

Service Manual



DECcolorwriter 1000 Color Printer

Warning

The following servicing instructions are for use by qualified service personnel only. To avoid personal injury, do not perform any servicing other than that contained in operating instructions unless you are qualified to do so.

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Digital Equipment Corporation
Maynard, Massachusetts U.S.A.

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Users safety summary

Terms in manual: CAUTION Conditions that can result in damage to the product.
WARNING Conditions that can result in personal injury or loss of life.

Power source: Do not apply more than 250 volts RMS between the supply conductors or between either supply conductor and ground. Use only the specified power cord and connector. Refer to a qualified service technician for changes to the cord or connector.

Operation of product: Avoid electric shock by contacting a qualified service technician to replace fuses inside the product. Do not operate without the covers and panels properly installed. Do not operate in an atmosphere of explosive gases.

Safety instructions: Read all installation instructions carefully before you plug the product into a power source.

Terms on product: CAUTION A personal injury hazard exists that may not be apparent. For example, a panel may cover the hazardous area. Also applies to a hazard to property including the product itself.

DANGER A personal injury hazard exists in the area where you see the sign.

Care of product: Disconnect the power plug by pulling the plug, not the cord. Disconnect the power plug if the power cord or plug is frayed or otherwise damaged, if you spill anything into the case, if product is exposed to any excess moisture, if product is dropped or damaged, if you suspect that the product needs servicing or repair, and whenever you clean the product.

Ground the product: Plug the three-wire power cord (with grounding prong) into grounded AC outlets only. If necessary, contact a licensed electrician to install a properly grounded outlet.

Symbols as marked on product:

DANGER high voltage:



Protective ground (earth) terminal:



Use caution. Refer to the manual(s) for information:



WARNING: If the product loses the ground connection, usage of knobs and controls (and other conductive parts) can cause an electrical shock. Electrical product may be hazardous if misused.

Service safety summary

For qualified service personnel only: Refer also to the preceding Users Safety Summary.

Do not service alone: Do not perform internal service or adjustment of this product unless another person capable of rendering first aid or resuscitation is present.

Use care when servicing with power on: Dangerous voltages may exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing the power supply shield, soldering, or replacing components.

Do not wear jewelry: Remove jewelry prior to servicing. Rings, necklaces, and other metallic objects could come into contact with dangerous voltages and currents.

Power source: This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

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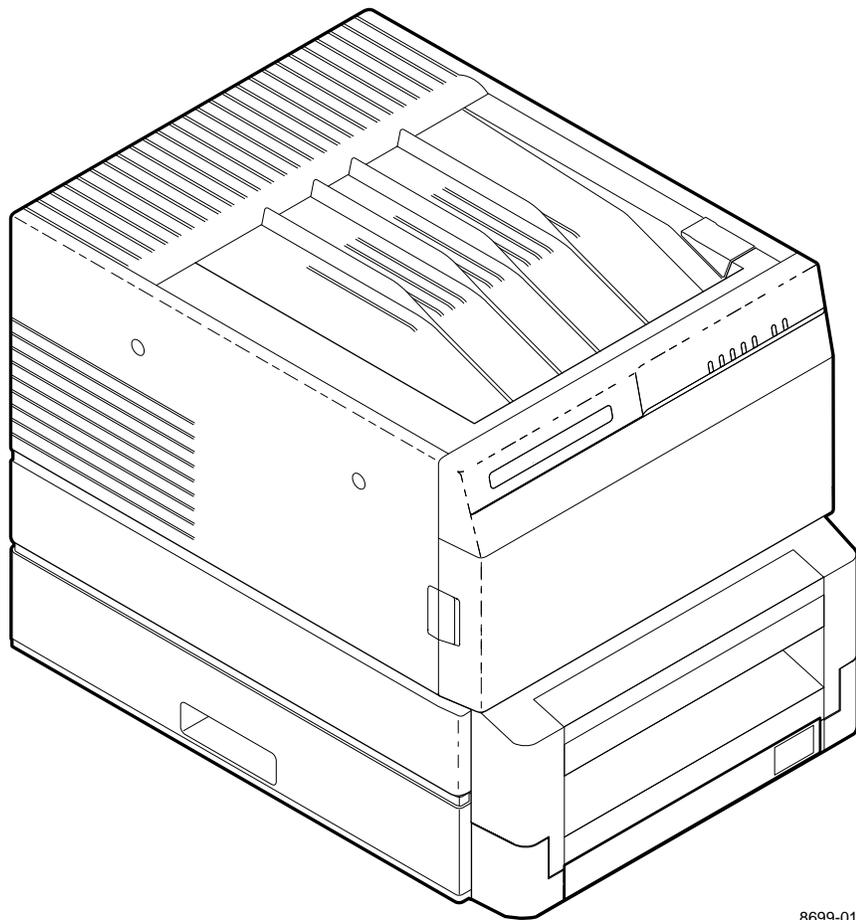
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General Information

This service manual contains information useful to verify operation, troubleshoot, repair, adjust, and maintain the DECcolorwriter 1000. The first half of this manual familiarizes you with the printer and provides information on installing and verifying the printer and training printer users. The latter half of the manual includes troubleshooting guides, adjustment procedures, assembly/disassembly procedures and an FRU list.

To ensure complete understanding of the product, we recommend participation in DECcolorwriter 1000 service training, if available.



8699-01

Figure 1-1. The DECcolorwriter 1000 (shown with the Lower Tray Assembly)

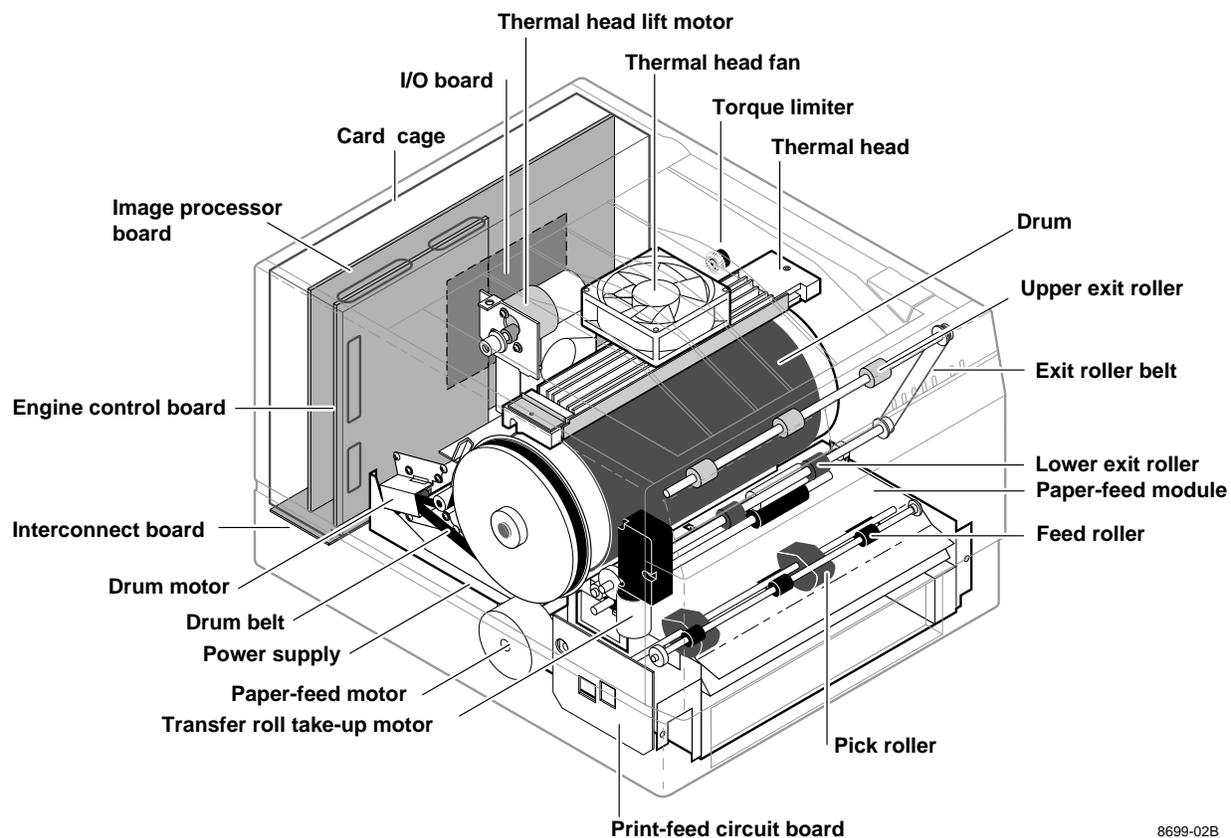
DECcolorwriter 1000

DECcolorwriter 1000 is an Adobe PostScript Level 2, two page-per-minute, color thermal-wax transfer printer. Besides PostScript, it also supports the Hewlett Packard-Graphics Language (HP-GL) printer language. DECcolorwriter 1000 prints at an addressability of 300 dots-per-inch. The printer features a single paper tray with an optional lower tray assembly which gives the printer a dual tray capability. (The Lower Tray Assembly is sometimes referred to as the second feeder.) The printer prints images on A- and A4-size paper and transparency film with 5 mm (0.2 in.) margins. DECcolorwriter 1000's image processor is powered by a 16-MHz RISC processor and features 8 Mbytes of RAM. The printer provides 17 standard printer fonts which can be expanded to 39 fonts with the installation of an optional font module. In addition, the DECcolorwriter 1000 supports a high-resolution 300 x 600 dots-per-inch printing mode. For host image input, the controller also features a standard parallel port, an RS-232 serial port and a LocalTalk port.

Plain-paper printing

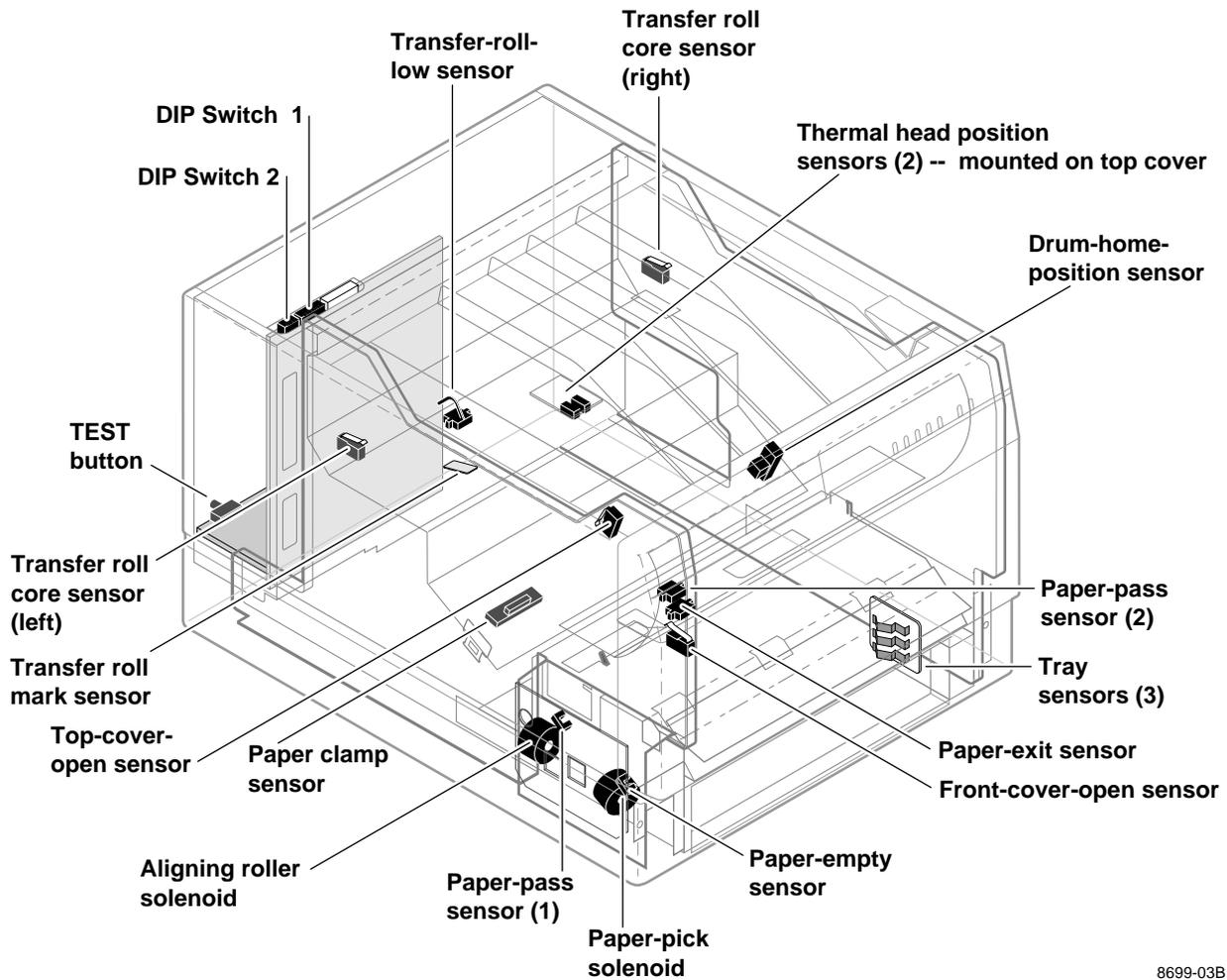
The DECcolorwriter 1000 prints on a specially coated paper with a very smooth, even surface, optimized for wax-transfer printing. The printers can also print on ordinary Bond paper, using a special 4-pass plain-paper transfer roll. During printing, a special primer coating is applied to the paper in its first pass past the thermal head. The coating is applied only to the portions of the paper where yellow, magenta and cyan wax will be applied in the following passes. The coating supplies a smooth, flat surface for the wax to adhere to. Because of the extra pass required for printing on plain-paper and the fact that the drum moves in a slower, half-step mode while placing the precoat on the paper, plain-paper printing times are slightly longer than printing on coated paper with the 3-pass, 3-Color Transfer Roll.

Print engine assemblies



8699-02B

Figure 1-2. Internal features of the DECcolorwriter 1000 print engine



8699-03B

Figure 1-3. Sensors and switches on the DECcolorwriter 1000 print engine

Combination sensors and their meanings

Combinations of sensors are used by the DECcolorwriter 1000 to determine the type of transfer roll and the type of media tray installed in the printers.

Transfer roll type sensing

The combinations of the two transfer roll core sensors “tell” the print engine what type of transfer roll is installed. The length of the cores (long or short) actuate the switches. Long cores close the switches, turning them on.

Table 1-1. Transfer roll core sensor combinations

Left transfer roll core sensor	Right transfer roll core sensor	Transfer roll type
Closed	Open	Plain Paper Transfer Roll
Open	Open	3-Color Transfer Roll (for coated paper)
Closed	Closed	Black Transfer Roll (for coated paper)

Media tray type sensing

The combinations of the three tray sensors “tell” the Phaser 200e what type of paper tray is installed. (The print engine does not detect the type of media installed in the tray; it only detects the particular tray used with the media.) The tray sensors are located on the right-side interior of the paper tray slot. There are four different tray types:

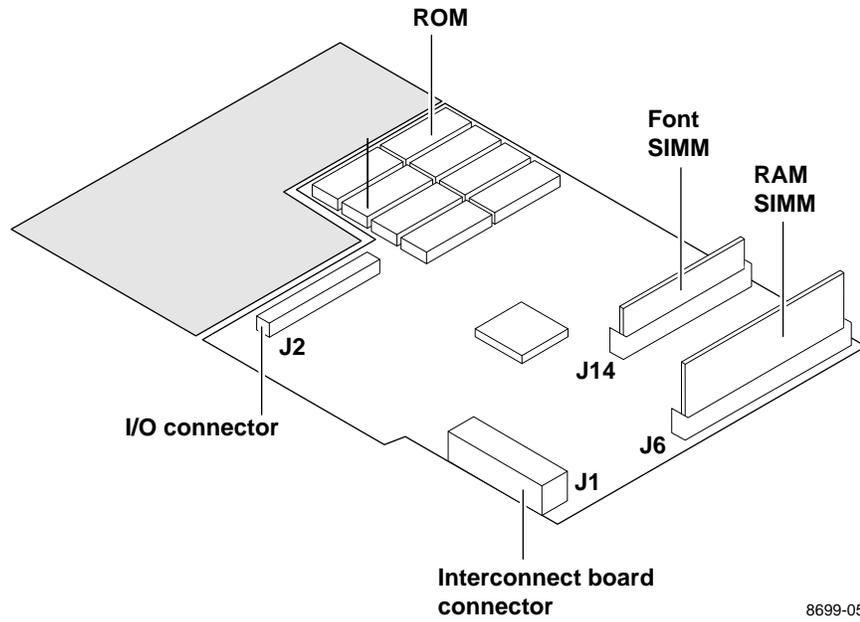
- n **Letter Perforated Media.** This tray is used for paper and transparency film with the tear-off perforation. This extra-long media accounts for the portion of the media held by the drum's paper clamp during printing (and therefore cannot be printed upon.) After tearing off the perforated end of the print, the result is a letter-size print in which the image is printed evenly to all four of the paper's edges. A slide switch on the side of the media tray lets you select either paper or transparency film.
- n **Letter Plain Paper.** This tray is sized for 8.5 x 11-inch plain paper. It is used when printing with the Plain Paper Transfer Roll.
- n **A4 Perforated Media.** This tray is used for the metric equivalent of the Letter-size perforated media. A slide switch on the side of the media tray lets you select either paper or transparency film.
- n **A4 Plain Paper.** This tray is sized for 210 x 297-mm plain paper. It is used when printing with the Plain Paper Transfer Roll.

Lower tray assembly. The identical sensor combination scheme is used to determine the type of tray (referred to as the lower tray) installed in the Lower Tray Assembly. (The Lower Tray Assembly is sometimes referred to as the *second feeder*.)

Table 1-2. Tray switch sensor combinations

Bottom switch	Middle switch	Top switch	Tray type
Open	Closed	Open	Letter – Perforated paper
Open	Open	Closed	Letter – Perforated transparency film
Open	Closed	Closed	Letter – Plain paper
Closed	Open	Open	A4 – Perforated paper
Closed	Open	Closed	A4 – Perforated transparency film
Closed	Closed	Closed	A4 – Plain Paper

Image processor boards



8699-05

Figure 1-4. Features of the DECcolorwriter 1000 image processor board

Rear panel

Connectors

The rear panel of the DECcolorwriter 1000 printer features the host interface connectors to the printer. They include the following connectors:

- n Standard parallel
- n RS-232 serial
- n LocalTalk

The DECcolorwriter 1000 rear panel also features DIP switches to control certain aspects of the printers' imaging. You can also use the DIP switches for controlling the self-tests of the printers' image processor board. Refer to the Section 6 topic "Image processor self-diagnostics" on page 6-30.

Health LED

A health LED indicates the status of the printer.

- n *Blinking* (at a steady rate): The printer is operating normally. The LED blinks irregularly during diagnostics.

If a soft error occurs, the image processor board will operate, but in a reduced capacity. Soft failures include failure of expansion memory SIMMs or any of the interface ports. When a soft error occurs, the printer automatically prints a start-up page listing the error.

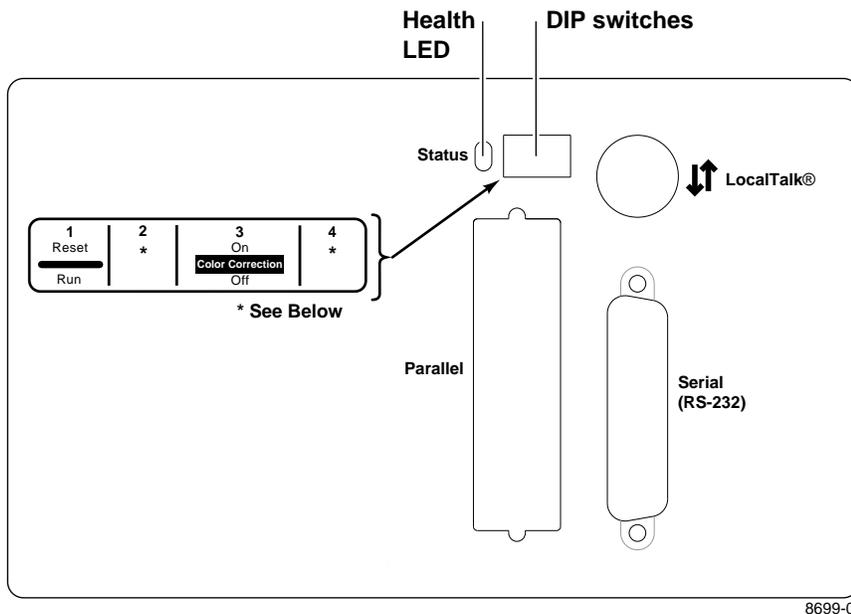
- n *On or Off*: A hard error condition has occurred that would keep the image processor board from operating.

TEST button

The **TEST** button, located at the bottom right rear corner of the printer, has two functions:

- n Following normal power-up, pressing the **TEST** button for 5 seconds prints a composite test pattern. Refer to Figure B-1 in Appendix B, *Test Patterns* for a sample of the composite test pattern.
- n Pressing and holding the **TEST** button while you turn on the printer places the printer in Service mode.

The following figure illustrate the rear panel of the DECcolorwriter 1000.



8699-07

Figure 1-5. DECcolorwriter 1000 rear panel

Table 1-3. DECcolorwriter 1000 rear panel DIP Switches

Switches	220e
1	(down) Normal operation (up) Reset
2 through 4	Diagnostics modes, serial parameters fixed at 1200 baud. Vivid Blue, Configuration page, NVRAM Reset, Demo pages
	2 3 4
	↓ ↓ ↓ Normal power-up self tests
	↑ ↓ ↓ Fixed RS-232 parameters
	↓ ↑ ↓ Used NVRAM-stored color correction
	↑ ↑ ↓ Service mode
	↓ ↓ ↑ Configuration page/NVRAM reset
	↑ ↓ ↑ Demo pages
	↓ ↑ ↑ Verification mode
	↑ ↑ ↑ No self tests

Front panel

The front panel consists of seven LEDs indicating the printer's normal operating status.

POWER: Illuminates to indicate that the power supply is generating +5 VDC.

READY: *On* indicates the printer is idle. *Blinking* indicates the printer is receiving and processing data.

COVER: *On* indicates either the front or top cover is open.

TRANSFER ROLL (RIBBON): *On* indicates the transfer roll is low and will soon need to be replaced. *Blinking* indicates the transfer roll is empty.

MEDIA: *On* indicates the paper tray is empty. *Blinking* (together with the JAM light) indicates the wrong size paper is installed in the paper tray.

JAM: *On* indicates a jam has occurred inside the printer. *Blinking* indicates a paper-pick error has occurred.

ERROR: *On* indicates a hardware engine error has occurred. *Blinking* indicates a data processing error has occurred with the image processor board.

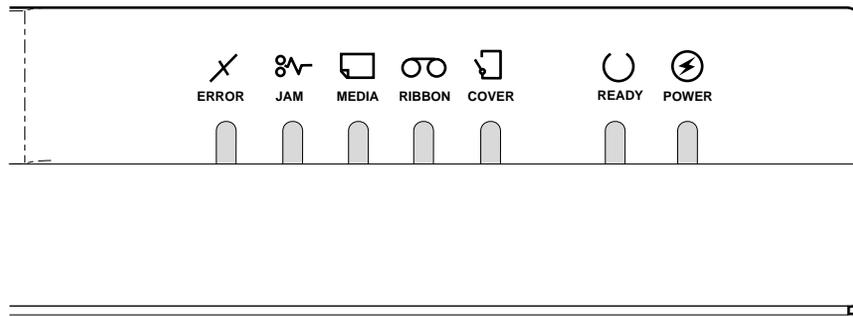


Figure 1-6. DECcolorwriter 1000 front panel

Front panel LED service mode error codes

Detected error conditions are displayed on the front panel as LED patterns. The following table lists the service mode error codes which are displayed while the printer is in service mode. (Service mode is explained in Chapter 9, “Checks and Adjustments.”) These codes are more specific than the error codes displayed during normal operation (see the previous topic “Rear panel). If an error occurs during normal operation, pressing the rear panel **TEST** button causes the appropriate, and more specific, service mode error code to be displayed on the front panel. The error codes listed below are explained in greater detail in the Chapter 6 topic “Print engine error codes and their causes” on page 6-19.

