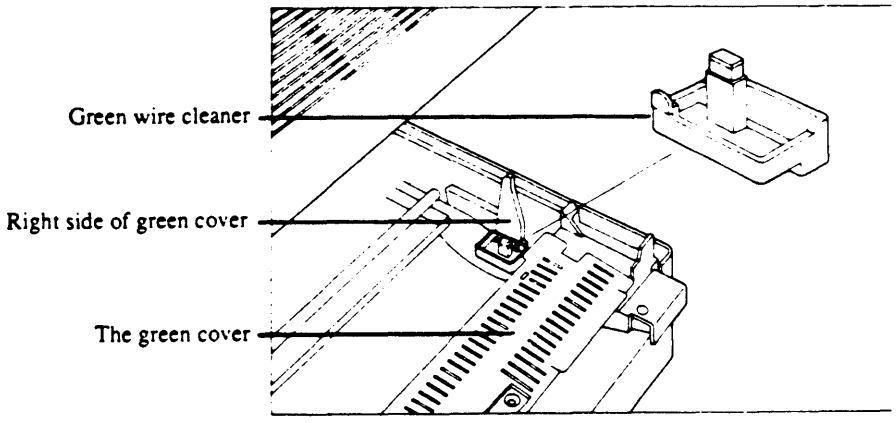


FIGURE 16

2. Insert the wire cleaner into the long slot of the toner cartridge (between the two shutters), and move the cleaner back and forth in the slot (Figure 17).

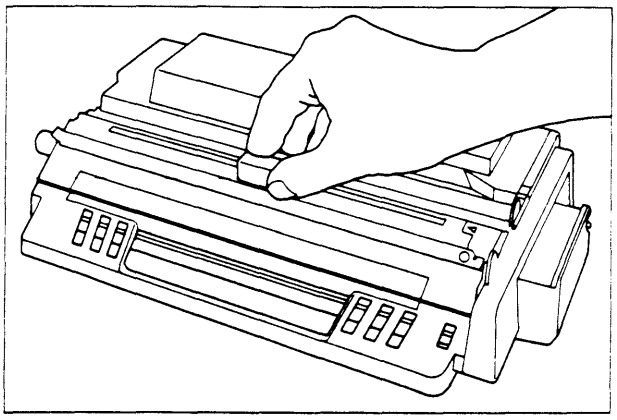


FIGURE 17

Clean Transfer Corona Wire

Open the printer and pull out the toner cartridge (if necessary, use the instructions in this section). Gently draw the cotton swab (provided with the cartridge) up and down the corona wire (Figure 18).

> ***Note:*** The transfer corona wire is hard to see. It's a very thin wire located under the almost-transparent crossed wires you see in the middle area inside the printer. Be gentle cleaning the wire; it's rather fragile.

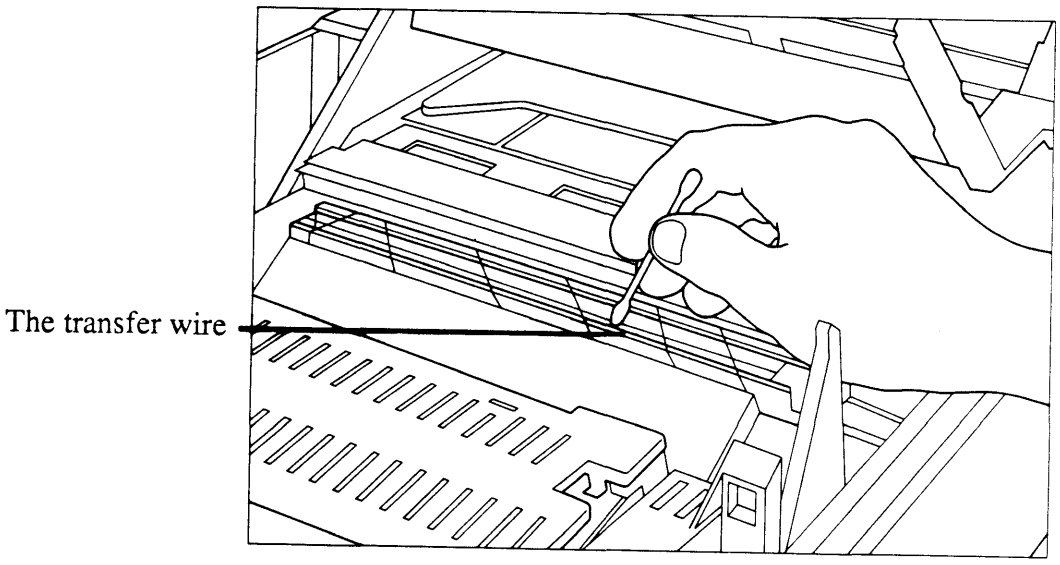


FIGURE 18

Clean Transfer Guide

Dampen a cloth with alcohol. (Don't soak it—it should be moist, not wet.) Clean the transfer guide with the cloth (Figure 19).

Note: The transfer guide is the brass-colored metal plate located behind the transfer wire.

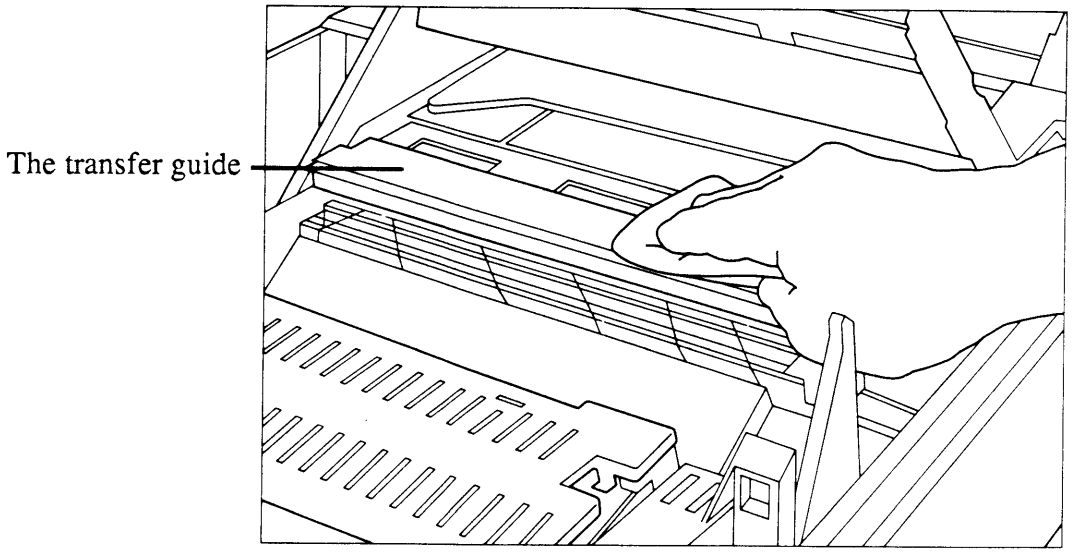


FIGURE 19

❑ JOB AIDS

The following two forms are provided to assist the technician in performing LaserWriter service and preventive maintenance:

- The Preventive Maintenance Checklist
- The Repair Log Label

Preventive Maintenance Checklist

The Preventive Maintenance Checklist (shown on the following page) is a shorthand version of the Preventive Maintenance procedure. It is a reminder for the technician who is already familiar with the procedure. Make copies of the Checklist and take a copy on every service call.

SERVICE TECHNICIAN MAINTENANCE PROCEDURE
CHECKLIST

EQUIPMENT NEEDED

4 by 4 dropcloth (for toner spillage)	soft lint free cloth (for cleaning)
penlight	cotton tipped swabs
magnetized stubby #2 Phillips screwdriver	Isopropyl alcohol

1. Prepare your work area for LaserWriter maintenance
   - ☐ Obtain the equipment listed above
   - ☐ Spread the drop cloth over the work area beside the LaserWriter

2. Check the page count for the following numbers
   - ☐ Under 50,000 - Go to Step 3
   - ☐ Over 50,000 - Replace the Separation Belt
   - ☐ Over 100,000 - Inspect the following items and replace if necessary
     - Fusing Assembly
     - Pre-Exposure Unit
     - Transfer Corona Assembly
     - Separation /Feeder Unit
     - Feed Roller
     - Paper Feed Roller
     - Paper Pickup Roller

3. Service the Toner Cartridge
   - ☐ Inspect the Light Blocking Shutter
   - ☐ Clean the Primary Corona Wire
   - ☐ Clean the Photosensitive Drum's Protective Shield
   - ☐ Inspect the surface of the Photosensitive Drum; clean if necessary

4. Service the Fusing Assembly
   - ☐ Inspect the Fusing Roller Cleaner Felt; replace if necessary
   - ☐ Clean the Separation Claws
   - ☐ Clean the Delivery Guide, Separation Guide, and Paper Guide

5. Service the Paper Path

   Clean the following items:
   - ☐ Toner Feed Rollers
   - ☐ Transfer Guides
   - ☐ Transfer Corona Assembly
   - ☐ Separation Belt
   - ☐ Separation Roller
   - ☐ Separation Guide
   - ☐ Fusing Feed Roller

Repair Log Label

The Repair Log Label (Figure 20) helps the technician keep a service maintenance record for each printer, and maintains a record of the number of prints produced by the printer. The Repair Log Label provides spaces for the following information:

- **Date**
  The date of the repair or preventive maintenance
- **Repair Action**
  The nature of the repair or type of preventive maintenance performed
- **Approximate Page Counter**
  The number of copies printed

The Repair Log Label should be affixed to the bottom panel of every LaserWriter/LaserWriter Plus, and should be updated after performing any repair or preventive maintenance on the printer.

The Repair Log Label is provided with each I/O PCA received from Apple Service, and can be ordered separately from your regional Apple Support Center.

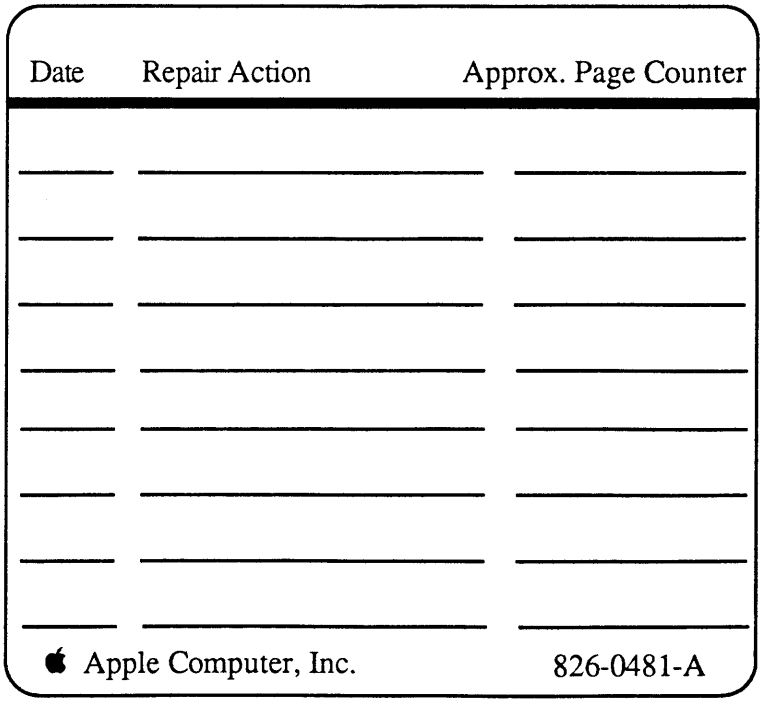


FIGURE 20

Apple Technical Procedures

LaserWriter / LaserWriter Plus

Section 6 – Illustrated Parts List

❑ CONTENTS

The figures and lists in this section include all piece parts that can be purchased from Apple for the LaserWriter, along with their part numbers. These are the only parts available from Apple. Refer to your *Apple Service Programs Manual* for prices.

❑ HOW TO USE THIS SECTION

Assembly Location Diagrams

This section begins with two Assembly Location Diagrams, which show all the major modules in the printer and refer you to more detailed diagrams later in the section.

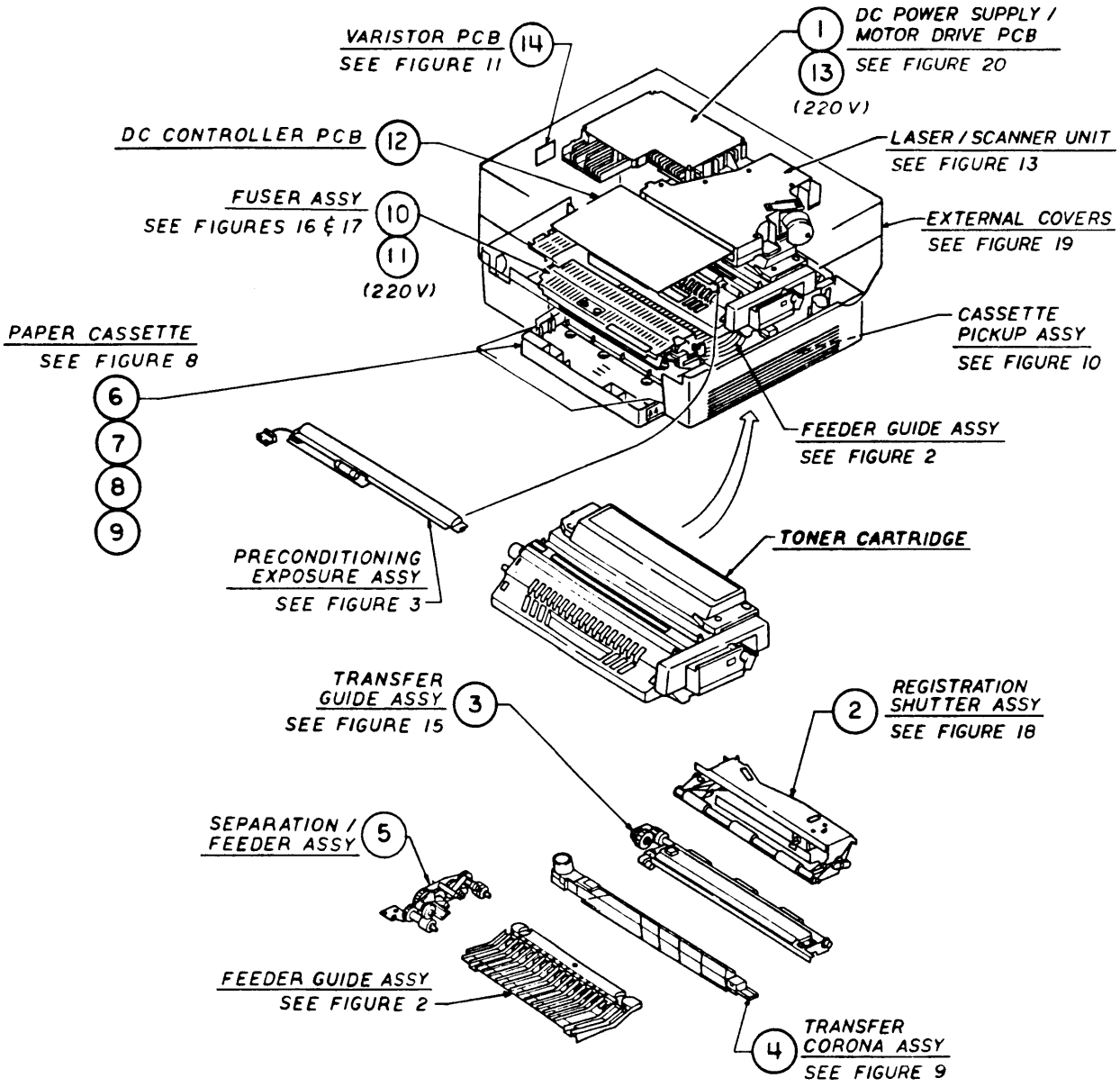
HP Part Numbers

Included for your convenience are Hewlett-Packard (HP) part numbers for some of the piece parts used in the LaserWriter. If no HP part number is listed, that part is available only from Apple. HP part numbers may change, so check Hewlett-Packard documentation before using the numbers listed here.

Kits

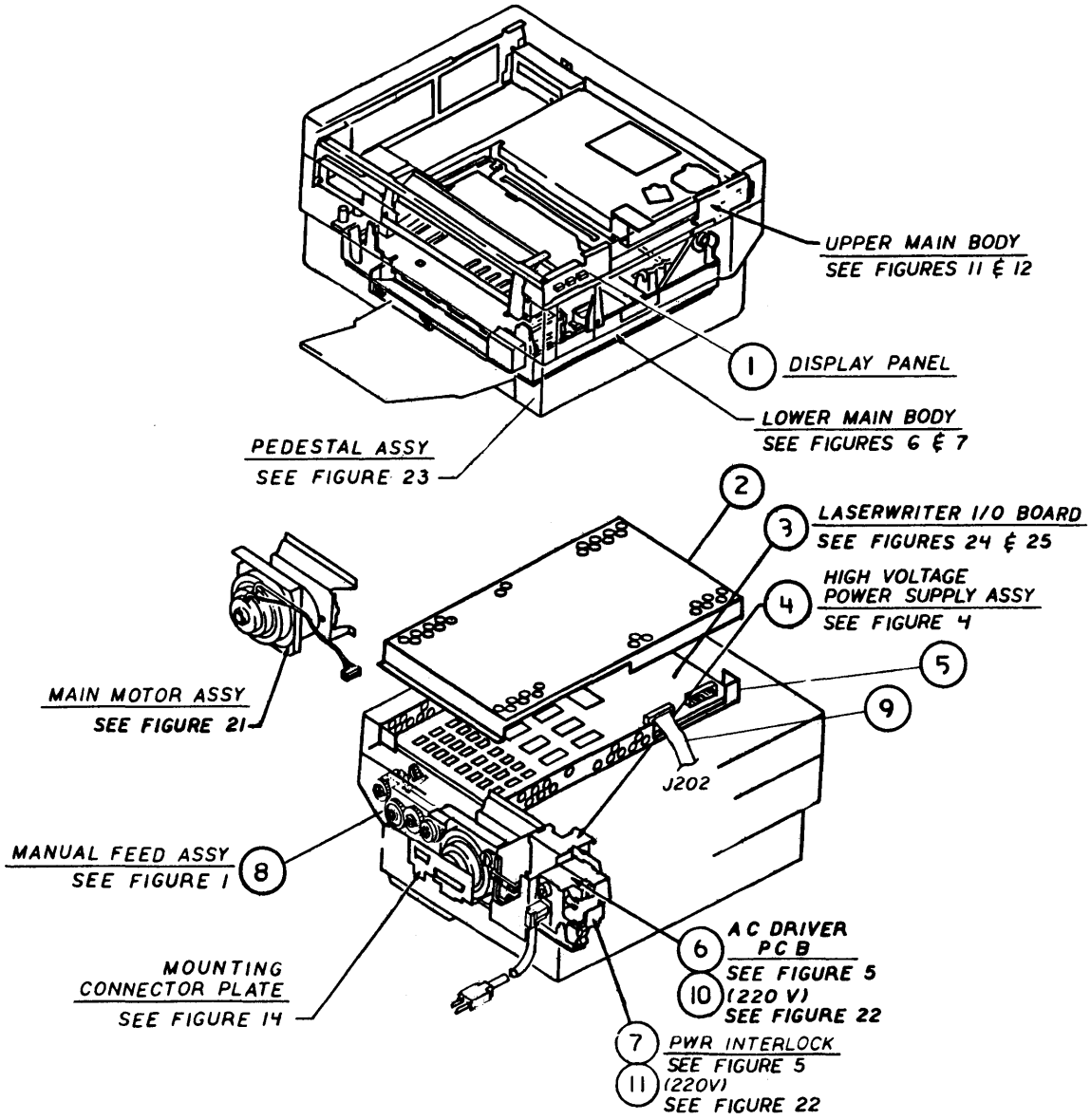
Certain piece parts shown on the following pages are available only in kits. For these parts, the part numbers listed refer to the kit that contains them. When placing an order for such parts, please note the descriptions below:

Apple P/N	Description
076-8133	Misc Screw Assy, LaserWriter
076-8135	Ring Set, Grip/E, LaserWriter
076-8136	Pin Set, Guide/Roll, LaserWriter
076-8137	Spring Set, Laserwriter
076-8138	Gear Set, LaserWriter
076-8139	Screw Set, LaserWriter
076-8167	Gear/Roller Set, Fuser
076-8168	Spring/Terminal Set, Fuser


VARISTOR PCB
14
SEE FIGURE 11
1
DC POWER SUPPLY / MOTOR DRIVE PCB
13
SEE FIGURE 20
(220 V)
DC CONTROLLER PCB
12
LASER / SCANNER UNIT
SEE FIGURE 13
FUSER ASSY
SEE FIGURES 16 & 17
10
11
(220 V)
EXTERNAL COVERS
SEE FIGURE 19
PAPER CASSETTE
SEE FIGURE 8
6
7
8
9
CASSETTE PICKUP ASSY
SEE FIGURE 10
FEEDER GUIDE ASSY
SEE FIGURE 2
TONER CARTRIDGE
PRECONDITIONING EXPOSURE ASSY
SEE FIGURE 3
TRANSFER GUIDE ASSY
3
SEE FIGURE 15
2
REGISTRATION SHUTTER ASSY
SEE FIGURE 18
SEPARATION / FEEDER ASSY
5
FEEDER GUIDE ASSY
SEE FIGURE 2
4
TRANSFER CORONA ASSY
SEE FIGURE 9

❑ LASERWRITER – ASSEMBLY LOCATION DIAGRAMS (1 of 2)

Item	Apple p/n	HP p/n	Description
1	661-0273	– – –	Power Supply/Motor Drive PCB, 110 V AC
2	699-0323	– – –	Registration Shutter Assembly
3	970-1149	– – –	Transfer Guide Assembly
4	970-1021	RG1-0191-020CN	Transfer Corona Assembly
5	970-1019	RG1-0194-000CN	Separation/Feed Roller Assembly
6	699-0357	– – –	Cassette, Letter, Platinum
7	699-0347	– – –	Cassette, Legal, Platinum
8	699-0326	– – –	Cassette, A4, Platinum
9	699-0305	– – –	Cassette, B5, Platinum
10	661-0450	RG1-0197-000CN	Fuser Assembly, 115 V
11	699-0318	RG1-0198-000	Fuser Assembly, 220 V
12	661-0267	– – –	DC Controller PCB
13	661-0274	– – –	Power Supply/Motor Drive PCB, 220 V AC
14	970-1035	RG1-0287-000CN	Varistor PCB


UPPER MAIN BODY
SEE FIGURES 11 & 12
1 DISPLAY PANEL
LOWER MAIN BODY
SEE FIGURES 6 & 7
PEDESTAL ASSY
SEE FIGURE 23
2
3 LASERWRITER I/O BOARD
SEE FIGURES 24 & 25
4 HIGH VOLTAGE
POWER SUPPLY ASSY
SEE FIGURE 4
5
9
J202
MAIN MOTOR ASSY
SEE FIGURE 21
MANUAL FEED ASSY
SEE FIGURE 1
8
MOUNTING
CONNECTOR PLATE
SEE FIGURE 14
6 A C DRIVER
P C B
SEE FIGURE 5
10 (220 V)
SEE FIGURE 22
7 PWR INTERLOCK
SEE FIGURE 5
11 (220V)
SEE FIGURE 22

❑ LASERWRITER – ASSEMBLY LOCATION DIAGRAMS (2 of 2)

Item	Apple p/n	HP p/n	Description
1	970-1109	– – –	Display Panel Assembly
2	970-1182	– – –	Top Shield Frame
3	661-0436	– – –	LaserWriter I/O PCB
	661-0437	– – –	LaserWriter Plus I/O PCB
4	661-0266	– – –	High-Voltage Power Supply Assembly
5	970-1183	– – –	Bottom Shield Frame
6	661-0268	– – –	AC Driver PCB, 110 V
7	699-0324	– – –	Power Interlock Assembly, 110 V
8	669-0322	– – –	Manual Feed Assembly
9	970-1192	– – –	Internal Video I/F Cable
10	661-0269	RG1-0205-000	AC Driver PCB, 220 V
11	669-0325	– – –	Power Interlock Assembly, 220 V

