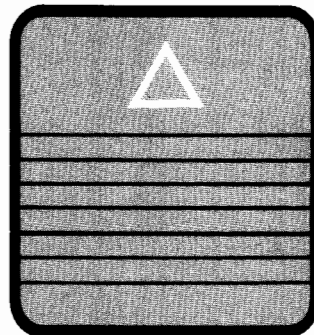




PAPER SPECIFICATION  
GUIDE

*LaserJet*  
**2000**  
Printer





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# HP LaserJet 2000 Printer Paper Specification Guide

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HP Part Number  
5954-8953

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## Printing History

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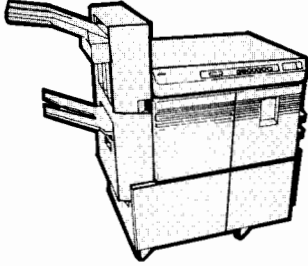
**Paper Checklist**

# 1

## Introduction

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### About the HP LaserJet 2000 Printer



### Basic Theory of Operation

The HP **LaserJet 2000** printer is a high resolution laser printer combining the superior print quality of the other members of the LaserJet family of printers with increased paper handling and print speed capabilities. The HP **LaserJet 2000** printer can print up to 20 pages per minute, at a resolution of 300 x 300 dots-per-inch. It has extensive paper handling capabilities consisting of dual input bins, a 2000 sheet input deck, the option of choosing correct order output, the ability to use 6 different paper sizes (three at any one time), automatic duplex printing (HP 2684D only), and automatic print data recovery from paper jams and multiple feeds. The internal memory of the printer is expandable to 5.5 Megabytes. The printer contains 34 internal fonts, three font cartridge slots, the ability to accept downloadable fonts (soft fonts) and the ability to perform automatic font rotation. The HP **LaserJet 2000** printer is offered in these models:

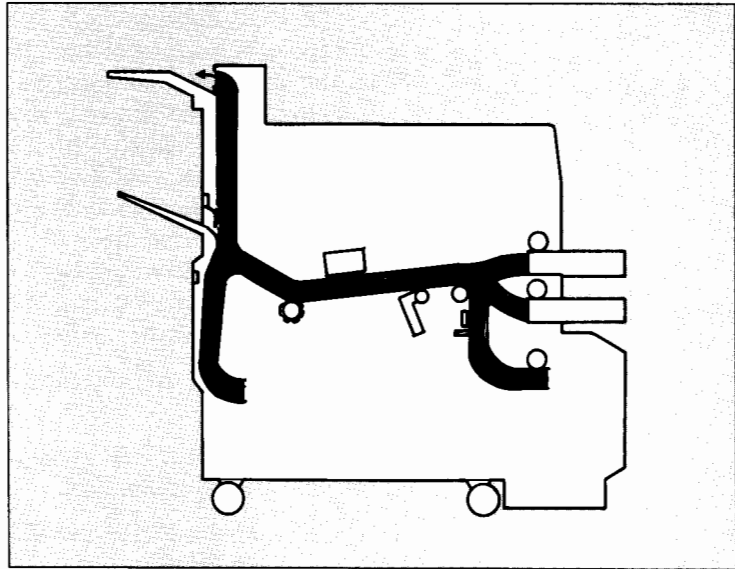
- Model A (HP 2684A) standard printer with pedestal stand
- Model D (HP 2684D) printer with duplex and high capacity paper deck
- Model P (HP 2684P) printer with high capacity paper deck only

Using electrophotographic laser technology, an image of the printed page is written on the surface of a photosensitive drum. This image attracts a coating of dry powdery ink containing iron, known as toner. As paper passes by the drum, the toner image is transferred to the paper surface electrostatically and is fused by an application of heat and pressure. The paper is then transferred to the output tray where it is ready for immediate use. Because the sheet of paper must be transported and electrically charged to print, its electrical properties, surface texture, flexibility and weight, and many other variables all affect the quality of the printed output. For this reason it is very important that paper meeting the specifications outlined in this document be used.



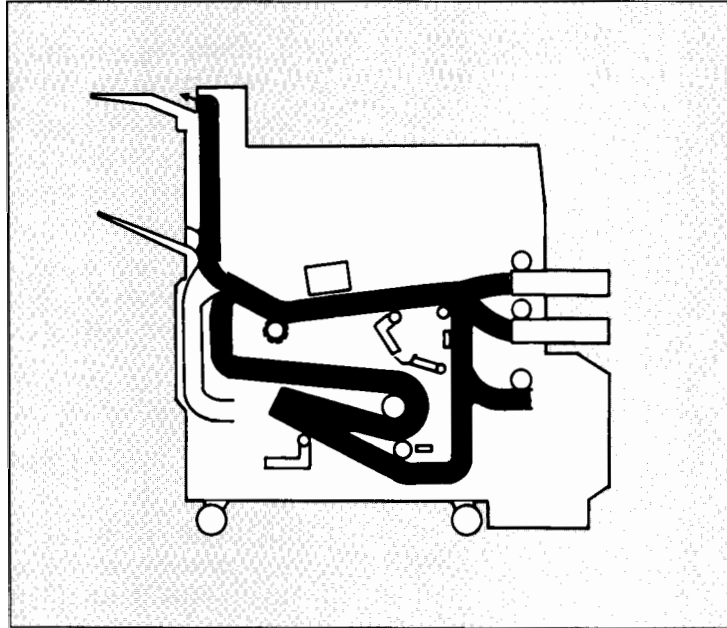
## The Paper Paths

There are two basic paper paths in the full option HP **LaserJet 2000** printer - the simplex (single-sided) paper path and the duplex (double-sided) paper path. In the simplex path, paper is picked-up from one of three paper sources, advanced through the electrophotographic printing process and into the switchback area. It then moves to the output tray face-down and stacks in correct order.