Table 1-4. Service mode error code summary

Front panel LEDs	Hex code	Error
o o o o o	o Z	00 No error
o o o o o	Z Z	01 Drum position error.
o o o o Z	o Z	02 Thermal head temperature error.
o o o Z o	o Z	04 Top cover open error.
o o o Z o	Z Z	05 Front cover open error.
o o o Z Z	o Z	06 Strobe error.
o o o Z Z	Z Z	07 Engine control board RAM error.
o o Z o o	o Z	08 Engine control board ROM error.
o o Z o Z	o Z	0A Interface error with image processor board.
o o Z Z o	Z Z	0D Thermistor failure.
o o Z Z Z	o Z	0E Thermal head lift error.
o o Z Z Z	Z Z	0F Thermal head thermistor failure.
o Z o o o	o Z	10 Transfer roll empty.
o Z o o o	Z Z	11 Transfer roll low.
o Z o o Z	Z Z	12 Transfer roll jam.
o Z Z o o	o Z	18 Transfer roll feed timer error.
Z o o o o	o Z	20 Out of media.
Z o o o o	Z Z	21 Tray not installed.
Z o o o Z	o Z	22 Paper eject sensor failed to turn on.
Z o o o Z	Z Z	23 Paper-pass error / lower tray.
Z o o Z o	o Z	24 Paper-pass error / upper tray.
Z o o Z o	Z Z	25 Paper-pass sensor 2 error.
Z o o Z Z	o Z	26 Paper clamped error.
Z o o Z Z	Z Z	27 Media size error.
Z o Z o o	o Z	28 Paper eject sensor failed to turn off.
Z o Z o o	Z Z	29 Paper-pass sensor 1 failed to turn off after paper eject.
Z o Z o Z	o Z	2A Paper-pass sensor 2 failed to turn off after paper eject.
Z o Z o Z	Z Z	2B Clamp timer error.

o means LED *off* Z means LED *on*

Z means the POWER LED which is *always on*

Specifications

These specifications apply to the DECcolorwriter 1000 printer.

Table 1-5. Physical dimensions

Dimensions	Value
Height	28 cm. (11 ins.) 37 cm (14.5 ins.) with Lower Tray Assembly
Width:	342 cm (13.4 ins.)
Depth:	42.5 cm (16.7 ins.)
Weight:	Approximately 18 kgs (40 lbs). Print engine weight only; add 26.4 kgs (12 lbs.) for Lower Tray Assembly. Shipping weight is not to exceed 32 kgs (70 lbs).

Table 1-6. Printer clearances

Clearances	Value
Top:	45.7 cm (18 ins.)
Left:	10.2 cm (4 ins.)
Right:	10.2 cm (4 ins.)
Front:	Unrestricted to replace trays and transfer rolls
Rear:	10.2 cm (4 ins.)
Bottom:	No obstruction under printer that could block its cooling vents.
Mounting surface flatness:	Within 5 degrees of horizontal with all four feet in contact with the surface.

Table 1-7. Functional specifications

Characteristic	Specification
Printing process	Sequential surface thermal transfer printing (thermal-wax transfer).
Transfer rolls	Wax-impregnated transfer rolls. The printer automatically senses the transfer roll type by the coding on the leading edge of the yellow band. 3-Color Transfer Roll features sequential bands of yellow, cyan, and magenta; 342 prints per roll. A 4-pass Plain Paper Transfer Roll features sequential bands of precoat, yellow, magenta and cyan; 214 prints per roll. Black Transfer Roll features all black panels; 880 prints per roll. The printer automatically senses the transfer roll type by the size of the transfer roll cores.
Addressability	300 dots-per-inch (horizontal and vertical).
Engine printing speed	The time it takes from paper loading to paper ejecting a print: 3-Color transfer roll: about 30 seconds per print. ColorCoat transfer roll: about 40 seconds per print. Print times do not include image processing time by the image processor which varies due to image complexity.
Minimum printing margins	Perforated paper: A- and A4-size: all sides, 5 mm (0.2 ins.). Non-perforated paper A- and A4-size: all sides, 5 mm (0.2 ins.) except the bottom, which is 21 mm (0.8 ins.)

Table 1-8. Electrical specifications

Characteristic	Specification
Primary line voltages	87 to 128 VAC (115 VAC nominal) 174 to 250 VAC (220 VAC nominal) Input voltage range is switch-selectable.
Primary voltage frequency range	47 to 63 Hz
Power consumption	235 watts at idle. (800 BTUs/hour) – Power consumption for the printer will be somewhat higher due to image processor electronics which draw power from the print engine.
Current rating	115 VAC configuration – 7 amp max./1 amp min. 220 VAC configuration – 7 amp max./1 amp min.
Primary voltage fusing	115 VAC configuration – 5 amp 220 VAC configuration – 5 amp Fuses are not user-accessible.
Secondary voltages	+5V (4.95 ~ 5.05 V) — 10 A maximum +12 V (11.2 ~ 12.6 V) -12 V (115.5 ~ 12.5V) +24 V (24.4 ~ 24.7V) VH – thermal head voltage ($V_{high} - 26 \sim 27.4$ V), ($V_{low} - 10.6 \sim 11.0$)
RF emissions	Both 115 and 220 VAC-configured instruments pass these standards: FCC Part 15 Class B VDE 0871/6.78 Class B EN55022 (CISPR 22) Class B VCCI (CISPR 22) Class B

Table 1-9. Environmental specifications

Characteristic	Specification
Temperature	
Operating	15 to 30 °C (59 to 86 °F)
Non-operating (power off)	0 to 40 °C (32° to 104 °F)
Storage (without transfer roll)	-20 to 60 °C (-4 to 140 °F)
Humidity	
Operating	20 to 80% relative humidity, non-condensing
Non-operating	10 to 90% relative humidity, non-condensing
Altitude	
Operating	0 to 4570 m (15,000 ft.) at 25 °C
Non-operating	0 to 15200 m (50,000 ft.)
Vibration/shock	
Non-Operating (vibration)	0.75g, 25 minutes in three mutually perpendicular axes, no resonant frequencies below 25 Hz.
Non-operating (shock)	30 g, half sine, 11 msec.
Operating (shock)	The printer may have any corner raised and dropped 2 inches, while no printing is in progress, without subsequent impairment of operation.
Acoustic Noise (operating)	Printing - sound power less than 6.6 Bels, sound pressure less than 50 db (A). Standby - sound power less than 6.3 Bels, sound pressure less than 46 db (A)..

Regulatory specifications

The DECcolorwriter 1000 is a recognized component in conformance with the following regulatory standards:

- n The packaged product meets National Safe Transit Committee Test Procedures.
- n UL 1950 Information Processing & Business Equipment.
- n CSA C22.2 No. 950 Safety of Information Technology Equipment, Including electrical Business Equipment.
- n IEC 950 (1991) Second Edition; EN60950 Information Processing & Business Equipment.
- n EC: EN60950 Safety of Information Technology Equipment including Electrical Business Equipment.
- n EC: EN55022 Limits and methods of measurement of radio interference characteristics of Information Technology Equipment.
- n Vfg 243 Radio Interference suppression of Radio Frequency Equipment for Industrial, Scientific, Medical (ISM) and similar purposes and Equipment used in Information Processing Systems; General License.
- n VDE 0871/6.78 (Class B) Radio Frequency Interference Suppression of Radio Frequency Equipment for Industrial, Scientific, Medical (ISM) and Similar Purposes.
- n FCC Class B (for 115 VAC equipment).

Installing the Printer and Drivers

This chapter discusses installing the printer and its drivers. Installation consists of three main functions detailed in this and the next two chapters of this manual:

- n Chapter 2 “Installing the Printer and Drivers.” The first portion of installation instructions, this chapter, consists of five basic processes:
 - n Pre-installation interview. This is a phone interview to verify that the customer is ready for the printer. The interview verifies that the customer has a suitable place for the printer with the proper environment. The call also verifies that any assistance, such as network system administration, will be available for the scheduled installation and that all necessary cables will be available.
 - n Unpacking. This is the procedure for taking the printer out of its shipping box.
 - n Testing. This checks that the printer works properly prior to connecting it to a host computer.
 - n Cabling and configuring. This discusses setting up the printer for communicating to the appropriate host computers.
 - n Loading drivers. This covers installing software on the host computers and configuring the host applications to drive the printer.

Following these steps, proceed to Chapter 3 and then Chapter 4.

- n Chapter 3 “Verifying the Printer and Its Hosts” explains how to verify that the printer, the host driver and the connection between them function correctly.
- n Chapter 4 “Key Operator Training” gives a procedure for training the user to use and care for the printer.

Pre-install questions for customers

Prior to installing a DECcolorwriter 1000, you should contact the customer and verify that he or she has prepared an appropriate location for the printer. You will also want to ensure that you have all the information you need to install the printer at the customer's site.

Ask the customer the following:

Customer's name _____
Address _____
Phone number _____

- n What type of computers will be networked to the printer?
 - o PC _____
 - o Macintosh _____
 - o UNIX _____
 - o other _____

- n Which type of host-to-printer connection will be used:
 - o serial
 - o parallel
 - o LocalTalk

- n In the event that the printer is to be installed into a network environment, will a network administrator be available to help in assigning network names and addresses for the printer?
Administrator's name _____
Phone Number _____

- n What software application packages will be used with the printer? (Some applications require special printing utility files.)

- n Will the application(s) and sample files be available at the time of the installation to send test files to the printer? _____

- n Does the customer have the appropriate power outlet available? The printer's AC power input is set for these voltages:
110 VAC (87 to 128 VAC)
220 VAC (174 to 250 VAC)
If necessary, refer to the later topic "Selecting the AC input voltage."

- n Did the customer order the correct model?
 - _____ U.S.
 - _____ European
 - _____ United Kingdom
 - _____ Australian
 - _____ Italian
 - _____ Israeli = UK + power cord
 - _____ Swiss

- n *Customers must provide* the particular interface cable or network adapter they need to use with the printer.
 - n 10 ft. parallel cable
 - n Serial, 25-pin to 25-pin, 3 m (10 ft.), null modem
 - n Serial, 9-pin to 25-pin, 3 m (10 ft.), null modem

For AppleTalk installations, *customers must provide* the appropriate network adapter to the printer's 9-pin circular LocalTalk connector. Customers can obtain an adapter from their dealer.

The printer requires the following environmental conditions:

- n Temperature: 15 to 35° C (59 to 95° F)
- n Humidity: 20 to 80% relative humidity, non-condensing
- n Power: 110 VAC or 220 VAC. The printer requires 7 amps of current at full load.
- n Clearances: A space measuring 46 cm wide by 92 cm deep by 76 cm high (18 ins. wide by 36 ins. deep by 30 ins. high). The space in front of the printer accounts for enough clearance to install the paper tray. The extra height is to install the transfer roll.
- n Weight support: 20 kgs (45 lbs.) minimum.

Driver software must be installed on the host computer to use the printer to its fullest potential. A host computer must meet the following conditions:

Mac

- n Mac II, Performa, Centris or Quadra
- n Operating System 6.0.7 or later
- n 4 Mbytes RAM

PC

- n IBM AT, PS/2 or compatible, with a 386 or later CPU, a 5.25- or 3.5-inch floppy drive, and a hard disk drive, 2 Mbytes RAM

DOS system

DOS 3.1 or later

An application that supports color PostScript or HP-GL

Windows systems

Windows 3.1

2 Mbytes of hard disk space

Workstation

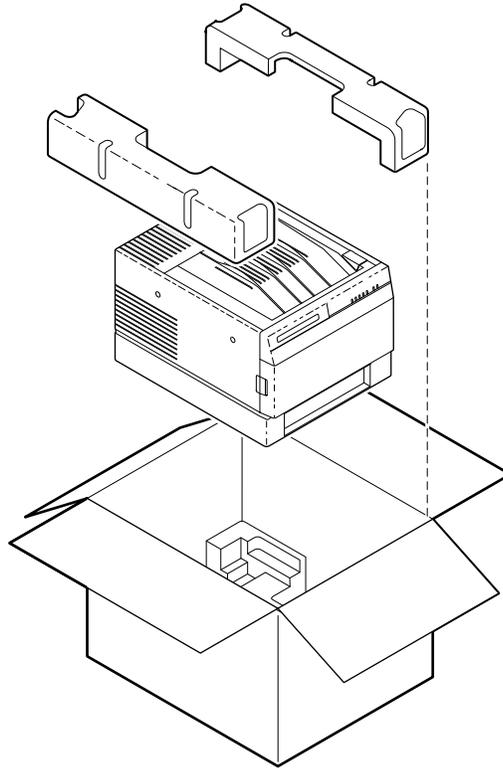
- n UNIX workstations: The X Windows System,
SUN workstations: OpenWindows recommended
- n 750 kbyte hard disk space for files

Unpacking

Inventory for the DECcolorwriter 1000 printer

- n Printer
- n Paper tray
- n Power cord
- n Getting Started folder
- n Cleaning kit
- n Supplies information sheet
- n Transfer roll
- n Paper
- n Transparencies
- n User manual
- n Printer drivers and utilities reference manual
- n Printing utilities and driver diskettes
- n Optional Lower Tray Assembly (with paper tray)

Note Prior to repacking a printer, ensure that the paper clamp is positioned under the bail rollers. This prevents the bail rollers from “denting” the soft material of the drum. In normal operation, the paper clamp is automatically parked in this position when the printer is not printing.



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Figure 2-1. The DECcolorwriter 1000 packaging

Setting up the printer

Installing the printer is explained in detail in either the *DECcolorwriter 1000 User Manual*. The following is a brief list of the steps you follow to unpack and set up the printer.

1. Place the printer in its working location.
2. Open the top cover and remove the shipping pad that protects the printhead. Also remove the shipping blocks on either side of the drum.
3. Install a transfer roll.
4. Close the top cover.
5. Load the paper tray with paper. Press the paper down in the tray until the spring plate latches to the bottom of the tray. Make sure the printed side is up and the perforated edge of the paper faces forward.
6. Set the media select switch on the side of the tray to *PAPER*. (Set the lever to *TRANSPARENCY* if you are loading the tray with transparency film.)

Caution *When moving a printer featuring the Lower Tray Assembly, be sure to grasp the Lower Tray Assembly by its hand holds on both sides to lift it and the printer together. Carry the printer by carrying the Lower Tray Assembly. Failure to do so may damage the printer.*

7. Install the paper tray in the printer. If also purchased, install the Lower Tray Assembly underneath the printer.
8. **AC voltage selection:** Locate the AC voltage select switch on the right side of the printer. Ensure that it is set to the correct voltage for the customer's installation (either 115 VAC or 220 VAC).
9. Ensure that the power switch is *off*.
10. Plug the printer's power cord into the printer's AC receptacle. Plug the other end into an appropriate AC power outlet.
11. **Rear panel switches:** Ensure that all the rear panel DIP switches are in the *down* position.
12. Turn on the printer. It will execute a power-up self-test and then it prints a startup page. If it fails its self-test or doesn't print a startup page, refer to Chapter 6, "Troubleshooting."
13. Turn off the printer.

Cabling the printer

Note *Carry spare serial and parallel cables. You can use them if you encounter a defective cable or as an alternate means of testing the printer-to-host communications.*

This topic explains making a hardware connection between a DECcolorwriter 1000 and its host computer, setting the communication parameters for the printer's serial and parallel ports to be compatible with the user's host computer and driver installation. This topic is divided into three main parts: Macintosh, PC, and workstation.

Connecting the printer to a Macintosh

A direct connection between the printer and a Macintosh would be through the printer's LocalTalk port. A networked connection for a Macintosh will most likely be either a LocalTalk network or an Ethernet network.

LocalTalk connection to a Macintosh

1. Turn off the printer. LocalTalk protocol requires that you attach the LocalTalk cable with the printer powered *off*.
2. For a direct connection, attach the interface cable or adapter to the host computer's LocalTalk port. (The port has a printer icon printed next to it.) Attach the other end to the printer's LocalTalk port.

For a LocalTalk network connection, attach the network adapter to the printer's LocalTalk port.

3. Turn on the printer and the computer.

Connecting the printer to a PC

Direct connection to a PC

1. Turn off the printer. Turn off the host computer.
2. Attach the parallel interface cable to the host computer. Attach the other end to the printer. Alternatively, attach the serial cable to the host computer's serial port. Attach the other end to the printer's serial port.
3. Turn on the printer and the computer.

Connecting the printer to a workstation

Direct connection to a workstation

1. Turn off the printer. Turn off the host computer.
2. Attach the parallel interface cable to the workstation. Attach the other end to the printer. Alternatively, attach the serial cable to the workstation's serial port. Attach the other end to the printer's serial port.
3. Turn on the printer and the computer.

Turning on the printer

The startup page

When you turn on a DECcolorwriter 1000 printer, it executes a series of self-tests to determine if there are any problems with the PostScript interface. After running self-tests, the printer prints a startup page if it has not been disabled. (The factory default condition is to have the startup page enabled.) After running self-tests and printing the startup page, the printer is ready for operation. A downloadable PostScript utility, found on the Drivers and Utilities diskette, allows you to enable or disable the startup page.

The startup page provides you with valuable information about the printer:

- n Fonts
- n Ports (Serial, Parallel, LocalTalk, Ethernet)
- n Printer name
- n Color corrections and print quality mode
- n Pages Printed
- n RAM installed
- n Image processor version firmware
- n Adobe PostScript version software
- n Type of transfer roll loaded

If the printer detects a non-fatal error at power-up, the startup page prints with an error message shown in red. This is true, even if the startup page has been disabled. The printer will still force a print to report the error.

Message	Description
Serial, Parallel, LocalTalk, EtherTalk, or SCSI Port failed	The named port is not working. The other ports can still be used.
DRAM SIMM <i>x</i> failed	The memory SIMM <i>x</i> is not working. In this message, <i>x</i> indicates the number of the SIMM that failed (1 or 2). Since the printer's base memory is still working, the printer can still be used, but large images may not print, special imaging features may not work and throughput may suffer.

If metric media is not being used and the page count in the image processor is equal to 6, 7, or 8, then a registration page will print out after the startup page.

The configuration page

To provide further diagnostic information, the printer is able to print a configuration page. The configuration page lists the values that the printer stores in its NVRAM. These values can be informative when troubleshooting the printer, particularly networked operations. A downloadable PostScript utility file, found on the Drivers and Utilities diskette, allows you to print the configuration page. You can also use the rear panel DIP switches to print one. To print a configuration page, while the printer is powered-up and idle toggle rear panel Switch 4 up and down.

The configuration page gives you the following information:

- n General information about the printer, such as print count, the programmed name, timeouts, number of fonts, and total memory
- n Color settings such as Vivid Blue.
- n Serial port settings
- n Parallel port settings
- n LocalTalk port settings

Table 2-1. Configuration page settings for DECcolorwriter 1000 printers

Parameter	Description	Saved in NVRAM	Default	Limits or alternate choices
Printer type	The name of the product	yes	DECcolorwriter 1000	
Printer name	The current name of the printer as seen on a network	yes	<printer name> the default is the same name of the product	Any name defined by the user up to 31 characters in length
Pages printed	Total number of prints processed through the image processor	yes	0	
Start page enabled	Indicates if the printer prints a startup page upon power-up	yes	No	Yes or no
Fonts in ROM	Number of font stored in the printers ROM memory		17 in DECcolorwriter 1000, unless font module is installed, which then totals 39	17 or 39
Job Timeout	Amount of time a job can take to process	yes	0 seconds	Any value denoted in seconds; 0 means unlimited amount of time
Wait Timeout	Amount of time the image processor will wait for additional data from a host	yes	40 seconds	Any value denoted in seconds; 0 means unlimited amount of time
RAM memory	Total amount of RAM on the image processor board		10 MBytes (220i) 8 MBytes (220e)	14 Mbytes (220i)

Table 2-1. Configuration page settings for DECcolorwriter 1000 printers (cont'd.)

Parameter	Description	Saved in NVRAM	Default	Limits or alternate choices
Color Correction	Indicates the type of color adjustments used to simulate different color uses	yes	None	User Defined, Vivid Blue, Simulate Display, SWOP Press, Euroscale Press, Commercial Press, Monochrome, Raw RGB Colors, Raw CMYK Colors
Print quality mode	Indicates the quality mode to use for image printing	yes	Standard	Enhanced, Hi-Resolution
Transfer roll	Type of transfer roll installed in the printer	no	3 color	4 pass, 1 color (black)
LocalTalk port interpreter	Indicates the type of interpreter in use at the port	yes	PostScript Level 2	Not installed, Disabled, <interpreter>
LocalTalk printer type	Indicates the type of printer installed at the port	yes	LaserWriter	Any string 32 characters in length or less
LocalTalk node	Indicates the LocalTalk network node number of the printer	no	0	Any integer 0 through 254
Parallel port interpreter	Indicates the type of interpreters in use at the port	yes	PostScript Level 2	Not installed, Disabled, <interpreter>
Parallel port Encoding	Indicates the type of data encoding the parallel port is inspecting	yes	ASCII	Binary, Raw, TBCP
Parallel port back channel	The device used for standard output and standard error	yes	Serial	Serial B, Serial C, ... , or Parallel, Parallel B, Parallel C, ...
Serial port interpreter	Indicates the type of interpreters in use at the port	yes	PostScript Level 2	Not installed, Disabled, <interpreter>
Serial port encoding	Data byte encoding for communication	yes	ASCII	Binary, Raw, TBCP
Serial port speed	Baud rate	yes	9600	38400 (printer dependant), 19200, 9600, 4800, 2400
Serial port flagging	Hardware or software flagging	yes	XonXoff	DTR, DTR low, Etx Ack, Robust Xon Xoff, Xon Xoff2
Serial port check parity	Parity check encoding method	yes	None	Space, Even, Odd, Mark
Serial port data bits	Bits used to encode a data byte	yes	8	7
Serial port stop bits	Number of stop bits	yes	1	2

Driver and communication setup

Loading the Macintosh driver

Note Turn off any anti-virus software running on the Macintosh before installing the Digital software.

DECcolorwriter 1000 printer uses the Adobe PostScript Level 2 language. To take advantage of the Level 2 features, the printer features a DECcolorwriter 1000-specific driver which appears in the Chooser along with the LaserWriter 7.0.x driver. The driver includes special paper sizes for each printer and color correction adjustment options. Refer to the *DECcolorwriter 1000 Drivers and Utilities Printing Reference* for more details.

To install the DECcolorwriter 1000 driver with system 6.0.7 or higher

1. Place the DECcolorwriter 1000 Drivers and Utilities diskette (Macintosh) into the disk drive.
2. Double-click on the Installer icon and click OK at the introductory screen.
3. In the Easy Install window, click the **Install** button.
4. Click the **Restart** button in the dialog box that appears.
5. Select the driver's icon and the printer in the Chooser.

Note Macintosh computers on a network should have a minimum of system software 6.0.7 installed.

LaserWriter 7.0.x and its support files (**Laser Prep**, **Backgrounder**, and **PrintMonitor**) are required to use the DECcolorwriter 1000 driver and to print in the background. The Installer automatically copies these files to your hard disk drive if you are using system 6.0.7 or higher.

Installing the custom driver for Windows 3.1

The Windows driver is a Windows PostScript driver customized for a DECcolorwriter 1000. These instructions assume a basic familiarity with Windows operation and terminology. For additional information about Windows, refer to your Microsoft Windows documentation.

1. Insert the Windows 3.1 Printer Driver diskette into your computer's disk drive, for example, drive **B:**.
2. Start **Windows**.
3. Open the **Control Panel**. Double-click the **Printers** icon; the **Printers** dialog box appears.
4. Choose the **Add>>** button.
5. In the **List of Printers**, select **Install Unlisted or Updated Printer**.
6. Choose the **Install** button.
7. Type in the drive the PC diskette is in, for example drive **B:**, and choose the **OK** button.
8. Select your printer and choose **OK**.
9. The driver software you need is automatically installed.
10. Continue with the later topic "Configuring the custom Windows printer driver" on page 2-14.