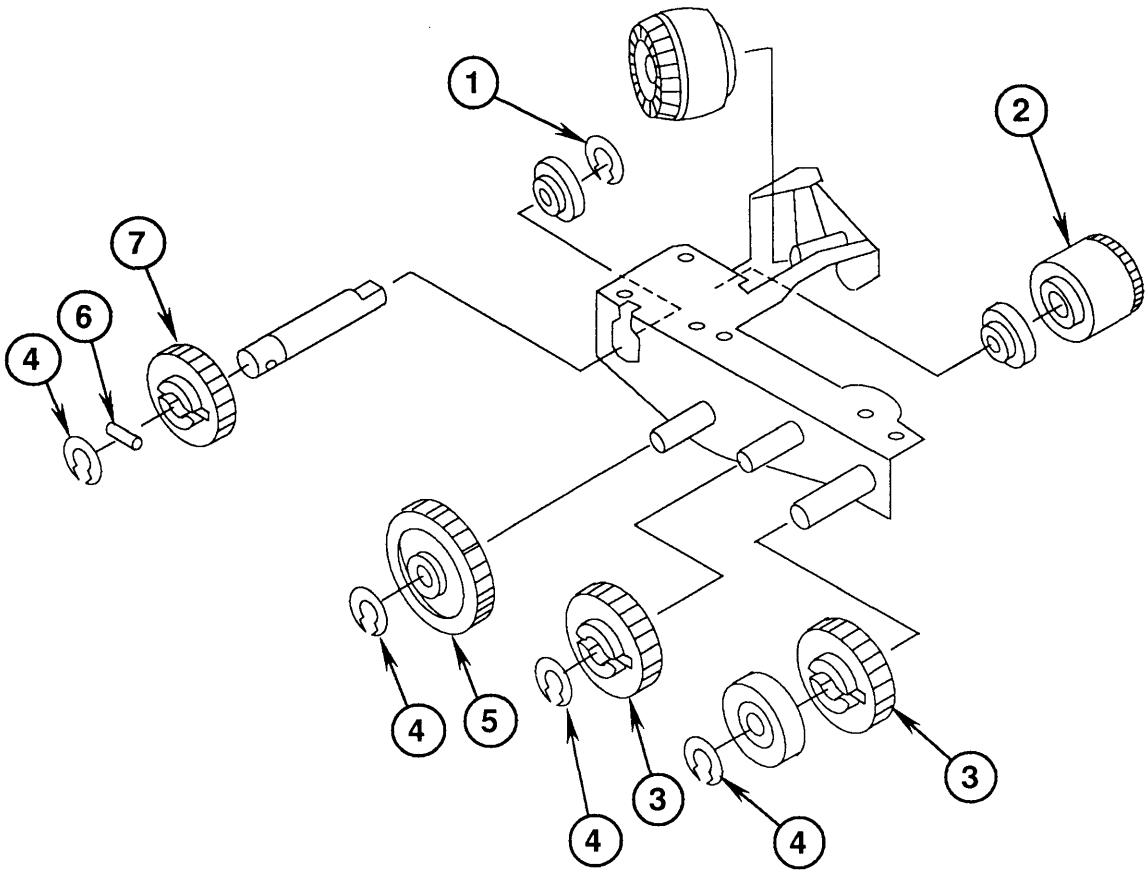


FIGURE 1

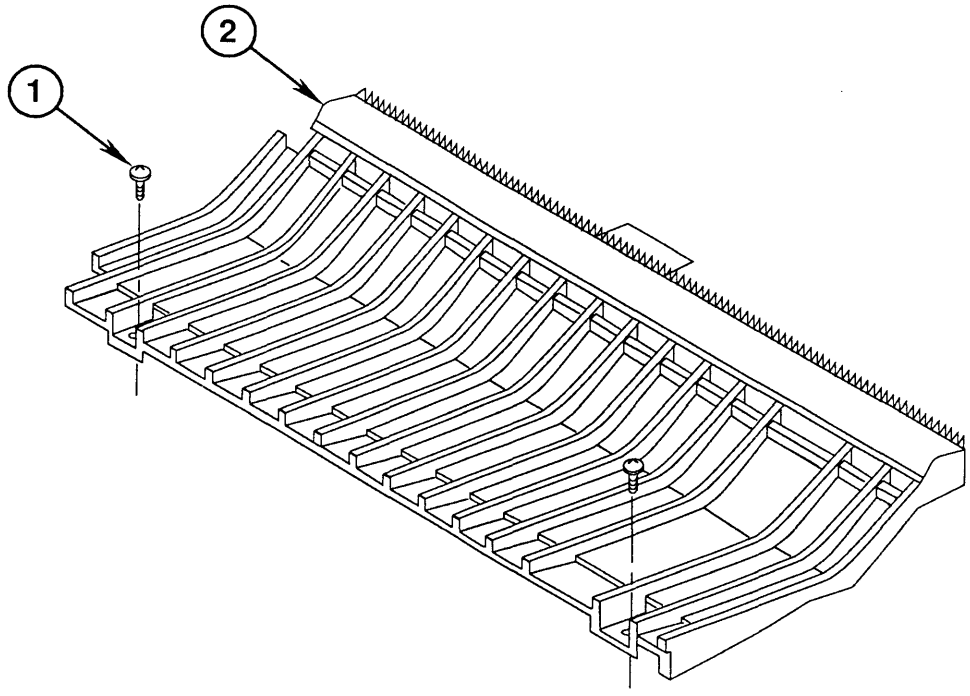


FIGURE 2

❑ LASERWRITER – MANUAL FEED ASSEMBLY (Figure 1)

Item	Part No.	Description
–	669-0322	Manual Feed Assembly
1	076-8135	E Ring, 5.0 mm, Stainless Steel
2	076-8138	Manual Feed Assembly Gear, 16T
3	076-8138	Manual Feed/Transfer Gear, 20T
4	076-8135	Grip Ring, 6.0 mm, Stainless Steel
5	076-8138	Manual Feed Assembly Gear, 24T
6	076-8136	Roll Pin, 1.2 x 2.0 mm, Stainless Steel
7	076-8138	Manual Feed Assembly Gear, 17T

❑ LASERWRITER – FEEDER GUIDE ASSEMBLY (Figure 2)

Item	Part No.	Description
1	076-8133	Screw, 4 x .7 x 8 mm, Truss Head
2	971-0037	Feeder Guide Assembly

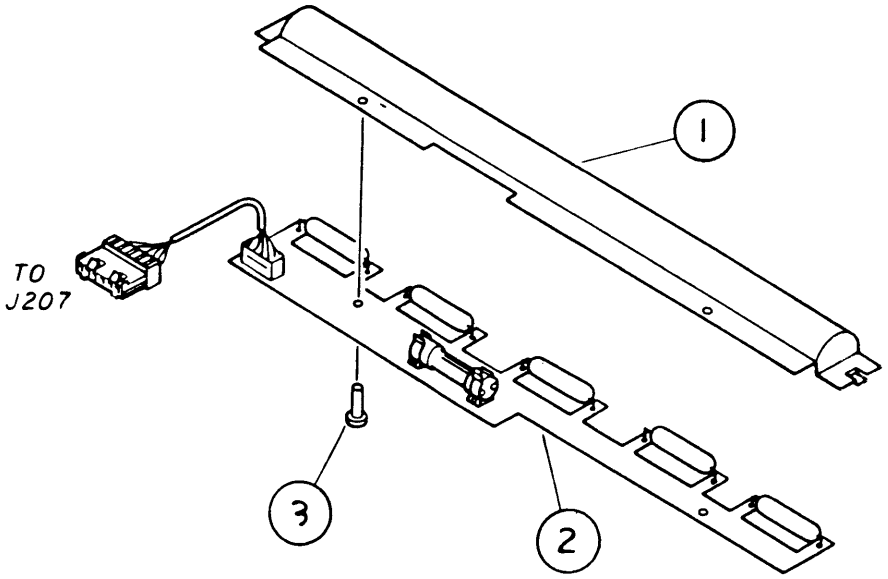


FIGURE 3

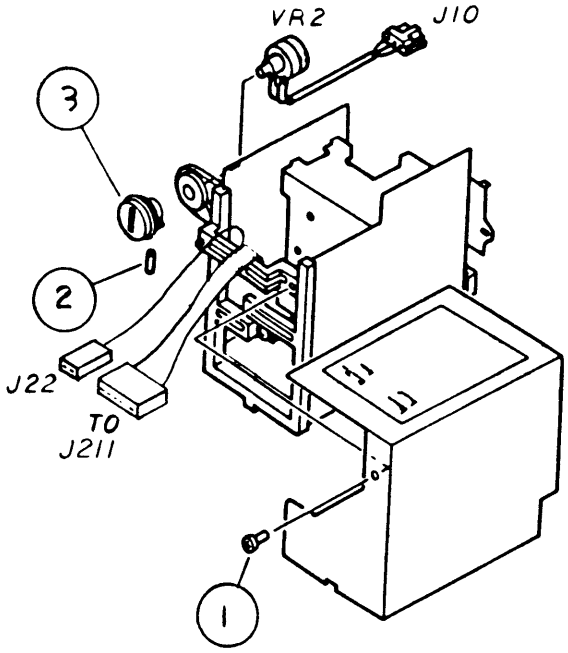


FIGURE 4

❑ LASERWRITER – PRECONDITIONING EXPOSURE ASSEMBLY (Figure 3)

Item	Apple p/n	HP p/n	Description
1	970-1146	RA1-0753-000CN	Reflector Shield, Preconditioning Assembly
2	970-1020	RG1-0101-000CN	Preconditioner Exposure PCB
3	076-8133	XB1-2300-609CN	Pan Head Screw, 3 x .5 x 6 mm

❑ LASERWRITER – HIGH VOLTAGE POWER SUPPLY (Figure 4)

Item	Apple p/n	HP p/n	Description
–	661-0266	– – –	High Voltage Power Supply Assembly
1	076-8133	XB1-2300-809CN	Pan Head Screw, 3 x .5 x 6 mm
2	076-8139	XB6-2400-508CN	Set Screw 4 x 5
3	970-1071	– – –	Exposure Control Dial, White
	970-1308	– – –	Exposure Control Dial, Platinum

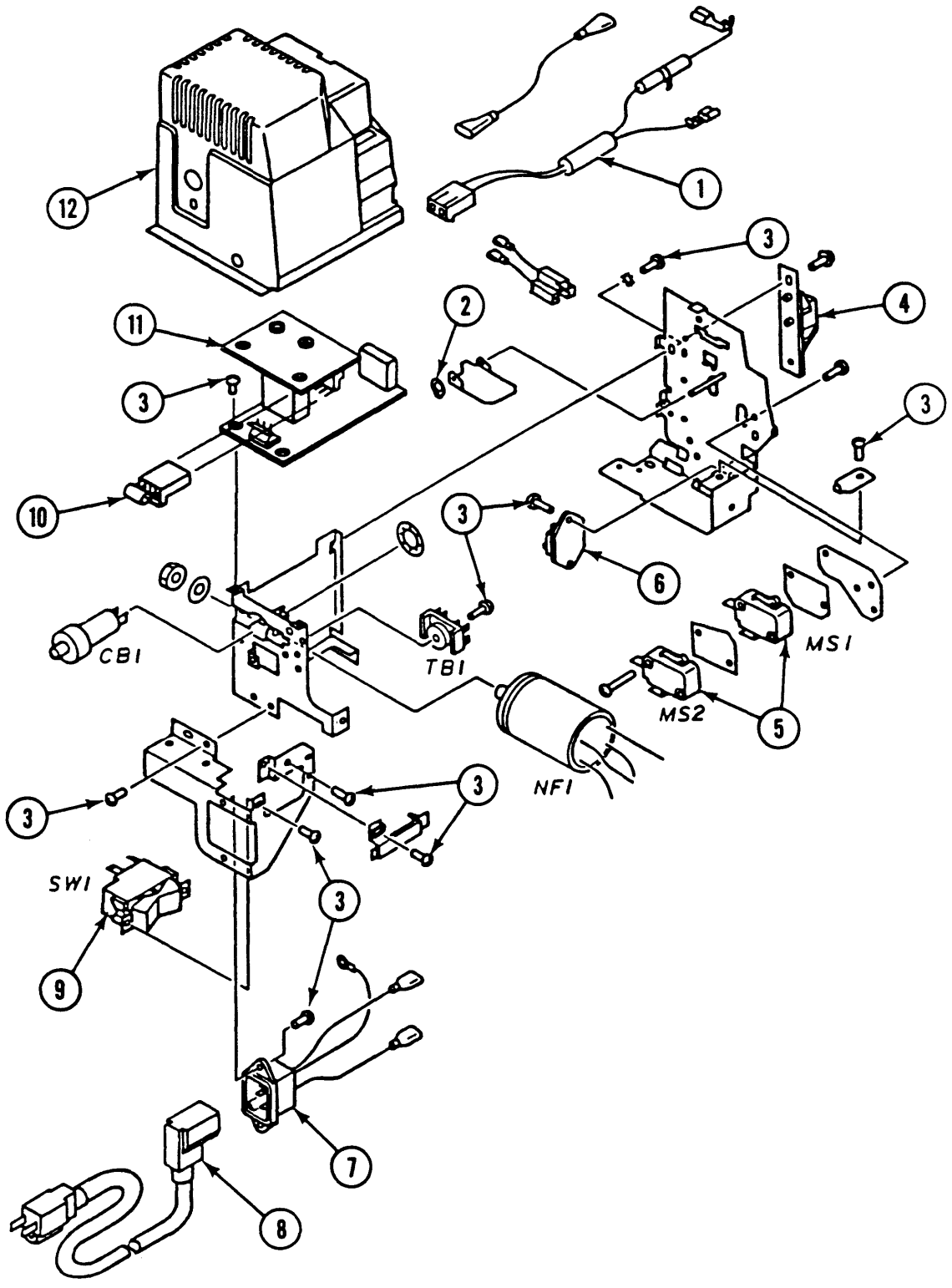


FIGURE 5

❑ LASERWRITER – POWER INTERLOCK ASSEMBLY, 110V (Figure 5)

Item	Apple p/n	HP p/n	Description
–	669-0324	– – –	Power Interlock Assembly 110V
1	970-1008	– – –	Fixing Assembly Cord
2	076-8135	XD2-2100-402CN	Grip Ring, 4.0mm, Stainless Steel
3	076-8133	XB1-2300-809CN	Pan Head Screw, 3 x 5 x 8 mm
4	949-0052	– – –	Cover Interlock Bracket
5	705-0109	WC4-0091-000CN	Microswitch, 115 VAC, 15A
6	970-1031	WA5-0045-000CN	TRIAC, AC16DIFR (115V)
7	970-1187	– – –	Power Supply Connector
8	590-0283	– – –	Power Cord, 115 VAC, Rt Angle
9	705-0110	RH7-6001-000CN	Rocker Switch, 250 VAC, 20A
10	076-8149	– – –	Resistor Assembly, 47 Ohm, 10/pk
11	661-0268	– – –	AC Driver PCB, 110V
12	970-1143	– – –	Power Interlock Assembly Cover

Note: See Figure 22 for 220V version.

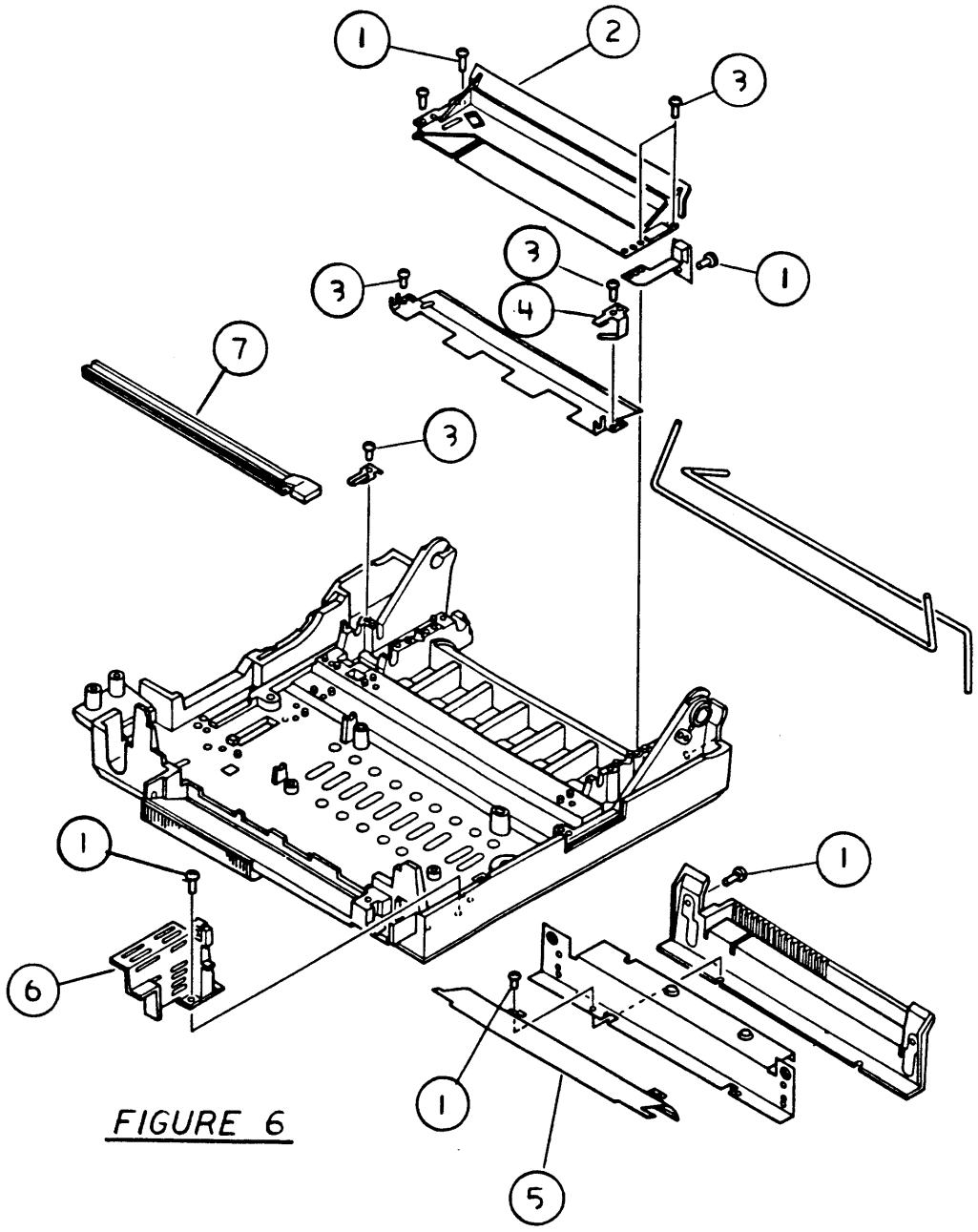


FIGURE 6

❑ LASERWRITER – LOWER MAIN BODY (Figure 6)

Item	Apple p/n	HP p/n	Description
1	076-8133	XB1-2300-809CN	Machine Screw, Truss Head, M 3 x 8
2	970-1272	RF1-0837-000CN	Manual Paper Feed Plate
3	076-8139	XB3-2401-209CN	Tapping Screw, Truss Head, M 4 x 12
4	076-8137	RA1-0837-000CN	Roller Retaining Spring
5	970-1127	FA2-5725-030CN	Lower Paper Guide Plate
6	970-1267	FA2-5682-000CN	Front Latch
7	970-1004	FG1-2377-020CN	Cleaning Felt

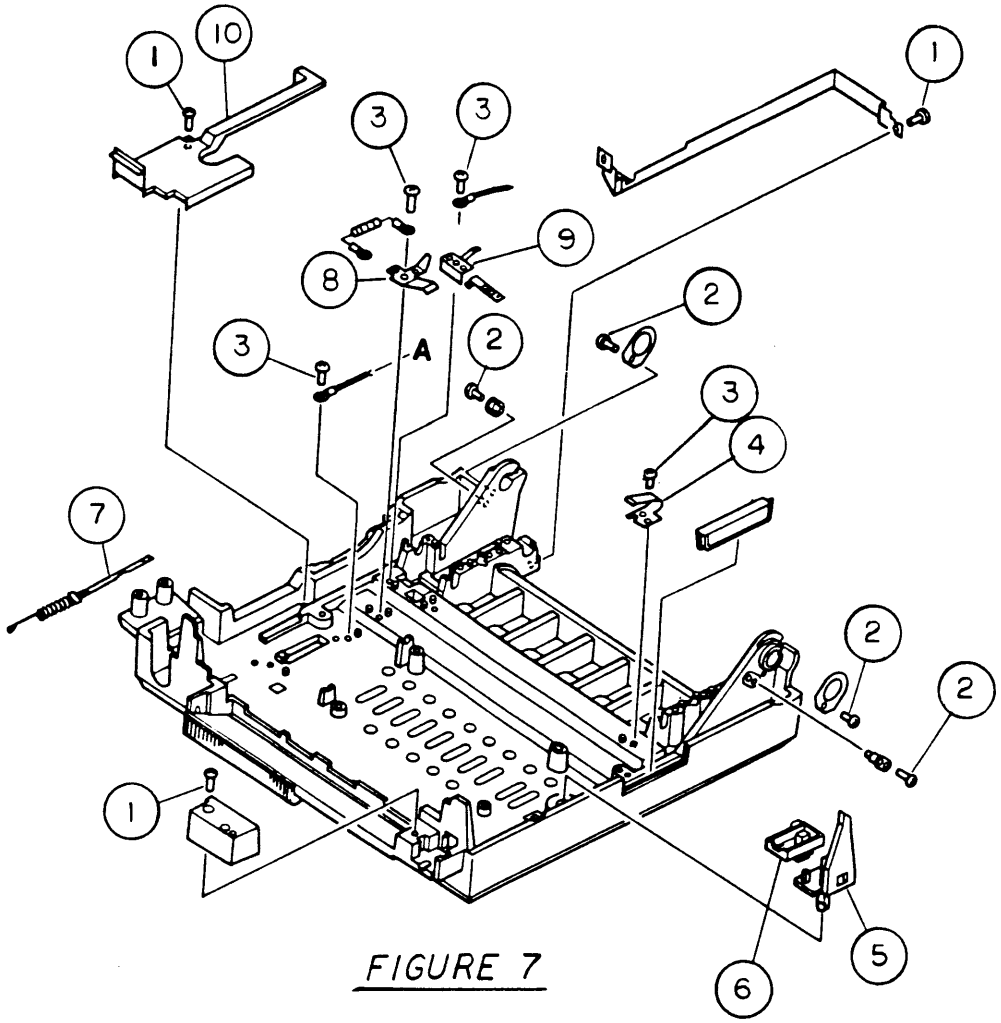


FIGURE 7

❑ LASERWRITER – LOWER MAIN BODY (Figure 7)

Item	Apple p/n	HP p/n	Description
1	076-8133	XB1-2300-809CN	Pan Head Screw, 3 x .5 x 8 mm
2	076-8139	XB3-2401-009CN	Tapping Screw, Truss Head, M 4 x 8
3	076-8139	XB3-2401-209CN	Tapping Screw, Truss Head, M 4 x 12
4	076-8137	FA2-5728-000CN	Transfer Guide Lifting Spring
5	970-1041	FA2-5683-000CN	Cartridge Shield Actuator
6	970-1064	FF1-3591-000CN	Corona Wire Cleaner Felt
7	970-1005	RF1-0224-000CN	Paper Separator Belt
8	076-8137	FA2-5730-000CN	Chassis Grounding Spring
9	076-8137	FA2-5729-000CN	Electrical Contact Spring
10	970-1069	FA2-5719-000CN	Wire Harness Cover