The LaserJet 2000 Printer Single-Sided Paper Path

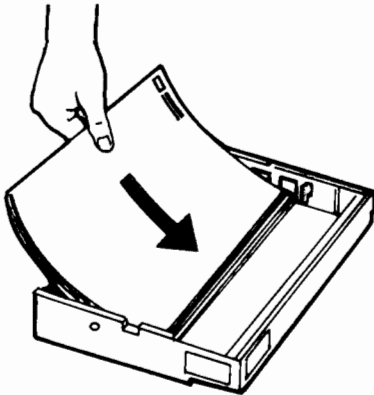
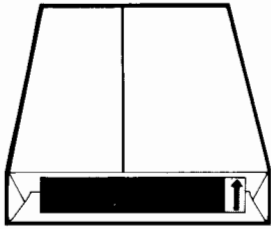
The duplex path picks paper from the same sources as single-sided printing and transfers the image in the same way. Instead of sending paper to the switch-back area, paper is routed into the duplex holding tray. The printed pages are then advanced through the printing process again, but this time the opposite sides are printed. The sheets are then sent to the output tray to stack face-down in their correct order.



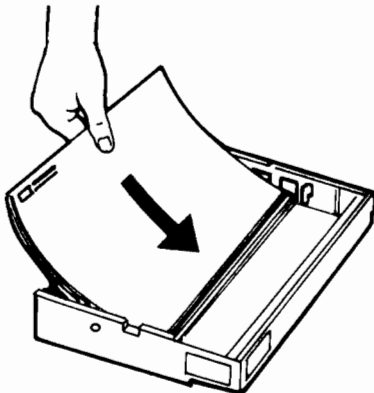
**The LaserJet 2000 Printer Duplex Paper Path**

In order for paper to be able to move through these complex paper paths without jamming or double feeding, it is very important that paper meeting the specifications outlined in this document is used.

## Loading Paper Correctly



Letter, A4



Other Sizes

← Paper Feed Direction

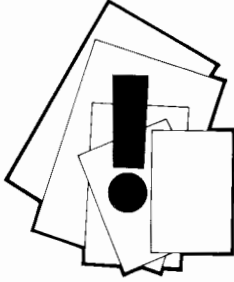
Improperly loaded paper can cause paper feed problems. When loading paper into the HP LaserJet 2000 printer, observe the following guidelines:

- DO NOT use paper that is creased, folded, torn, or is damaged in any way.
- Always discard the top and bottom sheets of a new ream.
- If the package of paper has an arrow on it, load the paper so that the arrows point up.
- Only add paper when the tray is completely empty and DO NOT add small amounts of paper at a time; an air pocket could form between layers, increasing the chance of a misfeed.
- Only load into the printer what you will print in one day. Paper left sitting in a tray will take on the temperature and humidity of the surrounding environment.
- DO NOT fan paper. Fanning causes air pockets between sheets which may greatly increase misfeeds.
- DO NOT overfill a paper tray. Use the yellow arrows as a guide.
- DO NOT add or remove paper in a currently selected source while paper is moving in the printer. This could cause paper jams.
- DO NOT load different sizes and types of paper in the same tray. Reserve the bottom paper tray (250 sheet capacity) for “special” sizes, colors, weights, etc.
- Keep the wire stop (on top of the output stacker) set for the size of the largest paper to be used. If the stop is set for too small a paper size, an output jam could result.
- Load punched hole paper with the holes at the leading edge.
- Load letterhead paper with the print facing up and toward the rear of the printer for letter and A4 size paper, and toward the leading edge for other sizes.

# 2

## Paper Selection Guidelines

### Important Notice



Hewlett-Packard neither warrants nor recommends the use of a particular paper. Paper properties are subject to change by paper manufacturers and Hewlett-Packard has no control over such changes. The entire risk as to the quality and performance of paper is with the customer. Although testing paper helps to characterize its performance, long term satisfaction requires process quality control by the paper manufacturer and proper handling until use.

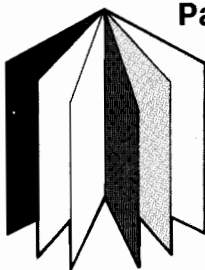
### Types of Media

The following types of media can be successfully printed with the HP **LaserJet 2000** printer as long as certain specific guidelines for each type of material are met.

#### Note



The HP **LaserJet 2000** printer will not print on pressure sensitive labels, overhead transparencies or envelopes.



#### Paper

Most printing applications use conventional white xerographic paper. The paper chosen should be of high quality, free of cuts, tears, grease spots, loose particles, dust, wrinkles, voids and curled or bent edges.

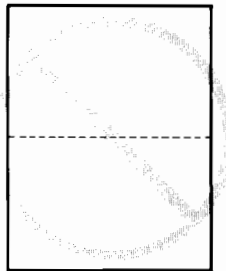
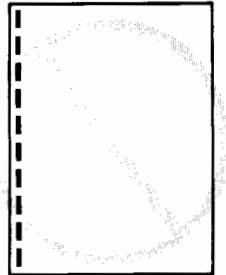
Using paper that does not meet the specifications outlined in this document may increase the incidence of paper jams, contribute to repair costs and cause premature wear to the printer.

#### Colored Paper

Colored paper, including pink, yellow, blue etc., can be used in the HP **LaserJet 2000** printer. Do not use papers where a colored coating has been added after the paper is produced. Pigments used should be able to withstand 200° C / 392° F (the HP **LaserJet 2000** printer's fusing temperature) without deterioration. Colored paper should also meet the same specifications as white xerographic paper.