Configuring the custom Windows printer driver

1. The **Printers** dialog box should still be displayed; if not, double-click the **Printers** icon in the **Control Panel**.
2. Choose your printer from the list of installed printers.
3. Choose the **Set As Default Printer** button if you want to select your printer as the default.
4. Choose the **Connect** button; the **Connect** dialog box appears.

5. Select the port the printer is connected to. Your printer is connected to your computer through one of the computer's communications ports. You need to tell the driver which port your printer uses so that the driver can print your documents.

The two main types of communications ports are parallel ports and serial ports; your computer may have one or more of each. Generally, your printer is connected through **LPT1**: if it is connected to a parallel port, or through **COM1**: if it is connected to a serial port. If you have multiple ports, your printer may be connected to another, such as COM2:.

Note *The printer's configuration page contains the information you need to setup the printer's port.*

- n **For a parallel port set-up in Windows:** Select your parallel (LPT) port in the list.
- n **For a serial port set-up in Windows:** Select your serial (COM) port in the list. Choose the **Settings** button to see the **Settings** dialog box. Fill in each item according to your configuration, then choose the **OK** button. Refer to your Windows documentation for details, or ask your network administrator for help.
- n **For a network port set-up in Windows:** Select your network (LPT or COM) port in the list. Choose the **Network** button to see the **Printers-Network Connections** dialog box. Fill in each item according to your configuration, then choose the **OK** button. Refer to your Windows documentation for details, or ask your network administrator for help.

Other communications ports may include **EPT**: (an interface for the IBM Page-Printer, which requires the installation of a special card in your computer), and **LPT1.OS2** and **LPT2.OS2**, which Windows may require if you are using certain spoolers or other add-on software programs. The port **FILE**: lets you write a PostScript document to a file instead of to the printer. For more information about communication ports, refer to your Windows documentation.

6. Set the **Timeouts**. These options regulate your computer's communications with its printer ports.
 - n **Device Not Selected:** (For parallel (LPT) ports only.) Type a value of **0**, or a value between **15** and **999**, in this text box to change the number of seconds Windows waits before notifying you that a printer is off-line. The default is **15** seconds.
 - n **Transmission Retry:** Type a value between **45** and **850** in this text box to change the number of seconds Windows waits after a print job has begun sending characters to the printer, before sending an Alert message that the printer is no longer accepting data. The default setting is **45** seconds. When using the Print Manager with a shared printer, you should set this option to a larger value, such as **600** (10 minutes) to avoid the Alert message when printing multiple-page documents.

7. Choose the **OK** button to return to the **Printers** dialog box, then choose the **Setup** button. A dialog box appears with the name of the printer you selected across the top. Use this dialog box to select paper source, paper size, and image orientation.
8. Choose the **Options** button to see the **Options** dialog box. Make sure that the **Color** box is checked to print in color.
9. From the **Options** dialog box, choose the **Advanced** button to see the **Advanced Options** dialog box. Make sure that the **Use PostScript Level 2 Features** check box is checked **on**.

This option affects the print time of bitmapped (raster) images by improving the image transfer time from the computer to the printer, and by improving the image processing time in the printer. This option is only available to applications that use this custom driver with DECcolorwriter 1000 printer. When this box is checked, the **Compress Bitmaps** option is unavailable (grayed out). Choose the **OK** button to return to the **Options** dialog box.

10. In the **Options** dialog box, choose the **Printer Features** button to see the **DECcolorwriter 1000 Printer Features** dialog box. Make color correction and media type selections as desired. Choose the **OK** button to return to the **Options** dialog box.
11. Choose the **OK** button to return to the dialog box that lists your printer's name across the top.
12. Choose the **OK** button to return to the **Printers** dialog box.
13. Choose the **Close** button.

Updating the standard Microsoft Windows PostScript driver

If a customer prefers to use the standard Microsoft Windows PostScript printer driver instead of the custom driver for Windows, follow these instructions. This update procedure provides printer page size information for applications within Windows using the standard driver. However, color adjustments and other PostScript Level 2 features are available only with the custom Windows 3.1 driver and are not supported by the standard driver.

These instructions assume a basic familiarity with Windows operation and terminology. For additional information about Windows, refer to your Microsoft Windows documentation.

Update procedure

1. Start Windows.
2. Open the **Control Panel**.
3. Double-click on the **Printers** icon.
4. Choose the **Add>>** button; a list of printers is displayed. Highlight the DECcolorwriter 1000 printer.
5. Select **Install Unlisted or Updated Printer**.
6. Choose the **Install** button.
7. When prompted, insert the provided standard Windows 3.1 Printer Driver diskette into your computer's disk drive. Connect to the appropriate floppy drive and the directory \WPD. Choose your printer and then click the **OK** button. When asked to insert a diskette with the updated *PSCRIPT.DRV* file, enter *system* as the location so that the current *PSCRIPT.DRV* file is used.

Installing the printer driver for OS/2 Version 2

Under OS/2 Version 2.0 printing is managed through printer object icons. Object icons represent a printer setup, and are associated with a port, a driver, and a queue, if appropriate. These object icons replace the earlier Print Manager functions. Normally, a printer object icon is installed during the initial OS/2 2.0 installation. A single printer object on the desktop may represent more than one printer. A printer object on the desktop is a "generic" object that can be configured to point to any printer by changing settings in the settings notebook for this object. You may *not* have more than one printer object pointing to the same I/O Port. Port designations for each printer object must be unique. Before new printers are installed, existing printer object assignments must be changed.

Note *IBM suggests that printer objects be named to represent available printer ports rather than printer names or printer drivers. This avoids the confusion of a specific printer name being associated with an object that is using a driver for a different printer.*

Check existing printer object port assignments before installing a new printer to be sure there is no conflict. Once you are familiar with existing printer objects (drivers and ports associated with these objects) you can install a new printer.

In the procedure below the printer remains associated with LPT1, and you will set up a new printer object for LPT2. Following are the steps to create the LPT2 PRINTER object:

1. Check all existing printer objects to be sure that they do not point to LPT2. Make any necessary changes to the settings for these printer objects.
2. Locate the original OS/2 Print Driver Diskettes (1-5).
3. Find and open the **TEMPLATES** folder and locate the **Printer Template**.
4. Using the mouse, point to the **Printer Template**, hold down the right mouse button, and drag the object onto the desktop and release the mouse button.
5. The **Create a Printer** dialogue box will be displayed. In the name field, type: **LPT2 PRINTER**. *This is the only opportunity to assign this name and it cannot be changed.* The first 8 characters (except spaces) will display in all printer selection menus, so the printer will be listed as **LPT2PRIN**.
6. Scroll through the printer drivers listed to locate the proper printer driver name. If it is listed, select it, otherwise, point the cursor to any other driver listed and click the right mouse button. Click **Install** from the menu options.
7. In the **Install New Printer Driver** dialogue box, set the directory to **B:** and insert the Printer Diskette #1 in drive **B:**. Click on **Refresh**. The system searches the diskette for driver groups and prompts you to stop the search or continue. When the PostScript driver (*PSCRPT.DRV*) appears, stop the search.
8. At this point, a list of possible PostScript printers are displayed for your selection. Using the scroll bars, move down through the alphabetical listing until you find the selection **PSCRIPT. DECcolorwriter 1000**. Click on the correct printer name and then click on **Install**. The system will install your printer driver. Click **OK**.
9. Close the **Install New Printer Driver** dialogue box. Before leaving the **Create a Printer** dialogue box, adjust the printer port timeout setting. Double-click on the port you have selected, in this example, **LPT2**. Change the timeout to **180** seconds. Then click **OK**.
10. To create the new printer object on the desktop, click on **Create**. A new printer driver object is placed on your desktop. Confirm and adjust the settings for this printer driver by launching an application program and performing the following steps.
 - a. Bring up the **Settings Notebook** by clicking the right mouse button on **LPT2 PRINTER**. Click on the arrow to the right of **OPEN**, click on **SETTINGS**.

- b.** Select the **Printer Driver Tab**. Confirm that the DECcolorwriter 1000 is selected (highlighted). Double-click on the DECcolorwriter 1000 driver to configure the **Printer Properties**. This is where you can define printer paper sizes and orientation. These settings can be adjusted from within software applications as well. To get started, set **Forms** to **Legal-size** paper. This is the recommended setting. Next, select **Device Defaults**, set **Form** to **Legal** and set **Orientation** to **Landscape**. One of the most likely causes of printer errors is that the document and device defaults do not match.
- c.** Select **Options** and make sure that it is set to **DECcolorwriter 1000**. If not, repeat the previous steps. While in this screen, set **Job and Wait** to **0**, if they aren't already. Select the **Output Tab**. Ensure that the proper port is selected.
- d.** Select the **Queue Options Tab**. Activate a check for both **Printer Specific Format** and **Job Dialog Before Print**. Return to the Settings Notebook and close it.
- e.** If **LPT2 PRINTER** is not the only printer object on the desktop, then you may want to make it the default printer before opening a software application. To do so, point the cursor to the **LPT2 PRINTER** object, click the right mouse button, click on **Set Default**, and select **LPT2 PRINTER**.

Configuring the printer's serial port for a PC

Use the PostScript command file *DEVPARAM.PS* (also located on the Utilities diskette) to modify the printer's serial port settings.

To modify *DEVPARAM.PS* you should be familiar with the PostScript **setdevparams** command. This file lets you configure the printer's serial port. The following example sets flow control to *Xon/Xoff*, parity to *none*, data bits to 8, stop bits to 2 and the baud rate to 9600. In the example below, the changes are persistent across print jobs and across power cycles; they remain in effect until specifically changed again.

Note *CTRL-D is the ASCII End-Of-Text (EOT) character.*

DECcolorwriter 1000

```
CTRL-D
systemdict/languagelevel known{languagelevel 2 eq
{true}{false}ifelse}{false}ifelse
{
(%Serial_NV%) <</Password ( )
/FlowControl /XonXoff
/Parity /None
/DataBits 8
/StopBits 2
/Baud 9600 >> setdevparams
) if
CTRL-D
```

When you change the settings for the serial port, the baud rate DIP Switch 7 on the printer's back panel must be *down* before the changes will take effect.

1. Use a text editor or word processor to modify the *DEVPARAMS.PS* file. (Be sure to save the file as a text-only file.) Substitute the values you want for the values used in the sample *DEVPARAM.PS* file. The possible values for each parameter are listed in the following table. The values are case-sensitive; they must be entered exactly as shown.

Table 2-2. Values for modifying the DEVPARAMS.PS file

Parameter key	Allowed Values	Types
FlowControl	XonXoff (software) Dtr (hardware)	string
Parity	Even Odd None Space	string
DataBits	7 8	integer
StopBits	1 2	integer
Baud	300 600 1200 2400 4800 9600 19200 38400	integer
Enabled	true false	boolean
CheckParity	true false	boolean
On	true false	boolean
Interpreter	PostScript HP7475A	string
Protocol	Normal Raw Binary	string

2. Use the DOS **COPY** command to send the *DEVPARAM.PS* file to the printer; for example: `COPY DEVPARAM.PS COM1 :` (Substitute the appropriate port for COM1:.)

Using *printcap* to configure a Unix workstation for the printer's serial port

The *printcap* file configures the workstation's **lpr** queues. The file is usually found in the workstation's */etc* directory. The printer's rear panel switch settings should all be *down*. Use a null modem cable, since the printer is set up as a DTE device. For this example, the printer's serial port settings are as follows:

```
Speed:      9600
Flagging:   Software (XON/XOFF)
Data Bits:  8
Parity:     Ignore
```

To set up a **printcap** entry, perform the following steps:

1. Make a backup copy of the */etc/printcap* file.
2. Add to the **printcap** file a new print queue name and set the port parameters as needed. Add the following to the **printcap** file:

```
px:\
:br#9600:rw:\
:fc#00000374:fs#00000003:\
:xc#0:xs#0040060:\
:mx#0:sf:sh:\
:sd=/var/spool/px:\
:if=/var/spool/px/if:\
:lp=/dev/ttya:
```

px may be changed to whatever unique printer name you choose. The device driver name in **lp** may be different depending upon which serial port the printer is connected to and the device driver naming scheme for the workstation.

3. Create a directory called */var/spool/px* and create a file in the directory called *if*. The content of the file should look like this:

```
#!/bin/sh
/bin/cat
```

4. Give the **if** file executable permission:

```
chmod +x if
```

If communication to the serial port uses 7 data bits, the value for **xs** changes as follows. All other setup parameters remain the same.

```
px:\
:br#9600:rw:\
:fc#00000374:fs#00000003:\
:xc#0:xs#0040040:\
:mx#0:sf:sh:\
:sd=/var/spool/px:\
:if=/var/spool/px/if:\
:lp=/dev/ttya:
```

5. To print a PostScript file type:

```
lpr -Ppx filename
```


Verifying the Printer and Host Connections

In this chapter, you verify that the host computer can send files to the printer. This chapter assumes that the printer and the printer drivers have been properly installed as explained in the previous chapter “Installing the Printer and Drivers.”

Verifying printing to a Macintosh

Selecting the printer via the Chooser

This procedure applies to both operating system version 6.0.7 (and higher) and system 7.0 (and higher).

1. Turn on the printer and the Macintosh, if they are turned off.
2. With the mouse, click and hold on the Macintosh's **Apple** menu (in the upper-left corner of the screen). Select the **Chooser** from the Apple's pull-down menu.
3. The Chooser dialog box is now displayed on the screen. On the left side of the dialog box are icons representing the printer drivers installed on the Macintosh. Select the driver icon **DECcolorwriter 1000** by clicking on it once. If the host and the printer are a part of a zone, you should first select the printer driver and then pick the zone that the printer resides in.
4. Displayed on the right side of the dialog box are a list of printers that the selected driver will print to. Select the newly installed printer **DECcolorwriter 1000**. (If, for example, a DECcolorwriter 1000 is already on the network with the name `DECcolorwriter 1000`, then the newly installed printer will be named `DECcolorwriter 10001`.)
5. Displayed on the bottom of the dialog box is the background printing option. Click the **OFF** button to turn it off. (If desired, this can be turned back on after the printer verification.)
6. Close the **Chooser** by clicking on the small box in the upper-left corner of the dialog box. The DECcolorwriter 1000 is now your chosen printer.

You have now verified that the printer is on the network and is communicating with the Macintosh.

If you do not see the printer listed in the dialog box, then the printer is not communicating with the Macintosh. Check the printer's cable connection to the network. Also check the printer to see if its rear panel health LED is blinking. Ensure that the correct network is selected, in the event that the Macintosh is connected to more than one network (such as both LocalTalk and Ethernet). Refer to Chapter 6, "Troubleshooting" for more information about networks. More troubleshooting tips are included in the reference manual *DECcolorwriter 1000 Drivers and Utilities Printing Reference*.

Print the directory from Macintosh

1. Make sure that you have an open window displayed on the screen (such as the hard disk drive's window).
2. At the Macintosh desktop, click and hold on the **File** menu bar item.
3. **For System 7 or higher:** Scroll down the **File** pull-down menu and select the item **Print Window...**

For System 6.0.7 to 6.0.8: Scroll down the **File** pull-down menu and select the item **Print Directory...**

4. A print dialog box appears on the screen. Click on the **Print** button in the upper right corner of the dialog box to send a file to the printer.

This verifies that the Macintosh and the printer driver can send a file to the printer. If the printer does not make a print, then there may be a problem with the printer driver. In this case, if possible, you should verify that the Macintosh can print to a different printer on the same network. Choose a different PostScript printer driver such as an Apple LaserWriter in the Chooser and then repeat Steps 2 and 3. If the file doesn't print, then you must diagnose and fix the problem on the Macintosh.

Verifying that an application communicates to the printer

This procedure verifies that an application installed on the Macintosh can print to the printer. Note that many applications require a special printer page description file (*APD*, *PDF*, *PDX* or *PPD* files) to print to a printer. These files contain information specific to a particular printer, such as page sizes, margins, and printing options. Refer to the Utility diskette's *README* file for the latest information on which applications require which printer page description file. The printer page description files are provided on the Drivers and Utilities diskette.

1. Ensure that the correct driver is selected in the Chooser.
2. Start an application and select a file that contains text.
3. With an illustration or a page of text displayed, click and scroll down the **File** pull-down menu and select **Print...**
4. A print dialog box appears on the screen. Click on the **Print** button in the upper right corner of the dialog box to send a file to the printer.

If problems occur at this point, download the error handling utility to the printer as explained in the next procedure. Refer to the *DECcolorwriter 1000 Drivers and Utilities Printing Reference* which provides information on using the printer with specific applications.

Using the Error Handler utility

If the Macintosh does not print to the printer, download one of the Tek Error Handler utility files to the printer.

1. Place the printer's Macintosh Printer Utilities diskette in the disk drive. (The utility files are stored in a compressed format and must be decompressed before they can be used. The compressed utility file automatically decompresses when you click on its icon.)
2. Select the **DECcolorwriter 1000** in the **Chooser**.
3. Locate the Advanced Error Handler file in the folder of utilities files.
4. Double-click on its self-sending arrow icon to open and send the file to the printer. Be sure that the **DECcolorwriter 1000** is selected.

This loads the error handling utility into the printer's memory where it remains until the printer is turned off. Send a file to the printer as explained in the previous procedure. If an error occurs, the printer will print a page listing the error.

Verifying printing to a PC

DOS connection verification

Verify that the PC can communicate with the printer.

1. Power up the printer and the PC. If the PC is running under Windows, exit Windows so that the PC is operating under DOS alone.
2. At the DOS prompt, type (in lowercase) the following:

echo showpage > port:

Substitute *port:* with **LPT1:**, **LPT2:**, or **COM1:** etc. or whichever corresponds to the port the printer is attached to.

The printer should respond by picking, processing, and ejecting a blank sheet of paper.

If this does not happen, check your cabling. Ensure that you have the port properly configured as explained in the Chapter 2 topic "Cabling the printer" on page 2-8.

Windows 3.1 driver verification

Using the Windows Paint application, verify that the PC, running under Windows 3.1, can print to the printer.

1. If it is not already running, launch Windows by typing this command:

WIN

2. Launch the program manager by double-clicking the **Program Manager** icon.
3. Open the Accessories window by double-clicking the **Accessories** icon.
4. Double-click on the **Write** icon. (If Write is not available, you can use any other text editor-type program.)
5. Type in a line of text such as `THIS IS A TEST.`
6. Click the **File** menu item and select **Printer Setup...** from the menu list. Select **DECcolorwriter 1000** from the displayed list of available printer drivers. Click **OK**.
7. Click **File** and select **Print**. A print file will be transmitted to the printer.

OS/2 connection verification

Note *The Print Screen function is controlled from within the OS/2 System folder.*

1. Open the **System** folder, then open the **System** object.
2. Click on the **Print Screen Tab** to view the Print Screen settings. Be sure that **Enable** has been selected. With Enable Print Screen selected, the following options are available.
 - a. You may print the contents of a window by pointing to that window and pressing **Print Screen**.
 - b. You may print the full screen by first opening any window, placing the cursor on the desktop away from any open windows, and then pressing **Print Screen**. *Be sure that at least one window is open.*
 - c. You may use Print Screen on any port (any available printer) by changing the default printer selection. (Point to any printer object, click the right mouse button, click on **Select Default**, and click on the desired printer.) This is a simple way to be sure that all printers are set up correctly.

Verifying printing to a PC using the Error Handler utility

If a PC has trouble printing directly to the printer, download one of the Advanced Error Handler utility files to the printer.

1. Locate the *ADVEHAND.PS* file in the Printer Utility diskette.
2. Copy the file *ADVEHAND.PS* to the PC's hard disk or use the file from the diskette.
3. Use the DOS **COPY** command to send the file to the printer. For example:

COPY *advehand.ps* LPT1:

If necessary, substitute the appropriate port for LPT1:

This loads the error handling utility into the printer's memory where it remains until the printer is turned off. Send a file to the printer as explained in the previous procedure. If an error occurs, the printer will print a page listing the error.

Verifying printing to a workstation using the Error Handler utility

If the workstation host does not print to the printer, download the Advanced Error Handler utility to the printer.

1. Locate the *ADVEHAND.PS* file in the PrinterUtility diskette.
2. Copy the file *ADVEHAND.PS* to the workstation's hard disk or use the file from the diskette.
3. Make sure that the printer port is configured to receive PostScript, then send the file to the printer.

This loads the error handling utility into the printer's memory where it remains until the printer is turned off. Send a print file to the printer as explained in the previous procedure. If an error occurs, it will print a page listing the error.

3 *Verifying the Printer and Host Connections*

Key Operator Training

This section covers the last portion of the printer installation: training the printer's key operator. The steps you follow here place an emphasis on encouraging the key operator to read and use the printer's user manual and to clean and care for the printer.

Printer controls and indicators

Front panel LEDs: Explain the meanings of the front panel LEDs.

- n Show where these indicators are explained in the user manual.

Error reporting: Explain how error conditions are displayed on the front panel.

- n Show where error conditions are explained in the user manual.

Rear panel DIP switches: Explain the functions of these switches.

- n Show how to reset the printer with DIP Switch 1.
- n Emphasize that the functions of the color correction switches, when switched on, are always in effect, no matter what print options were selected at the host computer through the printer driver.
- n Show where the functions of the rear panel switches are explained in the user manual.

TEST button: Explain the function of this switch.

- n Show how it prints a test pattern that can be used to judge the print quality and ensure that the print engine operates correctly. Leave the print with the customers so they can judge future printing.
- n Explain how, during an error condition, that pressing the switch displays an encoded error code on the front panel LEDs. This indication can be telephoned to a service representative to help diagnose a troubled printer prior to making a service call. You can open the top cover, and then press the **TEST** button, to demonstrate an error condition.
- n Show where the **TEST** button is explained in the user manual.

Loading media

Paper/transparency: Demonstrate how to load paper or transparency film into a paper tray.

- n Emphasize to the customers not to touch the printing surface of the media; handle it by the edges only. Fingerprints can affect print quality.
- n Explain that the customers should not bend the media (especially transparency film) too sharply. Otherwise print quality may be affected.
- n Demonstrate fanning the media prior to installing it in the paper tray.
- n Show where this is explained in the user manual.

Transfer roll: Demonstrate how to load a transfer roll.

- n Emphasize to customers not to touch the cyan, magenta and yellow bands of the transfer roll; handle it by the core endcaps only. Fingerprints can affect print quality.
- n Demonstrate how to remove the transfer roll.
- n Show where handling the transfer roll is explained in the user manual.
- n Emphasize that cleaning the printer should be performed each time the transfer roll is changed.

Cleaning

Explain the importance of keeping the printer clean. Emphasize how dirt and dust can affect print quality and paper-pick reliability.

- n Explain the contents and use of the cleaning kit.
- n Show how to clean the paper-pick rollers, the thermal head, the transfer roll guide, and the paper-feed rollers. Emphasize that these parts should be cleaned every time the transfer roll is replaced; particularly if plain paper is used.
- n Show how to clean the drum, the exit rollers and the white transfer roll mark sensor pad (mounted on the bail roller unit). These parts should be cleaned every 5000 prints.
- n Show where this is explained in the user manual.

Clearing paper jams

Paper input (pick jam): Show how you remove the tray to clear a paper-pick jam.

- n Show where this is explained in the user manual.
- n Point out the paper empty flag (inside the paper feeder). Emphasize to customers that they should not force the tray in or out of the printer and possibly break the flag.
- n Point out the pick rollers. Explain that if for some reason they should be out of their proper position (flat side facing down) that they could block the paper tray from being inserted into the printer. Show how the pick rollers can be manually rotated into their proper position.
- n Demonstrate how to push the media down in the paper tray so the lift plate lock to the bottom of the tray, before inserting the tray in the printer.

Drum (print jam): Show how you open the top cover to clear a printing jam.

- n Show where this is explained in the user manual.

Exit (exit jams): Show how you open the front cover to clear an exit jam.

- n Show where this is explained in the user manual.

Warranty information

Review the warranty information with customers to ensure that they are aware of the printer's warranty and the duration of its coverage.

Supplies ordering

The printer is shipped with the latest version of the supplies information sheet. It lists all the available supplies for the printer, as well as printer accessories, such as software and printer stands, that customers may be interested in. Additionally, some supplies are listed in the user manual.