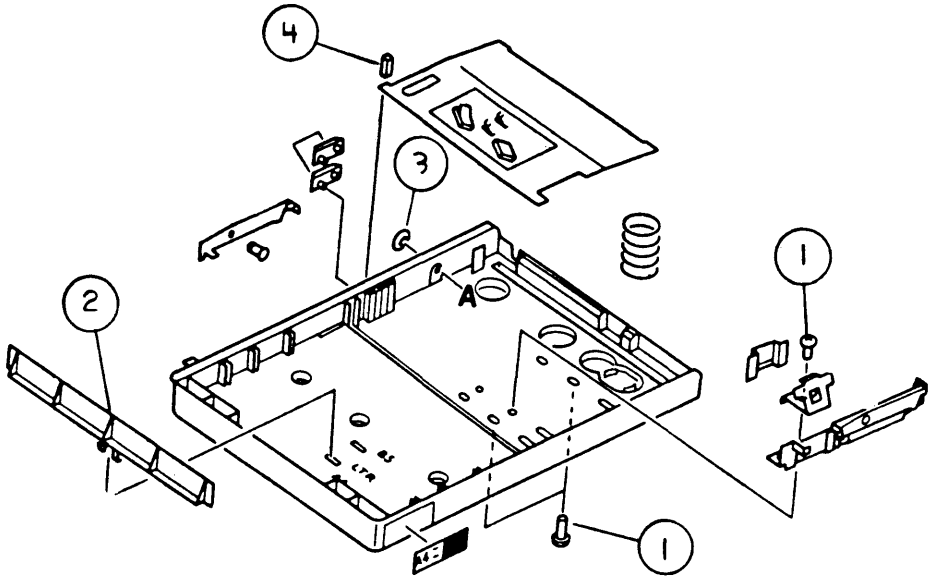


FIGURE 8

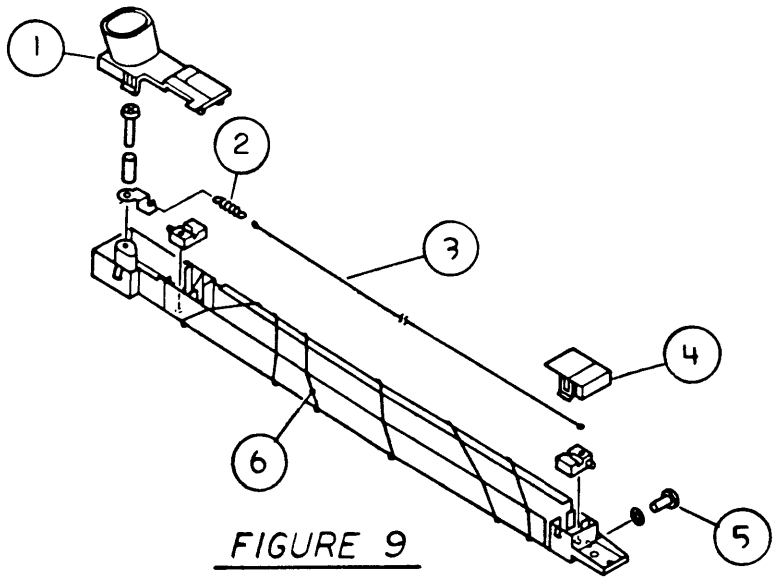


FIGURE 9

❑ LASERWRITER – CASSETTE (Figure 8)

Item	Apple p/n	HP p/n	Description
1	076-8133	XB6-7300-609CN	Pan Head Screw, 3 x .5 x 6 mm
2	970-1128	RA1-0861-000CN	Stop Plate Cassette
3	076-8135	XD2-1100-402CN	E Ring, 4.0 mm, Stainless Steel
4	970-1166	FA1-9787-000CN	Rubber Cassette Stop

❑ LASERWRITER – TRANSFER CORONA ASSEMLBY (Figure 9)

Item	Apple p/n	HP p/n	Description
–	970-1021	RG1-0191-020CN	Transfer Corona Assembly
1	970-1038	RF1-0137-000CN	Wire TerminatinCover, LH
2	970-1036	97-5527-000CN	Corona Wire Tension Spring
3	076-8126	FY1-0100-000CN	Corona Wire, Set
4	970-1037	FR1-0136-000CN	Wire Termination Cover, RH
5	076-8133	XB1-2300-609CN	Pan Head Screw, 3 x .5 x 6 mm
6	970-1040	RY1-1502-000CN	Nylon Guide Wire, Roll

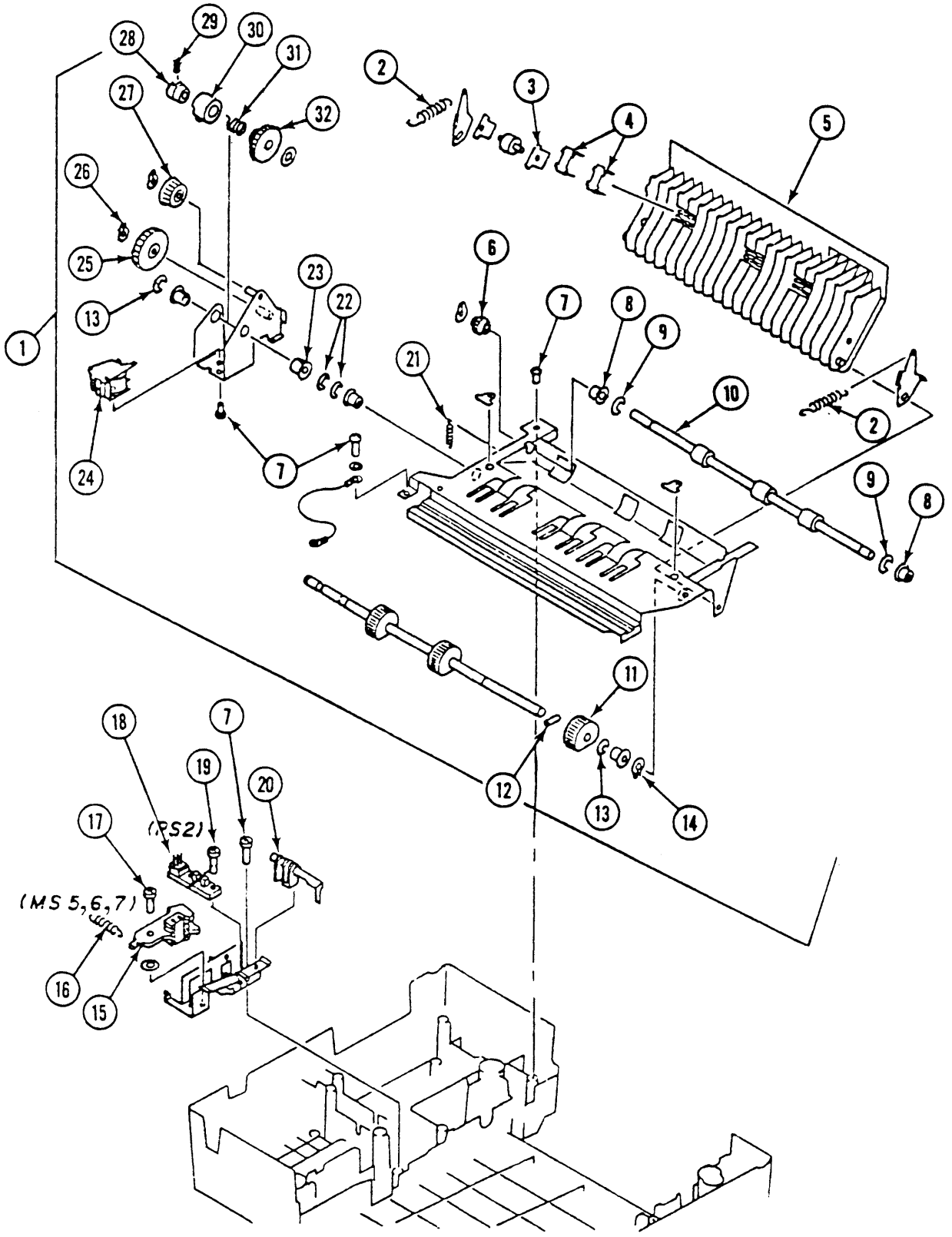


FIGURE 10

❑ LASERWRITER – CASSETTE PICKUP ASSEMBLY (Figure 10)

Item	Apple p/n	HP p/n	Description
1	949-0221	– – –	Cassette Pickup Assembly, White
	949-0222	– – –	Cassette Pickup Assembly, Platinum
2	076-8137	RS1-2011-000CN	Tension Spring Cassette Guide
3	970-1274	RA1-0667-000CN	Cassette/Roller Pickup Plate
4	076-8137	FA2-5600-000CN	Leaf Spring
5	970-1093	FA2-5611-010CN	Lower Paper Feed Guide, White
	970-1307	– – –	Lower Paper Feed Guide, Platinum
6	076-8138	FS1-0704-000CN	Paper Feed Idler Gear, 14T
7	076-8133	XB6-7300-609CN	Pan Head Screw, 3 x .5 x 6 mm
8	970-1055	FS1-1190-000CN	Paper Feed Roller Bushing
9	076-8135	XD2-1100-502CN	E Ring, 5.0 mm, Stainless Steel
10	970-1012	RA1-0977-000CN	Paper Feed Roller
11	970-1011	RA1-0666-000CN	Paper Pickup Roller
12	076-8136	XD3-2200-122CN	Roll Pin, 1.2 x 2.0 mm, Stainless Steel
13	076-8135	XD2-1100-642CN	E Ring, 6.4 mm, Stainless Steel
14	076-8135	XD2-2100-802CN	Grip Ring, 8.0 mm, Stainless Steel
15	970-1104	RF1-0163-000CN	Cassette Microswitch Assembly
16	076-8137	RS1-2007-000CN	Tension Spring, Cassette Switch
17	076-8139	FA2-5970-000CN	Screw, 3 x .5 x 5 mm, Truss Crs Rec Stl Blk
18	970-1014	FH7-7024-000CN	Paper-Out Detect Sensor
19	076-8133	XB1-2300-809CN	Pan Head Screw, 3 x .5 x 8 mm
20	970-1043	RA1-0673-000CN	Cassette Pickup Arm
21	076-8137	FS1-2652-000CN	Cassette Torsion Spring
22	076-8135	XD2-1100-642CN	E Ring, 6.4 mm, Stainless Steel
23	970-1054	FS1-1046-000CN	Paper Feed Idler Bushing
24	970-1032	FH7-5034-000CN	Cassette Solenoid, 24VDC
25	076-8138	FS1-0702-000CN	Paper Feed Idler Gear, 37T
26	076-8135	XD2-2100-602CN	Grip Ring, 6.0 mm, Stainless Steel
27	076-8138	FS1-0703-000CN	Paper Feed Idler Gear, 20T
28	970-1073	FA2-5606-000CN	Clutch Driver Drum
29	076-8139	XB6-2400-509CN	Set Screw, 4 x 5 mm
30	076-8135	FA2-5607-000CN	Pickup Control Clutch Ring
31	076-8137	FS1-2651-000CN	Cassette Torsion Spring
32	076-8138	FS1-0701-000CN	Drum/Clutch Drive Gear, 30T

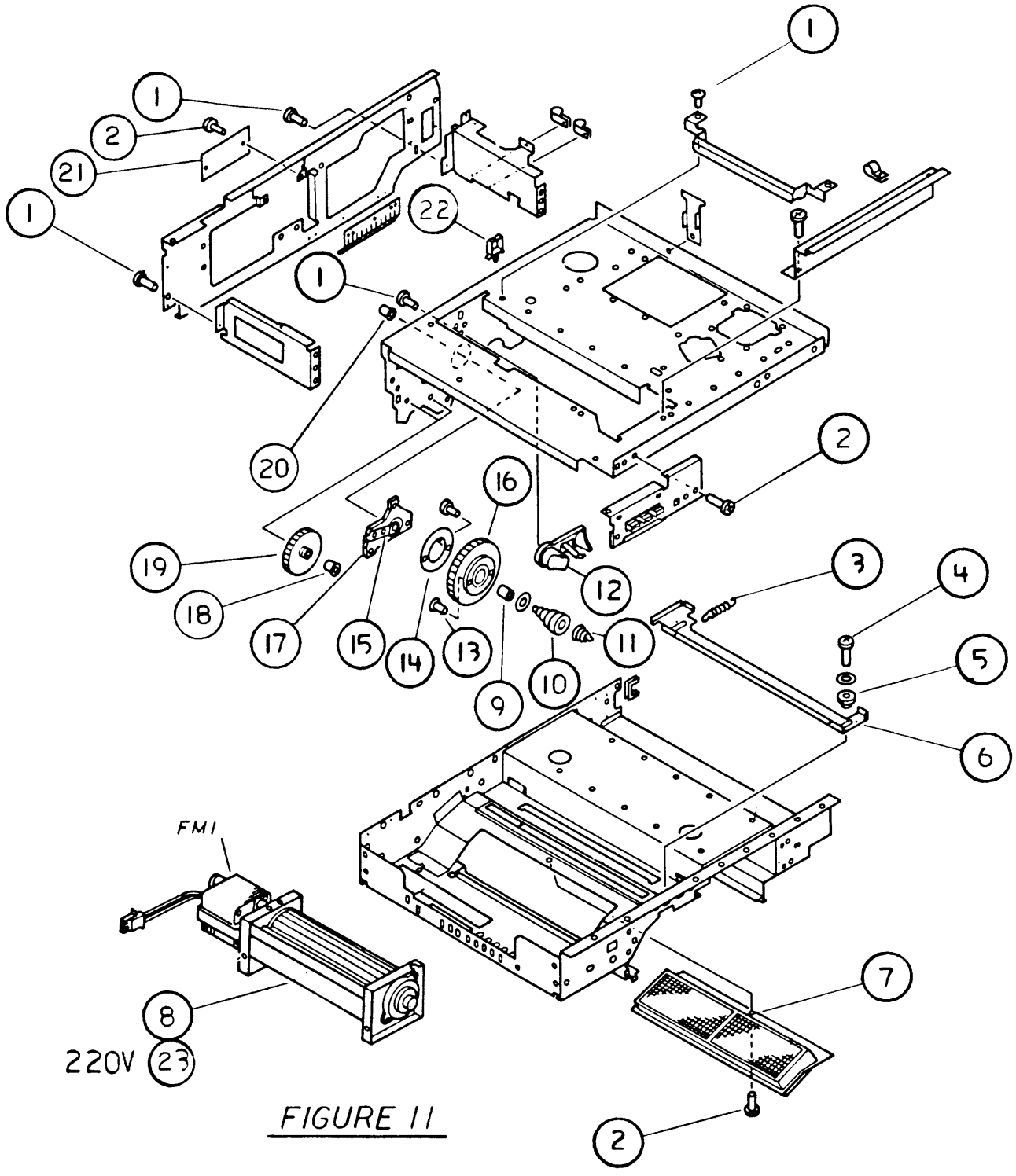


FIGURE 11

❑ LASERWRITER – UPPER MAIN BODY (1 of 2) (Figure 11)

Item	Apple p/n	HP p/n	Description
1	076-8133	XB6-7300-609CN	Pan Head Screw, 3 x .5 x 6 mm
2	076-8133	XB1-2300-809CN	Pan Head Screw, 3 x .5 x 8 mm
3	076-8137	RS1-2008-000CN	Shutter Tension Spring
4	076-8139	FA2-5970-000CN	Screw, 3 x .5 x 5 mm Truss Crs Rec Stl Blk
5	970-1056	RA1-0717-000CN	Shutter Bushing
6	970-1147	RA1-0716-000CN	Laser Shielding Shutter
7	970-1001	FA2-5664-020CN	Ozone Filter
8	720-0502	RH7-1006-000CN	Fan, 110V, 60 Hz
9	970-1108	XB7-2100-609CN	Hex Nut, 6 mm, Blk Stl Znc
10	970-1095	RA1-0972-000CN	Drum Holder
11	076-8137	FS1-2670-000CN	Grounding Spring, Drive Gear
12	970-1058	RF1-0138-000CN	Cartridge Shutter Cam
13	076-8136	FA2-5690-000CN	Drum Drive Pin
14	076-8137	FA2-5691-000CN	Drum Locator Drive Pin Spring
15	970-1170	RA1-0720-000CN	Grounding Terminal
16	970-1089	RS1-0011-000CN	Gear, 60 Tooth
17	970-1271	RA1-0721-000CN	Drum Drive Insulator Disc
18	970-1310	FA2-5706-000CN	Bushing, Cassette Drive
19	076-8138	FS1-0729-020CN	Cassette Drive Idler Gear, 38T
20	970-1309	RA1-0722-000CN	Bushing, Cover Mounting
21	970-1035	RG1-0287-000CN	Varistor PCB
22	970-1065	WT2-0133-000CN	Cable Clip, 3NS
23	970-1074	RH7-1007-000CN	Fan, 220V, 50 Hz

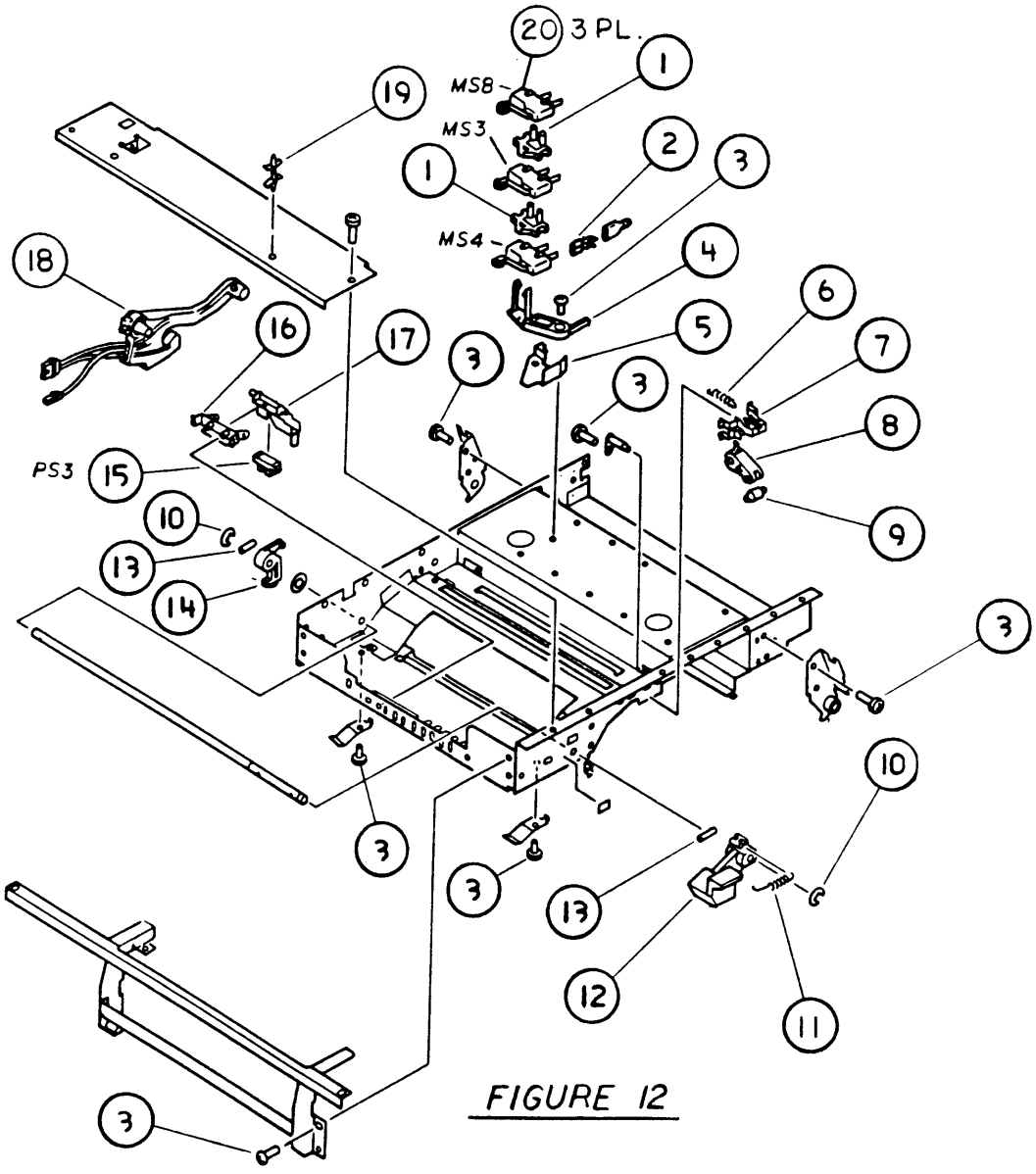

20 3 PL.
1
MS8
MS3
1
2
3
MS4
4
18
19
16
17
3
5
6
7
3
8
PS3
15
9
10
13
14
3
3
10
3
13
12
11
3

FIGURE 12

❑ LASERWRITER – UPPER MAIN BODY (2 of 2) (Figure 12)

Item	Apple p/n	HP p/n	Description
1	970-1151	RA1-0739-000CN	Microswitch Spacer
2	970-1148	X62-5370-000CN	Faston Socket, 115V, 20-24 AWG
3	076-8133	XB1-2300-809CN	Screw, 3 x .5 x 8mm, Pn Crs Rec Stl Znc
4	970-1002	RA1-0738-000CN	Motor Switch Mounting Bracket
5	970-1125	RA1-0718-000CN	Microswitch Mounting Plate
6	076-8137	FS1-2671-000CN	Tension Spring
7	970-1105	FA2-5693-000CN	Cartridge Latch Roller Mount
8	970-1042	FA2-5694-000CN	Cartridge Latch Roller Arm
9	970-1135	FA2-5695-000CN	Cartridge Latch Roller
10	076-8135	XD2-1100-502CN	E Ring, 5.0 mm, Stainless Steel
11	076-8137	FS1-2677-000CN	Release Lever Tension Spring
12	970-1003	- - -	Release Lever
13	076-8136	XD3-2200-122CN	Roll Pin, 1.2 x 2.0 mm, Stainless Steel
14	970-1129	FA2-5678-000CN	Upper Unit Rear Latch
15	970-1118	FH7-7023-000CN	Paper Delivery Photosensor
16	970-1106	FA2-5697-000CN	Paper Delivery Sensor Mount
17	970-1096	FA2-5696-000CN	Paper Delivery Photosensor Holder
18	970-1067	RH2-9001-000CN	High Voltage Connector
19	970-1165	VT2-0001-004CN	PCB Nylon Standoff
20	705-0108	WC4-0084-000CN	Toner/Paper Cassette Microswitch

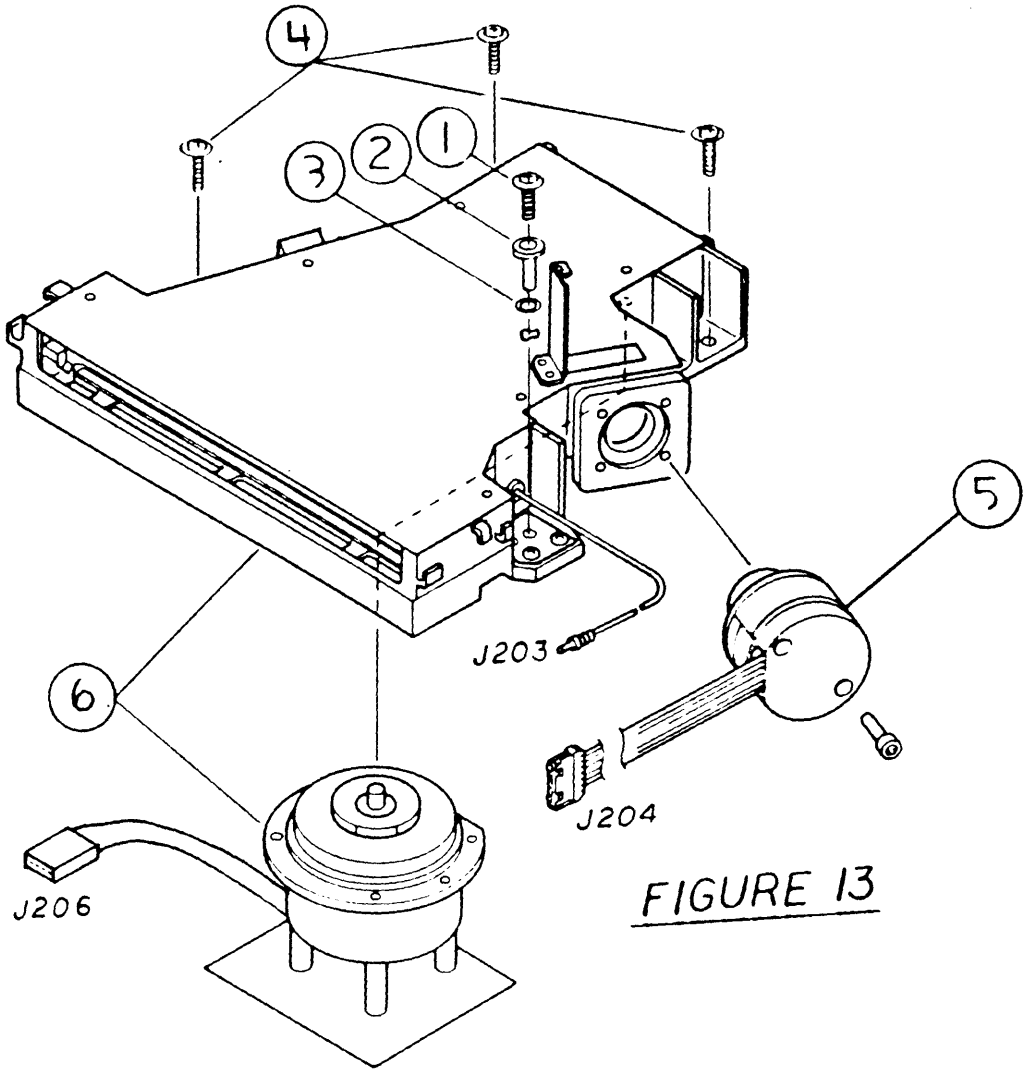


FIGURE 13

❑ LASERWRITER – LASER/SCANNER UNIT (Figure 13)