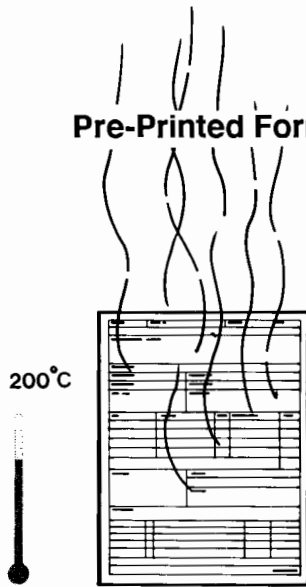
## Paper With Cutouts or Perforations

Hewlett-Packard does not support nor recommend using paper with cutouts or perforations in the HP LaserJet 2000 printer. These papers may cause problems ranging from increased jamming to physically damaging the drum. However, if it becomes necessary to print on these papers, care should be taken to conform to the following:



- **Cutouts:** A cutout is defined as any portion of the paper which has been removed, including binder holes, notches, square cuts, etc. Some special considerations about cutouts to note are:
  - Cutouts of up to 9.5 mm (0.375 in.) diameter or the equivalent area of 71.2 mm<sup>2</sup> (0.1104 in<sup>2</sup>) may be used.
  - Do not print at a cutout location or closer than 4 mm (0.10 in.) to the edge of a cutout.
  - Care must be taken in the placement of the cutouts on the page. Some cutout positions will interfere with paper sensor operation. For example, paper punched for use with a standard 3-hole binder may print acceptably. However, if loaded backwards in the paper tray, it will cause jams in the duplex unit. An optical sensor “looks” through the cutout and because of the location of the hole, senses that the paper is not there. Refer to the *Operator’s Manual* for correct paper loading procedures.
  - Holes should be cut clean without burrs, to avoid multiple feed, paper jams, or contamination problems.
  - The cutout paper must conform to the general specifications for plain white xerographic paper.
- **Perforations:** Paper with internal perforations may cause difficulties with misfeeds and paper jams. Pay particular attention to the following points:
  - Avoid perforations which run across the page perpendicular to the paper path. When paper is transferred from one set of rollers to the next, a perforation can cause the page to bend downward and miss the pickup point on the next roller.

### Pre-Printed Forms



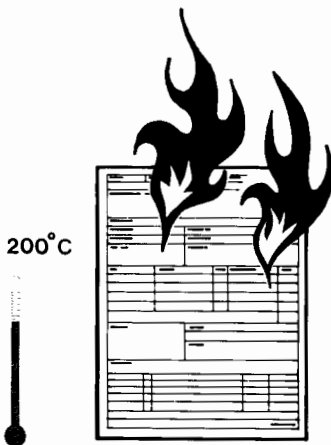
- DO NOT print closer than 4 mm to a perforation.
- Perforations should be cut from the direction of the image side so that edge trimmings are away from and won't scratch the drum.
- If perforated paper is to be used, the perforations should be cleanly cut. This will help avoid feeding problems.

In addition to problems with multiple feed and paper jams, there are two special concerns involved in the use of pre-printed forms:

- **Offset:** This is the transfer of ink from the printed form onto the printer, and can contaminate the internal printer mechanism. The principle causes of offset are inks not fully dried, heat generated during the HP LaserJet 2000 printer's fusing process, and the presence of silicone on the fusing rollers.
- **Emissions:** Undesirable emissions can be produced by using paper which has been pre-printed with the wrong types of ink. When these inks are exposed to heat generated during the fusing process they may vaporize, producing gases that may be hazardous to health or damaging to the printer.

To avoid problems with pre-printed forms, observe the following guidelines:

- Forms must be printed with heat-resistant inks that will not melt, vaporize or release hazardous emissions when subject to an environment of approximately 200° C / 392° F for 0.1 second.
- The inks used must have a high oil resistance, especially to silicone oils, and must not be affected by resin components in toner.
- The inks used must not be flammable and should not have adverse effects on any printer rollers.



- When the form is pre-printed, care must be taken not to change the moisture content of the paper being printed or use materials that change the paper's electrical or handling properties. The forms should be sealed in moisture proof wrap to prevent moisture changes during storage.

### Heavy Paper Stock

DO NOT use extremely heavy paper stock; misfeeds, misstacking problems, paper jams and excessive mechanical wear can result. Use paper that falls within the 16 to 24 pound (60 to 90 g/m<sup>2</sup>) range, as defined in Section 4 of this document. DO NOT attempt to print on paper that has a weight greater than 24 pounds.

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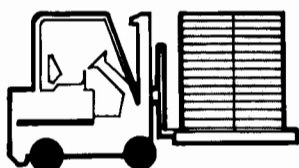
## Recommendations to the Customer

### Buy Paper That Meets Specifications

Since there are many varieties of paper and variations in the paper manufacturing process, the only guarantee that paper will print reliably and successfully in the HP LaserJet 2000 printer is to test it in your own particular environment.

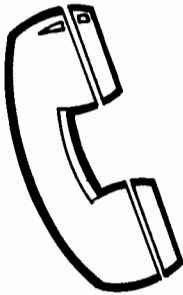
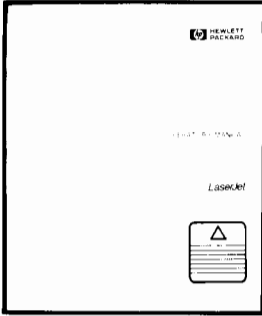
The first step in choosing paper is to select paper that meets the specifications listed in Section 4. Some papers will meet these specifications and still not print well because of variations in the paper manufacturing process and in the environment. However, these specifications still remain the primary consideration when choosing a new type of paper.

### Before Purchasing Large Lots of Paper



The second step in choosing paper, particularly when planning a large purchase, is to print a small quantity (we recommend at least 2 reams) in your particular environment. The way to guarantee purchase of a successful paper that produces quality printed output, is to subject it to the temperature, humidity and printing application which it will be operating in. **DO NOT purchase large lots of paper before first testing it!** Hewlett-Packard recommends that you ask your paper vendor for a guarantee that the paper sold to you will perform satisfactorily in your laser printer, and that the vendor will assume responsibility for the replacement of any paper that will not print acceptably.

## Alternate Sources of Information



The manufacturer and the vendor of the paper that you select should be able to provide you with information about the paper's suitability for use in a laser printer. Hewlett-Packard cannot guarantee every paper that is manufactured. Your paper vendor should be your contact when selecting paper for your individual application needs.