United States: Customers can call 1-800-DIGITAL (1-800-344-4825) to place a supplies order. Open Monday through Friday, 7:30 am to 8:00 pm (EST). Shipments are made within 24 hours.

Outside the United States: Contact your nearest dealer.

Theory of Operation

This chapter provides a high-level description of the thermal-wax transfer printing technology and how the printer employs it. Following that is a high-level discussion of the image processor board and how it receives data from a host computer and transforms it into data for the print engine.

Print engine

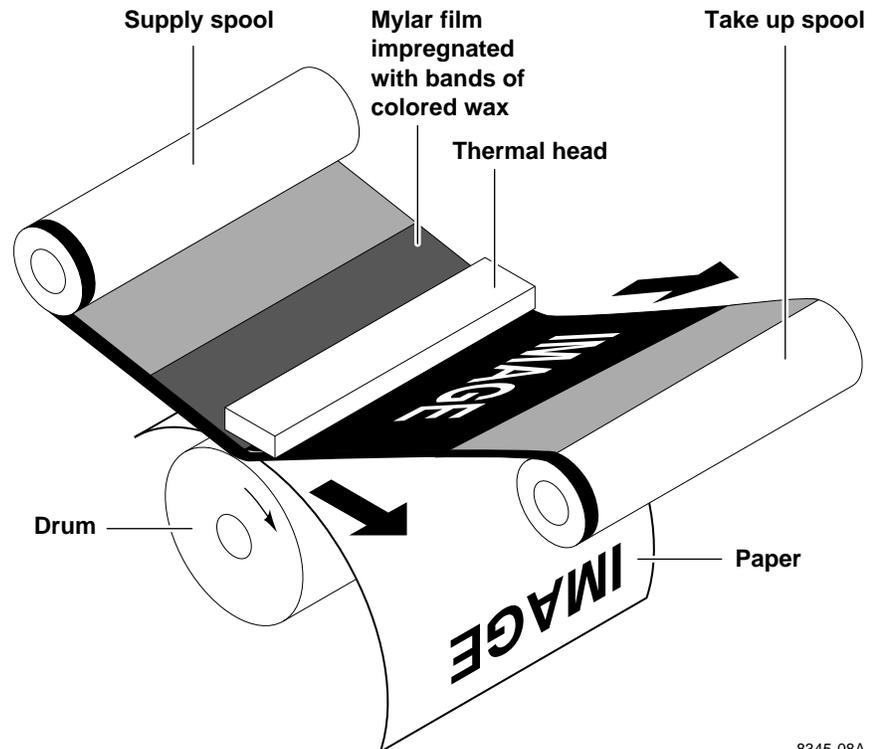
Wax transfer — the engine's printing technology

To make colored prints, the print engine uses a color printing method called *sequential surface thermal transfer printing*. Simply said, the print engine prints by melting dots of colored wax from a Mylar ribbon onto a piece of paper. The benefits of this method are high-resolution printing, easy maintenance, and fast printing.

The print process

Figure 5-1 illustrates the printing process employed by the print engine. In the printing process, a single piece of clay-coated paper (or transparency film) is drawn past a thin Mylar ribbon, called a transfer roll, which is coated with sequential bands of colored wax: yellow, magenta and cyan. A heating device, called a thermal head, melts the colored wax from the transfer roll onto the paper. The wax melts at approximately 68° to 70° C (154° to 158° F). The thermal head is an electrical device containing over 2400 individually controlled heating elements aligned parallel to the short axis of the paper it prints upon. And because the row of thermal elements span the width of the page, the print engine prints an entire line at one time; this accounts for the print engine's fast print time. The printer uses a special clay-coated paper which presents a smooth, flat surface for the wax to adhere to.

During printing, the print engine moves the paper past the thermal head three times. During each pass, individual thermal head elements melt tiny dots of wax from the transfer roll's colored bands; first from the yellow band, then the magenta band, and finally, cyan. The three overlaid colors combine on the paper to produce a complete color image. After the three passes, the finished copy is ejected from the printer. The wax transfer roll is supplied on one spool, feeds past the thermal head and drum for printing, and collects on a take-up spool. Note that every three bands of the used transfer roll contains a negative impression of the printed image; this is somewhat analogous to a photographic negative.



8345-08A

Figure 5-1. The thermal-wax transfer print process

Plain-paper printing

Using the special 4-pass, Plain Paper Transfer Roll, the printer can print on ordinary Bond paper. In this process, a special coating is applied to the paper in its first pass past the thermal head. The coating supplies a smooth, flat surface for the yellow, magenta and cyan wax applied in the following three passes. The coating is applied only to the portions of the paper where colored wax is to be applied.

Because of the extra pass required for printing on plain paper and the fact that the drum moves in a slower, half-step mode while laying down the precoat layer, plain-paper print times are about 10 seconds longer than printing on coated paper with the standard 3-Color transfer roll.

In addition, a greater demand is made on the image processor board's memory for plain-paper printing. The image processor board must generate a composite bitmap of the cyan, magenta, and yellow bitmaps. The composite bitmap guides the print engine on where to apply the precoat on the plain paper.

Image data

DECcolorwriter 1000 print engines must receive data in a specific format to correctly print the image that the data represents. The printer's image processor board must convert the data into the correct format. The following topics describe some of the data formatting that the host or the interface module must perform.

The print engine prints an image in a raster format, line by horizontal line, dot by dot. The image to be printed is “described” with the colors yellow, magenta and cyan. First the yellow raster making up the image is printed, then the magenta raster is printed, and finally, the cyan raster. It is the responsibility of the image processor board to communicate the image data, serially, to the print engine, in this order.

Creating colors

As mentioned earlier, DECcolorwriter 1000 print engines print only the colors cyan, magenta and yellow. However, these colors, called primary colors, can be mixed together to simulate other colors, called secondary colors. When tiny dots of two primary colors are intermixed, your eye perceives a third color. That is how the print engine can use just three basic colors to create multi-colored images. For example:

- n Cyan and yellow intermixed produce green.
- n Cyan and magenta intermixed produce blue.
- n Yellow and magenta intermixed produce red.
- n Mixing yellow, magenta and cyan produces the color black.

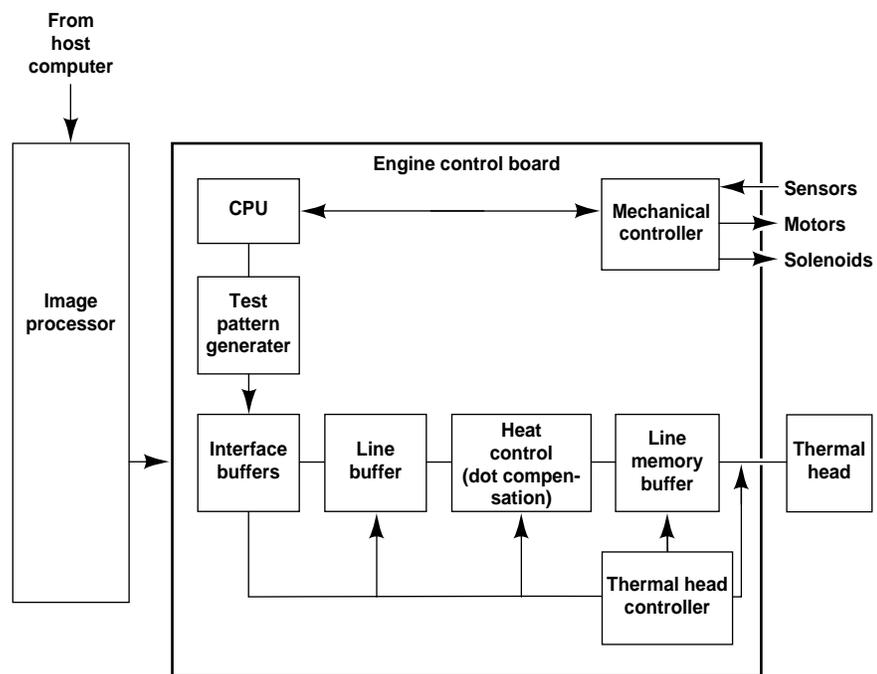
A method called *dithering* creates a wide spectrum of printable colors. By intermixing different percentages of primary colors in predefined patterns, subtle shades of other colors can be produced. For example, if 75% of the colored dots in a square inch of copy are magenta and the other 25% are cyan, then a dark blue will result. But if the magenta and cyan are mixed in a 50:50 ratio then a lighter shade of blue would result. Note that the primary color dots must be intermixed in an ordered fashion to properly produce a particular color shade.

It is the responsibility of the image processor board to output, to the print engine, the CMY-encoded data in the proper sequence to produce the desired dither pattern.

Engine control board block description

The engine control board receives color bitmaps from the image processor board. It also controls the print engine's printing process, including all motors, sensors, and the thermal head. The block diagram shown in Figure 5-2 illustrates the functional operation of the print engine control board. The block diagram consists of nine major functions:

- n Central processing unit (CPU)
- n Interface
- n Data controller and data buffer
- n Timing controller
- n Dot compensator
- n Head controller
- n Thermal head
- n Mechanical controller with motors, solenoids, and sensors
- n Internal test pattern generator



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Figure 5-2. Print engine board block diagram

CPU

All DECcolorwriter 1000 print engine CPUs consist of a microprocessor, ROM, RAM and a clock circuit. The CPU is the heart of the print engine. It controls the timing controller, the mechanical controller, and print engine diagnostics.

Interface buffers

The interface buffers receive data from the image processor board, where the image data was received from the host computer and processed into data for the print engine. The interface buffer routes received data signals to the data controller.

Data controller and line buffers

The data controller receives input data from the interface and stores it in a data buffer. The data buffer contains two buffers: one buffer holds the current line of image data being transmitted to the print engine and the other buffer holds the preceding seven lines of image data received by the print engine. When the data buffers contain all eight lines of data, then the data controller transfers the data to the heat controller.

Heat controller (dot compensation)

Each thermal heating element must receive sufficient energy to melt wax properly. Too much energy and the wax dot smears when printed. Too little energy, and the wax dot is ill-formed and does not adhere to the paper. In the heat controller, the data of the current raster line to be printed is compared with the seven previously printed lines. The dot compensator determines when, and for how long, the individual thermal head elements should be energized to properly melt wax onto the paper. This comparison accounts for the thermal energy stored in each heating element from its previous dot printing action as well as the thermal energy picked up from adjacent heating elements.

In this comparison, the heat controller determines, for each dot to be printed, if the heating element was used to print any dots during the last seven lines, and also if any neighboring dots were or will be printed next to the dot in question. Knowing this history, the heat controller can determine how long to sustain the voltage pulse to the dot's heating element to correctly print the dot. This information is transferred to the line memory buffer.

Thermal head controller

The thermal head controller uses the information received from the heat controller, in conjunction with timing signals, to drive the thermal head with the data stored in the line memory buffer. The head controller generates four different strobes. These four strobes are combined to provide seven drive pulses ranging from 435 μ S for “cold” thermal elements, to 200 μ S for “hot” elements. The drive pulses are combinations of these pulse widths: 145 μ S, 120 μ S, 90 μ S and 80 μ S pulses. During printing, the strobe length is varied, based on the overall thermal head temperature and the volume of dots printed in a line. The voltage level of the pulse is fixed at 25.5 VDC.

Thermal head

The thermal head is the device that melts wax dots onto paper. It contains a row of 2496 solid-state heating elements. (Only a maximum of 2440 are actually used.) The actual number of elements used during a particular print depends on the paper size (A or A4) and the image to be printed. The thermal head prints raster lines parallel to the short axis of the paper.

Earlier, in the topic “The print process,” we said that the print engine prints one line at a time; this is not exactly the case, it just appears that way. To simplify its electrical design, the print engine actually uses a drive signal multiplexing scheme to energize the heating elements. During printing, the head controller activates a pair of heating element segments from eight heating segments of the thermal head. (Individual elements in the segments may or may not be energized depending upon whether the element is to print a dot; it is just that segments are printed as pairs.) Following the printing of the first pairs of segments, the head controller energizes the second pair of segments from the eight heating element segments, then the third pair. Energizing the fourth pair of segments completes the raster line printing. A line is printed in 1.8 msec.

Mechanical controller

The printer engine mechanical controller interfaces the CPU to the print engine’s motors, sensors, solenoids and fans. By interpreting signals from the sensors, buffered by the mechanical controller, the CPU keeps track of the paper drum position, transfer roll position and paper position during printing. Based on this information the CPU determines the proper time to transmit signals to the mechanical controller to advance the paper, energize a solenoid, or check a sensor.

Internal test pattern generator

This circuit produces the print engine's internal test patterns. The test pattern algorithms are stored in ROM. The internal test pattern data are routed to the interface block and pass through the rest of the print engine just as regular image data would.

Paper path in operation

This topic discusses the movement of a piece of paper from the paper tray, through the printing process, to the printer's output tray.

Paper pick-up

Paper pick-up takes place at the paper-feed unit. It begins when the pick-up solenoid energizes and the paper-feed motor rotates forward. This causes the pick-up roller (gear-driven by the paper-feed motor through a one-way clutch) to force a sheet of paper from the tray to the feed rollers. The pick-up solenoid allows the pick-up roller to rotate only long enough to force the paper into the feed rollers. The pick-up solenoid then de-energizes so that the pick-up rollers are disengaged from the gear train. The feed motor continues to rotate forward, causing the feed rollers (also gear-driven by the paper-feed motor) to carry the sheet of paper to the aligning rollers. As the paper passes through the paper-feed unit, it triggers paper-pass sensor 1 which checks to see if the paper made it to the aligning rollers.

Note that the action of the feed rollers forcing a sheet of paper into the aligning rollers aligns the sheet of paper to the paper path. There is a slight pause between the time the paper strikes the aligning rollers (resulting in a slight buckle in the paper, at which time the alignment takes place) and when the aligning roller solenoid is energized, which allows the aligning rollers to rotate and drive the paper to the paper clamp.

Also note that, although unrelated to the paper pick-up process, the drum rotates backward (counterclockwise) against a pair of stops that force the clamp open to receive and clamp the leading edge of the paper when it reaches the drum.

Lower Tray Assembly. Picking paper in a manner identical to the printer's paper-feed unit, the Lower Tray Assembly's front door routes the sheet of paper to the feed roller in the paper-feed unit.

Caution Never rotate the pick rollers in the reverse direction.

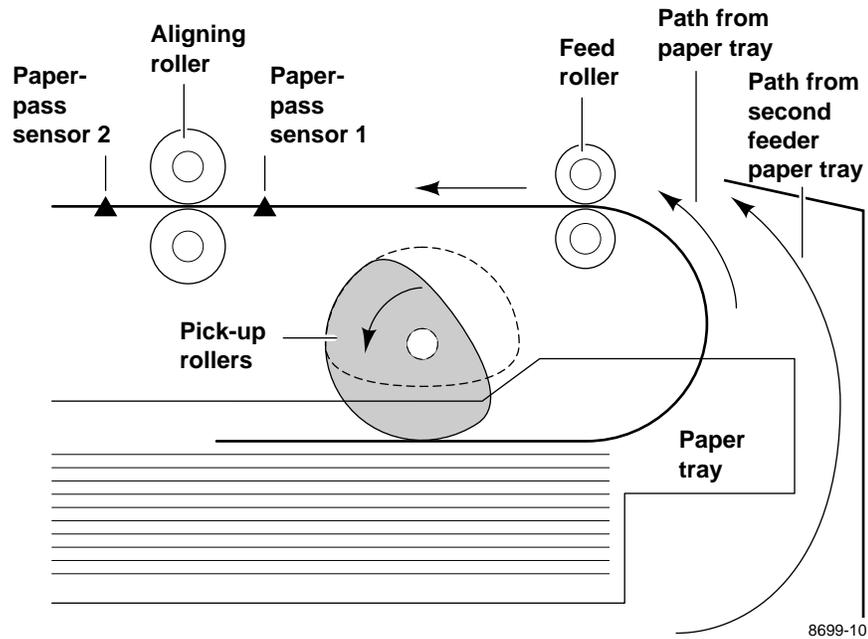


Figure 5-3. The paper pick process

Drum loading

As the paper passes beyond the aligning rollers, it triggers paper-pass sensor 2. This activates the transfer roll feed motor long enough to apply tension to the transfer roll, pulling it taut. The aligning rollers carry the sheet of paper to the spring-loaded paper clamp, waiting in the clamp open position to capture the leading edge of the paper.

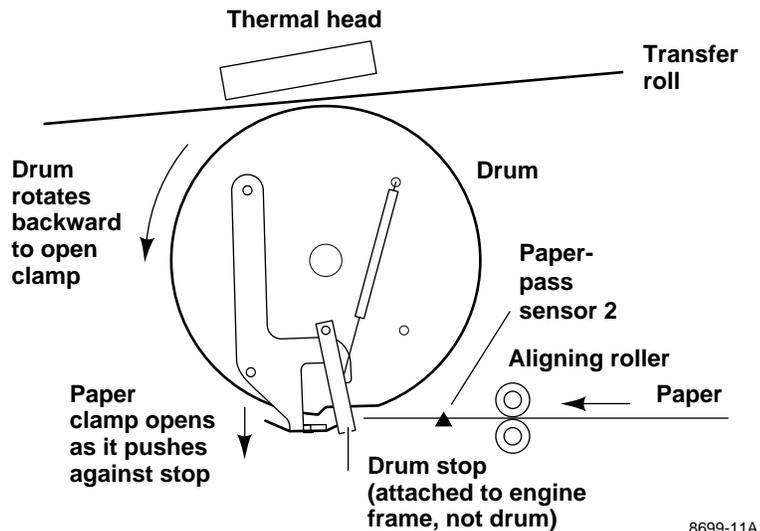


Figure 5-4. Paper clamp opening to receive a sheet of paper

The drum slowly rotates forward (clockwise, viewed from the left side), automatically closing the spring-loaded clamp until the paper-clamp sensor detects the paper loaded in the clamp, and then speeds up to draw more of the paper around the drum. This continues until the leading edge of the paper (the clamped end) is beneath the thermal head, ready for printing.

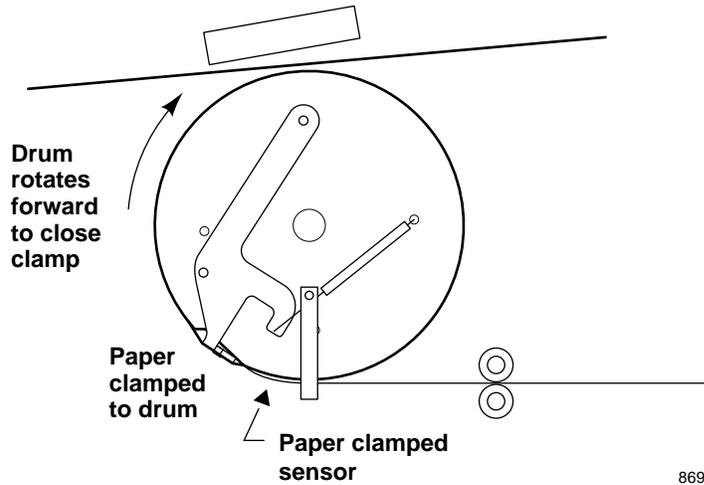


Figure 5-5. Clamping the paper

The position of the drum is determined by the drum motor. At this time, the transfer roll motor is energized to draw the transfer roll to its start position with the leading edge of its yellow band at the thermal head. The sheet of paper and the transfer roll are now in position for printing.

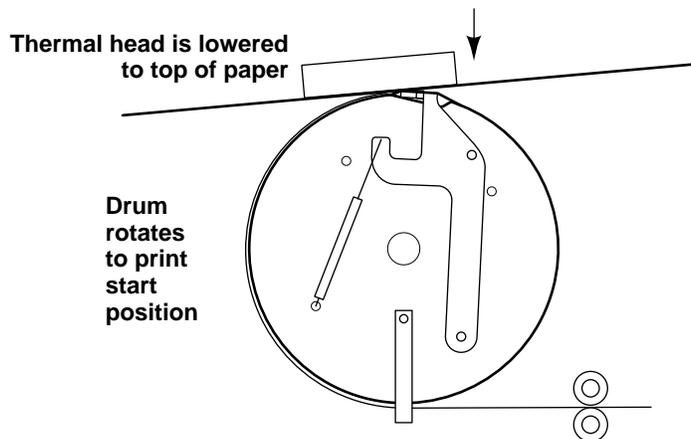


Figure 5-6. Positioning the paper for printing

Printing

After checking the transfer roll's position (through the transfer roll mark sensors) the thermal head lift motor rotates an eccentric cam to push the thermal head down from its standby position to its print position, sandwiching the transfer roll and paper together between the thermal head and the drum.

Printing begins as the drum slowly rotates forward (clockwise) drawing the paper and the transfer roll past the thermal head where wax is melted from the transfer roll onto the paper to form a printed image. Contact friction between the moving paper and the transfer roll moves the transfer roll past the thermal head at the same rate as the paper.

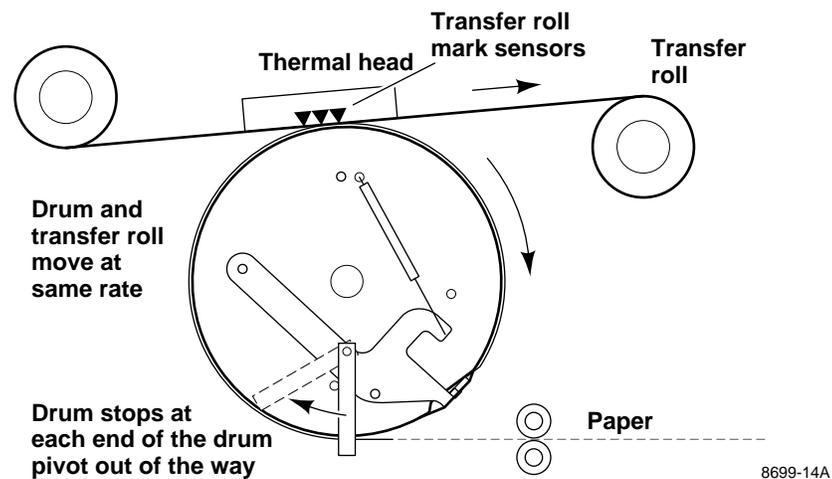
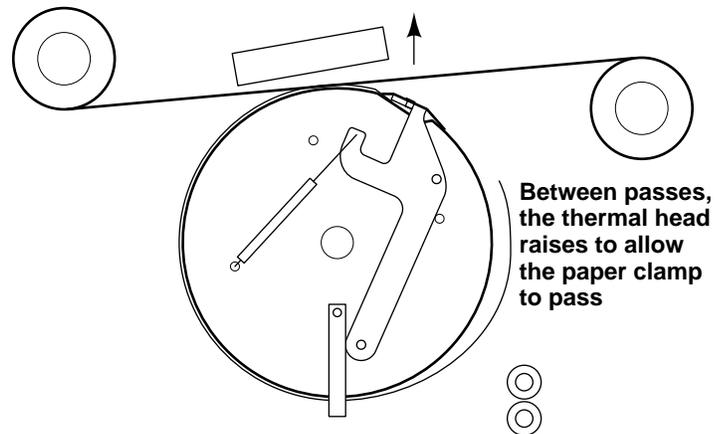


Figure 5-7. Printing on the paper

The sheet of paper is drawn past the thermal head three times to form a complete image. When the first pass (yellow printing) is completed, the thermal head lift motor raises the thermal head to its standby position allowing the paper clamp to pass underneath. When the paper reaches the print-start position, the thermal head lift motor rotates to bring the thermal head back to the print position, and printing continues with magenta printing. This process repeats once more for cyan printing and then the print is ready to be unloaded to the printer's output tray. (During forward rotation, the drum stops are simply pushed out of the way. The drum stops can only open the clamp during reverse drum rotation.)

Unlike other thermal wax printers, the DECcolorwriter 1000 does not reverse the drum to “back up” the print to the start position for each pass during printing. This is one of the reasons for the DECcolorwriter 1000's faster print times.