Item	Apple p/n	HP p/n	Description
1	467-5300	– – –	Screw, M 4 x .7 x 16, Pn Crs Rec Steel Black
2	955-0001	– – –	Shoulder Standoff, M 12.6 x 3.95 x 13 Steel
3	860-0243	– – –	Washer, 6.1 x 12, Brass
4	467-5301	– – –	Screw, M 4 x .7 x 12, Pn Crs Rec Steel Black
5	661-0277	RS0-0009-000CN	Laser Unit, Service Stock
6	661-0278	– – –	Scanner Unit, 300DPI, Service Stock

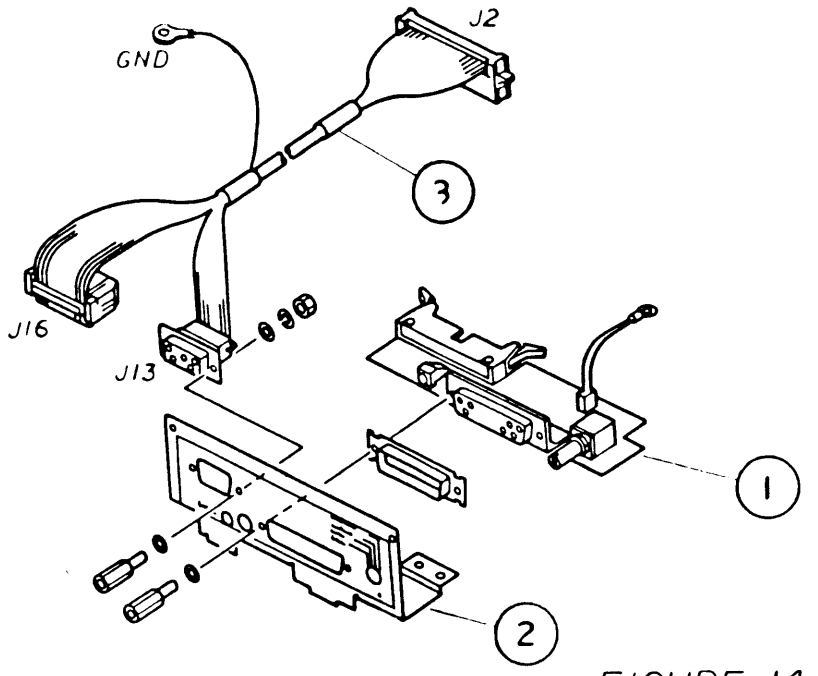


FIGURE 14

❑ LASERWRITER – MOUNTING CONNECTOR PLATE (Figure 14)

Item	Apple p/n	HP p/n			Description
1	970-1194	-	-	-	I/O Assembly Connector
2	970-1312	-	-	-	Mounting Connector Plate
3	970-1193	-	-	-	I/O Cable

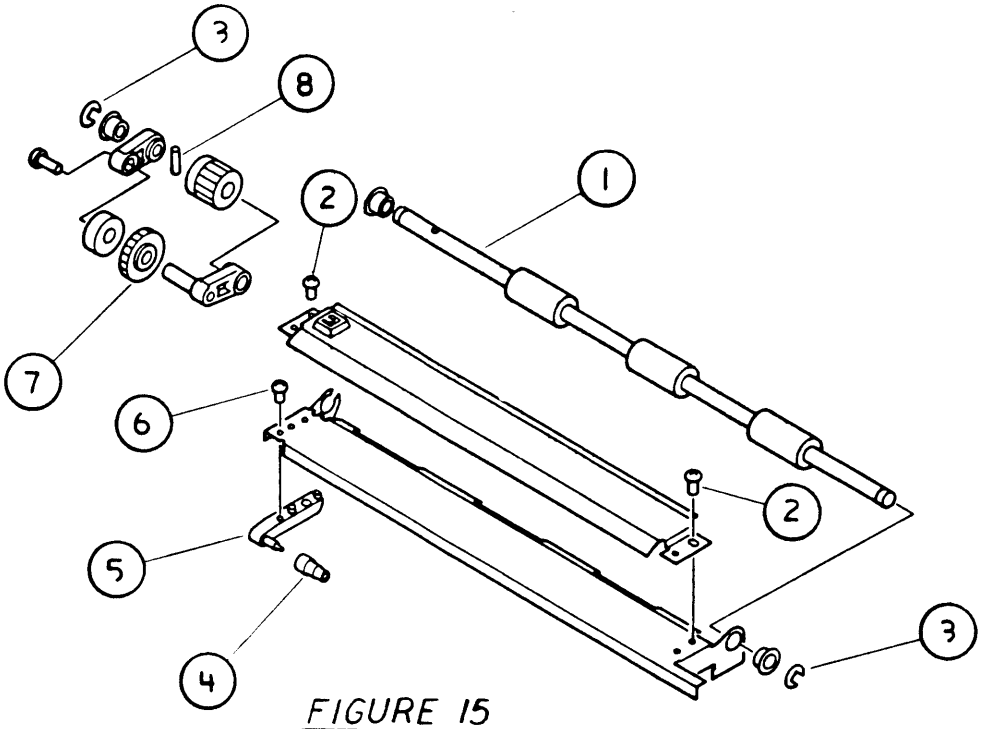


FIGURE 15

❑ LASERWRITER – TRANSFER GUIDE ASSEMBLY (Figure 15)

Item	Apple p/n	HP p/n	Description
–	970-1149	– – –	Transfer Guide Assembly
1	970-1017	RA1-0968-000CN	Transfer Assembly Feed Roller
2	076-8133	XB1-2300-809CN	Screw, 3 x .5 x 8 mm, Pn Crs Rec Steel Zinc
3	076-8135	XD2-1100-502CN	E Ring, 5.0 mm, Stainless Steel
4	970-1139	FA2-5886-000CN	Roller, Transfer Guide
5	970-1107	FA2-5885-000CN	Transfer Guide Stud Mount
6	076-8133	XB1-2300-809CN	Screw, 3 x .5 x 8 mm, Pn Crs Rec Stl Znc
7	076-8138	FS1-0708-000CN	Manual Feed/Transfer Gear, 20T
8	076-8136	X03-2200-122CN	Roll Pin, 1.2 x 2.0 mm, Stainless Steel

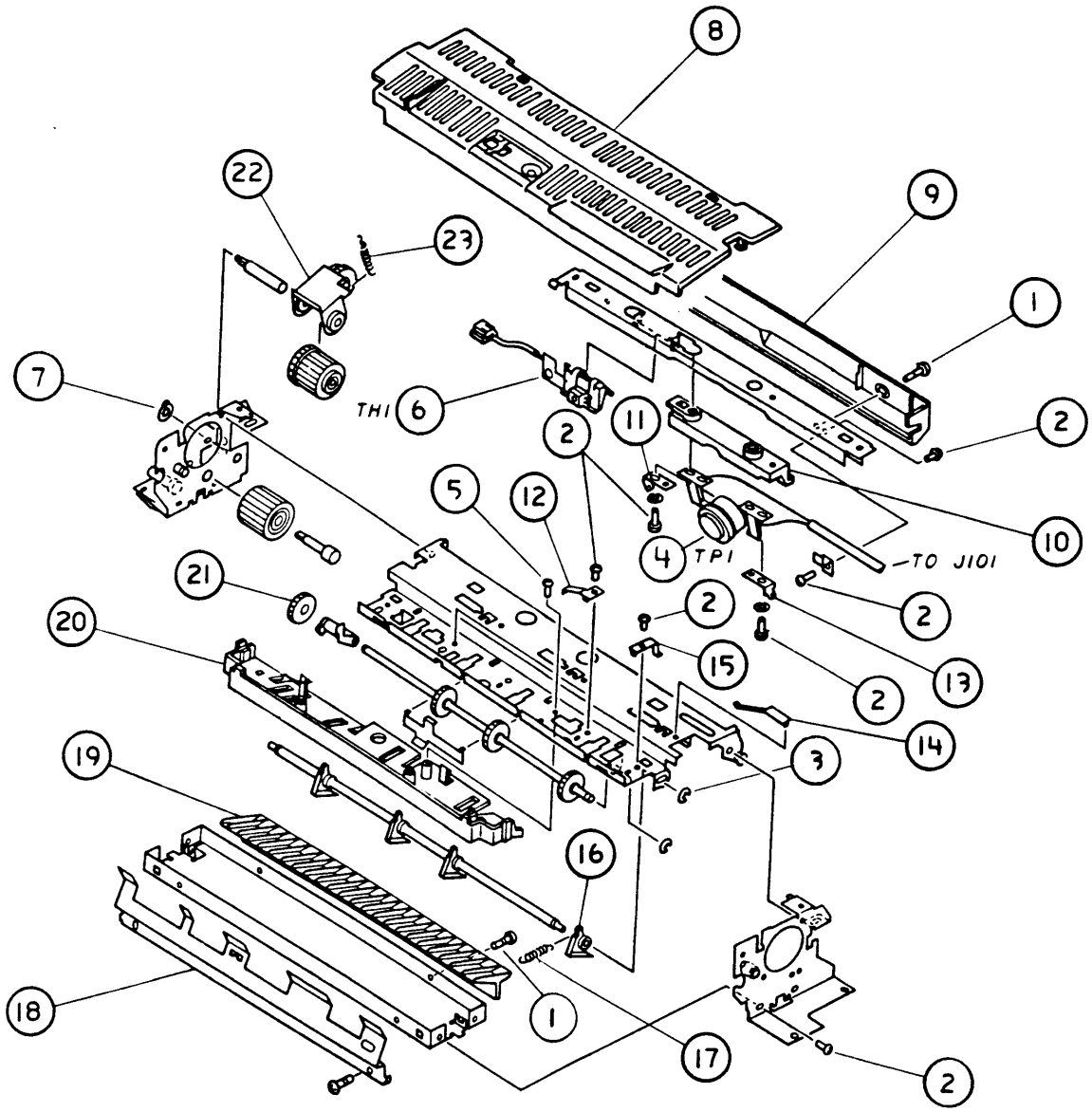

8
22
23
9
1
7
THI
6
2
11
2
5
12
4
TPI
10
—TO J101
21
2
2
20
15
13
2
14
19
3
16
18
1
17
2

FIGURE 16

❑ LASERWRITER – FUSER ASSEMBLY (1 of 2) (Figure 16)

Item	Apple p/n	HP p/n	Description
–	661-0450	RG1-0197-000CN	Fuser Assembly, 115V
–	699-0318	RG1-0198-000	Fuser Assembly, 220V
1	076-8139	FA2-5970-000CN	Screw, 3 x .5 x 5 mm, Truss Crs Rec Stl
2	076-8133	XB1-2300-609CN	Screw 3 x .5 x 6 mm, Pn Crs Rec Stl Znc
3	076-8135	XD2-1100-402CN	E Ring, 4.0 mm, Stainless Steel
4	720-0003	FH7-7041-000CN	Fuser Thermal Protector Sensor
5	076-8133	XB3-2300-809CN	Screw, 3 x .5 x 8 mm, Truss Crs Rec Stl
6	107-0102	RH7-7002-000CN	Fuser Thermistor
7	076-8135	XD2-2100-402CN	Grip Ring, 4.0 mm, Stainless Steel
8	970-1068	FA2-6261-030CN	Fuser Upper Cover
9	970-1115	FA2-9823-000CN	Upper Fuser Paper Guide
10	970-1049	FA2-9820-000CN	Thermo Mounting Bracket
11	076-8168	FA2-9818-000CN	LH Thermo Spade Terminal
12	076-8168	FA2-5959-000CN	Fuser Leaf Spring
13	076-8168	FA2-9819-000CN	RH Thermo Spade Terminal
14	076-8168	FA2-5963-000CN	Fuser Leaf Spring
15	076-8168	FA2-5962-000CN	Fuser Leaf Spring
16	970-1024	FA2-5938-000CN	Fuser Separation Claw
17	076-8168	FS1-2658-000CN	Separation Claw Spring
18	970-1025	FA2-5947-020CN	Lower Fuser Delivery Guide
19	970-1114	RA1-0695-000CN	Lower Fuser Paper Guide
20	970-1091	FA2-5946-000CN	Upper Fuser Delivery Guide
21	076-8167	FA2-5957-000CN	Fuser Exit Roller
22	076-8167	FF1-3532-030CN	Fuser Driver Gear Assembly
23	076-8168	FS1-2676-000CN	Fuser Tension Spring

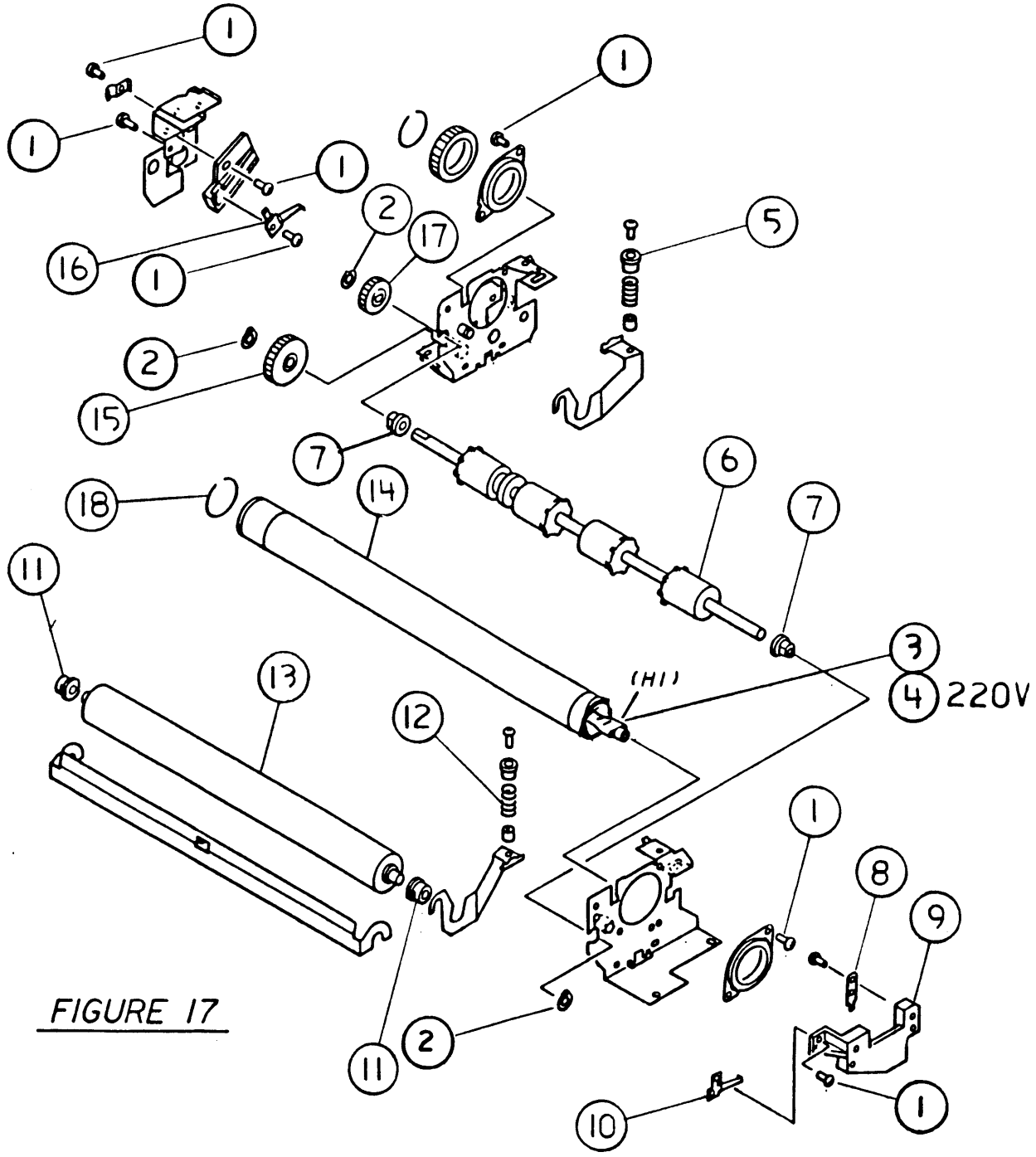


FIGURE 17

❑ LASERWRITER – FUSER ASSEMBLY (2 of 2) (Figure 17)

Item	Apple p/n	HP p/n	Description
1	076-8133	XB1-2300-609CN	Screw, 3 x .5 x 6 mm Pn Crs Rec Stl Znc
2	076-8135	XD2-2100-602CN	Grip Ring, 6.0 mm, Stainless Steel
3	970-1027	RH7-4007-000CN	Fuser Heater, 115V, 500 W
4	970-1094	RH7-4009-000CN	Fuser Heater, 220V, 570 W
5	970-1052	FA2-5955-000CN	Fuser Bushing
6	970-1136	FA2-5939-000CN	Rubber Delivery Roller
7	970-1051	FS1-1205-000CN	Delivery/Transfer Bushing
8	076-8168	FA2-5966-020CN	Fuser Lamp Lug Terminal
9	970-1047	FA2-5964-000CN	RH Fuser Bracket
10	076-8168	FA2-9824-000CN	RH Fuser Leaf Spring
11	970-1050	FS1-1204-000CN	Bronze Fuser Roller Bushing
12	076-8168	FS1-2657-000CN	Fuser Compression Spring
13	970-1023	RA1-0696-000CN	Lower Fuser Roller
14	970-1022	RA1-0697-000CN	Upper Fuser Roller
15	076-8167	FS1-0716-000CN	Delivery Gear, 26T
16	076-8168	FA2-5968-000CN	Fuser Lamp Lug Terminal
17	076-8167	FS1-0717-000CN	Fuser Idler Gear, 19T
18	958-0005	FA2-5971-020	Ring, Snap, Fuser

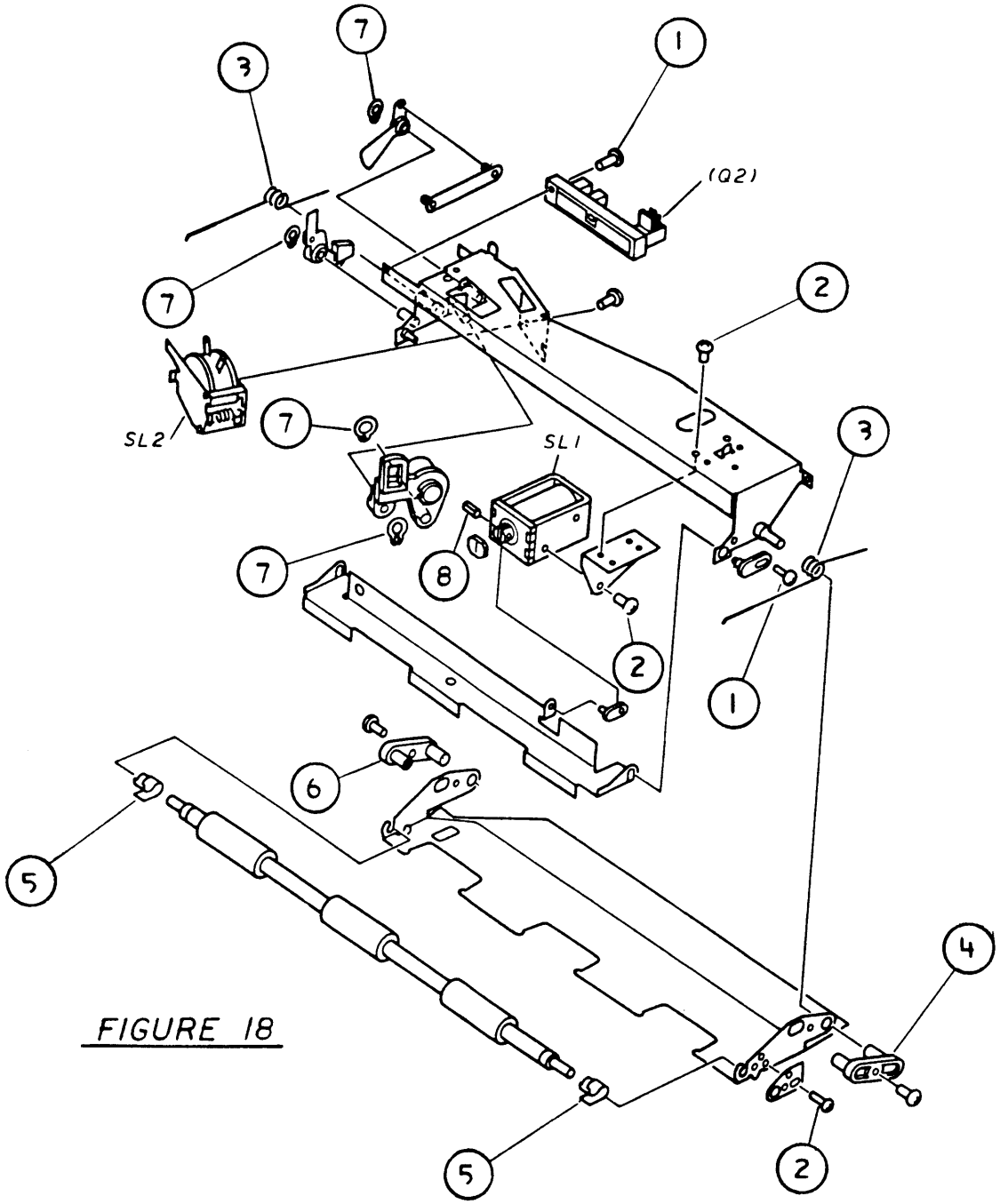


FIGURE 18

❑ LASERWRITER – REGISTRATION SHUTTER ASSEMBLY (Figure 18)

Item	Apple p/n	HP p/n	Description
–	699-0323	– – –	Registration Shutter Assembly
1	076-8133	XB1-2300-309CN	Screw, 3 x .5 x 8 mm, Pn Crs Rec Stl Znc
2	076-8139	XB1-2300-409CN	Screw, 3 x .5 x 4 mm, Truss Crs Rec Stl
3	076-8137	FS1-2659-000CN	Shutter Loading Spring
4	076-8136	RA1-1016-000CN	Registration Shutter Guide Pin, R.H.
5	076-8137	FA2-5867-020CN	Registration Roller Spring
6	076-8136	FA2-5858-020CN	Registration Shutter Guide Pin, L.H.
7	076-8135	XD2-2100-402CN	Grip Ring, 4.0 mm, Stainless Steel
8	076-8136	XD3-1300-802CN	Roll Pin, 8.0 x 3.0 mm, Stainless Steel