For further information on the HP **LaserJet 2000** printer, consult the *LaserJet 2000 Operator's Manual*, HP Part Number 02684-90901.

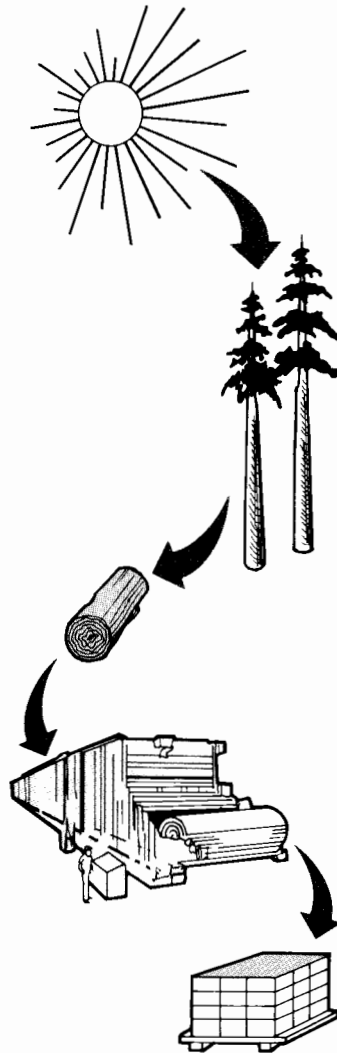
If all of the suggestions for obtaining optimum print quality outlined in this document and in the *LaserJet 2000 Operator's Manual* have been tried and you are still in need of assistance, you may call the authorized Hewlett-Packard dealer where you purchased your printer. Hewlett-Packard also offers support through the LaserJet Assist Service. A customer assistance operator will be happy to offer advice to help solve your printer operation problems. The number is 1-208-323-2551, available 7 AM to 4 PM Mountain Standard Time.



**Paper Selection Guidelines 2-6**

## Paper Basics

### How Paper is Made



Paper is a sheet material made up of many small individual fibers interwoven together. It was invented and first produced in China, sometime around 100 A. D. The raw materials used in paper making include fiber, fillers, sizing compounds, colorants and large amounts of water.

The source of fiber is usually cellulose, derived primarily from wood or cotton. These cellulose fibers are separated and cleaned through a chemical process called pulpmaking. The end-product of pulpmaking is a bright, clean mass of cellulose fibers called pulp.

Some fillers, blended with pulp to enhance paper, are clay, talc, titanium dioxide, and calcium carbonate. These fillers enhance the physical and optical appearance of paper, such as the brightness, opacity, color and the stiffness (“hand” or “feel”) of the final sheet. Some of these materials, such as clay and talc, are not desirable in large quantities in paper designed for printing in laser printers.

To make a sheet more durable and resistant to water penetration, sizing is added. Internal sizings are such materials as rosin or alum. Surface sizings are usually liquid starches.

When paper is wet, the sheet can be further modified so a pattern, design or word is impressed in it. This impression is called a watermark and can be seen in the dried sheet when it is held up to light.

All of this chemical and physical action takes place in the presence of large quantities of water. The water is drained and removed by pressure and the application of heat. This pressing and drying operation reduces the moisture content of paper, to where it now has the curl and electrical properties required for successful laser printing.

The final critical steps to paper making are cutting, trimming and packaging. These steps have a critical impact on how successfully paper will work in the HP **LaserJet 2000** printer.

## Definition of Terms

The terminology used in the paper industry can be confusing and sometimes rather technical. The following list has been provided to establish clear definitions and aid in understanding paper specifications.

**Acid Content** Acid content refers to the pH, or the acidity/alkalinity of paper. It is determined by the TAPPI (Technical Association of the Pulp and Paper Industry) cold extraction method.



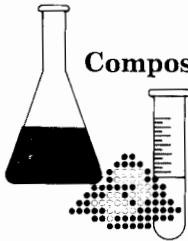
**Ash Content** In paper, the ash content refers to the inorganic residue remaining after ignition, to remove combustibles and volatile compounds.

**Basis Weight** Basis weight is measured on a metric scale as the weight, in grams, of one square meter of paper. In English units, basis weight refers to the weight of 500 sheets of a standard size paper.

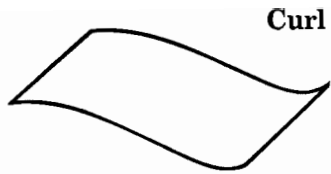
**Background** Background is a symptom of a print quality problem where the paper looks grey or appears dirty.

**Brightness** Brightness refers to the brilliance and whiteness of a piece of paper. Higher brightness is usually associated with higher quality papers.

**Caliper** Caliper refers to the thickness of a sheet of paper and is expressed as the smallest of three dimensions of a single sheet, usually measured in two separate places.



**Composition** Composition refers to the parts or elements that make up paper and is expressed in terms of fiber composition and chemical composition. Composition can be further expressed in terms of how fiber pulp is manufactured; either as mechanical wood pulp or chemical wood pulp.



### Curl

Paper curl refers to the amount of curvature in a sheet of paper when laid on a flat surface. In-ream curl is the amount of curvature the sheet has at the time it is loaded into the paper tray, before printing. Post-image curl is the curvature resulting after the fusing and delivery operations.

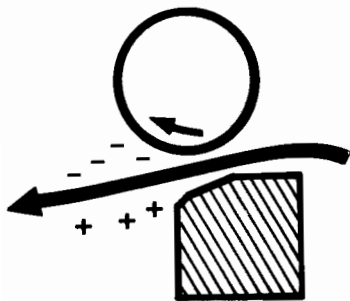
### Cut Edge Condition

Cut edge condition refers to the condition of the edges of paper, a factor that can affect paper's ability to feed properly.

### Density

Density refers to the relative darkness of print or the amount of showthrough of white areas beneath the printed characters.