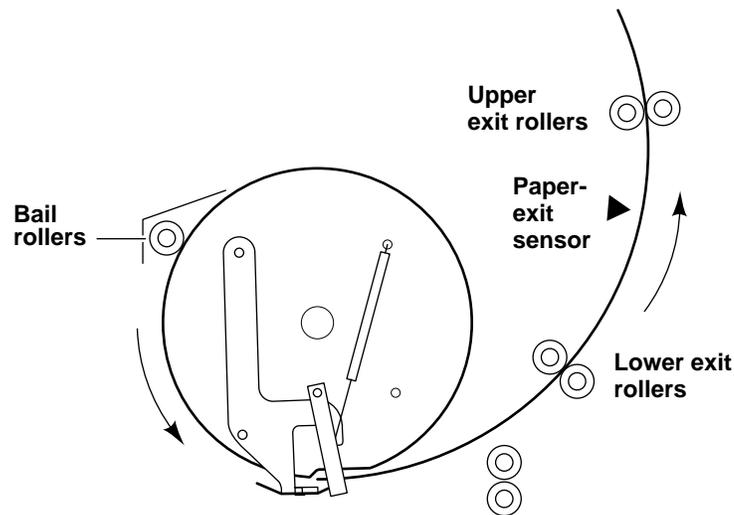
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Figure 5-8. Raising the thermal head between passes

With plain-paper printing using the 4-pass, Plain Paper Transfer Roll, the first pass lays down a precoat layer on the paper and then the yellow, magenta and cyan passes are made.

Print unloading

To unload the print after printing, the drum rotates clockwise until the trailing edge of the paper flips out into the exit path, then the drum motor rotates the drum counterclockwise to the clamp-open position. This also pushes the print to the lower exit rollers. The paper-feed motor, running backward for a set amount of time, drives the lower and upper exit rollers, which pull the print through the rollers and out to the printer's output tray. The print engine checks to make sure that the paper's trailing edge has passed the paper-exit sensor. After a set amount of time, the drum rotates to park the paper clamp under the bail rollers (to prevent them from denting the drum). Then the paper-feed motor is turned off, completing the print process.



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Figure 5-9. Ejecting the print

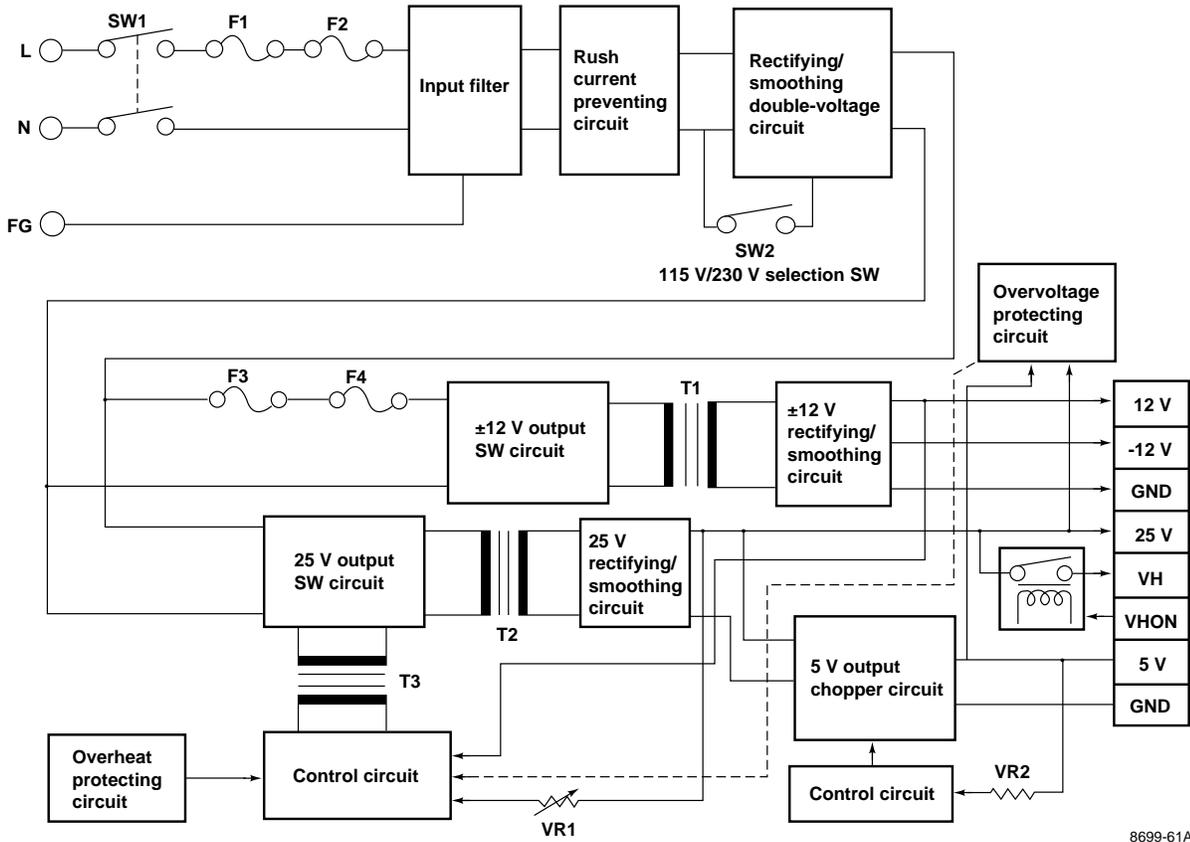
Power supply

The printer power supply is a combination power supply. It outputs the following voltages:

- n +5 VDC generated from a chopper system. +5 VDC is used for the digital logic systems.
- n ± 12 VDC generated from a flyback converter system. ± 12 VDC is supplied to the image processor board for specialized circuitry.
- n +25.5 VDC generated from a pulse-width-modulated (PWM) system. +25.5 VDC is used for the 24 V motors and the thermal head. A control signal (VHON-0) can switch the thermal head voltage on and off, independently of the +25.5 provided to the motors.

An externally accessible switch allows you to select from line voltages of 115 VAC and 220 VAC.

Fusing is provided by two in-line fuses on the AC input line. Overvoltage protection for the +25.5 VDC and +5 VDC supplied is provided by a “crowbar” circuit formed by a Zener diode and an SCR. +25.5 VDC overcurrent is sensed and regulated by altering the oscillations of the pulse-width-modulator that generates the voltage. Overheating is detected by a thermostat that also shuts down the pulse-width-modulator oscillator.



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Figure 5-10. Power supply block diagram

DECcolorwriter 1000 image processor

Image rendering technology

The image processor board handles PostScript data sent from a host computer and transforms it into a format suitable for the print engine. The hardware/software structure that performs this function is called a *graphics pipeline*. The graphics pipeline is composed of five basic parts.

- n The *I/O serializer* handles the communication and protocol with the host computers connected to the serial, parallel, Ethernet, and LocalTalk ports as well as the SCSI port. A special portion of the I/O serializer is dedicated to handling the multi-layered AppleTalk protocol.
- n The PostScript data received through the I/O serializer is routed to the *PostScript interpreter*. The PostScript interpreter generates display lists which describe objects and text fonts as they are to appear on the printed page. As needed, the PostScript interpreter reads font data stored in ROMs on the image processor board. The PostScript interpreter also handles errors it encounters in the PostScript data.
- n The PostScript interpreter's display list is, in turn, routed to the *rasterizer*. The rasterizer converts the objects and fonts into a bitmapped image composed of color planes. Color planes are bitmaps of the primary colors cyan, magenta and yellow that make up the image.
- n The *engine driver* outputs the color bitmaps to the print engine. It handles the data transfer buffering and basic input/output functions.

- n The *control loop*, which oversees the operation of the graphics pipeline, routes the color planes to the engine driver that transmits the color plane data to the print engine. The control loop also monitors the control and error signals fed back from the print engine.

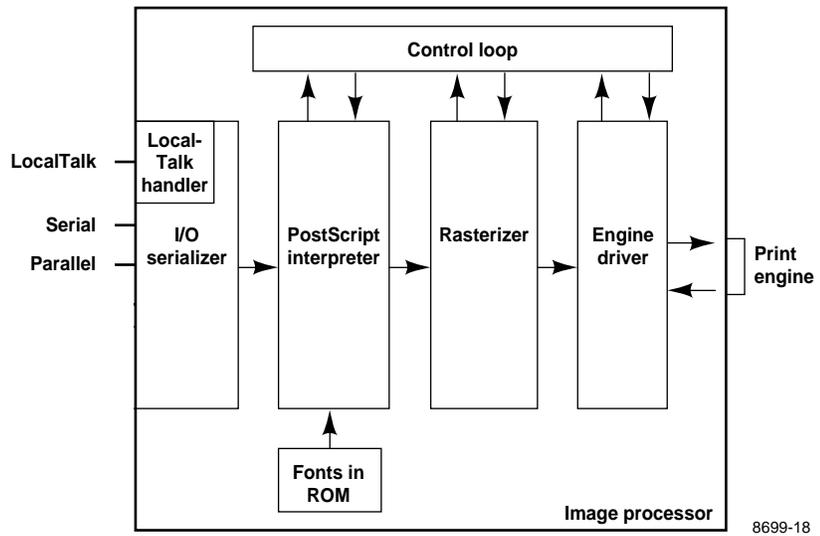


Figure 5-11. The image processor graphics pipeline

Troubleshooting

This chapter discusses troubleshooting the DECcolorwriter 1000. Troubleshooting is discussed with two approaches:

- n A step-by-step verification procedure that systematically confirms that particular components of a printer are properly functioning until a problem is found.
- n A symptom/cause scheme that lists particular printer failures and error codes and their possible causes.

System Power-up Sequence

The following lists the chain of events that occur when you turn on a printer. You can follow this list as one means of determining if the printer is operating correctly.

Power switch turned on:

1. The front panel LEDs are momentarily lighted and then turned off. The POWER LED remains on all the time since it is wired to +5 VDC. The READY LED flashes during the printer initialization.
2. The thermal head lift motor energizes to raise the thermal head into its standby position if it is out of position. The position is sensed by the thermal head position sensors.
3. The transfer roll feed motor energizes and advances the transfer roll until a yellow band is detected by the transfer roll mark sensors if the yellow band is not detected at power-up.
4. The drum motor rotates the drum about one and one-half revolutions.
5. The drum is reversed for half a revolution. At the same time, the paper-feed motor runs for about 3 seconds. This action ejects any sheet of paper that may have remained in the printer following an abnormal power-down.
6. Following the drum reversal, the drum motor rotates the drum forward for a quarter of a revolution to position the paper clamp under the bail rollers. This prevents the bail rollers from forming depressions in the drum.
7. The READY LED then blinks while the image processor initializes. Following initialization, the READY LED is on.

The print engine is initialized. The engine fan runs continuously while the printer is on. The thermal head fan runs during printing and while the thermal head temperature is greater than 35°C (95°F).

Print Engine Troubleshooting

This topic is a step-by-step procedure for systematically verifying particular aspects of a printer's operation. Following this procedure should lead to the cause of a printer's failure.

Verifying image processor operation by using the Test Pattern Generator

Instructions for using the Test Pattern Generator are provided in Appendix D “Test Pattern Generator.”

1. Attach the Test Pattern Generator to the printer's parallel port. The Test Pattern Generator can be attached to the printer while the printer is turned on.
2. If the printer does not power up go to the later topic “Verifying power supply operation” on page 6-3.
3. Observe that the READY light is on (not blinking). If it does not light, go to the later topic “Verifying power supply operation” on page 6-3.
4. Select any test pattern using the Test Pattern Generator's four DIP switches and then press its print button.
5. After the print is made, remove the Test Pattern Generator.

If the printer prints a test pattern, then the printer's image processor board and print engine are working correctly. The printer's problem resides with the host computer-to-printer connection, or the host computer. Refer to the appropriate topics in Chapter 3 “Verifying the printer and its hosts.” (Note that since the Test Pattern Generator prints only through the parallel port, the possibility also exists that the hardware of any of the other hosts interface ports could be non-functioning, and could be the source of the print failure. In this case, the printer should be able to print from another port, except the non-functioning port.)

If the printer does not print a test pattern, then a problem exists with the printer's image processor board or the print engine. Proceed with the topic “Verifying print engine operation by using its self-test print” on the next page.

Verifying print engine operation by using its self-test print

1. If not already on, turn on the printer. If the printer does not power up, go to the topic “Verifying power supply operation” below.

2. Once the READY light is on (not blinking), press and hold the **TEST** button for 5 seconds. The printer should print out a test pattern.

If the printer prints a test pattern, then the print engine is working correctly and the printer's problem resides with its image processor board. Refer to the later topic “Image processor self-diagnostics” on page 6-30.

If the printer does not print a test pattern, then a problem exists with the print engine. Proceed with the topic “Verifying power supply operation” below.

Verifying power supply operation

Required tools

- n #1 POSIDRIV® screwdriver
- n Volt-ohm-meter (VOM)

Verifying the power supply involves four steps:

- n Measuring the input and output voltages
- n Inspecting the power supply fuses
- n Checking its +24 VDC safety interlocks
- n Testing for a shorted motor which would shut down the power supply

Measuring power supply voltages

1. Turn off the printer and unplug it from its power outlet.
2. **AC Input:** With the VOM set to measure AC voltages, measure for power being supplied to the printer. It should measure between 87 to 128 VAC (115 VAC nominal) or 174 to 250 VAC (220 VAC nominal). Ensure that the switch is correctly set.
3. Remove the left side cabinet panel to access the wiring harnesses plugged into the print engine control board.
4. Plug in the printer and turn it on.
5. **DC Output:** With the VOM set to measure DC voltages, measure for +5 VDC and +24 VDC (this actually measures 25.5 VDC). The following illustration shows the test points. Be aware that the +24 VDC supplied to the motors is supplied directly through the cover-open safety interlock switches.
6. **Thermal head voltage:** With the VOM set to measure DC voltages, measure for about 25.5 VDC at Pin 1 through 6 of the thermal head's 12-pin power connector. Pins 7 through 12 are ground.
7. **Engine fan:** Ensure that the power supply fan runs while the printer is turned on. The fan blows into the card cage (toward the image processor board).

If you do not measure DC voltages, proceed to the next step “Inspecting the power supply fuses.”

If the +5 VDC and +24 VDC voltages measure correctly, but the printer does not operate correctly, then proceed to the procedure “+24 VDC safety interlocks.”

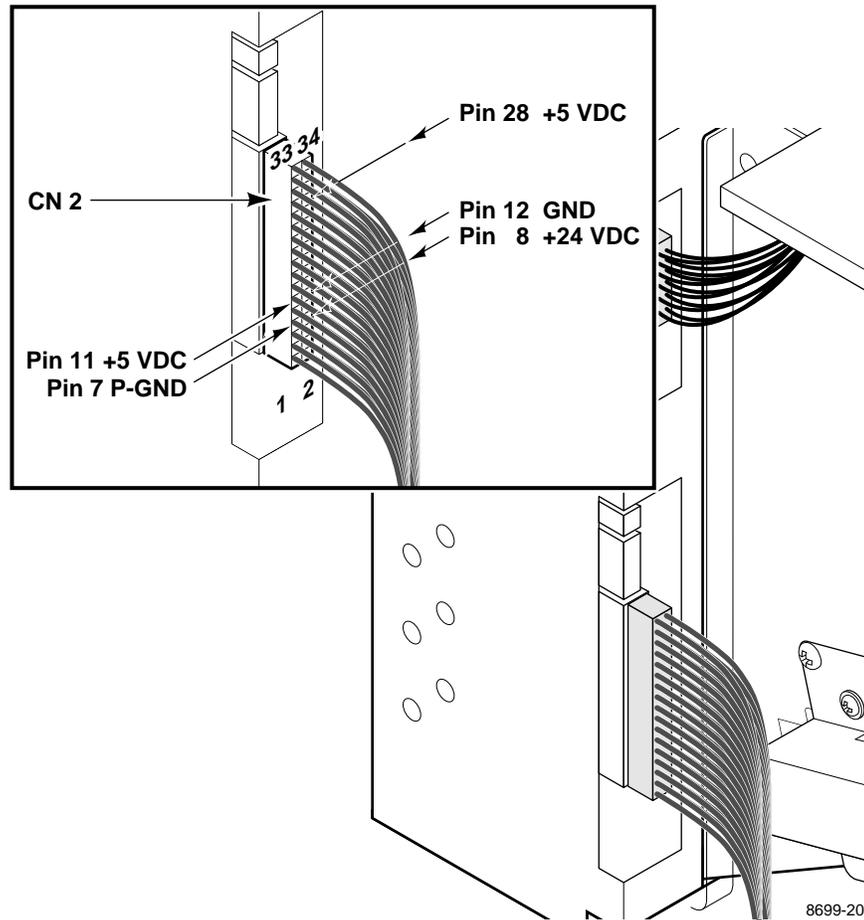


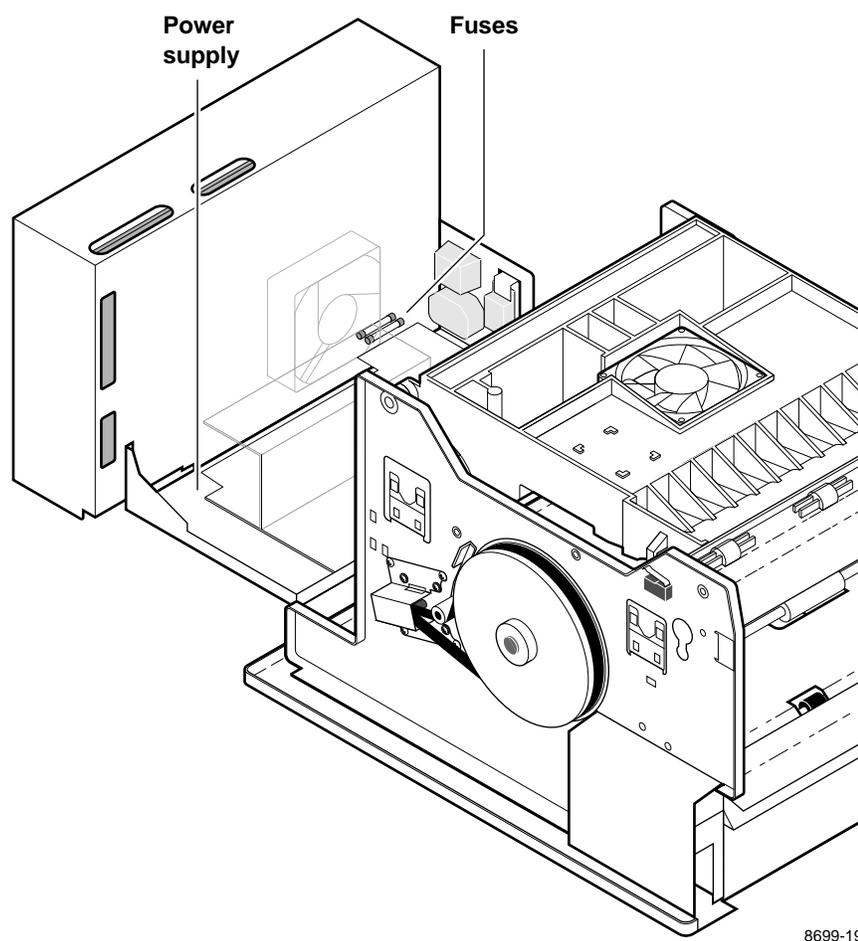
Figure 6-1. Measuring the DC voltages (test points)

Inspecting the power supply fuses

Two 5 A fuses are mounted on the power supply.

1. Refer to the Chapter 8 topic “Card cage and power supply” on page 8-35 for the procedure to follow to access the fuses.
2. Visually, and with a VOM, check to determine that the fuses are good.

If the fuses are good, but the printer's power supply does not output DC voltages, proceed to the topic “Testing for a shorted motor” on page 6-6.



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Figure 6-2. Locating the fuses

Testing for a shorted motor

1. Reinstall the power supply removed in the previous procedure.
2. Disconnect the drum motor, the thermal head lift motor, transfer roll take-up motor and the paper-feed motor.
3. Turn on the printer again to see if it does not overload now that the motors are disconnected from the power supply.

If the power supply is functional, move to the procedure “Testing motor resistances” on page 6-8.

If the motors and solenoids are working properly, but the power supply still does not function, replace it. Refer to the Chapter 8 topic “Card cage and power supply” on page 8-35.

+24 VDC safety interlocks

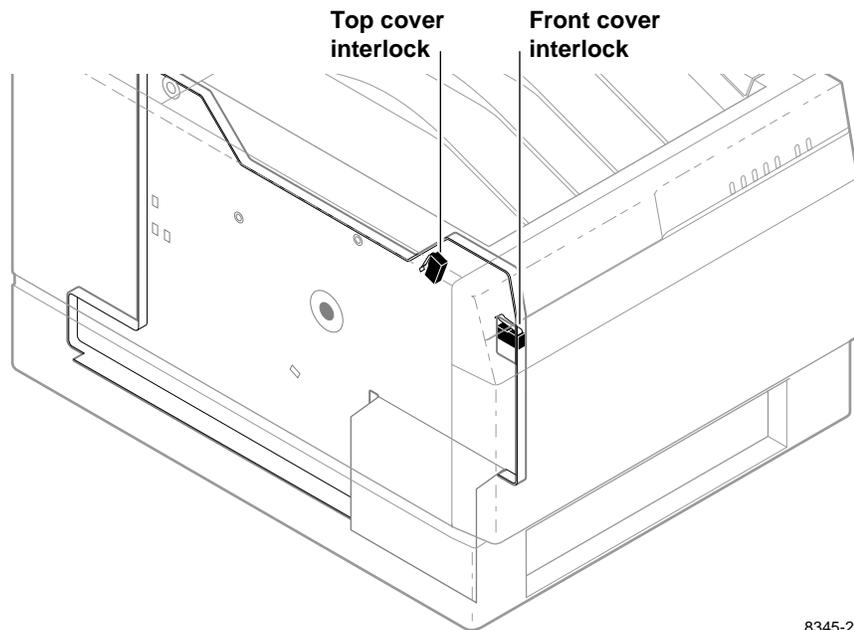
The printer features two +24 VDC safety interlocks. They are two switches, in series, that can disconnect +24 VDC to all the motors. The +24 VDC (actually 25.5 VDC) supplied to the motors is supplied through the interlock switches. The interlocks function off of the top and front covers. Generally, when an interlock switch is opened, the front panel COVER light is on.

1. Turn off the printer.
2. Use a VOM, set to measure resistance, and test each switch when it is opened and closed.
3. Inspect the wiring harnesses for pinched wires, nicks and opened connections.

If you find a switch that does not function correctly, replace it.

If the switches work correctly and the DC voltages are correct, then the problem may be an opened or otherwise bad motor. Proceed to the topic “Testing motor resistances” on page 6-8.

If motor resistances are correct, replace the engine control board. Refer to the Chapter 8 topic “Engine control board” on page 8-39.



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Figure 6-3. 24 VDC safety interlocks (top and front covers)

Testing motor resistances

Required tools

- n #1 POSIDRIV® screwdriver
- n VOM

With a VOM set for measuring resistance, test each motor's windings for its correct resistance. Rotate the motor's drive shaft slightly while taking the measurement.

Table 6-1. Motor and solenoid resistances

Motor or solenoid	Resistance (approximately)
Paper-feed motor (white wire is pin 1)	60 ohms between pins 3, 4 and 5, 6 30 ohms between pins 1, 3 and 1, 4 30 ohms between pins 2, 5 and 2, 6
Drum motor (white wire is pin 1)	30 ohms between pins 4, 5 and 5, 6 15 ohms between pins 1, 5 and 1, 6 15 ohms between pins 2, 3 and 2, 4
Transfer roll feed motor	45 ohms
Thermal head lift motor	35 ohms
Solenoids	150 ohms

Media jams and the paper path

Required tools

- n #1 POSIDRIV® screwdriver
- n VOM

Jams fall into the following four categories:

- n Media-based problems
- n Paper-picking errors
- n Paper-clamping errors
- n Paper-ejecting errors

Media-based problems

1. Check that the correct type of media is being used. For plain-paper printing, the customer should be using a quality plain paper (like that used in a laser printer) with the Plain Paper Transfer Roll. When using coated paper with the 3-Color Transfer Roll, be sure that the coated side of the paper faces *up* in the tray.

Fanning perforated media eliminates its tendency to double-pick due to the perforations interlocking with neighboring sheets.