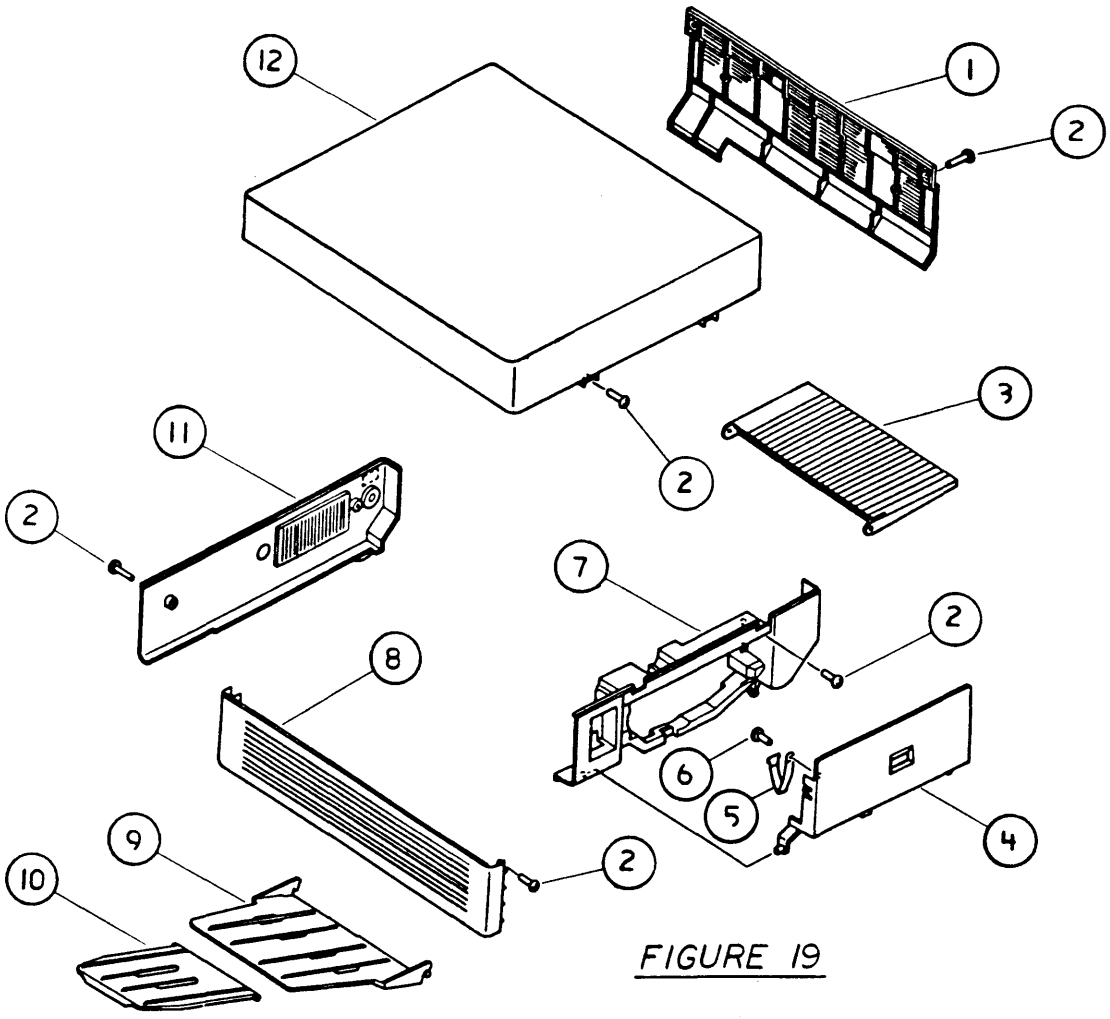
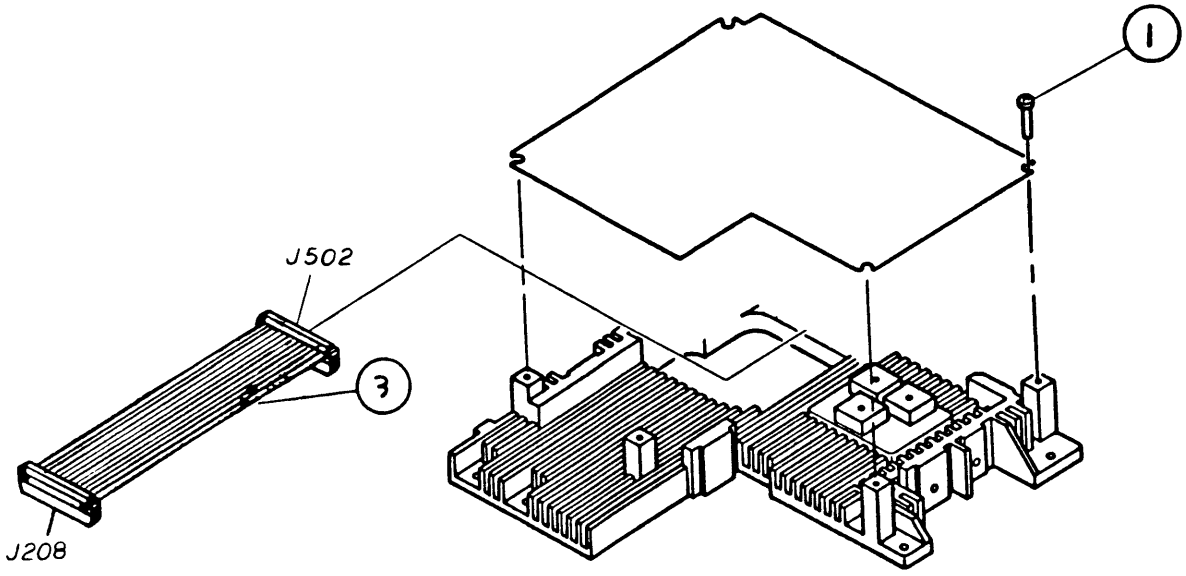


FIGURE 19

❑ LASERWRITER – EXTERNAL COVERS, PANELS, ETC. (Figure 19)

Item	Apple p/n	HP p/n	Description
1	970-1112	– – –	Right Panel
2	076-8133	XB1-2300-609CN	Screw, 3 x .5 x 6 mm, Pn Crs Rec Stl Znc
3	970-1030	– – –	Manual Paper Feed Tray
4	970-1142	– – –	Cassette Door
5	970-1269	FA2-6003-000CN	Cassette Door Strap
6	076-8133	XB1-2300-809CN	Screw, 3 x .5 x 8 mm, Pn Crs Rec Stl Znc
7	970-1113	– – –	Front Panel
8	970-1110	– – –	Left Panel
9	970-1028	– – –	Copy Tray
10	970-1029	– – –	Print Auxiliary Tray
11	970-1111	– – –	Rear Panel
12	810-0608	– – –	Top Cover



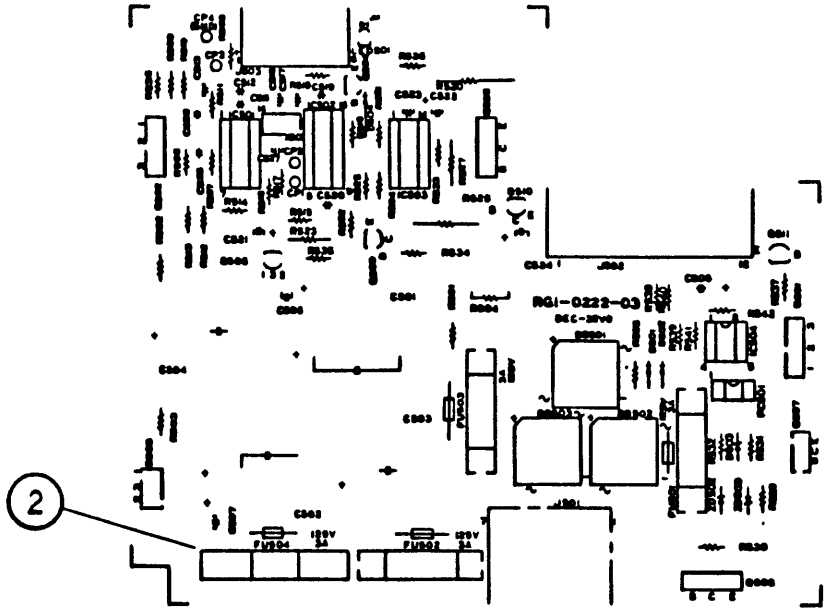


FIGURE 20

❑ LASERWRITER – DC POWER SUPPLY/MOTOR DRIVE PCB (Figure 20)

Item	Apple p/n	HP p/n	Description
–	661-0273	– – –	DC Power Supply/Motor Drive PCB, 110 VAC
–	661-0274	– – –	DC Power Supply/Motor Drive PCB, 220 VAC
1	076-8133	XB1-2300-809CN	Screw, 3 x .5 x 8 mm, Pn Crs Rec Stl Znc
2	740-0102	– – –	Fuse, 3 Amp, 250V, 3 AG
3	970-1190	– – –	DC Controller Power Cable

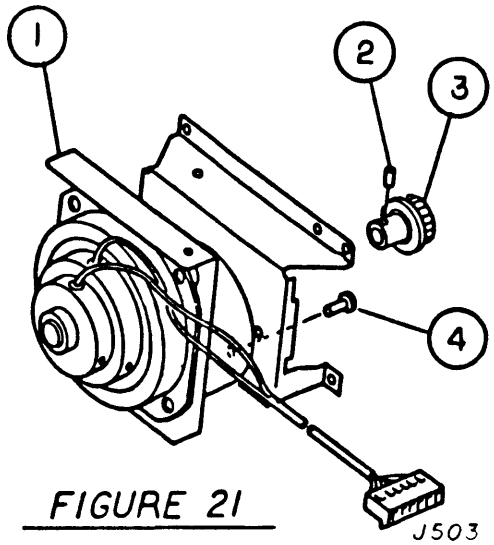


FIGURE 21

❑ LASERWRITER – MAIN MOTOR ASSEMBLY (Figure 21)

Item	Apple p/n	HP p/n	Description
1	970-1009	RG9-0102-000CN	Main Drive Motor
2	076-8139	XB6-2400-508CN	Set Screw, 4 x 5
3	970-1010	RS1-0010-000CN	Main Motor Gear, 24T
4	076-8133	XB1-2400-809CN	Screw, 4 x .7 x 8 mm, Truss Crs Rec Stl

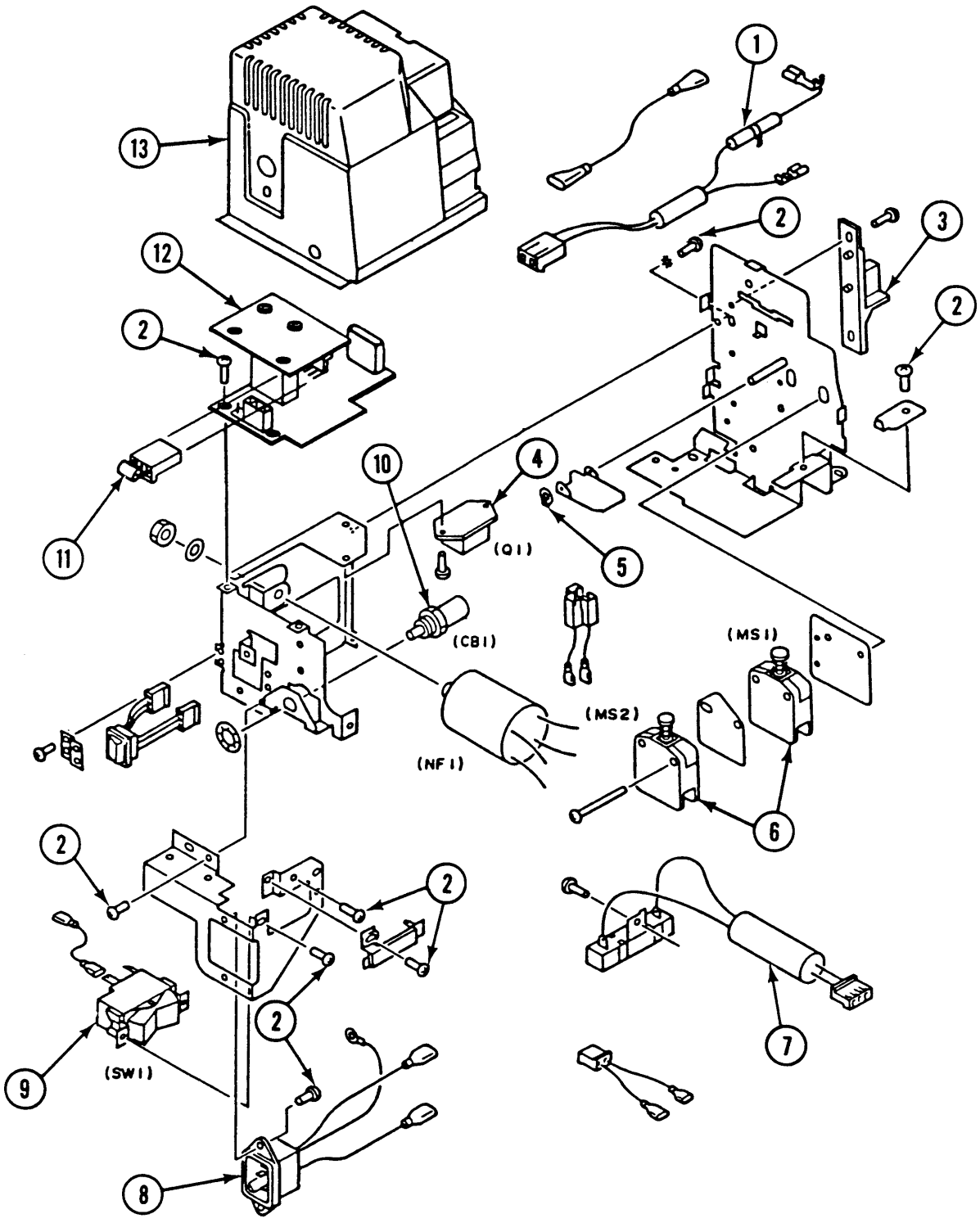


FIGURE 22

❑ LASERWRITER – POWER INTERLOCK ASSEMBLY, 220V (Figure 22)

Item	Apple p/n	HP p/n	Description
–	699-0325	– – –	Power Interlock Assembly, 220V
1	970-1008	– – –	Fixing Assembly Cord
2	076-8133	XB1-2300-809CN	Pan Head Screw, 3 x .5 x 8 mm
3	949-0052	– – –	Cover Interlock Bracket
4	970-1177	– – –	Triac, AC16FIFR (220V)
5	076-8135	XD2-2100-402CN	Grip Ring, 4.0mm, Stainless Steel
6	970-1167	– – –	Microswitch, 220VAC, 15A
7	970-1130	– – –	Resistor Assembly, 10K ohm, 10W Ceramic
8	970-1187	– – –	Power Supply Connector
9	705-0110	RH7-6001-000CN	Rocker Switch, 250VAC, 20A
10	970-1063	WD3-0085-000	Circuit Breaker, 220V, 15A
11	076-8149	– – –	Resistor Assembly, 47 ohm, 5 PK
12	661-0269	RG1-0205-000	AC Driver PCB, 220V
13	970-1143	– – –	Power Interlock Assembly Cover

Note: See Figure 5 for 110V version.

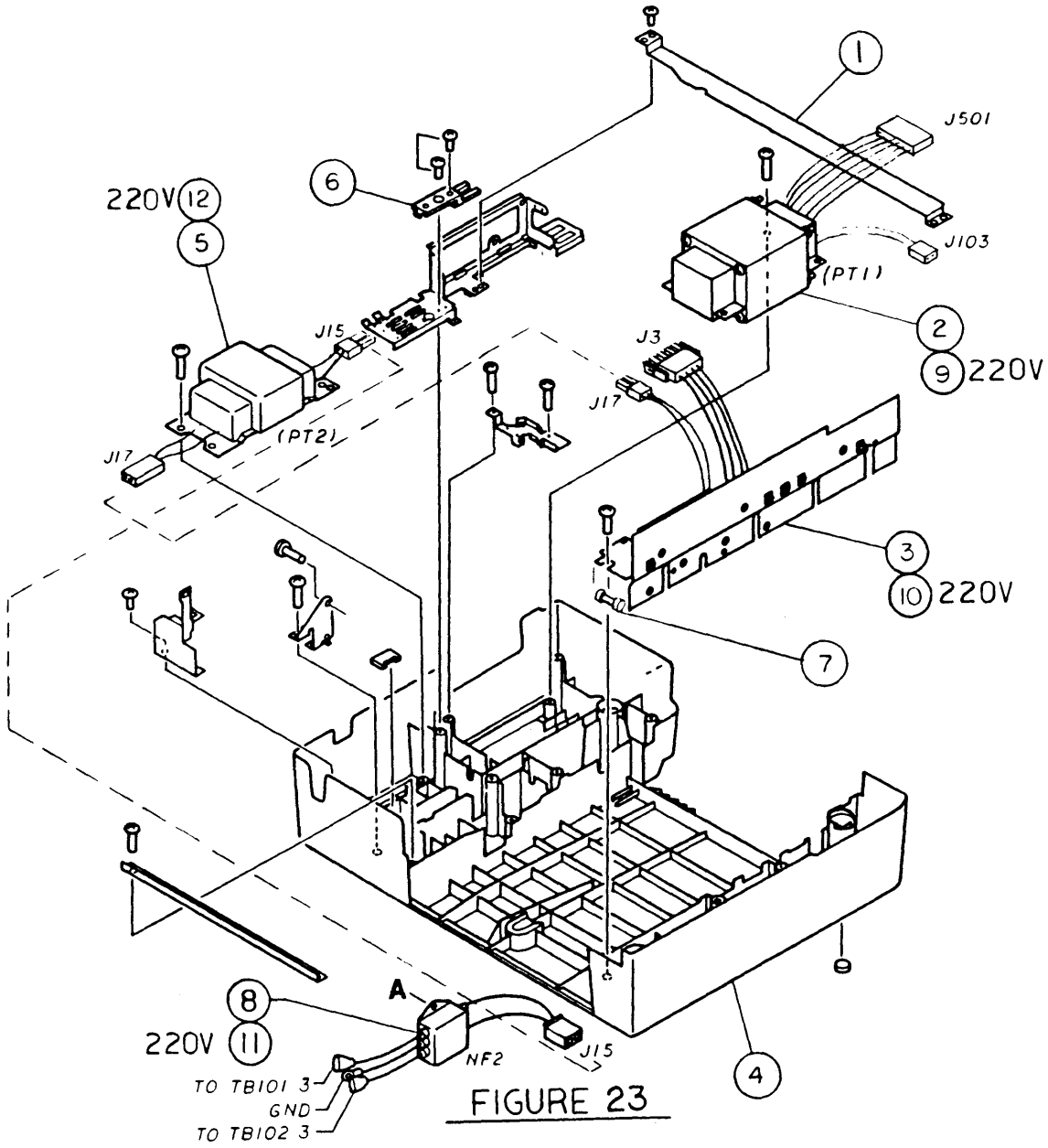

1
J501
J103
(PT1)
2
9 220V
J3
J17
3
10 220V
7
6
220V 12
5
J15
(PT2)
J17
8
220V 11
A
NF2
J15
4
TO TB101 3
GND
TO TB102 3

FIGURE 23

❑ LASERWRITER – PEDESTAL ASSEMBLY (Figure 23)

Item	Apple p/n	HP p/n	Description
1	970-1141		Grounding Plate
2	970-1273	RH3-0011-000CN	Transformer, DC Power Supply, 110V
3	661-0323	– – –	LaserWriter I/O Power Supply, 110V*
4	949-0002	– – –	LaserWriter Bottom Cover
5	157-0050	RH3-0014-000CN	Transformer, I/O PCB, 110V
6	970-1173	RA1-0794-000CN	SG Terminal
7	740-0302	– – –	Fuse, 5A, 125V
8	199-0005	RF1-0190-000CN	Noise Filter, 110/115VAC, 15A
9	970-1276	– – –	Transformer, 220/240V, 50Hz
10	970-1198	– – –	I/F Regulator PCB, 220V
11	970-1075	– – –	Noise Filter, 220VAC, 15A
12	970-1176	– – –	Transformer, 220V, 50Hz

*Formerly called "Interface Regulator"

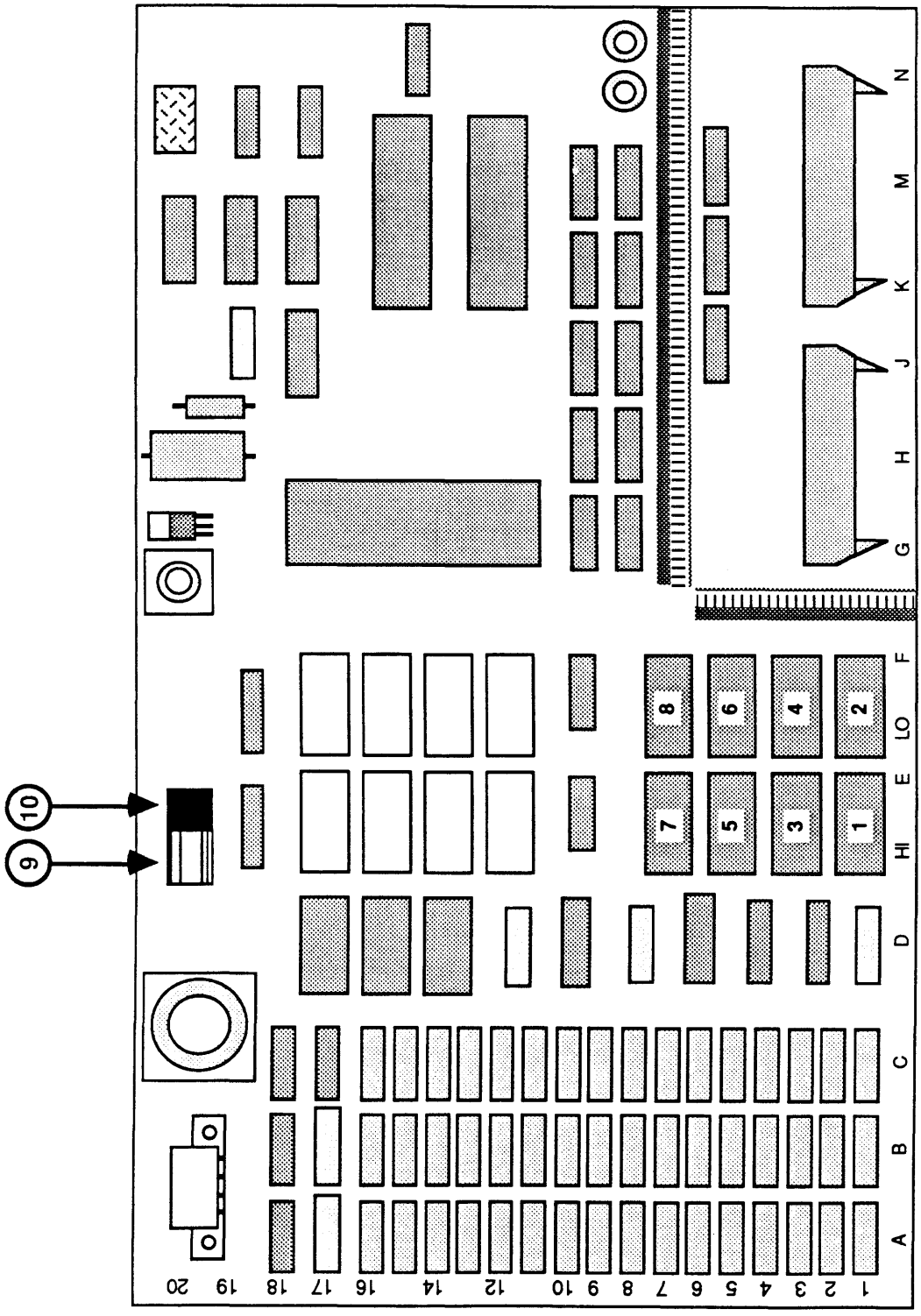


FIGURE 24

❑ LASERWRITER - LASERWRITER I/O BOARD WITH REV 2 ROMS (Figure 24)

Item	Apple p/n	Description
1	342-0082	IC, ROM, LaserWriter Rev 2, H0
2	342-0081	IC, ROM, LaserWriter Rev 2, L0
3	342-0084	IC, ROM, LaserWriter Rev 2, H1
4	342-0083	IC, ROM, LaserWriter Rev 2, L1
5	342-0086	IC, ROM, LaserWriter Rev 2, H2
6	342-0085	IC, ROM, LaserWriter Rev 2, L2
7	342-0088	IC, ROM, LaserWriter Rev 2, H3
8	342-0087	IC, ROM, LaserWriter Rev 2, L3
9	511-1603	IC Socket, 16 Pin
10	750-0102	LaserWriter Configuration Block