### Electrical Resistivity



Electrical resistivity characterizes how a sheet of paper accepts and holds a charge. This property can be greatly affected by changes in moisture content, and is one of the most important determinants of a quality printed output.

Since the HP **LaserJet 2000** printer employs electrical charges to form the print image, the electrical properties of the sheet are important to the overall imaging process. Two factors that affect the electrical properties of paper that **can** be controlled are the moisture content and the inclusion of certain chemical additives, either on the surface or internally.

A certain level of resistivity is required for optimum performance. If the sheet is too resistive, it can accumulate and hold a static charge which could adversely impact feeding or transport, or may cause scatter of toner on the paper.

A sheet that is too conductive may dissipate charges too quickly and not allow transfer of toner to the paper. This could hurt the overall image quality by increasing the background level, break-up of the image, or toner smearing.

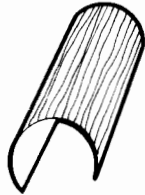
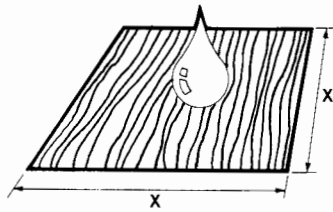
### Finishing Dimensions

Finishing dimensions refer to the length and width of paper, how closely cut to the stated size it is, and how square it is. Using paper that is accurately cut to size is important so the printer can properly handle it.

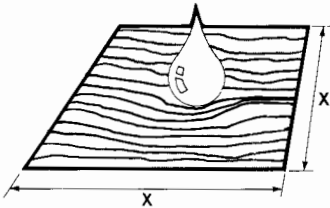
### Fusing Compatibility

Fusing Compatibility refers to the compatibility of media used in the printer and how it reacts when exposed to the fuser's temperature of 200° C / 392° F for 0.1 second. It should not discolor, melt, offset material, release hazardous emissions, or break down in any other way.

### Grain



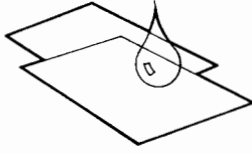
LONG



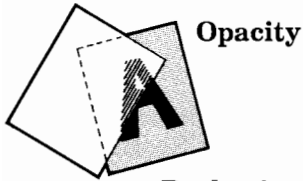
SHORT

Paper grain refers to the position of the paper fibers. During the manufacturing process, most fibers are oriented with their length running parallel to the paper path. Once manufactured, paper can be cut into sheets with the grain running either parallel to the long dimension of the paper (long grain) or perpendicular to the long dimension (short grain).

This characteristic is usually specified right on the paper package (i.e. "LONG" or "SHORT".) The dimensions listed on a ream of paper also will list the long grain dimension last; if short grain paper is specified on a ream of letter size paper, the size will read 11 x 8.5. If this specification is not readily available, it is fairly easy to tell in which direction the grain is oriented by wetting one side of a 3 inch square piece of paper and watching it curl. It will curl so that the edges running parallel to the grain will curl under. Refer to the illustration at left for clarification. The sample will flatten back out as it dries.

**Moisture Content**

Moisture content is defined as the ratio of moisture to the dry mass of paper. Moisture content varies for different paper types and may change considerably if open paper is subjected to temperature and humidity extremes. The method most used to measure the relative moisture level of paper is the gravimetric method, where paper is weighed, oven dried and then re-weighed. The result is then calculated and expressed as a percent value.

**Opacity**

Opacity determines the amount of “show-through” of printed matter on the reverse side of a sheet of paper or of the show-through of dark matter on an adjacent sheet.

**Packaging**

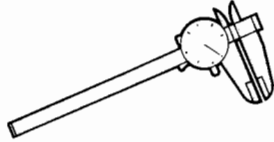
Packaging is an important consideration in paper used in a laser printer, as it maintains the proper level of moisture and protects paper from damage during transport and storage.

**Porosity**

Porosity reflects the openness of a sheet as determined by the spacing between the fibers. The porosity of a sheet is commonly evaluated by measuring its air permeability and is usually expressed in *Gurley* units.

**Smoothness**

Smoothness refers to the property of a surface determined by the degree to which it is free of irregularities. It is usually expressed in *Sheffield* or *Bekk* units.

**Thickness**

Although basis weight is usually a good indicator of proper paper thickness, variabilities in paper density will also have an effect. Paper thickness is measured in at least two places on the test sheet and is expressed in mils (english) or millimeters (metric).

**Type**

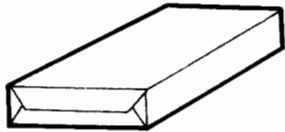
There are many types of paper used in the printing industry, such as fan-fold, roll and cut-sheet. For the purposes of this specification, cut sheet paper is assumed, as it is the only type of paper that can be used in the HP LaserJet 2000 printer.

**Watermark**

A watermark is an impression made in a wet sheet of paper as it is being manufactured. It can be seen when the sheet is held up to light, and will appear as a word, design or some other impression. Generally the preferred side to print on can be determined by holding the sheet up to light. The watermark will read correctly from the side to be printed on. It will be backwards on the opposite side.

**Wax Pick**

Wax pick is an important measure in checking the surface strength of a sheet. It characterizes the resistance of the surface layer of a sheet to the breakaway of surface fragments. Wax pick is expressed in *Dennison* units.

**Xerographic Paper**

Xerographic paper refers to a grade of paper suitable for copying by the xerographic process. It is characterized by a smooth finish, heat stability, non-curling qualities and good aesthetic properties such as color, brightness and cleanliness.

# 4

## Specifications

### Choosing Paper

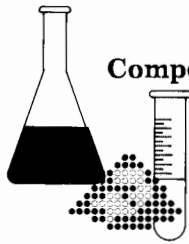
One of the most important things you can do to assure the best possible performance from your HP **LaserJet 2000** printer is to select a quality paper. Some general guidelines to follow when selecting a paper are summarized below.