2. Inspect the paper for bent, torn or folded corners.

3. Ensure that the correct media is in the correct paper tray. The tray indicates the size and the type of media loaded in the tray; the printer does not directly sense the size or type of media.

Paper-pick errors

Paper-pick errors occur when the media in the paper tray mis-picks or the printer double-picks two sheets of paper.

1. Clean the interior of the paper tray. When installing paper, push the stack of paper down until the tray's lift-plate locks to the bottom of the tray. This prevents the top sheet of paper from being mis-positioned as the tray is inserted in the printer.
2. Fan the media before inserting it in the paper tray. This is particularly important when using perforated media. The perforations of neighboring sheets can "lock" together.
3. Ensure that the media fits properly in the tray. With one edge of the stack of paper flush against the tray rail, there should be a 0.5 mm gap between the opposite edge of the stack of paper and the opposite side rail.
4. Check that the pick roller is being rotated. If it is not, go to the topic "Checking the paper-feed motor and drive train" on page 6-11. Otherwise, go to Step 5. In their starting position, the pick rollers' flat side should face downward.
5. Clean the pick rollers. This is particularly important if customer print on plain paper; plain paper is "dustier." Paper dust can coat the pick roller and affect its ability to grip the paper and pull it out of the tray.
6. If the printer picks the paper but it stops feeding while the paper is in the paper-feed unit, check the hex-encoded error indicators on the front panel by momentarily pressing the **TEST** button. (The later topic "Displaying error codes on the front panel" on page 6-18 explains how to interpret error codes.)

Error code 23 and 34 are mispick errors.

Error code 23 can also be caused by the front door of the Lower Tray Assembly not being fully closed.

Error code 26 is caused by the paper clamp improperly clamping the media; clean the clamp.

Error code 27 is caused by a paper-pass error. Check for media remaining in the paper path or a defective sensor.

Run the Chapter 9 procedure "Switch and interrupt sensor checks" on page 9-8 to test paper pass sensors 1 and 2."

7. Lubricate the pick roller and alignment roller clutches. Refer to the Chapter 7 topic "Lubrication."

8. Inspect the wiring harness leading to the paper-feed module for nicks, cuts or crimped wiring.
9. Inspect the paper-feed module for obstructions.

Paper-clamping errors

Note *Figure 1-3 illustrates the location of all the printers' sensors.*

1. Check hex-encoded error indicators on the front panel by momentarily pressing the **TEST** button. (The later topic “Displaying error codes on the front panel” on page 6-18 explains how to interpret error codes.) In most cases, either an error code from 22 or 26 through 2B through 2F is displayed. These failures can be caused by faulty sensors, improper media size, roller failure or poor media clamping. Also check for foreign objects in the paper path.
2. Ensure that the paper clamp operates correctly. The paper clamp should be opened when the drum motor reverses and drives the drum against the drum stops, which forces open the clamp.
3. If the paper clamp is not opening correctly because the drum is not rotating against the drum stops, then test the drum home position sensor. Refer to the Chapter 9 topic “Switch and interrupt sensor checks” on page 9-8.
4. Clean the paper clamp with alcohol and a lint-free cloth to ensure that it is fully gripping the sheet of paper.
5. If clamping does not improve, inspect and clean the lenses of the paper clamp sensor. The lenses face upward and can be occluded by paper dust. You must either clean the sensor with a long-stemmed swab through the access hole in the left side of the printer frame or else you must remove the drum to access the sensor underneath. Refer to the Chapter 8 topic “Drum” on page 8-19 for information on drum removal.
6. If the paper reaches the paper clamp but fails to be clamped, run the Chapter 9 procedure “Calibrating the paper clamp sensor (reflective sensor)” on page 9-10 to calibrate the paper clamp sensor.
7. If clamping still does not improve, replace the paper clamp sensor.

Print-eject jams

1. Test the paper eject sensor. Refer to the Chapter 9 topic “Switch and interrupt sensor checks” on page 9-8. If the sensor fails the test, replace it.
2. Check to see if the upper eject roller drive belt is broken or slipped off of its pulleys. In such a case, the upper roller will not rotate when the lower roller rotates.

3. Inspect the idler rollers on the inside of the top-front cabinet panel; they should rotate freely.
4. Check that the exit roller rotates smoothly and that the front cover is fully closed and seated.
5. Check the paper eject path for obstructions.

Checking the paper-feed motor and drive train

1. Determine if the paper-feed motor runs. If it does not rotate, go to Step 2. If it does rotate, go to Step 5.
2. Ensure that the top and front cover safety interlock switches are closed and operating correctly. Refer to the earlier topic “+24 VDC safety interlocks” on page 6-6.
3. Measure to determine if +25.5 VDC is being supplied to the motor. If it is, go to Step 3. If it is not, inspect the paper-feed motor's wiring harness. If the harness is good, then troubleshoot the power supply. Refer back to the topic “Verifying power supply operation” on page 6-3.
4. Disconnect the motor's wiring harness. Measure the resistance of the motor's windings. The expected resistances are listed in Table 6-1. “Motor and solenoid resistances,” on page 6-8. If the windings are opened, shorted or far out of tolerance, replace the motor.
5. If the motor windings resistance are within specification, then inspect the wiring harness for nicks, crimps, opens or other problems. If the harness checks out, then replace the engine control board.
6. Remove the paper-feed module. Inspect the gear train on the inside of the printer frame; look for stripped gears or broken teeth.

Media skews passing through the paper path

1. Check to see if the media is excessively curled. Curled media can get mistracked in the paper path.
2. Examine the paper path. Is there an obstacle blocking the path?
3. Check to see if the drum's paper clamp operates correctly. You should be able to open and close it smoothly and evenly. Is it clean? Paper or film can slip in a dirty clamp. Refer to the cleaning procedures in Chapter 5.
4. Ensure that the pick rollers are clean so that they pick up a sheet of media evenly.
5. Determine if the paper-feed unit's aligning rollers pressure is unbalanced; the tension springs at each end of the rollers should exert an even pressure. You can check them by simply lifting each spring to see if they each offer about the same amount of spring resistance.

Transfer roll jam

1. Ensure that the transfer roll is not installed backwards. It should feed off the bottom of the supply roll and over the top of the take-up roll. The black stripe should be oriented under the transfer roll mark sensors on the left side of the printer.

Black transfer rolls do not have a black stripe. In this case, look to see that the gear on the take-up roll (front roll) is smaller than the gear on the supply roll (back roll).

2. Clean the transfer roll sensors and the white reflective pad they sense light reflecting off of. Ensure that the left edge of the transfer roll tracks properly and passes over the white reflective pad.
3. Inspect the wiring leading to the transfer roll sensors for nicks, cuts or bad connections.
4. Inspect the wiring leading to the transfer roll take-up motor for nicks, cuts or bad connections. Ensure that the motor operates correctly and that its gear (which meshes with the take-up roll) is mounted securely to the shaft of the take-up motor.
5. Check the transfer roll gear train for smooth operation.

Printing and print quality problems

Required tools

- n #1 POSIDRIV® screwdriver
- n Volt-ohm-meter (VOM)

Print problems fall into the following five categories:

- n Streaks or lines in the prints
- n No printing
- n Printing too light or too dark
- n Image is offset or cut off
- n Wrinkling

Streaks or lines in the print parallel to the long axis of printing

1. Clean the thermal head. This is discussed in the Chapter 7 topic “Cleaning.”
2. If the streak (a dot-wide line of no printing) runs the entire length of the page, the thermal head may have a defective heating element. Replace the thermal head.

Streaks or lines in the print parallel to the short axis of printing

1. Inspect the drum drive system. Ensure that the drum rotates smoothly. If necessary, remove the drum drive belt from the drum pulley so that you can rotate the drum and determine that it smoothly rotates in its bearings.
2. Ensure the drum drive belt is properly tensioned. Refer to the Chapter 9 topic “Drum belt tension adjustment” on page 9-11.
3. Check the drum motor by measuring the resistance of its windings. Refer to Table 6-1 for the expected winding resistance values. If one or all of the windings are out of value, replace the motor.
4. Test the torque limiter located next to the right end of the transfer roll's supply spool. It should rotate in one direction only, and it should offer a small amount of resistance to being turned. The torque limiter supplies a constant amount of back-tension to the motion of the transfer roll to keep it taut.
5. Check the transfer roll feed motor by measuring the resistance of its winding. Refer to Table 6-1 for the expected winding resistance value. If the resistance is incorrect, replace the motor. During printing, the motor keeps the transfer roll at a specific tension as the transfer roll is pulled passed the thermal head by the motion of the drum. If the tension is incorrect, print aberrations across the width of the print can occur.

6. If no problems are found in the previous steps, then you can assume that the print engine control board is driving the drum motor incorrectly; replace the engine control board.

White portion of print is colored

1. If the thermal head is transferring wax to the paper when it shouldn't, the thermal head is too hot. Thermal head voltage control may be bad; check the power supply thermal head voltage. Measure the power being supplied to the thermal head (refer to the earlier topic "Verifying power supply operation" on page 6-3).
2. Replace the print engine control board. Refer to the Chapter 8 topic "Engine control board" on page 8-39.

Color is uneven

1. The paper may be slipping in the drum's paper clamp. Clean the paper clamp. See Chapter 5.
2. Check the drum's paper-clamping pressure; if it's too low the media could be slipping. If the clamp springs are weak and cannot firmly hold a sheet of media, replace the drum. Refer to the Chapter 8 topic "Drum" on page 8-19.
3. Check the drum for side-to-side play; there should be none. If the drum does move from side to side, remove the drum and add a drum shim washer. The shim washers are included in the hardware parts kit. Refer to the Chapter 8 topic "Drum" on page 8-19.
4. Check the drum drive belt for proper tension. Refer to the Chapter 9 topic "Drum belt tension adjustment" on page 9-11.
5. Ensure that the drum pulley is correctly mounted on the drum shaft. The set screws should be driven against the flat cutouts in the drum shaft. Ensure that one of the set screws fits into a countersunk recess in its flat cutout.
6. Be sure that the thermal head leaf spring (which presses against the right end of the thermal head when it's in its print position) is in good contact with the thermal head. If it isn't, bend the leaf spring until it makes good contact and keeps the thermal head from making any side-to-side motion during printing.
7. Check for a defective drum motor drive. Ensure it doesn't jerk, chatter, or lug down.
8. Test the torque limiter located next to the right end of the transfer roll's supply spool. It should rotate in one direction only, and it should offer a small amount of resistance to being turned. The torque limiter supplies a constant amount of back-tension to the motion of the transfer roll to keep it taut.
9. Check for nicks or burrs in the paper path (particularly the front cover) that could impede the loading of a sheet of media into the paper clamp.

10. Perform the Chapter 9 procedure “Adjusting for best print quality” on page 9-14.
11. Replace the thermal head. This is explained in the Chapter 8 topic “Thermal head” on page 8-17.

Not printing

The printer processes a sheet of paper, but no image is printed on it.

1. Ensure that the thermal head temperature-adjust DIP switches are correctly set for the resistance of the thermal head. Refer to the Chapter 9 topic “Adjusting for best print quality” on page 9-14.
2. Ensure that the thermal head power and data cables are properly connected.
3. Measure the power being supplied to the thermal head (refer to the earlier topic “Verifying power supply operation” on page 6-3). If no DC voltage is being supplied to the thermal head, then troubleshoot the power supply and the wiring harness leading to the thermal head.
4. Inspect the data wiring harness leading from the engine control board to the thermal head for nicks, cuts, or damage.
5. If everything checks out in the previous steps you can assume that the data drivers on the print engine control board are bad; replace the print engine control board. Refer to the Chapter 8 topic, “Engine control board” on page 8-39.

Printing too light or too dark

1. Check that a quality brand of paper is being used. In the case of coated paper, ensure that it is being placed in the tray with the printing side up.
2. Ensure that the customer is using the Plain Paper Transfer Roll for printing on plain paper. The 3-Color Transfer Roll will appear dull and washed out on plain paper. Ensure the PAPER/TRANSPARENCY switch on the side of the tray is set to the correct setting.
3. Ensure that the thermal head voltage setting, determined by DIP Switch 2-1 through 2-4, is correct for the resistance of the thermal head. Refer to the Chapter 9 topic “Adjusting for best print quality” on page 9-14.
4. Measure the voltage being supplied to the thermal head (refer to the earlier topic “Verifying power supply operation” on page 6-3). It should measure 25.5 VDC during printing.
5. Ensure that the wiring harness leading to the transfer roll mark sensor board is not nicked or damaged. A thermistor mounted on the board “tells” the engine control board of the print engine's ambient temperature. An erroneous thermistor value could cause the print engine to use an incorrect thermal head voltage value for printing.
6. Ensure that the thermal head fan runs during printing to keep the thermal head from overheating during printing. The fan blows upward.
7. If the voltage supplied to the thermal head is correct and the DIP Switch 2 setting is correct, then replace the thermal head. Refer to the Chapter 8 topic “Thermal head” on page 8-17.
8. If printing still does not improve, replace the engine control board. Refer to the Chapter 8 topic “Engine control board” on page 8-39.

Image is offset or cut off

1. Check the application for the correct image sizing.
2. If the customer is using non-perforated (plain) paper, ensure that **Letter** or **A4** is the selected paper size. If **Letter Perforated** or **A4 Perforated** is selected, the image will be cut off.
3. If the customer is using perforated (plain) paper, ensure that **Letter Perforated** or **A4 Perforated** is the selected paper size. If **Letter** or **A4** is selected, the image will be offset. Ensure that the perforated media is loaded correctly in the paper tray with the perforated end toward the front of the printer.

Wrinkling

An example of wrinkling is shown in Appendix B “Color Test Patterns.” Wrinkling occurs when the transfer roll is not maintaining smooth, even contact between the thermal head and the paper; instead, it is wrinkling and rippling.

1. Clean the thermal head. Refer to the Chapter 7 topic “Cleaning.”
2. Inspect the front idler roller. Ensure that the two sleeves are properly located on the idler roller and that they line up correctly with the drum. The sleeves should be firmly attached to the roller; they should not slide or rotate on the roller. Note that the right sleeve is located 2 mm (0.08 in.) inside the right notched edge of the drum. Refer to Figure 6-4, “Proper front idler roller-to-drum alignment (to prevent wrinkling),” on page 6-17.
3. Determine if the transfer roll has been unrolled and then rolled up again. Uneven packing in the transfer roll causes uneven tension which results in wrinkling.
4. Inspect the thermal head for damage. If it is damaged, replace it. Refer to the Chapter 8 topic Figure , “Thermal head,” on page 8-17.

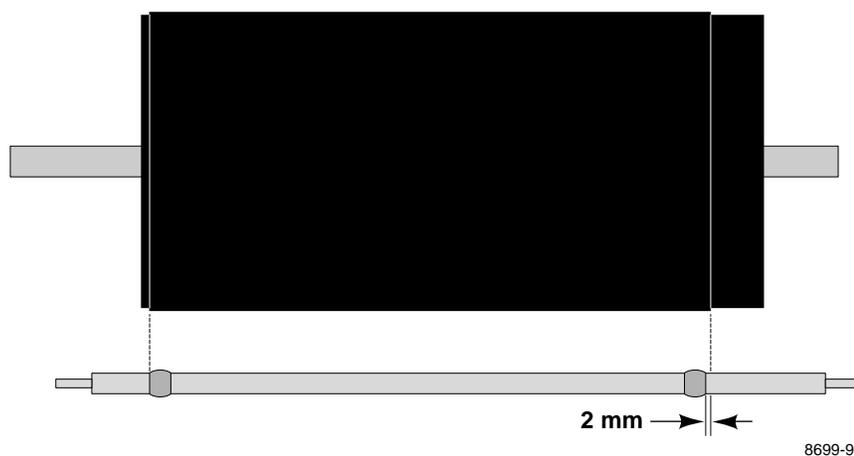


Figure 6-4. Proper front idler roller-to-drum alignment (to prevent wrinkling)

Print engine self-diagnostics

Starting service mode (self-diagnostics)

1. Turn off the printer if it is not already turned off. Ensure that the printer has paper and a transfer roll installed.
2. Press and hold the **TEST** button and turn on the printer. Wait 1 or 2 seconds and then release the **TEST** button. The printer will power-up into service mode.

Displaying error codes on the front panel

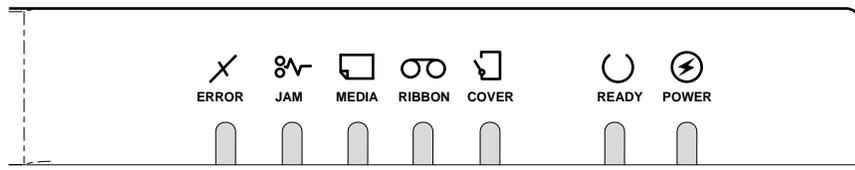
In service mode, the front panel constantly displays error codes reflecting the print engine's current status. The highest priority error code is displayed at a blinking rate of 4 Hz. If more than one error condition exists, you can view each error code by momentarily pressing the **TEST** button. The subsequent error codes are displayed on the front panel at a blinking rate of 2 Hz. The blinking rate of 4 Hz indicates when you have cycled back to the highest priority error code.

The following chart shows how to read and convert the front panel display into a hex-encoded code.

Table 6-2. Decoding the front panel display

ERROR	JAM	PAPER	TRANSFER ROLL	COVER	READY	POWER
2	1	8	4	2	1	Always on
Example: o	o	o	Z	o	Z	Z
equals hex code 05:						
0	0	0	4	0	1	
	0				5	

Z means light is *on* in normal operation, or blinking in service mode.



Problems and solutions

Print engine error codes and their causes

These are the error codes displayed in service mode and their possible causes. These codes can also be displayed in normal mode, after an error occurs, when you press the **TEST** button.

Table 6-3. Print engine error codes and their meanings

Code	Meaning
o o o o o o Z Hex Code 00 No error	Print engine is functioning normally.
o o o o o Z Z Hex Code 01 Drum position error.	Check the drum-home position sensor; ensure that it is plugged in. Rotate the drum to see if it interrupts the sensor. Does the drum rotate during printer operation? Check the drum motor and belt.
o o o o Z o Z Hex Code 02 Thermal Head temperature error.	<p>Ensure that the thermal head is warmed up to operational level. The thermal head unit should feel warm to the touch; don't touch the printing elements. If the thermal head is cold, check power connections and the power supply.</p> <p>If the power connection and power supply feels too hot, ensure that the thermal head fan is operating correctly. It should run during printing and while the thermal head temperature is above 35°C (95°F). Also check that the engine fan blows outward (into the card cage) and the thermal head fan blows upward.</p> <p>Ensure that the cable to the transfer roll mark sensors and thermistor, which senses ambient temperature, is functional.</p> <p>Ensure that thermal head resistance value, set by DIP Switch 2, is correct. Refer to the Chapter 9 topic "Adjusting for best printing quality."</p> <p>Are the thermal head cable connectors functional?</p> <p>If everything else checks out, replace the thermal head. Refer to the Chapter 8 topic "Thermal head" on page 8-17.</p> <p>If the thermal head and power supply check out, replace the print engine control board. Refer to the Chapter 8 topic "Engine control board" on page 8-39.</p>
o o o o Z Z Z Hex Code 03 EEROM failure.	Power-down the printer, wait 30 seconds, and power-up. If the EEROM fails again, replace it (IC 79 is socketed). The EEROM contains the sensor calibration settings. If you replaced it, you must run the continuous sensor adjust mode to restore the calibration settings. Refer to Chapter 5.
o o o Z o o Z Hex Code 04 Cover open error.	If an error occurs while the top or front cover are closed, then determine if the top cover or front cover interlock switches are defective. Refer to the topic "Switch and interrupt sensor checks" on page 9-8 in Chapter 9, "Checks and Adjustments." The two switches are wired in series.

Table 6-3. Print engine error codes and their meanings (cont'd.)

Code	Meaning
o o o Z Z o Z Hex Code 06 Strobe error.	The strobe pulse driving the thermal head is too long. Turn the printer off and then on again and try making another print. If the error recurs, replace the print engine control board. Refer to the Chapter 8 topic "Engine control board" on page 8-39.
o o o Z Z Z Z Hex Code 07 RAM error.	Turn the printer off and on again. If the error recurs, replace the print engine control board. Refer to the Chapter 8 topic "Engine control board" on page 8-39.
o o Z o o o Z Hex Code 08 ROM error.	Turn the printer off and on again. If the error recurs, replace the print engine control board. Refer to the Chapter 8 topic "Engine control board" on page 8-39.
o o Z o Z o Z Hex Code 0A Interface error.	Turn the printer off and on. Try making another print. Check the image processor board-to-print engine connection. Examine all the wiring harnesses for proper connection and dress. Press and hold the TEST button for three seconds to start a test print. If a print is made, the print engine is functional. The problem is probably with the image processor board. If the error recurs, run diagnostics on the image processor board as explained in the topic "Image processor self-diagnostics" on page 6-30 at the end of this chapter.
o o Z Z o Z Z Hex Code 0D Thermistor failure.	Ambient temperature sensor thermistor is shorted or open. Check the wiring harnesses leading to the transfer roll sensor board. Replace the transfer roll mark sensor board. Refer to the topic "Calibrating the transfer roll mark sensors (reflective sensors)" on page 9-10 in Chapter 9, "Checks and Adjustments."
o o Z Z Z o Z Hex Code 0E Thermal Head lift error.	Check for thermal head lift motion; ensure that the thermal head lift motor operates correctly. The topic "Thermal head motor check" on page 9-5 explains how to test the motor. Ensure that the thermal head lift sensor operates properly and is interrupted by the movement of the thermal head. The topic "Switch and interrupt sensor checks" on page 9-8 tests these sense switches. The sensor is located behind the left end of the thermal head.
o o Z Z Z Z Z Hex Code 0F Thermal Head thermistor failure.	Thermistor is shorted or open. Check the wiring harnesses leading to the thermal head. Replace the thermal head. Refer to the Chapter 8 topic "Thermal head" on page 8-17.

Table 6-3. Print engine error codes and their meanings (cont'd.)

Code	Meaning
<p>o Z o o o o Z</p> <p>Hex Code 10 Transfer roll empty.</p>	<p>Determine if the transfer roll is empty.</p> <p>Determine if the transfer roll is installed and is properly seated in the transfer roll holders.</p> <p>Check the operation of the transfer roll sensors located under the left and right ends of the supply roll. The switches are actuated by the core end of the roll. Refer to the topic “Calibrating the transfer roll mark sensors (reflective sensors)” on page 9-10 in Chapter 9, “Checks and Adjustments.”</p> <p>Ensure that the transfer roll is feeding properly past the transfer roll sensors.</p> <p>Check the operation of the transfer roll sensors. The transfer roll mark check mode tests these reflective sensors. Ensure that the white reflection plate below the sensors is clean.</p> <p>Ensure that the transfer roll feeds properly and is not binding or skewing. Ensure that the transfer roll feed-motor runs smoothly.</p>
<p>o Z o o o Z Z</p> <p>Hex Code 11 Transfer roll low.</p>	<p>Check if the transfer roll is low (75 to 90% used). If not, check the sensor and its wiring harness. Refer to the topic “Switch and interrupt sensor checks” on page 9-8.</p>
<p>o Z o o Z o Z</p> <p>Hex Code 12 Transfer roll jam.</p>	<p>Check to see if the transfer roll is empty or binding. If not, check the sensor and its wiring harness. Refer to the topic “Switch and interrupt sensor checks” on page 9-8 in Chapter 9, “Checks and Adjustments.” Check the transfer roll mark sensors and transfer roll motor for proper operation.</p>
<p>o Z Z o o o Z</p> <p>Hex Code 18 Transfer roll feed timer error.</p>	<p>Check the transfer roll for proper movement; it should not bind.</p> <p>Check the transfer roll mark sensors and transfer roll motor for proper operation. If the “transfer roll timer error” occurs when the transfer roll is installed, then the transfer roll mark sensor is defective, or the transfer roll is skewed, or the transfer roll motor is defective, or there is a problem with the transfer roll drive system. If none of these is true, the transfer roll sensor is defective and must be replaced. Refer to the Chapter 8 topic “Sensors and switches” on page 8-29.</p>
<p>Z o o o o o Z</p> <p>Hex Code 20 Out of media.</p>	<p>Ensure that media is installed in the tray.</p> <p>Ensure that the paper-empty sensor operates properly. Refer to the switch and sensor tests in Chapter 9, “Checks and Adjustments.” Refer to the topic “Switch and interrupt sensor checks” on page 9-8.</p>
<p>Z o o o o Z Z</p> <p>Hex Code 21 Tray not installed.</p>	<p>Ensure that the tray is properly installed.</p> <p>Ensure that the tray-installed sensors operate properly and are not damaged. Refer to the topic “Switch and interrupt sensor checks” on page 9-8.</p>

Table 6-3. Print engine error codes and their meanings (cont'd.)