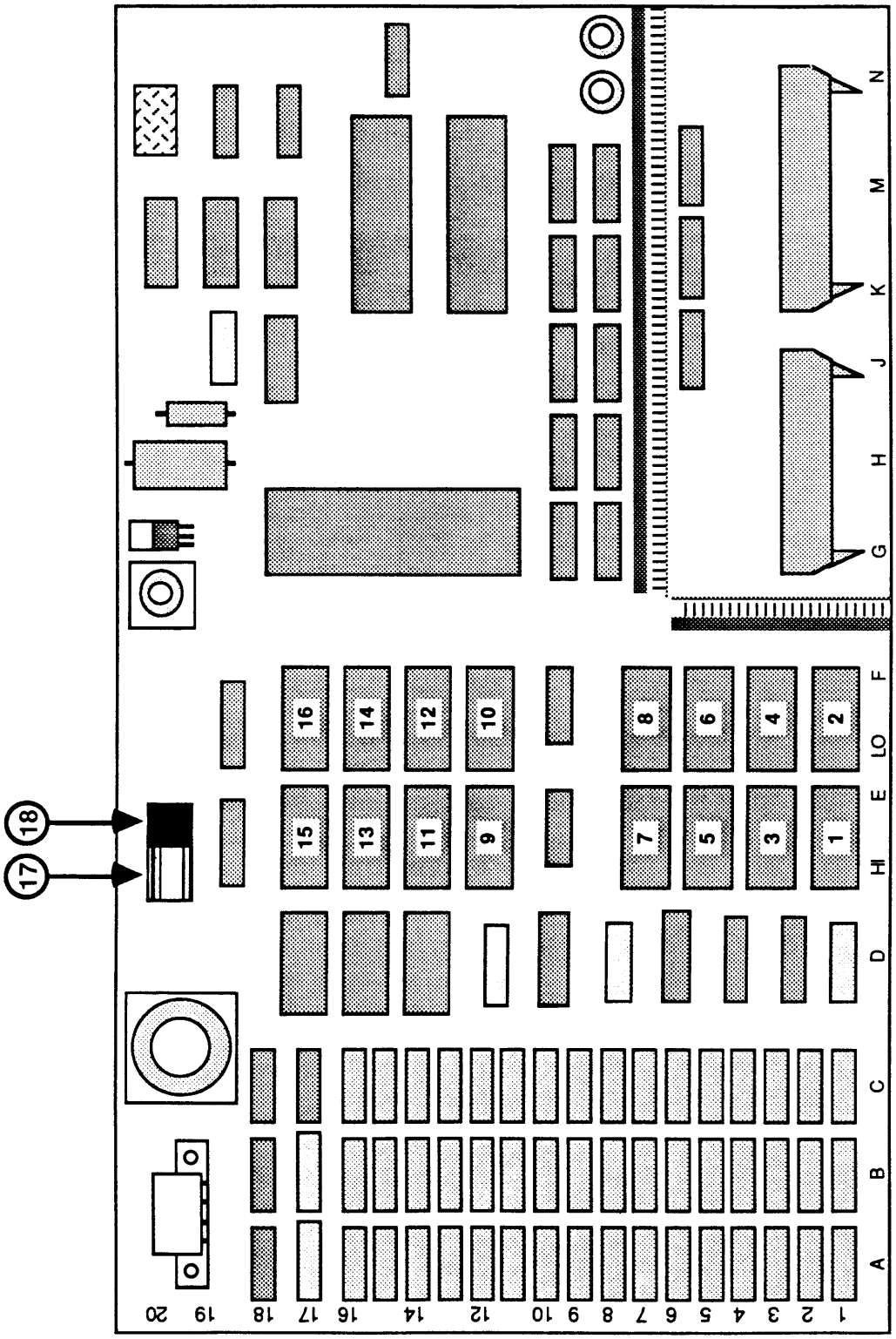

18
17
A
B
C
D
HI
E
LO
F
G
H
J
K
M
N
1 2 3 4 5 6 7 8 9 10 12 14 16 17 18 19 20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

FIGURE 25

❑ LASERWRITER - LASERWRITER PLUS I/O BOARD (Figure 25)

Item	Apple p/n	Description
1	342-0090	IC, ROM, LaserWriter Plus, H0
2	342-0089	IC, ROM, LaserWriter Plus, L0
3	342-0092	IC, ROM, LaserWriter Plus, H1
4	342-0091	IC, ROM, LaserWriter Plus, L1
5	342-0094	IC, ROM, LaserWriter Plus, H2
6	342-0093	IC, ROM, LaserWriter Plus, L2
7	342-0096	IC, ROM, LaserWriter Plus, H3
8	342-0095	IC, ROM, LaserWriter Plus, L3
9	342-0098	IC, ROM, LaserWriter Plus, H4
10	342-0097	IC, ROM, LaserWriter Plus, L4
11	342-0100	IC, ROM, LaserWriter Plus, H5
12	342-0099	IC, ROM, LaserWriter Plus, L5
13	342-0102	IC, ROM, LaserWriter Plus, H6
14	342-0101	IC, ROM, LaserWriter Plus, L6
15	342-0104	IC, ROM, LaserWriter Plus, H7
16	342-0103	IC, ROM, LaserWriter Plus, L7
17	511-1603	IC Socket, 16 Pin
18	750-0102	LaserWriter Configuration Block

Apple Technical Procedures

LaserWriter Printer

Section 7 – Diagnostics

❑ CONTENTS

❑ INTRODUCTION TO APPLECAT LASERWRITER

AppleCAT™ LaserWriter is a diagnostic tool that uses a known-good Macintosh to diagnose module failures in a defective LaserWriter. The two machines are connected through their communication ports. Acting as a test station, the known-good Macintosh performs the following functions:

- Downloads tests to the faulty machine
- Displays test results on the test station screen
- Identifies the failing module
- Prompts the technician for information
- Recommends a repair procedure

With *AppleCAT LaserWriter*, the machine being tested does not have to be fully operational. By using an independent working computer to troubleshoot a faulty LaserWriter, *AppleCAT LaserWriter* is more reliable and thorough than traditional diagnostic methods.

Standard windows guide the technician through each stage of the diagnostic. When the unit under test (UUT) fails a test or indicates a problem, an *AppleCAT LaserWriter* window will ask for more information or recommend a repair.

After each module replacement or adjustment, *AppleCAT LaserWriter* reruns the failed test to verify that the problem has been fixed. If the UUT successfully completes this final test, *AppleCAT LaserWriter* issues a repair confirmation code (RCC).

❑ RUNNING APPLECAT LASERWRITER

Materials Required

LaserWriter or LaserWriter Plus (unit under test or UUT)
Known-good Macintosh Plus, SE, or II (test station)
AppleCAT LaserWriter diagnostic diskette
LaserWriter service adapter cable
DB-9 to DB-25 peripheral cable (for communications)
DB9 serial loopback plug
Mini DIN-8 adaptor cable
Laser power checker
Digital multimeter
Magnetized #2 phillips screwdriver
Allen wrench (2mm)

Note: The DB-9 to DB-25 peripheral cable must be revision "C" or higher in order for communication to be established between the test station and the LaserWriter. The revision number is located on the DB-9 end of the cable. It is recommended that this cable be set aside and labeled, "For AppleCAT."

Set Up the Systems

1. Connect the Macintosh test station to a wall socket with an AC power cord.
2. Place the LaserWriter or LaserWriter Plus (UUT) next to the Macintosh test station.
3. Connect the LaserWriter or LaserWriter Plus (UUT) to a wall socket with an AC power cord.

Set Up the LaserWriter (UUT)

1. Power off the LaserWriter if it is powered on.
2. Set the mode selector switch on the I/O panel to AppleTalk.
3. Open the LaserWriter (raise the upper main body by pressing up on the cover release lever).

4. If a mounting connector plate cover (Figure 1, #1) is present on the LaserWriter, remove it. First remove the two right panel screws and lift off the right panel. Then remove the single screw holding the mounting connector plate cover in place.

5. Disconnect P16 from J16 on the mounting connector plate. Connect the LaserWriter service adapter cable (Figure 1, #2) between J16 on the mounting connector plate and P16 on the I/O cable, and close the LaserWriter. **As you close the LaserWriter, hold the cable to one side so that it is not crushed by the main motor assembly!**

CAUTION: *The service adapter cable is easily damaged. When removing it,* ***do not pull on the cable wire!*** *Remove the cable by pulling gently at the cable ends.*

6. Connect the DB-9 loopback plug to the DB-9 port of the LaserWriter (Figure 1, #3).

7. Connect the DB-25 end of the peripheral cable to the DB-25 port of the LaserWriter (Figure 1, #4).

8. Connect the DB-9 end of the peripheral cable to the mini DIN-8 adapter cable, and connect the other end of the mini DIN-8 adapter cable to the Macintosh modem port.

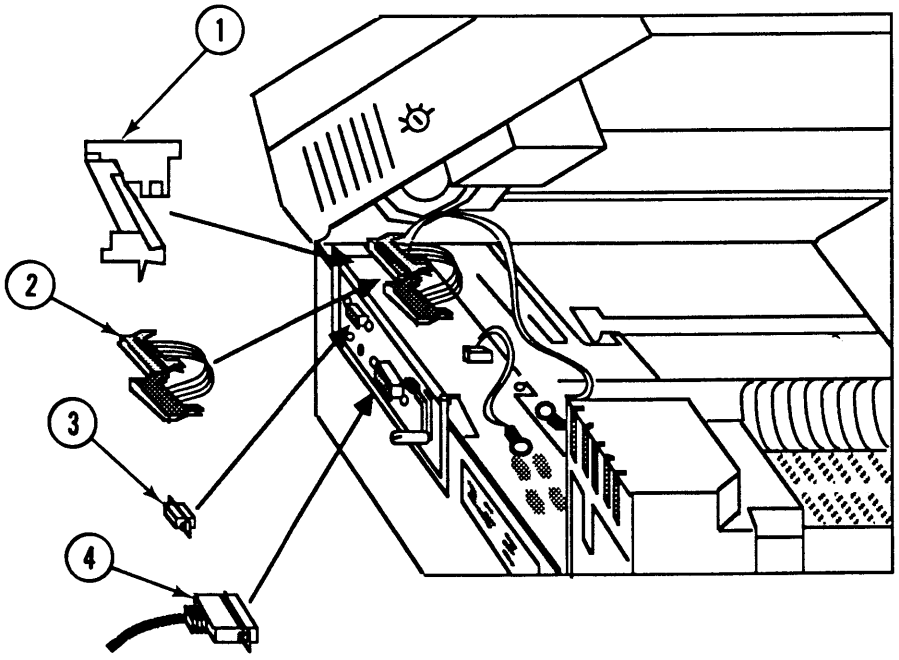


FIGURE 1

Establishing Communication

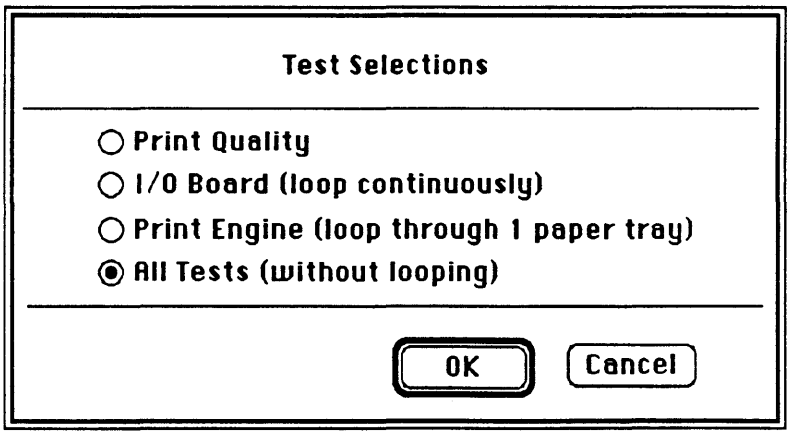
1. Power on the LaserWriter or the LaserWriter Plus (UUT).
2. Insert the *AppleCAT LaserWriter* disk in the Macintosh test station, and power on the test station.
3. Open the diskette icon and then the *AppleCAT LaserWriter* icon.
4. Click **Start** on the test station screen. The status line will tell you when communication has been established.

Using the AppleCAT LaserWriter Menus

The *AppleCAT LaserWriter* menus may be used to select certain features of the diagnostic.

Options Menu

The **Options** menu contains the **Test Selections** submenu. When **Test Selections** is chosen, the following window appears:



Test Selections allows you to select and run a single test. For example, if you are certain that the problem is with the print engine, you may bypass all other tests by selecting only the print engine test. This can be a useful and time-efficient troubleshooting strategy.

To select a test, click in the circle next to the name of the item to be tested. The circle will be highlighted. To deselect the test, make a different test selection. Only one test may be selected at a time. When you have selected the test you wish, click in the **OK** box.

You will be returned to the *AppleCAT LaserWriter* **Start** window.

1. **Print Quality:** This test checks the quality of the printed image produced by the LaserWriter.

2. **I/O Board (loop continuously):** This test exercises the various components and circuitry on the I/O board, and can be used to identify intermittent failures on the I/O board. This test runs continuously, or loops, until either a problem is found or you select **Stop.**

   Note: The I/O Board test loops only when selected as an individual test. As part of the **All Tests** selection, it will run only once.

3. **Print Engine (loop through 1 paper tray):** This test verifies the correct operation of all print engine functions, and can be used to identify intermittent failures of the print engine. In this test, *AppleCAT LaserWriter* communicates with PostScript™ to send function commands to the print engine.

   At the start of this test, you are instructed to fill the paper cassette tray with paper. The print engine test will run continuously until the printer runs out of paper, an error in the print engine is found, or you click **Stop.**

   Note: The Print Engine test will loop only when selected individually. As part of the **All Tests** selection, it will run only once.

4. **All Tests (without looping):** This test is a complete, comprehensive test of all functions, components, and circuitry of the LaserWriter. This test includes the print engine, I/O board, and print quality tests, and performs each test sequence only once (does not loop).

   Note: You must make your test selection before you start *AppleCAT LaserWriter*. If you do not use the **Test Selections** menu, **All Tests** will be the default test.

File Menu

The **File** menu displays the following items. All will be dimmed except **Stop** and **Quit.**

- **Open...** [Command-O]
- **Close** (Dimmed unless a desk accessory is open)
- **Stop** [Command-.]
- **Quit** [Command-Q]

1. **Stop:** Select **Stop** to end the diagnostic and return to the *AppleCAT LaserWriter* Start window.

2. **Quit:** Select **Quit** to exit the program and return to the desktop.

Apple Menu

The Apple (🍎) menu contains **About AppleCAT LaserWriter.** When selected, a dialog box displays the diagnostic name, version number, date of release, serial number, and a copy-protect statement.

Edit Menu

The **Edit** menu contains the following items. All are dimmed except **Back Up**, which is dimmed only when disabled.

- **Undo** [Command-Z]
- ------
- **Cut** [Command-X]
- **Copy** [Command-C]
- **Paste** [Command-V]
- ------
- **Back Up** [Command-B]

Select **Back Up** to back up just one window or as far back as the last electronic test. **Back Up** is always disabled during an electronic test and can only be selected from a manual window.

Running the Tests

After selecting the tests you wish to run using **Test Selections**, you are ready to start *AppleCAT LaserWriter*. Click on the **Start** button in the *AppleCAT LaserWriter* **Start** window. Please note the following:

1. *AppleCAT LaserWriter* will interact with you throughout each stage of the testing. When the UUT fails a test or indicates a problem, *AppleCAT LaserWriter* will prompt you for more information or recommend a repair.

2. *AppleCAT LaserWriter* will ask you for information that it cannot obtain electronically. The screen will display a choice of answers. Select the most appropriate answer in each situation.

3. After selecting a response, click **Done** to continue.

CAUTION: Do not select the* Done *button until you've completed every instruction given on the screen. *Failure to complete the instructions may misdirect the diagnostic.*

4. You may halt the testing by clicking on **Stop** or **Pause** any time during the tests:

   - Choose **Stop** to halt the testing and to return to the *AppleCAT LaserWriter* **Start** window. Choose **Start** when you wish to begin the testing sequence again.

   - Choose **Pause** if you wish to discontinue testing temporarily. Choose **Continue** to resume testing from the point of interruption.

WARNING: *1) Power off the LaserWriter before you make any removals or replacements. 2) Unplug the LaserWriter when you work in the pedestal or the power interlock assembly.*

Repair Confirmation Code

When the UUT passes its final test, *AppleCAT LaserWriter* issues a repair confirmation code (RCC). The RCC is an eight-digit information record that contains the diagnostic name, the diagnostic version number, the replaced module name, and the repair sequence the program followed.

If *AppleCAT LaserWriter* finds no problems, an RCC code is displayed with the message, **All selected tests have passed.**

Use the Wiring Diagram

As you work, refer to the *LaserWriter Technical Procedures* wiring diagram.

Abbreviations

ACV	AC voltage
CB	circuit breaker
DCV	DC voltage
GD	ground
J	jack (part of a connector)
MS	microswitch
NF	noise filter
P	plug (part of a connector)
PT	power transformer
TB	terminal block
UUT	unit under test (LaserWriter)
PCB	printed circuit board

When You Count Pins

Don't count blank pin positions. In Figure 2, for example, the pin in the third position is actually pin 2.

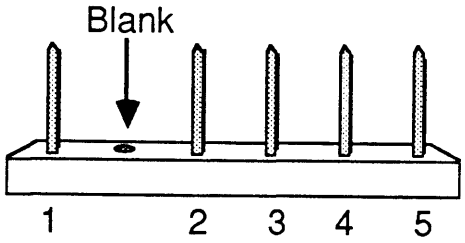


FIGURE 2

Required Measurements

When taking a measurement during a test print, measure while initiating **and** throughout the completion of the test print.

When taking measurements on a disconnected cable, **insert the probes into the wire-entry side of the connector** to contact the copper pin on the inside (Figure 3).

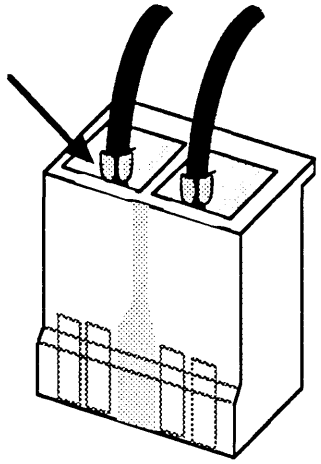


FIGURE 3

Apple Technical Procedures

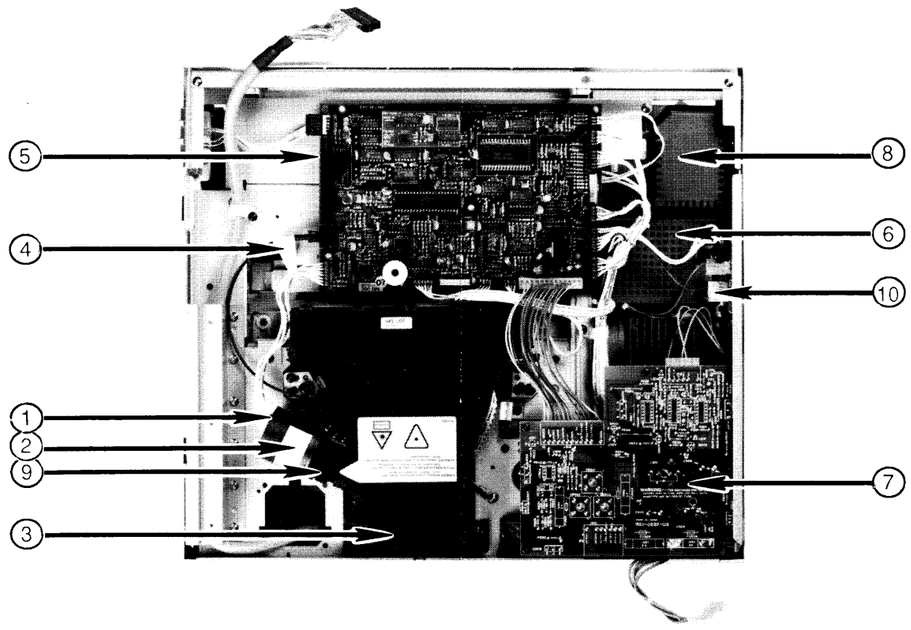
LaserWriter

Section 8 – Appendix

❑ CONTENTS

❑ TOP VIEW OF LASERWRITER WITH I/O BOARD REMOVED – PHOTO #1

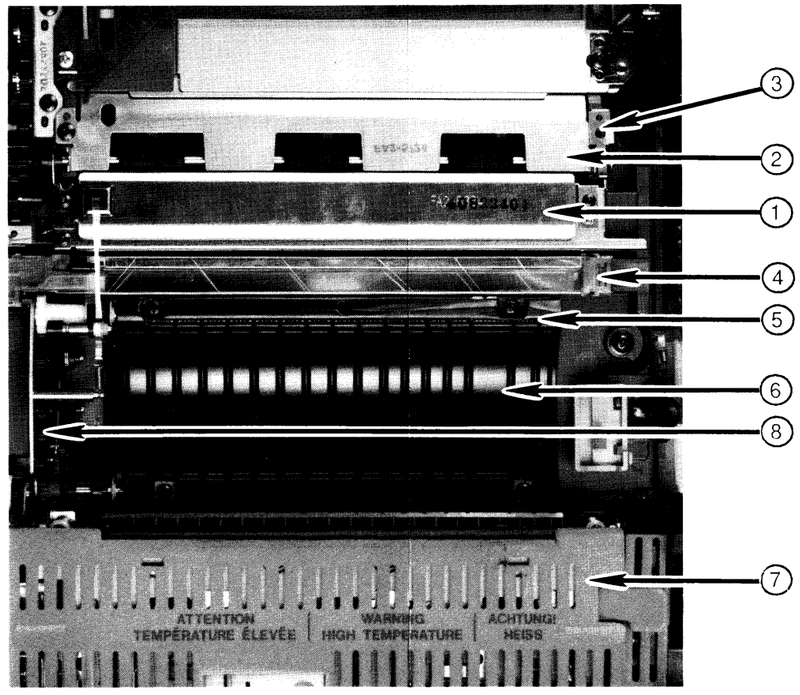
1. Laser Unit
2. Label
3. Scanner Unit
4. Optical Fiber
5. DC Controller PCB
6. High Voltage Power Supply
7. DC Power Supply/Motor Drive
8. Power Interlock Assembly
9. Laser Access Hatch
10. Varistor PCB



Top View of LaserWriter with I/O Board Removed

❑ LOWER MAIN BODY OF PRINTER – PHOTO #2

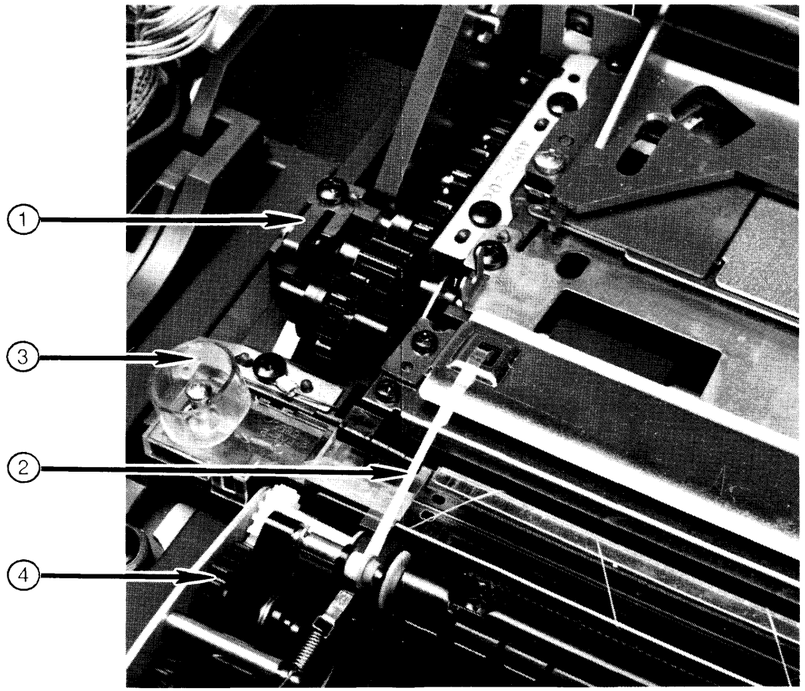
1. Transfer Guide
2. Lower Guide Plate
3. Roller Pressure Spring
4. Transfer Corona Assembly
5. Static Eliminator
6. Feeder Guide
7. Fuser Assembly
8. Separation/Feeder Assembly