#### Paper Weight

Paper weight is an important characteristic to consider because paper that is too light or too heavy may cause misfeeds, mis-stacking, paper jams or excessive mechanical wear to the printer.

#### Quality

The HP **LaserJet 2000** printer was designed to use a high quality xerographic (photocopy) paper and can also accommodate some special application papers. Quality paper for laser printers is characterized by uniform physical properties, freedom from dust and lint, accurate cutting to size, and packaging that protects it from moisture and physical damage. The quality of paper affects the printer as well as productivity and operating costs. Curled or bent edges, spots, excessive dust or lint, wrinkling and inaccurate cutting to size are common paper problems and should be avoided. These problems can be characterized by misfeeding, paper jams, premature wear or illegible printing.



#### Composition

Paper used in the HP **LaserJet 2000** printer should be manufactured from chemical wood pulp and/or cotton fiber. To ensure that paper of a special fiber composition will work properly, always test it before purchasing large quantities. Other components of paper are sizing, fillers, buffers and pigments.

#### Note

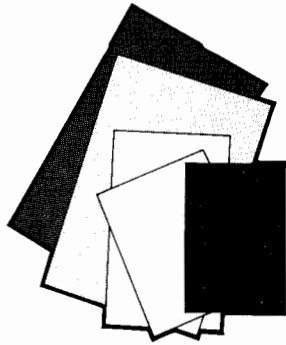


DO NOT use coated paper or paper containing materials that melt, offset, discolor, vaporize or release hazardous emissions at temperatures of 200° C or below.

#### Sizes

The following information provides paper sizes that can be used with the HP **LaserJet 2000** printer, the printable area for each of those sizes, and the HP part number for the paper tray size.





#### Paper Sizes

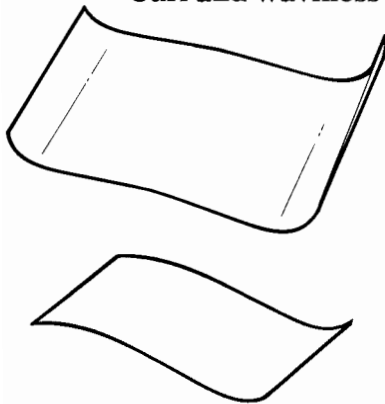
Size Name	Physical Size	Printable Area Size	HP Part Number
<b>Letter</b>	8.5 x 11 in.	8.1 x 10.6 in.	92282B
<b>Ledger</b>	11 x 17 in.	10.6 x 16.6 in.	92282D
<b>Legal</b>	8.5 x 14 in.	8.1 x 13.6 in.	92282C
<b>Executive</b>	7.25 x 10.5 in.	6.85 x 10.1 in.	92282E
<b>A4</b>	210 x 297 mm	200 x 287 mm	92282F
<b>A3</b>	297 x 420 mm	287 x 410 mm	92282G

#### Smoothness

As paper gets rougher, the printed output gets broken and rough in appearance. The paper surface should neither have a heavy texture nor a glossy smoothness.

Paper with embossed surfaces is not recommended for use in the HP **LaserJet 2000** printer as spotty printing may occur. Paper with embossed areas only in the leading or trailing edge, or other areas which will not be printed on, may print satisfactorily but is not recommended because of the potential for misfeeding or paper jams.

#### Curl and Waviness



Curl is the amount of curvature in a piece of paper toward either side of the sheet. It is expressed in inches of the radius of the circle formed by the curled paper. Curl can be expressed as: 1) in-ream curl resulting from the manufacturer's process or 2) post-image curl resulting from the post-printing process. This second type of curvature is due to one surface of paper being exposed to fuser heat, causing it to shrink more than the reverse side. Some papers can have worse problems with in-ream curl and others with post-image curl. To identify in-ream curl problems, open a ream and lay a fresh sheet on a flat surface. It should lay flat. Post-image curl is identified by laying a newly printed sheet on a flat surface. It also should lay flat. Avoid excessively curled or wavy paper (see the specification on page 4-4). Misfeeding, paper jams and poor print quality can result.

## Felt Side Vs. Wire Side

For most writing papers, the “top” side of the paper sheet as it is formed is known as the felt side and the “bottom” is known as the wire side. The wire side of paper is usually the preferred side for printing and most packages of paper will have an arrow showing the direction to load paper so that this side will be printed on.

### Tested Papers



XEROX®  
4024®

Canon  
PAPER  
DRY



To obtain the clearest, sharpest images, paper manufactured for photocopying, such as Canon NP or Xerox 4024 should be used. Generally these types of papers are manufactured to provide desirable properties for image quality and paper handling. Always test paper prior to purchase to verify that it provides acceptable performance.

For some applications it may be desirable to use cotton paper. Several cotton papers are now being manufactured specifically for laser printing. Hewlett-Packard has tested cotton content papers such as Gilbert Neu-Tech and Neenah N.P. and found the results satisfactory. Generally, as paper weight or surface texture increases, image quality and paper handling deteriorate. Once again, test the paper to verify acceptable performance prior to purchase.

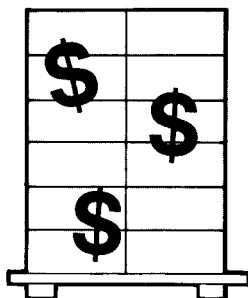
Note 

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Hewlett-Packard neither warrants nor recommends the use of a particular paper. Paper properties are subject to change by paper manufacturers and Hewlett-Packard has no control over such changes. The entire responsibility as to the quality and performance of paper lies with the customer.

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## Purchasing Information



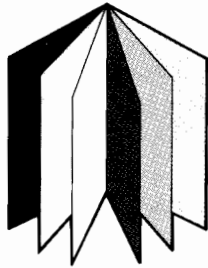
Acceptable paper can be purchased from your local supply house. Ask your vendor for verification that the paper chosen will work acceptably with a laser printer.