Code	Meaning
Z o o o Z o Z Hex Code 22 Paper-eject sensor failed to turn on.	<p>Check the paper-exit rollers for proper operation.</p> <p>Check for blockage at the paper-exit sensor or paper tray.</p> <p>Ensure that the paper-exit sensor operates correctly and is properly adjusted. Refer to the topic “Switch and interrupt sensor checks” on page 9-8.</p>
Z o o o Z Z Z Hex Code 23 Paper-pass error – lower tray.	<p>If media didn't reach paper-pass sensor 1, check to see if media was picked from the tray.</p> <p>Clean the paper-pick rollers in the lower tray assembly. Refer to Chapter 7.</p> <p>Ensure that the paper path is clear.</p> <p>Ensure that the paper-feed motor and gear train operate correctly.</p> <p>If media reached the paper-pass sensor, ensure that the paper-pass sensor 1 operates properly. Refer to the topic “Switch and interrupt sensor checks” on page 9-8.</p> <p>Ensure that the Lower Tray Assembly is correctly installed and its door is closed if the printer is picking from the lower tray.</p>
Z o o Z o o Z Hex Code 24 Paper-pass error – upper tray.	<p>If media didn't reach the paper-pass sensor 1, check to see if media was picked from the tray.</p> <p>Clean the paper-pick rollers in the print engine. Refer to Chapter 7 topic “Cleaning.”</p> <p>Ensure that the alignment roller pressure springs at each end of the aligning rollers hold the rollers firmly together.</p> <p>Ensure that the paper-feed motor and gear train operate correctly.</p> <p>Ensure that the paper path is clear.</p> <p>If media reached the paper-pass sensor, ensure that paper-pass sensor 1 operates properly. Refer to the topic “Switch and interrupt sensor checks” on page 9-8.</p> <p>Ensure that the lower tray assembly is correctly installed and its door is closed if the printer is picking from the lower tray.</p>
Z o o Z o Z Z Hex Code 25 Paper-pass sensor 2 error.	<p>Clean the aligning rollers. Refer to Chapter 7 topic “Cleaning”.</p> <p>Ensure that the alignment roller pressure springs at each end of the aligning rollers hold the rollers firmly together.</p> <p>Ensure that the paper path is clear.</p> <p>If media reached the paper-pass sensor, ensure that the paper-pass sensor 2 operates properly. Refer to the topic “Switch and interrupt sensor checks” on page 9-8.</p> <p>Check the aligning roller clutch and solenoid for proper action.</p>

Table 6-3. Print engine error codes and their meanings (cont'd.)

Code	Meaning
<p>Z o o Z Z o Z Hex Code 26 Clamp error.</p>	<p>Check to see that the paper clamp is opening properly when the drum is rotated backward into the drum stops. Determine if the drum rotates smoothly to the clamp-open position.</p> <p>Ensure that the clamp holds media firmly; clean it.</p> <p>Ensure that no foreign matter interrupts the paper clamp sensor.</p> <p>Ensure that the bail rollers operate smoothly and correctly.</p> <p>Ensure that the paper clamp sensor operates properly. Refer to the topic “Calibrating the paper clamp sensor (reflective sensor)” on page 9-10.</p>
<p>Z o o Z Z Z Z Hex Code 27 Media size error.</p>	<p>Ensure that the proper media is loaded in the tray being used. The tray “informs” the print engine of the paper that should be loaded in the tray. The actual paper size is not sensed by the print engine.</p> <p>Ensure that paper-pass sensor 1 and 2 are operational and properly adjusted. Refer to the topic “Switch and interrupt sensor checks” on page 9-8.</p>
<p>Z o Z o o o Z Hex Code 28 Paper eject sensor failed to turn off.</p>	<p>Check the paper-exit rollers for proper operation.</p> <p>Check for blockage at the paper-exit sensor or paper tray.</p> <p>Ensure that the paper-exit sensor operates correctly and is properly adjusted. Refer to the topic “Switch and interrupt sensor checks” on page 9-8.</p>
<p>Z o Z o o Z Z Hex Code 29 Paper-pass sensor 1 failed to turn off after paper eject.</p>	<p>Check for a media jam after media eject.</p> <p>Check to see if two sheets of media were picked up during the print process. Also look for an entangled transfer roll or torn media.</p> <p>Check that the paper-feed motor rotates forward for proper operation.</p> <p>Ensure that the paper-exit sensor operates correctly and is properly adjusted. Refer to the topic “Switch and interrupt sensor checks” on page 9-8.</p>
<p>Z o Z o Z o Z Hex Code 2A Paper-pass sensor 2 failed to turn off after paper eject.</p>	<p>Check for a media jam after media eject.</p> <p>Check to see if two sheets of media were picked up during the print process. Also look for an entangled transfer roll or torn media.</p> <p>Check that the paper-feed motor rotates forward for proper operation.</p> <p>Ensure that the paper-exit sensor operates correctly and is properly adjusted. Refer to the topic “Switch and interrupt sensor checks” on page 9-8.</p>

Table 6-3. Print engine error codes and their meanings (cont'd.)

Code	Meaning
Z o Z o Z Z Z Hex Code 2B Clamp error.	<p>Check the platen for a media jam.</p> <p>Clean the paper clamp. See Chapter 7 topic “Cleaning.”</p> <p>Check to see if media is being clamped firmly by the paper clamp. Ensure that the paper clamp operates smoothly.</p> <p>Ensure that the drum drive operates correctly.</p> <p>Check the paper clamp sensor for proper operation. Refer to the topic “Calibrating the paper clamp sensor (reflective sensor)” on page 9-10.</p>

Power problems

All front panel indicators remain off.	Check to see if the printer is plugged in. Check the line power fuses inside the power supply.
The printer does not initialize upon power-up.	<p>Check the power on/off switch.</p> <p>Check the power supply for proper input and output voltages. Is the power supply set to the correct 115/220 VAC setting?</p> <p>Check the +24 VDC safety interlocks. Refer to the topic “+24 VDC safety interlocks” on page 6-6.</p>

Front panel indicators

Media tray indicates empty when it is not.	<p>If there is media in the tray, then check the media tray microswitches (on the right side of the tray slot).</p> <p>Check to see if the paper-empty flag is broken.</p> <p>Check the switch-tripping projections on the right side of the paper tray.</p>
Transfer roll out indicated when it is not.	<p>A transfer roll out condition occurs when all three transfer roll mark sensors no longer detect the black stripe running along the edge of the transfer roll. If the transfer roll has not run out, check to see that the transfer roll is properly passing the transfer roll sensors. Ensure that the transfer roll is not slack or skewed and aligns properly with the sensors.</p> <p>Cover the transfer roll mark sensors with a piece of opaque tape and see if the error indication clears. Run a sensor test. Refer to the Chapter 9 topic “Calibrating the transfer roll mark sensors (reflective sensors)” on page 9-10. If they continue to fail, the sensors or the sensor wiring are probably defective.</p>

Macintosh printing problems

<p>Image never prints. Printer READY light flashes as if receiving data, but nothing comes out of printer or goes back to "Ready" mode without printing image.</p>	<p>Make sure that the correct DECcolorwriter 1000 icon was selected in the Chooser. Try printing the job again.</p> <p>In the Chooser, switch background printing to <i>off</i>. Try printing the job again.</p> <p>Download the Error Handler utility and try printing the job again. (Refer to the Chapter 3 topic "Using the Error Handler utility" on page 3-3). If an error page is printed after printing the job again, call the Customer Support Hotline for further assistance. Please have the error page in hand.</p> <p>If available, try printing to a black-and-white PostScript printer (such as an Apple LaserWriter). If the file does not print on the black-and-white PostScript printer, this may mean that the problem may be application- or network-related.</p> <p>Ensure that the print engine can print by pressing and holding the rear panel TEST switch to print an internal test print.</p>
<p>Image prints in blackand-white.</p>	<p>In the print dialogue box, make sure the Color/Grayscale option has been selected.</p> <p>Make sure that the DECcolorwriter 1000 icon was selected in the Chooser. Try printing the job again.</p> <p>Check the version of your LaserWriter driver to ensure that it is version 6.0.7 or higher. Earlier versions of the driver do not support color PostScript.</p> <p>The application may require special instructions to print. Check in the <i>DECcolorwriter 1000 Drivers and Utilities Printing Reference</i>.</p>
<p>Image is rotated 90 degrees.</p>	<p>In the application's Page Setup, make sure that the image is selected to print in portrait or landscape orientation.</p>

PC DOS printing problems

Image never prints. Printer READY light flashes as if receiving data, but nothing comes out of printer, or the printer goes back to "Ready" mode without printing image.

Make sure that you are communicating with the printer.

At the DOS prompt, type the following in lowercase letters:

echo showpage > port:

(substitute **LPT1:**, **LPT2:** or **COM1**, etc., for *port*.)

The printer responds by sending a page through the print cycle and ejecting a blank page. If this does not happen, check your cable, or try a different parallel cable. If using the serial port, refer to the serial port configuration.

Ensure that the print file ends with a "CTRL-D" character. CTRL-D indicates the end-of-file which the printer responds to by closing host-to-printer communications and then processing and printing the file. Use a text editor to open and examine the file.

Check and add, if necessary, the following line to the autoexec.bat file:

mode = LPT1,,,p

(If your port is not LPT1, substitute **LPT2:** or **COM1:** for the correct port). This turns on printer retry indefinitely.

Ensure that the print engine can print by pressing and holding the rear panel **TEST** switch to print an internal test print.

Is the printer in PostScript mode? Check this by sending the file *TESTHPGL.PLT* (located on the Utilities diskette, *HP-GL* directory) to the printer.

At the DOS prompt, type the following DOS command:

COPY TESTHPGL.PLT LPT1:

(If your port is not LPT1, substitute **LPT2:** or **COM1:** for the correct port).

The PC responds with 1 FILE COPIED. If this file prints stating that the printer is in HP-GL mode, then the printer needs to be changed back to the PostScript mode. Use the utility located on the diskettes to change language emulation. Refer to *DECcolorwriter 1000 Drivers and Utilities Printing Reference* for complete instructions.

Download **ADVEHAND.PS** file located on the Utilities diskette. At the DOS prompt, type the following DOS command:

COPY ADVEHAND.PS LPT1:

(If your port is not LPT1, substitute **LPT2:** or **COM1:** for the correct port).

The PC responds with 1 FILE COPIED. The printer now has a PostScript error handler present which remains resident until power is cycled on the printer. Resend the image file that was not printing.

Any PostScript errors encountered by the printer are recorded on a printout (save the print with the error message).

Windows printing problems

<p>Image never prints. Printer READY light flashes as if receiving data, but nothing comes out of printer or the printer goes back to "Ready" mode with out printing image.</p>	<p>Perform the same troubleshooting ideas suggested in the previous topic "PC DOS printing problems."</p> <p>Under the printer's setup options set RETRY = 400</p>
<p>Blue color on the screen is printing too purple.</p>	<p>Many applications describe color as percentages of a video display screens primary colors red, green, and blue (RGB). When a printer translates these RGB colors into it's own primaries of cyan, magenta, and yellow (CMY), blue is often printed as purple.</p> <p>To Adjust Blue from within Microsoft Windows: Within the Tektronix PostScript Windows driver you have an option, Adjust Vivid Blue, that alters to blue colors that are appearing purple.</p> <p>To Access this option select: Printer Setup Options Printer Features Media Selection</p> <p>You are now at theOptions window Select Adjust Vivid Blue.</p> <p>This Options window can also be accessed through the Control Panel: Printers option from the Windows MAIN menu.</p>
<p>Printing from Windows produces the message "Problem writing device LPT1: Cancel or Retry".</p>	<p>Option #1:</p> <ol style="list-style-type: none"> 1. Select Printers, and click Configure. 2. Change the port selection from LPT1 to LPT1.OS2. The MODE command disables DOS timeouts. The LPT1.OS2 selection forces Windows to print through DOS instead of directly to the printer. <p>Option #2: The solution above does not allow users to spool documents using the PrintManager. To use the PrintManager as well as correcting time-out problems, edit the following line in the <i>win.ini</i> file:</p> <pre>TransmissionRetryTimeout=45 to: TransmissionRetryTimeout=850</pre> <p>In Windows 3.1:</p> <ol style="list-style-type: none"> 1. Follow the above instructions for issuing the MODE command in DOS. 2. Start Windows. 3. Select the Control Panel from the Main menu. 4. Select Printers 5. Select the appropriate printer and click on Connect. 6. Uncheck the "Fast Printing Direct to Port" box.

Workstation printing problems

Image never prints. Printer READY light flashes as if receiving data, but nothing comes out of the printer or the printer goes back to "Ready" mode without printing an image.

For serial or parallel printing. Ensure that the print file ends with a "CTRL-D" character. CTRL-D indicates the end-of-file which the printer responds to by closing host-to-printer communications and then processing and printing the file. Use a text editor to open and examine the file. There is a utility file that you can use to tag or remove a CTRL-D to the end of a print file. TCP/IP and Novell protocols do not accept CTRL-D with the print files. Refer to the network manual.

DECcolorwriter 1000 image processors

Image processor normal operation indicators

There are three indications that the print engine and its image processor are powered-up and operating normally: the front panel POWER and READY indicators are on (steady) and the rear panel STATUS light is blinking.

When the printer is receiving or processing data, the front panel READY light blinks.

Image processor hard and soft error indicators

Hard errors are image processor self-test failures that would prevent the printer from printing a page. Hard errors cause the rear panel STATUS light to stop blinking and remain *on* or *off*. Hard errors are also any error that occurs during service mode.

Soft errors are errors that occur during the normal power-up self-test that, while limiting the printer, would not stop the printer from printing its startpage. A message regarding the soft error would then be printed on the startup page (even if the startup up page had been turned off). Soft errors include failures of the expansion SIMMs, as well as the serial, LocalTalk and parallel ports and their cabling or connections.

Verifying the image processor's operation

The front panel READY light indicates the activity of the image processor. If the light is on (steady), then the image processor is idle. If READY blinks, then the image processor is receiving and processing data.

You can verify that the image processor can correctly receive, process and output a print file by using the Test Pattern Generator. Appendix D “Test Pattern Generator” explains how to use the Test Pattern Generator.

Image processor self-diagnostics

Image processor rear panel switches for self-testing

All the image processors feature types of self-diagnostic modes. The type of self-diagnostics run depend upon the position of rear panel DIP Switches 2, 3 and 4. The switch combinations are listed here. The selected self-diagnostics begin upon power-up or after a hardware reset (DIP Switch 1 is toggled).

Switch			Self-diagnostic mode
2	3	4	
↓	↓	↓	Normal power-up self-test
↑	↓	↓	Fixed RS-232 parameters
↓	↑	↓	Use NVRAM-stored Color Adjust setting
↑	↑	↓	Manufacturing Service test
↓	↓	↑	Configuration page/NVRAM Reset
↑	↓	↑	Demo pages
↓	↑	↑	Verification mode
↑	↑	↑	No self-diagnostics

Normal power-up self-test. This test requires no paper or customer interaction. If a problem is encountered with the image processor's expansion memory or other options, then the information is printed on the printer's start up page. Normal power-up tests take between 40 to 80 seconds.

No self-diagnostics. The printer skips all self-tests and goes directly to PostScript initialization.

Verification self-test. This test requires no paper and no customer interaction. Disconnect all host cables from the printer before starting the test. Verification tests take between 1 and 2 minutes.

Note *Be sure to disconnect any terminal or host connected to the serial port if you do not want it to receive the self-test messages.*

During the verification self-test the test results are transmitted out the serial port. Communication parameters for the serial port are 9600 baud, 8 data bits, no parity, 2 stop bits. The rear panel LED flashes irregularly as the tests are executed (*on* for one test, *off* for the next).

Manufacturing service test. This test setting is used for servicing and testing the printer during manufacturing. It is not intended for use in field servicing.

The rear panel LED flashing in a regular one flash-per-second rate means *no errors were detected* and that the image processor's CPU is running.

Printing the configuration page

While the printer is idle, if you toggle Switch 4 up and then down, as detailed on the previous page, then the DECcolorwriter 1000 prints a configuration page. The configuration page shows a great deal of information regarding the data and set-up values stored in NVRAM. Refer to the topic “The configuration page” on page 2-15 for an explanation of the configuration page.

Resetting the DECcolorwriter 1000's NVRAM

Resetting NVRAM returns all the image processor's parameters to factory defaults except the print count (processed through the image processor) and the Adobe firmware serial number.

To reset the image processor to its factory default values, follow this procedure:

1. Place the rear panel DIP Switch 4 in the *on* position (*up*). Place the rear panel DIP Switches 2 and 3 in the *off* position (*down*).
2. Flip DIP Switch 1 *up* and back *down* to reinitialize the printer.
3. Observe the rear panel LED; it quickly flashes four times for 1 second and then is off for 1 second. This pattern repeats for 10 seconds.

During the time the “quick flash” pattern is displayed, move DIP Switch 4 into the *off* (*down*) position. NVRAM will automatically reset when the health light begins blinking at its steady one blink/second “heartbeat” rate, indicating normal operation.

If you do not move DIP Switch 4 *down* during the “quick flash LED” pattern display, then the NVRAM is not reset. If Switch 4 is down during an ordinary power-up, then the quick flash LED pattern is not displayed and NVRAM is not reset.

Cleaning and Maintenance

The DECcolorwriter 1000 requires cleaning for optimum operation. Follow the printer cleaning, lubricating and inspecting procedures in this chapter for the best printer performance.

Cleaning

Tools and supplies required

- n #1 Phillips screwdriver
- n Lint-free cloth
- n 600 grit sandpaper
- n 90% pure isopropyl alcohol

Generally, the following three steps are performed by the customer.

Each time the transfer roll is replaced:

1. Wipe the line of heating elements of the thermal head with a lint-free cloth dampened with 90% isopropyl alcohol. Also clean the thermal head's transfer roll guide located just above the row of thermal head heating elements.
2. Remove the front cover and wipe the surfaces of the three black rubber feed rollers with an alcohol-dampened cloth.
3. Clean the pick rollers. Customers can either do this with an alcohol-dampened, lint-free cloth or use the pick-roller cleaning tray provided in the cleaning kit.

Each time you service a printer:

1. Wipe the line of heating elements of the thermal head with a lint-free cloth dampened with 90% isopropyl alcohol to remove all traces of dirt and wax. Clean the transfer roll guide to remove all traces of dirt.
2. Remove the front cover. Clean the six spring-loaded white plastic rollers with an alcohol-dampened cloth.
 - n Clean the plastic ribs.
 - n Ensure that there are no nicks in the plastic ribs that might scratch a print. If you do find nicks, sand them with 600 grit sandpaper.
 - n Wipe the sheet metal surfaces clean.

3. Remove the paper-feed module as explained in the Section 8 topic “Paper-feed module” on page 8-5 to gain easier access to its rollers. With an alcohol-dampened cloth, clean the following:
 - n Three black rubber feed rollers
 - n Two alignment rollers
 - n All sheet metal surfaces
4. Reinstall the paper-feed module.
5. With a 90% isopropyl alcohol-dampened cloth, clean the lower paper-eject rollers.
6. Remove the front top cabinet panel to access the upper paper eject rollers; clean them with an alcohol-dampened cloth.
7. With an alcohol-dampened cloth, gently clean the drum. Use side-to-side strokes. Rotate the drum as you clean it.
8. Clean the transfer roll mark sensor's white reflection plate with an alcohol-dampened cloth.

Lubrication

Tools and supplies required

- n Light oil
- n White grease

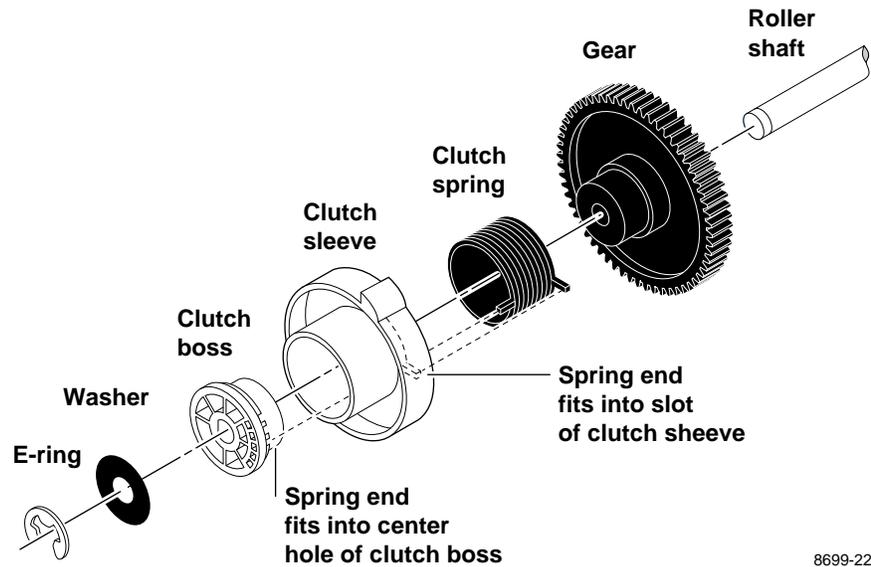
In general, all of the printer's bearings and motors are lifetime factory lubricated. However, over time and under certain extreme operating conditions, oil and grease may dry out causing squeaks and rumbling noises in the printer. Look for fine metal particles – a clear sign of an old or worn bearing. Replace the bearing or the component it is a part of.

A drop of oil or grease on a noisy bushing will quiet a noisy printer. Too much lubrication can get into the paper path and attract dust, so apply lubrication sparingly.

Lubricate the following only when lubrication is needed:

- n **Bushings:** Apply a drop of light oil to a bearing if it is noisy or running dry.
- n **Alignment roller clutch and paper-pick clutch:** The clutches each use a spirally wound spring riding on a metal gear core. The springs are very noisy if they lose lubricant. Disassemble the clutch and lubricate the spring with grease. For reassembly, the spring catch fits into the center hole of the clutch sleeve.

The two clutches used in the printer look slightly different but function and are serviced in the same manner. Refer to the Section 8 topics “Paper-pick roller, clutch, and paper-empty flag” on page 8-9 and “Lower aligning roller, clutch, and paper-pass sensor/pflag” on page 8-11 for the procedures on removing the clutches.



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Figure 7-1. Lubricating the clutches

- n **White plastic gear train:** This gear train from the paper-feed motor to the paper-feed module requires only a small amount of white grease for noise reduction purposes. Apply it sparingly so that the grease does not fling off of the gears when they turn. You need only to apply a dab of grease to a single gear and the grease will migrate throughout the entire gear train.
- n **White (nylon) plastic bearings and cams:** No lubrication required.

Inspecting

Rollers: Replace the rollers when you see any of the following defects:

- n Flat spots.
- n Out of roundness.
- n Cracked rubber.
- n Loss of traction (tackiness) causing consistent pick or feed failures.

Gears: Replace gears that show any signs of wear or breakage. Look for these problems:

- n Thinned gear teeth.
- n Bent or missing gear teeth; check especially where a metal gear drives a plastic gear.
- n Fractured or cracked gears.

Belts: Inspect the belts for wear. There are three rubber belts in the printer: a belt from the head motor to the head lift cam, a belt from the drum motor to the drum pulley, and a belt from the lower eject roller to the upper eject roller. Look for these problems:

- n Loose rubber particles below the belts indicate a worn belt.
- n Missing teeth in the belts.
- n Cracking or moderate fraying; a small amount of fraying is inevitable, so look for other signs of wear before replacing the belt.