Lower Main Body of Printer

❑ LOWER MAIN BODY NEAR SEPARATION BELT – PHOTO #3

1. Bearing Holder
2. Separation Belt
3. Grounding Lug
4. Separation/Feeder Assembly

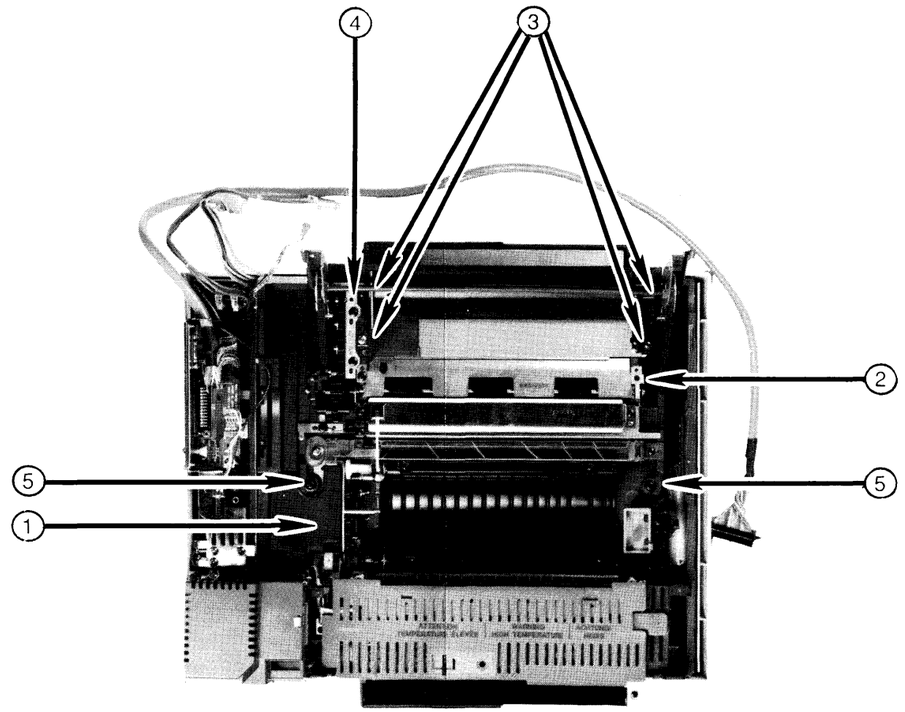


Lower Main Body near Separation Belt

❑ LOWER MAIN BODY – PHOTO #4

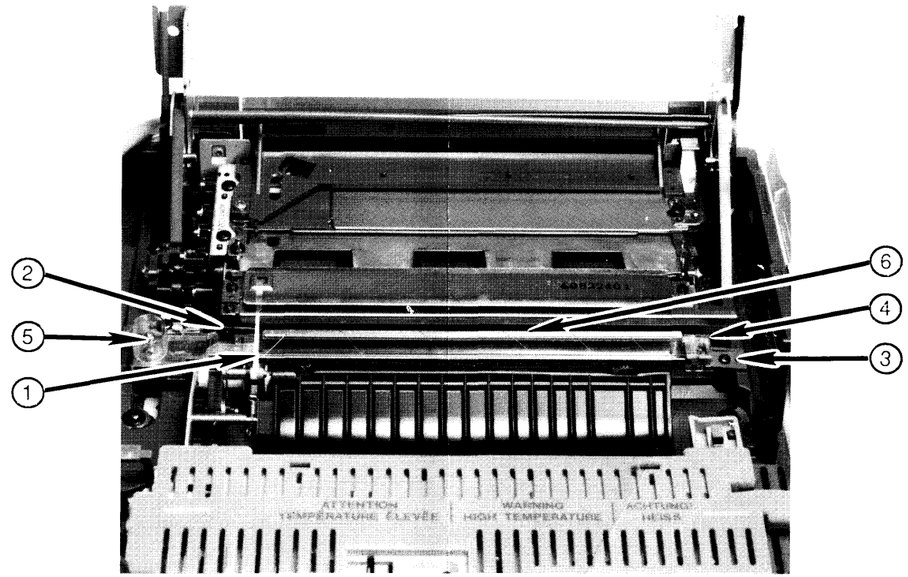
1. Harness Cover
2. Roller Pressure Spring
3. Manual Feed Guide Screws
4. Manual Feed Roller Assembly
5. Main Pedestal Screws

PHOTO #4



Lower Main Body
(Part 1 of 2)

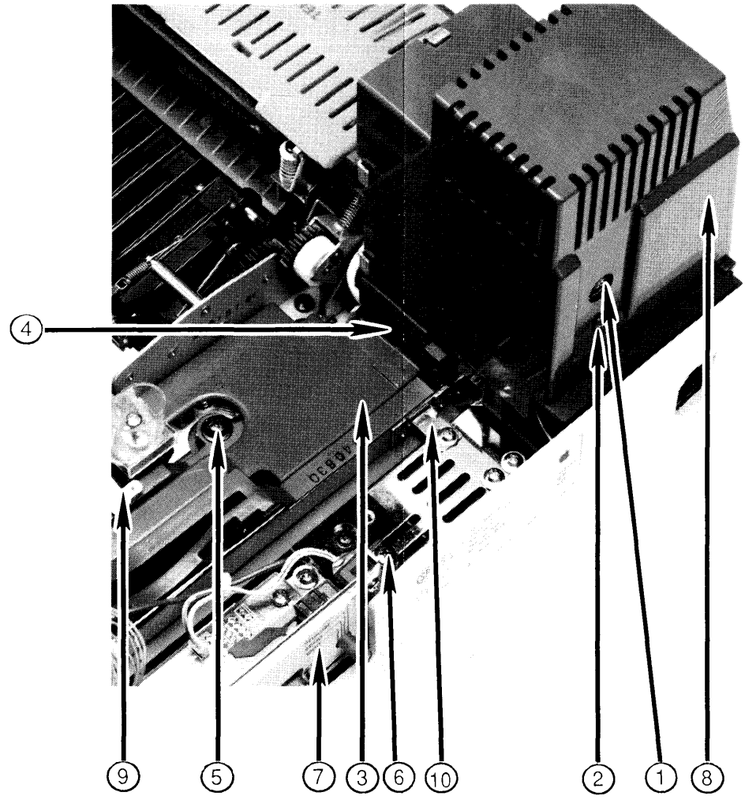
1. Separation Belt
2. Transfer Roller
3. Screw
4. Corona Wire Termination Cover
5. Corona Terminal
6. Corona Wire



Lower Main Body
(Part 2 of 2)

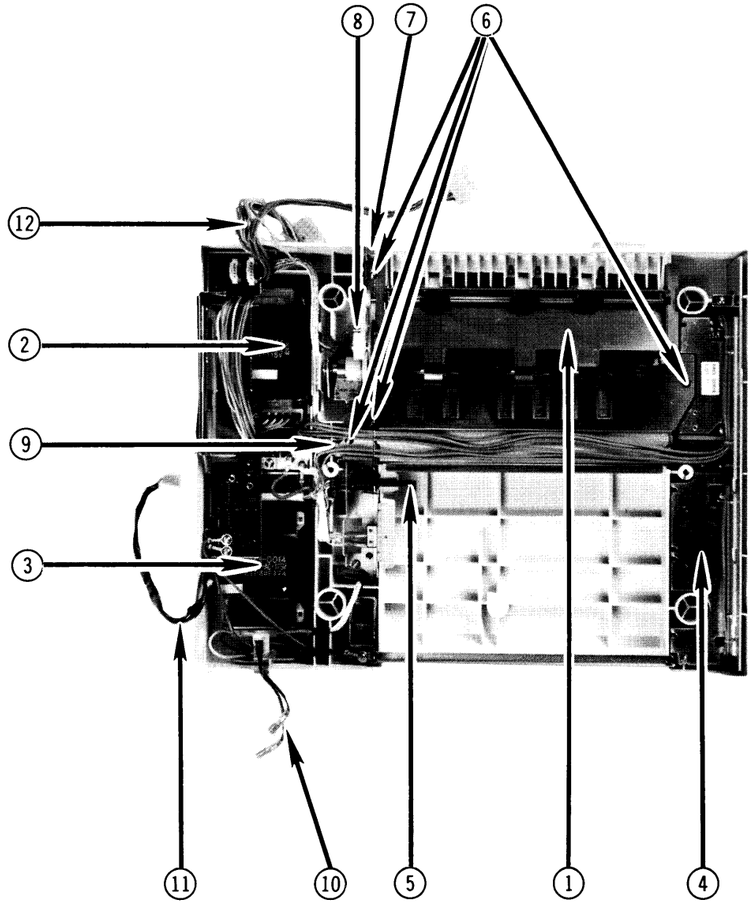
❑ LEFT REAR CORNER OF PRINTER – PHOTO #6

1. Circuit Breaker
2. Screw
3. Harness Cover
4. Plastic Tab
5. Main Pedestal Screw
6. Ground Wire
7. I/O Plate
8. Power Interlock Assembly
9. Ground Lug
10. Metal Tab



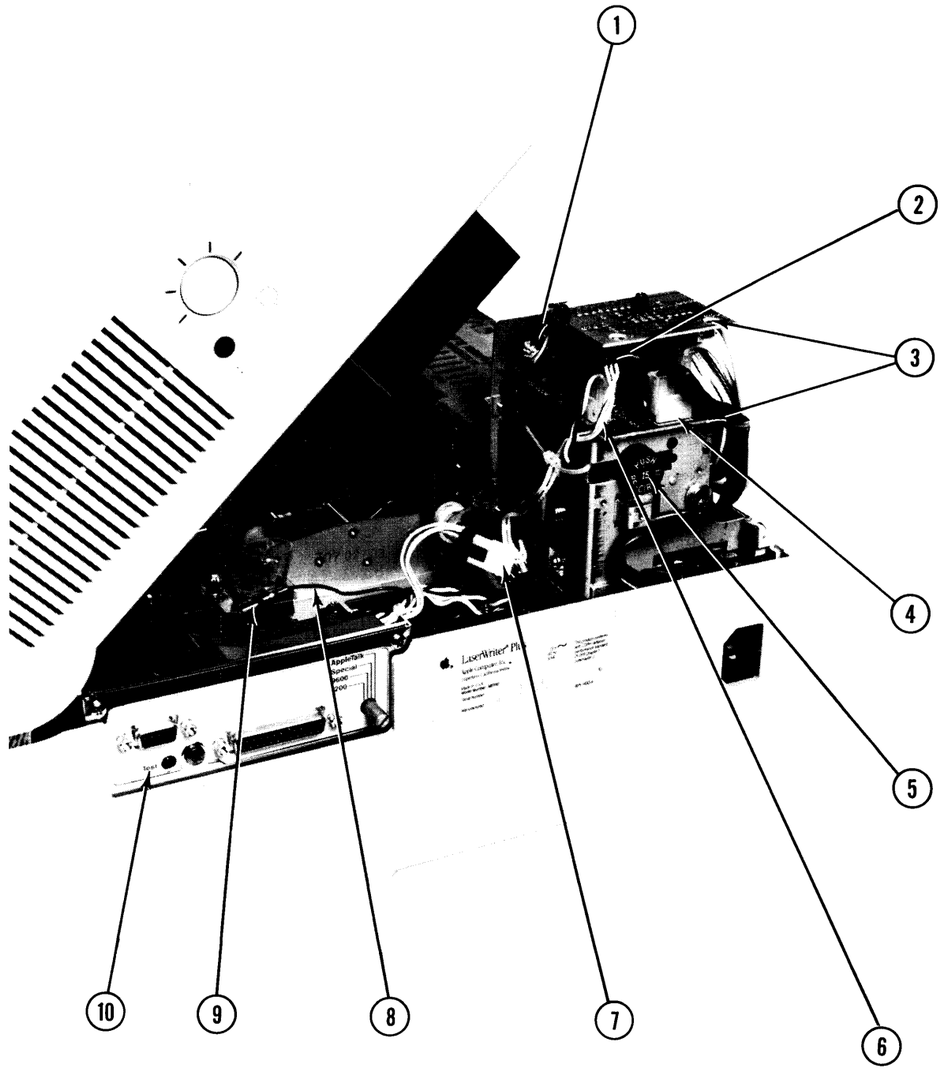
Left Rear Corner of Printer

1. Cassette Pickup Assembly
2. Transformer (PT1)
3. Transformer (PT2)
4. Interface Regulator
5. Paper-out Sensor Assembly: Paper Detection Arm
6. Cassette Pickup Assembly Screws
7. Manual Feed Guide Tab
8. Solenoid
9. Metal Plate
10. Wires to Power Interlock Assembly
11. Wire to J103
12. Wires to DC Power Supply, I/O Board



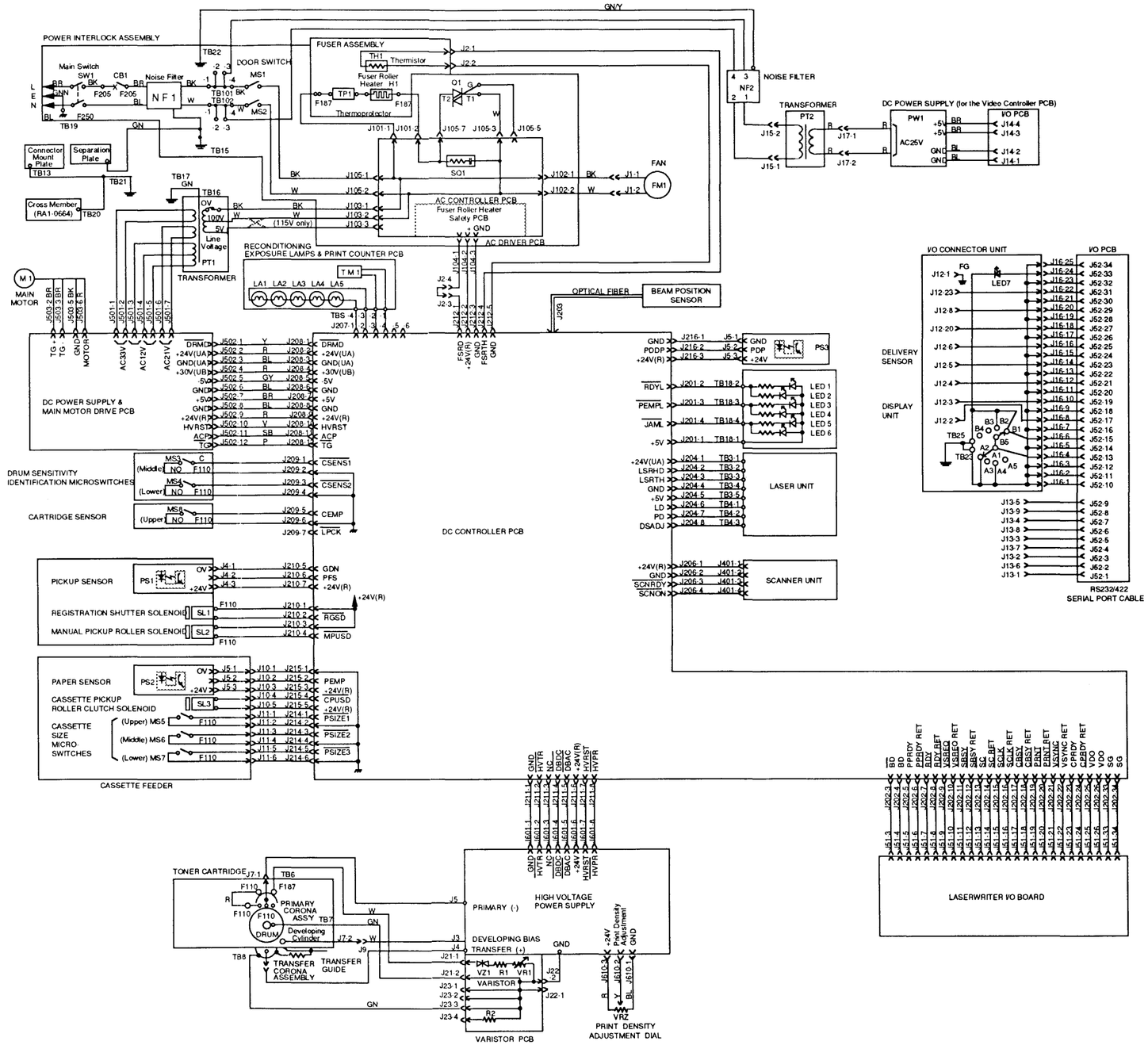
❑ LEFT REAR CORNER OF PRINTER WITH POWER INTERLOCK ASSEMBLY COVER REMOVED – PHOTO #8

1. J106
2. J104
3. AC Driver PCB
4. J103
5. Circuit Breaker
6. J102
7. Fuser Assembly Connector
8. Ground Wire
9. Ground Lug
10. Mounting Connector Plate



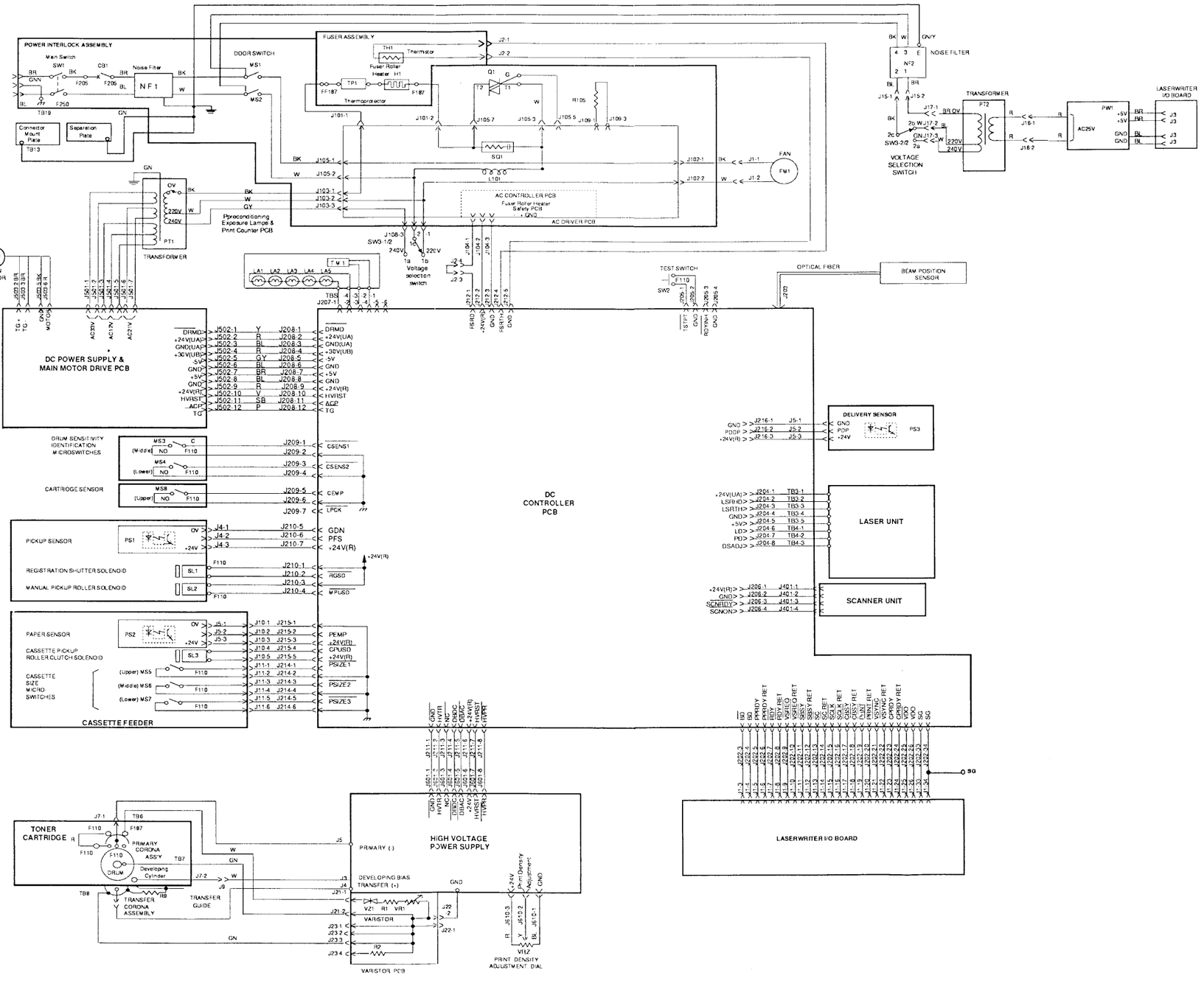
Left Rear Corner of Printer with Power Interlock Assembly Cover Removed

❑ LASERWRITER WIRING DIAGRAM – 110V



Wiring Diagram – 110V

❑ LASERWRITER WIRING DIAGRAM – 220V



Apple Technical Procedures

LaserWriter Plus

Technical Procedures

❑ CONTENTS

Apple Technical Procedures

LaserWriter Plus

Section 1 – LaserWriter Plus Kit

❑ CONTENTS

Note: If a step is underlined, detailed instructions for that step can be found in *LaserWriter Technical Procedures*, Section 2, Take-Apart.

WARNING: *This installation may involve soldering a socket onto a four-layer board. If soldering is necessary and you are not experienced at soldering, do not attempt this procedure. Call your regional Apple Support Center for an Advance Exchange Module.*

❑ INTRODUCTION

Product Description

The LaserWriter Plus Kit adds 35 typeset-quality, built-in fonts to the LaserWriter printer.

Things to Remember

1. The LaserWriter I/O board can have four, eight, or sixteen ROMs. Regardless of how many ROMs are on the original board, you will be removing **all** the original ROMs and installing sixteen 512K Rev. 47 ROMs to make a LaserWriter Plus configuration.

2. LaserWriter and LaserWriter Plus printers can coexist on the same AppleTalk network; **however, all users on the network should upgrade at the same time to the current system software, in particular to the current LaserWriter Driver and Laser Prep file.**

❑ ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

The LaserWriter I/O board is the most expensive single module in the printer, and its components are soldered into place. It is therefore very important to protect the chips on the board from damage.

Electrostatic discharge can be an important factor in causing board failures. Just touching a chip or brushing it with a nylon sleeve can degrade a circuit so that it never again performs to specification. Some microcircuits are sensitive to as little as 500 volts, or about one-sixth as much static electricity as you can feel.

Certain preventive measures must be taken to avoid ESD damage. When you are unwrapping, installing, or replacing any microcircuits, observe the following precautions:

Grounds

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.

Bodies

Don't touch anybody who is working on integrated circuits.

If that person is properly grounded, your "zap" may not cause any damage, but just to be on the safe side, keep your own body charge away from other technicians.

Bags

Use antistatic bags for boards and chips during handling.

Whenever you are about to leave your bench and take a board to a storage place, first put the board in an antistatic bag. Leave all Apple service exchange components in their ESD-safe packaging until needed for use.

Leads

Handle all ICs by the body, not the leads.

Also, do not touch PCB edge connectors, exposed circuitry, or printed circuits. Handle ICs and PCBs by the edges, or use extractors.

Synthetics

Do not wear polyester clothing or bring plastic, vinyl, or styrofoam into the work environment.

The electrostatic field around these nonconductors cannot be removed.

Metals

Never place components on any metal surface.

Use antistatic or conductive mats or foam.

Atmosphere

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 used routinely.

❑ INSTALLATION PROCEDURES

The LaserWriter board has either four, eight, or sixteen ROMs. Regardless of how many ROMs are on the original board, remove **all** of them. You may need to install a configuration block on some older versions of the I/O board.

Before you begin the installation, plug in the LaserWriter to make sure it produces the user test print.

1. **Read the ESD precautions before you begin.**

2. Turn off and unplug the LaserWriter. Then, to be sure you and the LaserWriter are grounded to the same potential, set up your grounded workstation and attach yourself (with a wriststrap) and the LaserWriter (with an alligator clip) to the grounded workbench pad.

3. Remove the top cover of the LaserWriter and the card cage cover. Disconnect the cables attached to the I/O board, and remove the board from the card cage. Place the I/O board on the grounded workbench pad. Orient the board so that the three rows of RAM chips are on your left.

4. Using an IC extractor, **carefully** remove the original ROMs from rows E and F on the I/O board, and place them on the grounded workbench pad. (There may be four, eight, or sixteen original ROMs. Remove them all.)

5. The upgrade kit includes a 16-pin socket. Newer LaserWriter I/O boards with 512K or 1M ROMs already have the socket and configuration block installed. If you have an older board without the socket, you must solder it on the I/O board at position E-20 (see Figure 1, #1). To install the socket, follow the directions below:

   a) Desolder and discard the four jumper wires at the socket location.

   b) Desolder (clear) all 16 holes at the socket location.

   c) Install the socket (on the component side of the board) so that the 16 pins of the socket match the 16 holes on the board. Solder all pins.