## Specifications

The following table summarizes the specifications to consider when selecting conventional white or colored xerographic paper. The paper chosen should meet all of the criteria discussed in this document. Your paper vendor should be able to provide you with a satisfactory paper using the specifications listed below.

**Note** 

It is possible that paper could meet all of the general specifications listed in this table and still not print satisfactorily because of printing environment or other variables over which Hewlett-Packard has no control.



**The HP LaserJet 2000 Printer Paper Specifications**

<b>Acid Content</b>	5.5 to 7.4 pH (cold extraction)
<b>Ash Content</b>	Not to exceed 10% or contain large amounts of clay or talc
<b>Basis Weight</b>	60 to 90 g/m <sup>2</sup> (16 to 24 pound)
<b>Brightness</b>	83% minimum
<b>Caliper</b>	3.75 to 5.5 mils
<b>Composition</b>	All chemical pulp ('free sheet') xerographic paper
<b>Curl</b>	No allowable curl toward side to be imaged and 15" radius of curvature, minimum, on opposite side...as measured in relaxed condition.
<b>Cut edge condition</b>	Cut clean with no visible fray, image side up
<b>Electrical Surface Resistivity</b>	2.0 to 15 x 10 <sup>10</sup> ohms (conditioned @ 22°C & 50% RH)

(continued)

**Paper Specifications (continued)**

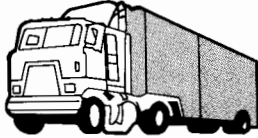
<b>Electrical Volume Resistivity</b>	1.2 to 15 x 10 <sup>11</sup> ohms•cm (conditioned @ 22°C & 50% RH)
<b>Finishing Dimensions</b>	+0.0313 inch of nominal, corners 90 ° ±0.2 °
<b>Fusing Compatibility</b>	Must not scorch, melt, offset or release hazardous emissions when heated to 200° C for 0.1 second.
<b>Grain</b>	Long grain
<b>Moisture Content</b>	4% to 6% by weight
<b>Opacity</b>	85% minimum
<b>Packaging</b>	Polylaminated moisture-proof ream wrap
<b>Porosity</b>	11 minimum (Gurley)
<b>Smoothness</b>	100 to 300 (Sheffield)
<b>Type</b>	Cut sheet
<b>Wax Pick</b>	12 minimum (Dennison)



## Paper Handling and Storage

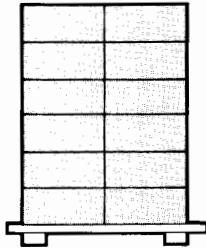
The performance of the HP LaserJet 2000 printer is dependent on the condition of the paper used. This section contains recommendations for proper packaging, handling and storage of paper.

### Shipping



When paper is shipped through different environments, the entire stack of cartons on the shipping pallet should be plastic wrapped. When shipped across bodies of water, individual cartons should be wrapped as well. Paper should never be shipped in such a manner that it is damaged or folded along the edges.

### Stacking



Consider the following guidelines when stacking paper:

- DO NOT store cartons of reams directly on the floor; cartons should be placed on a pallet or on shelves.
- DO NOT stack more than six cartons high.
- Stack each carton squarely on top of the one underneath.
- Stack each carton upright.
- DO NOT store individual reams in such a manner that they will curl or warp along the edges.
- DO NOT place anything on top of paper, whether it is packaged or unpackaged.

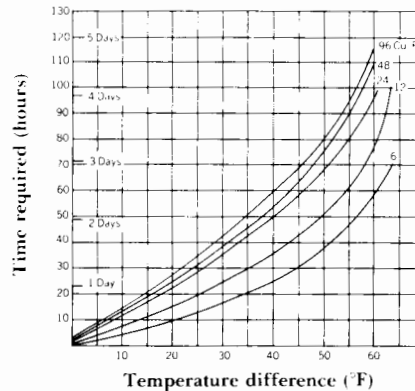
## Environmental Considerations



Paper should be protected from temperature and humidity extremes. The HP **LaserJet 2000** printer is designed to operate in a wide range of environmental conditions, but for best performance, paper should be stored and used at 20° C ( $\pm 3^\circ$ ) or 68° F ( $\pm 5^\circ$ ), with a relative humidity of 45%  $\pm 5\%$ .

When paper is used in an environment which is outside the ranges of temperature and humidity shown above, and optimum print quality is desired, follow these guidelines:

- DO NOT leave the paper exposed to humidity or temperature extremes. Any extreme changes in the environment will cause the paper to take on those characteristics if left sitting unwrapped or in the paper feed tray of the printer.
- In the case of humidity extremes, keep paper tightly wrapped in plastic.
- If there is a significant temperature difference between the paper storage area and the printer's operating environment, paper should be allowed to adjust to the temperature in the printer's operating environment before being unwrapped. The greater the temperature difference and the greater the volume of paper to equilibrate, the longer this time period should be.
- The table below gives some guidelines for the amount of time required for a specific amount of paper to change temperature.

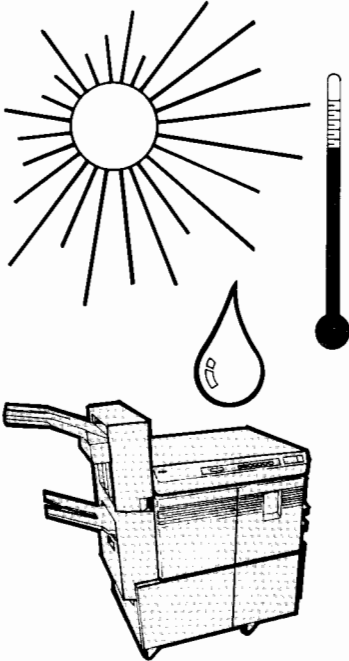


**Specifications 4-8**

# 5

## Troubleshooting

### Factors That Contribute to Print Problems

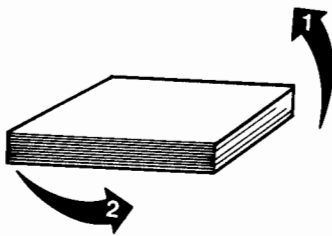


The **two single factors** that contribute most significantly to print quality problems when using paper are 1) **paper that does not meet this specification is being used** and/or 2) **it has been stored improperly**. Ask yourself the following questions to determine if paper is the cause of print quality problems:

- Are your print quality problems related to a specific type of paper?
- Does your paper meet the specifications outlined in this document?
- Did you check the following aspects of your printer's operating environment:
  - temperature?
  - humidity?
  - sunlight exposure?
  - cleanliness?
- Are you observing the correct paper handling practices?

If you are unable to determine the cause of your print defects, try the following:

1. **Try printing paper from another lot or a different brand.**
2. **Rotate paper in the tray from either top to bottom or from front to rear (or both if necessary.)**
3. **Perform the preventive maintenance procedures recommended in your Operator's Manual.**
4. **Call your Service Engineer for assistance.**

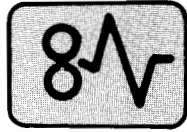




## Indications of Paper Problems

The following conditions encountered in printing can be indicators of paper problems:

### High Jam Rates



This problem can be due to paper that is:

- Too stiff or heavy (paper can't negotiate the paper path or can't be picked from the paper tray)
- Too moist (jams occur due to waviness and curl)
- Too smooth (not enough friction for transport)
- Not cut to specification (can cause poor print alignment, mis-stacking, improper fit in the paper tray or cause difficulties for the paper sensors)
- Affected by in-ream curl

### High Multiple Feed Rates

This problem is seen when the following occurs:

- Paper has been added in small amounts
- Paper is not moist enough (less conductive, more static buildup)
- Paper is too light or thin (multiple feeds)
- Paper is too smooth (not enough air space between sheets)
- Paper is too rough (surfaces tend to interlock)

### Excessive Post Image Curling

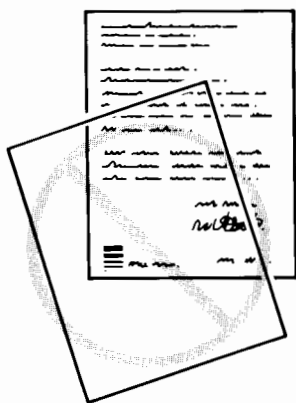
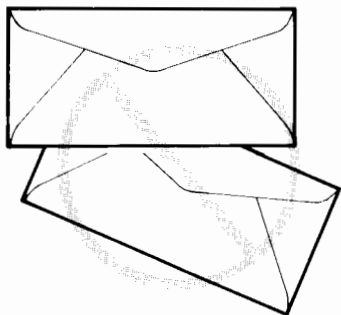


Paper curl is usually caused by excessive moisture in the sheet or by stresses within the sheet acquired during the manufacturing process. Paper curl can also occur during the laser printing process. This phenomena occurs when paper is subjected to heat, causing one surface of the paper to dry and shrink more than the other surface. Curl is always towards the source of heat (i. e. the fusing roller.) The following points can make curl problems less severe:

- Turn paper over; the curl induced in paper during the manufacturing process may be contributing to curl induced during the printing process.
- Follow the storage and handling specifications; changing moisture content and temperature in your environment may be contributing to paper curl.

- Try using a different paper; your environment may be unsuitable for a particular type of paper even though it may fall within the specifications described in this document. Only test trials in your environment can be the final determinant of paper that meets your own printing needs.

## Things to Avoid



DO NOT attempt to print on any of the following:


- Paper that does not meet the specifications listed in this document
- Recycled paper
- Extremely shiny, smooth or textured paper
- Embossed paper
- Multipart forms
- Carbonless or coated papers
- Paper printed with dyes or inks that can't withstand 200° C
- Paper that produces hazardous emissions when exposed to 200° C for 0.1 second
- Paper or paper coatings that melt at 200° C
- Paper that offsets or discolors
- Damaged, wrinkled or irregularly shaped paper
- Paper containing large amounts of clay or talc
- Labels (pressure sensitive)
- Overhead transparencies
- Envelopes

## Paper Checklist

Each time a new lot or type of paper is used, we recommend keeping track of its performance. The following checklist has been provided to aid in monitoring both the performance of your paper and the printer. A sample has been filled out to give the printer user an example of how to log the information. A blank checklist is then attached for reproduction. We recommend attaching a self test printout (which is where the page count information can be found) to each sheet of the log.

Printer <i>LaserJet 2000 (Data Center)</i>		Page Count <i>23062</i>				
Paper Manufacturer <i>Brand XYZ Inc.</i>	Product # <i>7224</i>	Lot # <i>A301</i>	Basis Weight <i>20</i>			
Date <i>5-30-87</i>	Amount Printed <i>2 reams</i>	Price <i>\$6.<sup>10</sup>/ream</i>				
<b>RESULTS:</b>						
	excellent	very good	good	acceptable	poor	very poor not-acceptable
Background?		✓				
Quality?	✓					
Density?				✓		
Smearing?	✓					
Streaks?	✓					
Jams? Number of occurrences <i>2</i>				NO	YES	
Multiple Feed? Number of occurrences				✓		
Curling? <i>some</i>					✓	
Sample Attached?					✓	
<b>NOTES:</b>						
<i>Very humid day. Some in-ream</i>						
<i>curl noticed. Changed EP Cartridge.</i>						
Initials: <i>JE</i>						

## Paper Checklist

Printer				Page Count			
Paper Manufacturer			Product #		Lot #		Basis Weight
Date		Amount Printed			Price		
<b>RESULTS:</b> <div style="float: right; text-align: center;">  </div>							
<small>excellent    very good    good    acceptable    poor    very poor    not-acceptable</small>							
Background?							
Quality?							
Density?							
Smearing?							
Streaks?							
Jams? Number of occurrences					NO		YES
Multiple Feed? Number of occurrences							
Curling?							
Sample Attached?							
<b>NOTES:</b>							
Initials:							



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