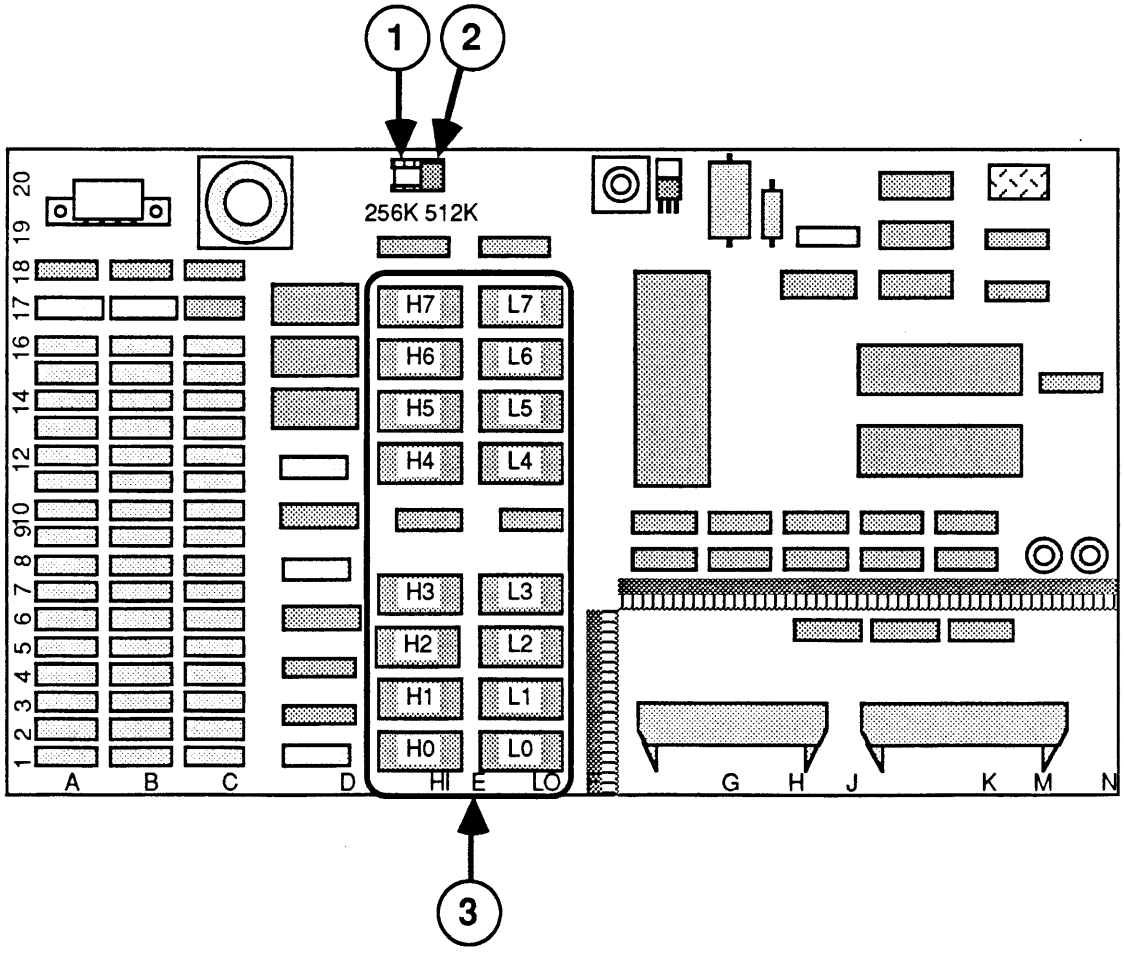


FIGURE 1

6. Install the configuration block:

   If you have the 256K/512K I/O board (Figure 1), install the configuration block into the eight holes of the socket labeled "512K" (Figure 1, #2).

   If you have the 1M I/O board (Figure 2), install the configuration block into the eight holes of the socket labeled "512K" (Figure 2, #2).

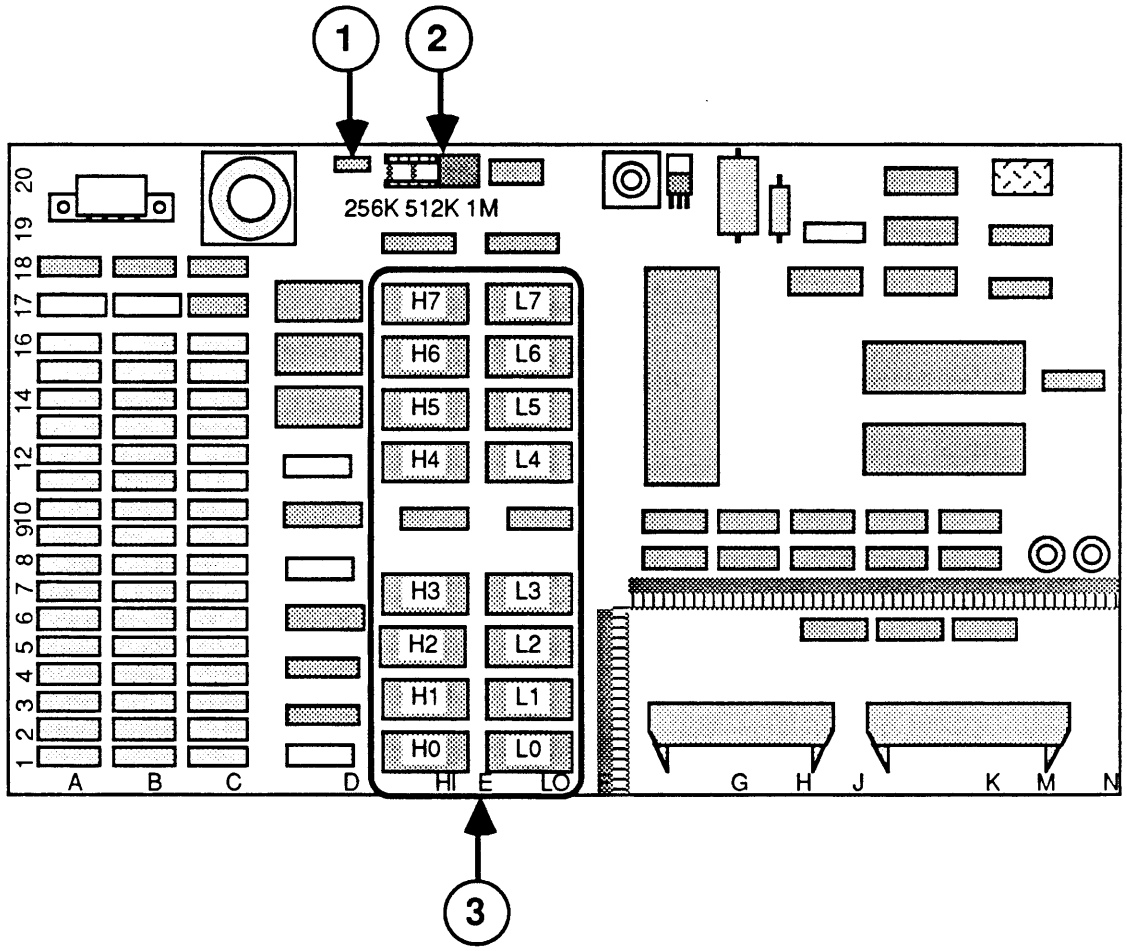


FIGURE 2

7. If you are installing the upgrade kit on an I/O board with the 512K/1M jumper--as shown in Figure 2, #1--place the jumper plug on the set of pins marked "512K."

8. Look at the markings on each new ROM. At the end of the third line of print, you will see one of the following markings:

   H0, H1, H2, H3, H4, H5, H6, or H7 (H = High side)

   OR

   L0, L1, L2, L3, L4, L5, L6, or L7 (L = Low side)

   The corresponding locations are marked on the board.

9. One at a time, carefully remove the new ROMs from their antistatic pad, **handling them by the body, not the leads**. Match the markings on the ROMs with the appropriate socket (see Figure 3, #3). Install the ROMs, making sure that the notch along the edge is on the left.

   Make sure the ROM pins are placed correctly in the socket. If a ROM is installed with one pin out of its socket, or with a pin bent, the LaserWriter will not work.

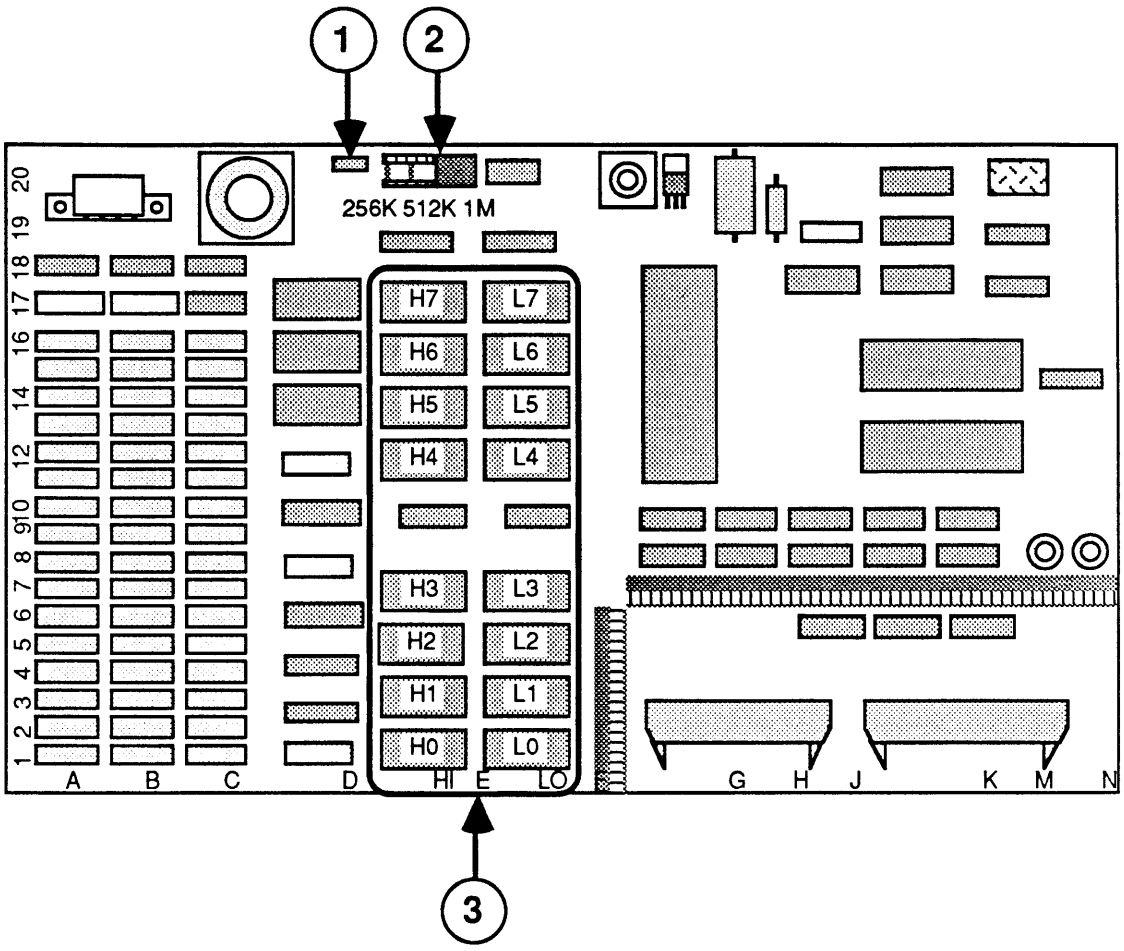


FIGURE 3

10. Place the old ROMs in the kit packaging to return to Apple for credit. You must use the LaserWriter Plus Return Form, included in the kit, to receive credit when you return the old LaserWriter ROMs.

11. Replace the I/O board, the card cage cover, and the top cover of the printer. Attach the LaserWriter Plus label just below the serial number plate on the back of the printer.

12. Power on the LaserWriter Plus. It should produce a test print within two minutes.

    If the printer does not produce a test print, check to see that the ROMs are properly installed.

If it still doesn't produce the test print, run the built-in diagnostics described in Section 2, LaserWriter Plus Diagnostics. These procedures will identify specific faulty ROMs. Exchange any ROMs specified by the built-in diagnostics.

If the printer still doesn't produce the test print, replace all the old ROMs with ROMs from a new LaserWriter Plus Kit.

When a good test print is produced, leave the printer on overnight.

13. The next day, test the LaserWriter Plus with a Macintosh using the following steps:

    a) Connect the LaserWriter Plus to the Macintosh using AppleTalk cables.

    b) Switch on the LaserWriter Plus and wait two minutes for a test print.

    c) Be sure the Macintosh is switched off. Then insert the *Printer Installation Diskette* in the disk drive and switch on the Macintosh.

    d) Open the disk icon if it is not already open.

    e) Choose **Control Panel** from the **Apple** menu and click the **AppleTalk Connected** button if it is not already selected.

    f) Close the **Control Panel**.

    g) Choose **Chooser** from the **Apple** menu. Click on the LaserWriter icon as the printer type.

    When the LaserWriter's name appears, select the name by clicking on it.

    h) Close the **Chooser**.

    i) Choose **Print Catalog** from the **File** menu

    j) Click **OK** or press <Return> in the print dialog box.

    k) When the document has been printed, eject the *Printer Installation Diskette.*

Apple Technical Procedures

LaserWriter Plus

Section 2 – Diagnostics

❑ CONTENTS

❑ INTRODUCTION

AppleCAT™ LaserWriter is a diagnostic tool that uses a known-good Macintosh to diagnose failures in a defective LaserWriter or LaserWriter Plus. For instructions on the use of *AppleCAT LaserWriter*, see Section 7, Diagnostics, under the LaserWriter tab in this manual.

The LaserWriter Plus also has on-board diagnostics that verify that the ROMs on the board are good. This section will explain what materials are needed to access the built-in diagnostics and how to interpret the results you receive.

Materials Required

Macintosh 512K, 512K Enhanced, Plus, SE, or II
The correct ImageWriter cable for the computer being used (Refer to the *Apple Service Technical Procedures — Peripheral Interface Guide* if you need assistance.)
MacTerminal diskette
LaserWriter Plus

Things to Remember

1. Any setting of the mode selection switch on the rear of the LaserWriter Plus will work for the diagnostics.

2. Before attempting to use *MacTerminal* to display the results of the built-in diagnostics, be sure to use either the Control Panel or Chooser to disable AppleTalk, depending on which version of System you are using.

3. The built-in diagnostics check **only** the ROMs and work **only** on the LaserWriter Plus with sixteen 512K ROMs or eight 1M ROMS.

4. If a ROM is indicated as bad, exchange the ROM. Do not exchange the entire board.

5. If ROMs H0 and/or L0 are bad, you will have a solid failure (no test print and/or the internal diagnostics will not run).

6. If a completely dead ROM is on the I/O board, you will have a solid failure (no test print and/or the internal diagnostics will not run).

❑ BUILT-IN DIAGNOSTICS

Running the Diagnostic

1. Set up the Macintosh computer, keyboard, and mouse.

2. Connect the ImageWriter cable from the printer port on the rear of the Macintosh to the RS232 connector on the LaserWriter. The mode selection switch on the back of the LaserWriter Plus does not need to be changed.

   Note: Do not turn on the LaserWriter Plus until instructed to do so.

3. Insert the *MacTerminal* diskette into the internal drive on the Macintosh or Macintosh Plus.

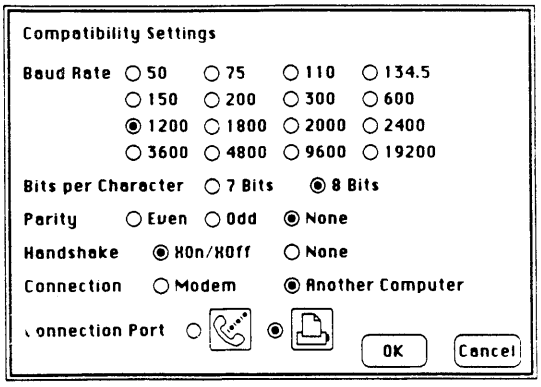
4. Select **Chooser** from the **Apple** menu and click the **AppleTalk Inactive** button if it is not already selected.

   Note: If the version of Chooser is lower than 3.0, you will need to disable AppleTalk using the Control Panel.

5. Open the *MacTerminal* diskette icon. Double-click on the *MacTerminal* icon.

6. Pull down the **Settings** menu and select **Compatibility**.

7. Set the settings by clicking once in the appropriate circle. The settings that should be selected are shown below.



8. Turn on the LaserWriter Plus.

   The *MacTerminal* screen will scroll and display a number. See the next page for interpretation.

   Note: No information will be displayed if the ROMs test OK. An error code is displayed only if a defective ROM is found.

Interpreting the Results

The *MacTerminal* screen will scroll and display the results.

Version 2.0 ROMs

If the LaserWriter Plus has version 2.0 ROMs installed, the results will be displayed in the format **XXXXXXTB.** T stands for "top" and B for "bottom." The **XXXXXX** can be ignored.

If the value of T is greater than 0, an error was encountered in the top or upper bank of ROMs (Figure 1, #1).

If the value of B is greater than 0, an error was encountered in the bottom or lower bank of ROMs (Figure 1, #2).

The value of **T** or **B** indicates which **pair** of ROMs may be bad. Figure 1 shows the values of the error codes next to the number of the ROMs.

For example, if you received the error **XXXXXX40**, the position of the "4" (corresponding to the **T**) in the error code indicates an error occurred in the top bank (Figure 1, #1). The value "4" indicates which ROMs in the top bank may be bad. In this example, the indicated ROMs are H6 or L6 (Figure 1, #3).

If you received the error **XXXXXX02**, the position of the "2" (corresponding to the **B**) in the error code indicates an error occurred in the bottom bank (Figure 1, #1). The value "2" indicates which ROMs in the bottom bank may be bad. In this example, the indicated ROMs are H1 or L1 (Figure 1, #4).

When you have determined where the error took place, exchange the ROMs one at a time, and rerun the built-in diagnostics. When the error has been corrected, both **T** and **B** will have the value of 0, and no error message will be displayed.

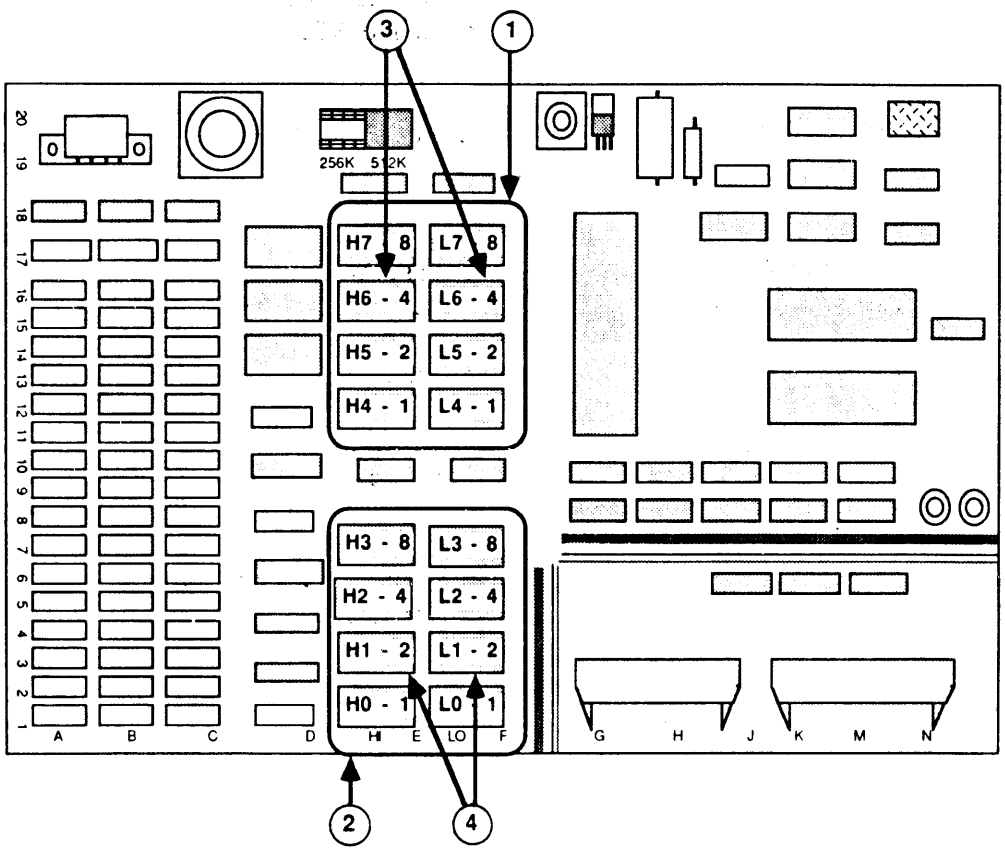


FIGURE 1

Version 3.0 ROMs

If the LaserWriter Plus has version 3.0 ROMs installed, the results will be displayed in the format **XXXXXXBB.** BB indicates which ROM in the bottom bank may be bad. The **XXXXXX** can be ignored.

The value of **BB** indicates which **pair** of ROMs may be bad. Figure 2, #1 shows the values of the error codes next to the number of the ROMs.

For example, if you received the error **XXXXXXC0,** the H3 and L3 ROMs (Figure 2, #2) may be bad.

When you have determined where the error took place, exchange the ROMs one at a time, and rerun the built-in diagnostics. When the error has been corrected, no error message will be displayed.

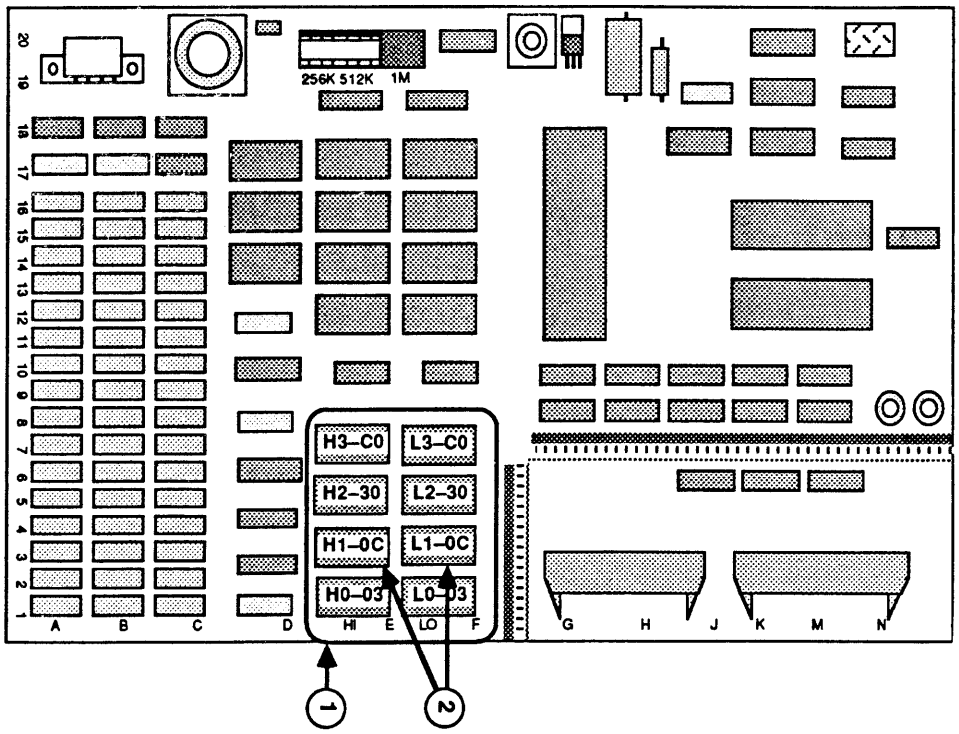


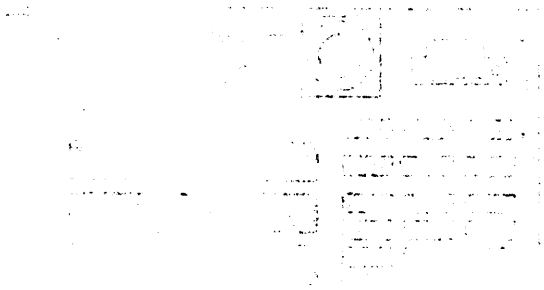
FIGURE 2

Apple Technical Procedures

LaserWriter Plus

Section 3 – Troubleshooting

❑ CONTENTS



❑ LASERWRITER PLUS TROUBLESHOOTING

The LaserWriter Plus has built-in diagnostics that allow you to verify that the ROMs on the I/O board are good.

If you suspect one of the ROMs may be defective, refer to Section 2, Diagnostics to access the built-in diagnostic.

If a ROM is designated as bad, exchange it and rerun the built-in diagnostics.

If exchanging ROMs does not solve the problem, go to the *LaserWriter Technical Procedures*, Section 4, Troubleshooting, and follow the procedures given.

Special Cases

The following ROMs cause special symptoms or require special attention.

1. If either of the first two ROMs (H0 or L0) is bad, the green test light will come on and stay on steadily.

2. ROMs H7 and L7 exist in two revisions. If either H7 or L7 needs to be replaced, make sure that both ROMs on the I/O board are of the same revision when you are done; otherwise, the printer will not function properly.

   If you have to exchange a ROM for compatibility, return the old ROM with an SRO. List the ROM part number on the SRO, and write the authorization code 5ER541 on the line marked *Other* in the *Warranty Information* section.

3. If the green light does not come on, replace all four ROMs (H0, L0, H7, and L7) one at a time. Retest the printer after each replacement.

Exchanging I/O Boards

If you have to exchange a faulty LaserWriter Plus I/O board, Apple recommends that you replace it with a LaserWriter Plus exchange module rather than with a LaserWriter exchange module. If you use a LaserWriter exchange module, you will have to swap in the customer's LaserWriter Plus ROMs, and you run the risk of in the process damaging the ROMs with electrostatic discharge.

LaserWriter Plus exchange boards are available from Apple as exchange modules, and Apple recommends that you stock a spare along with your LaserWriter I/O board.