Clutches: There are two clutches: the paper-pick roller clutch and the alignment roller clutch. Symptoms of a malfunctioning clutch are the printer not picking paper from the tray or random skewing of the print. In such cases disassemble and check inside the suspect clutch for a lack of grease, a broken spring, or worn gear teeth.

Replacements

Drum belt: Replace the drum belt after 20,000 prints.

Torque limiter: Replace the transfer roll torque limiter after 20,000 prints.

FRU

Disassembly/Assembly

Required tools

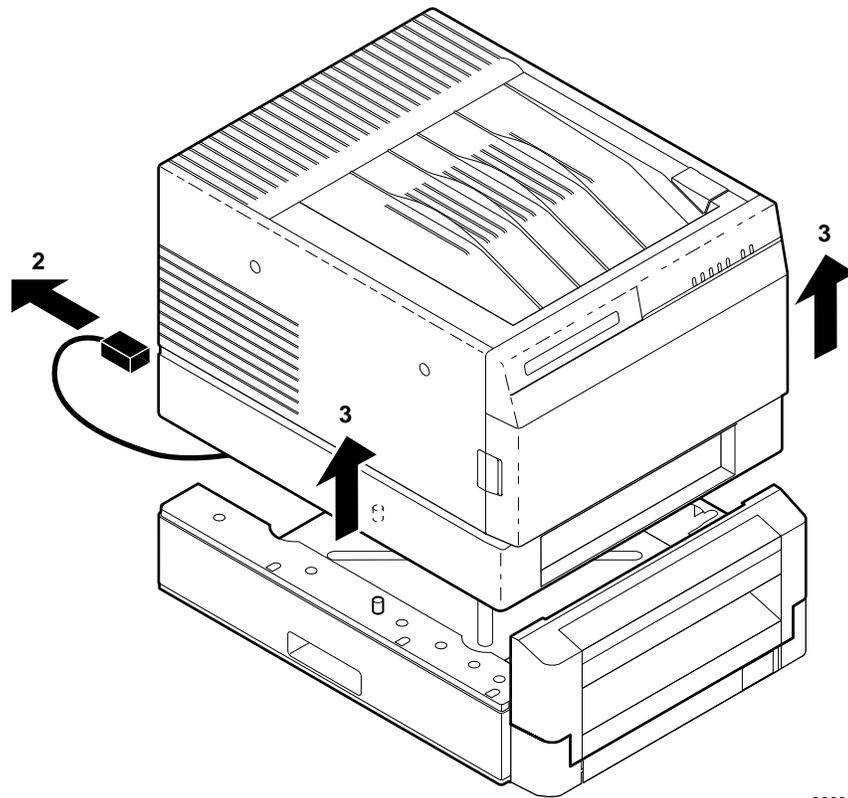
- n Magnetic tip screwdriver — 8.5 in.
- n Extension tip
- n #1 POSIDRIV® tip
- n #2 POSIDRIV® tip
- n Tweezers
- n Hex wrench kit
- n G-311S lubricating grease
- n Antistatic mat
- n Flat-blade screwdriver
- n Needle nose pliers
- n Volt-ohm-meter such as a
Tektronix DM250 Multimeter
- n Magnifying lens such as
Micronta (Radio Shack) Cat# 63-851
- n Spring removal tool

Lower tray assembly

The Lower Tray Assembly, sometimes referred to as the second feeder, is serviced and replaced as a unit. Its construction and operation is very similar to the paper feed unit in the print engine.

1. Turn off the printer.
2. Unplug the Lower Tray Assembly cable from the rear of the printer.
3. Lift the printer off of the Lower Tray Assembly.

Reverse these steps to reinstall the Lower Tray Assembly making sure that the printer is fully seated over the Lower Tray Assembly's guide pins.



8699-56

Figure 8-1 Removing the Lower Tray Assembly

Printer cabinet panels

Tools required

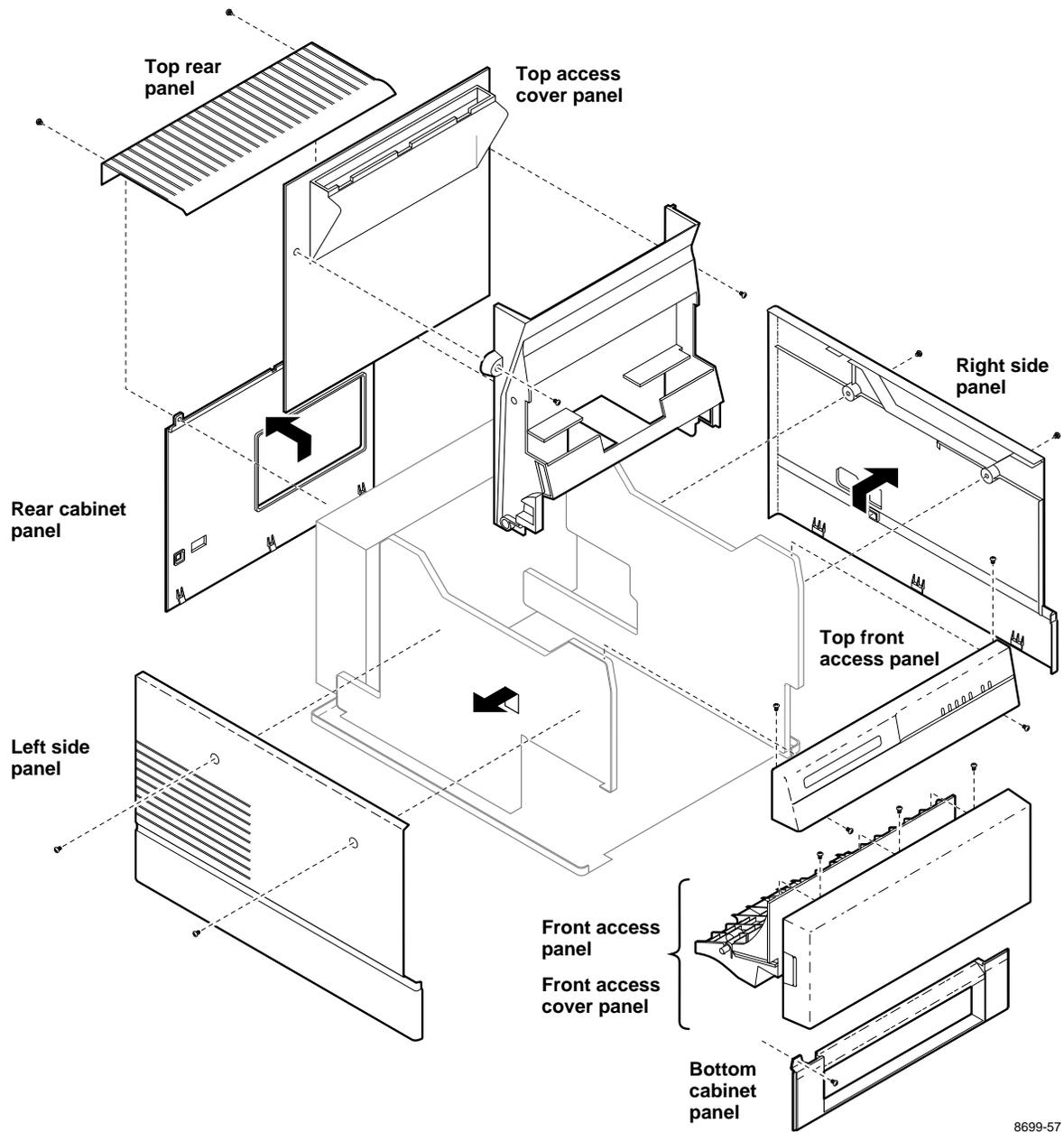
- n #1 POSIDRIV® screwdriver

The printer features cabinet panels. To a certain degree the cabinet panels interlock; you must remove some cabinet panels before you can remove others. You can remove the following panels anytime:

- n Top rear panel (two screws).
- n Left and right side panels (two screws each.) Slide the front cover forward and loosen the rear panel slightly before removing a side panel.

Before you remove the following panels, you must first remove the panels noted above:

- n Rear cabinet panel – remove the top rear panel first.
- n Top front cabinet panel – remove the front cover and open the top cover.
- n Bottom front cabinet panel – remove the front cover and the side panels.
- n Front cover panel – first remove the front cover.
- n Top cover panel (exit tray) – open the top cover and remove the two screws securing it to the thermal head frame. Do not overtighten the screws during reinstallation.



8699-57

Figure 8-2 Removing the cabinet panels

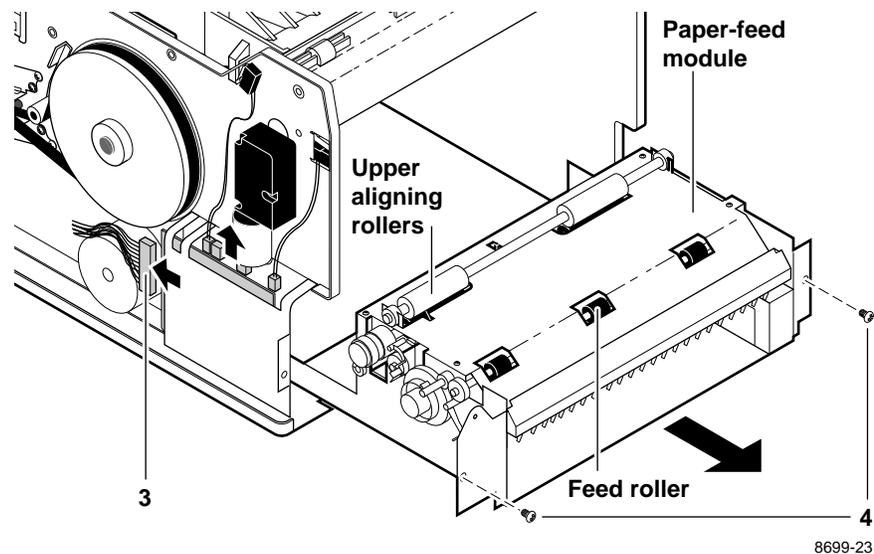
Paper-feed module

Tools required

- n #1 POSIDRIV® screwdriver
- n Small flat-blade screwdriver
- n Needle-nose pliers

1. Power down the printer and remove the power cord. Remove the paper tray.
2. Remove the front access cover. Also, remove the lower front cabinet panel and the left and right side cabinet panels. Refer to the earlier topic “Printer cabinet panels” on page 8-3.
3. Disconnect the paper-feed module wiring harnesses on the left side of the printer.
4. Remove the two screws securing the paper-feed module to the printer frame. Slide the module out.

Reverse this procedure to reinstall the paper-feed module.



8699-23

Figure 8-3 Removing the paper-feed module

Accessing the pick roller, aligning roller, and the lower feed roller

1. Power down the printer and remove the power cord.
2. Remove the paper-feed module as explained in the previous procedure “Paper-feed module” on page 8-5.
3. Remove the two screws securing the paper-feed circuit board to the paper-feed module. (One screw is reached through an access hole.) Slide the board out of the way.

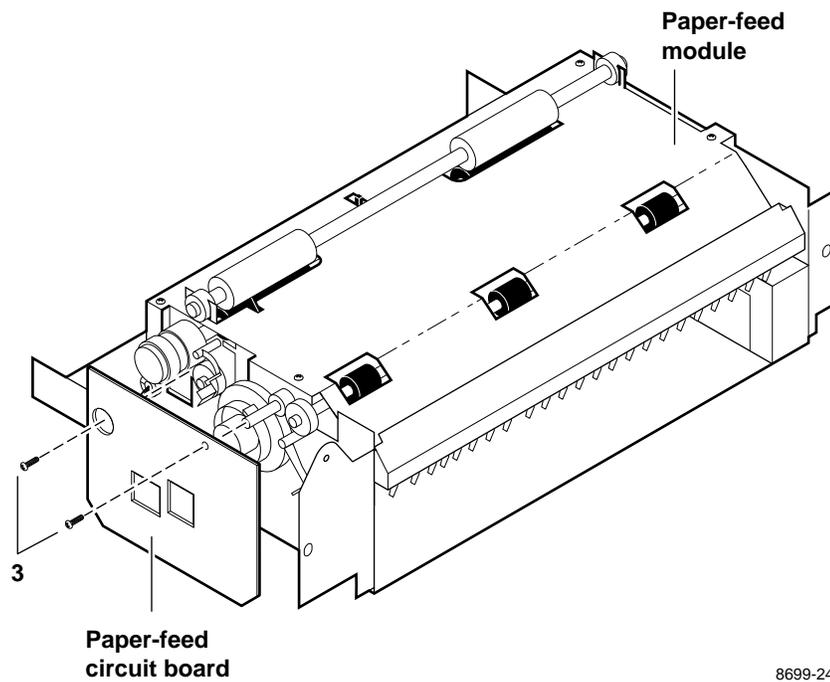
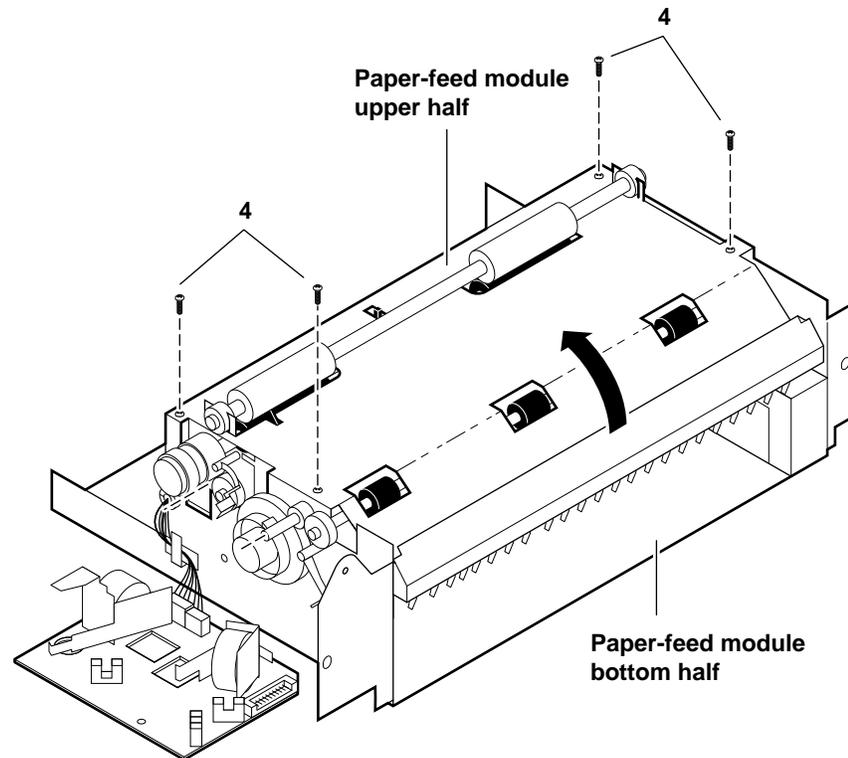


Figure 8-4 Removing the paper-feed circuit board

When you reinstall the paper-feed circuit board, be sure to engage the two solenoid gear pawls with their respective clutches.

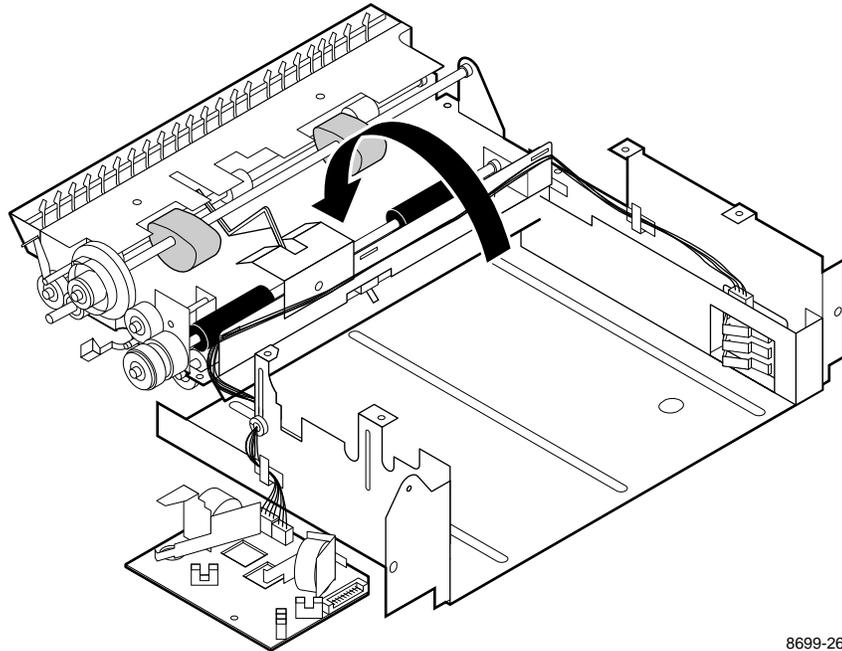
4. Remove the four screws securing the top half of the paper-feed module. (For reassembly, note the alignment pins in the top half and the receiving holes in the bottom half. Ensure that they properly line up during reassembly.)



8699-25

Figure 8-5 Removing the paper-feed unit screws

5. Separate the two halves and flip the upper half over to expose all the rollers.



8699-26

Figure 8-6 Separating the paper-feed unit

At this point you can proceed to any individual roller removal procedures explained on the following pages.

Paper-pick roller, clutch, and paper-empty flag

You must remove the paper-pick roller and clutch prior to removing the paper-empty flag. Removing the paper-empty flag is an optional step.

1. Remove the E-ring securing the pick roller clutch. Remove the clutch. (For reassembly, note the keyed shaft the clutch fits onto.)
2. Remove the two E-rings securing the pick roller to the upper half of the paper-feed module. Rotate and remove the paper-pick roller.

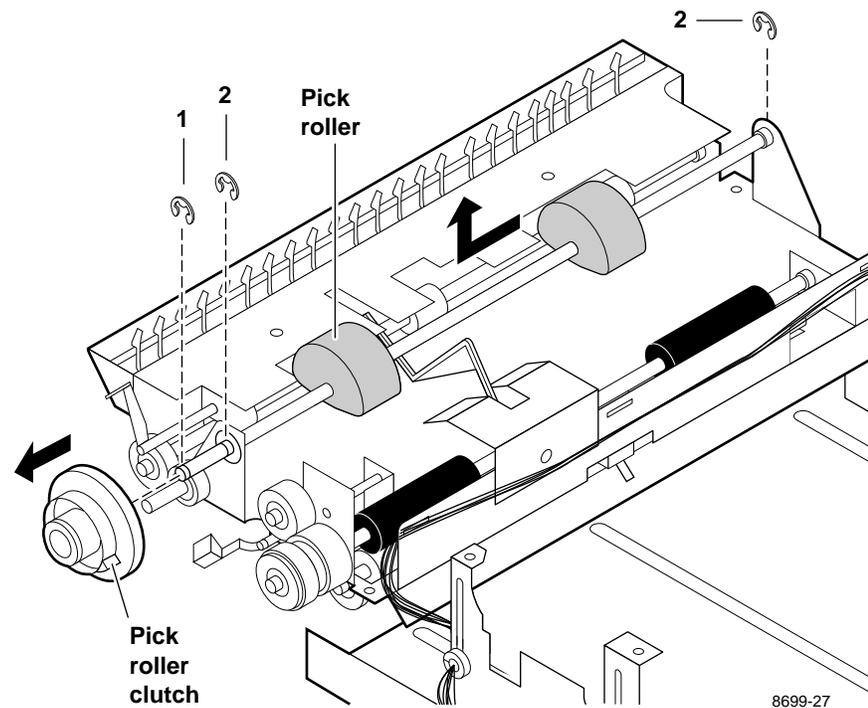


Figure 8-7 Removing the pick roller and clutch

3. Remove the flag stop secured in place by one screw.

4. Rotate and remove the paper empty flag.

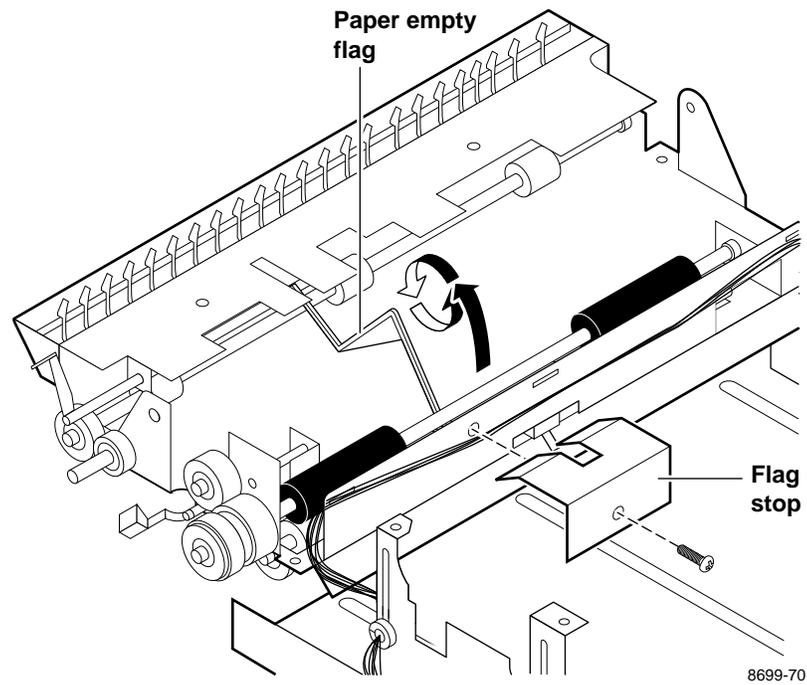


Figure 8-8 Removing the paper-empty flag

Lower aligning roller, clutch, and paper-pass sensor 1 flag

You must remove the lower aligning roller and clutch prior to removing the paper-pass sensor 1 flag. Removing the paper-pass sensor 1 flag is an optional step.

1. Remove the E-ring securing the aligning roller clutch. Remove the clutch. (For reassembly, note the keyed shaft the clutch fits onto.)
2. Remove the two E-rings securing the lower aligning roller (black rubber) to the upper half of the paper-feed module. Remove the lower aligning roller. Be careful not to damage the paper-empty flag.

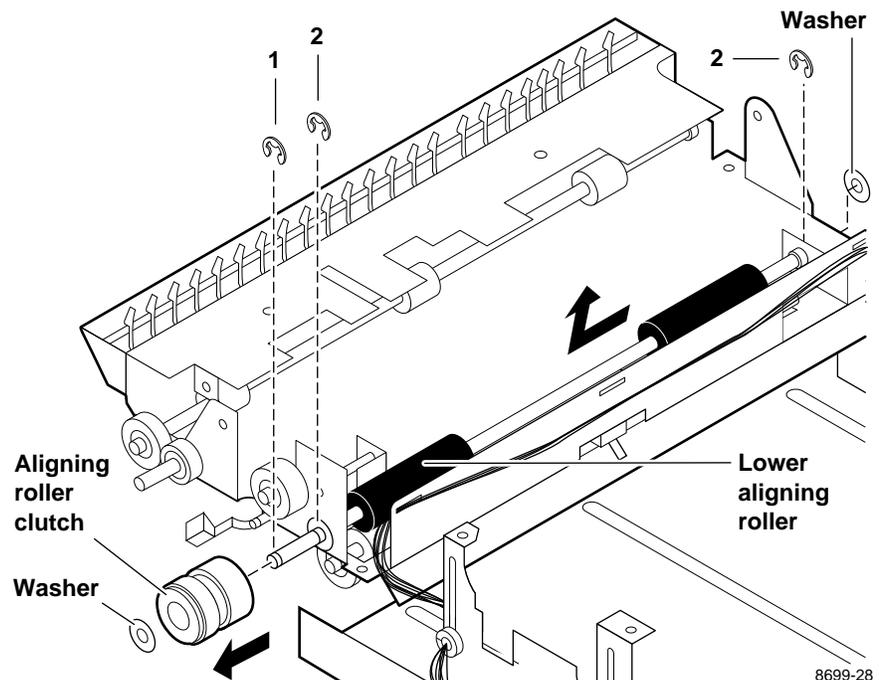


Figure 8-9 Removing the lower aligning roller

3. Paper-pass sensor 1 flag removal: Rotate the paper-pass sensor flag about 180° and slide it out of the paper feed unit.

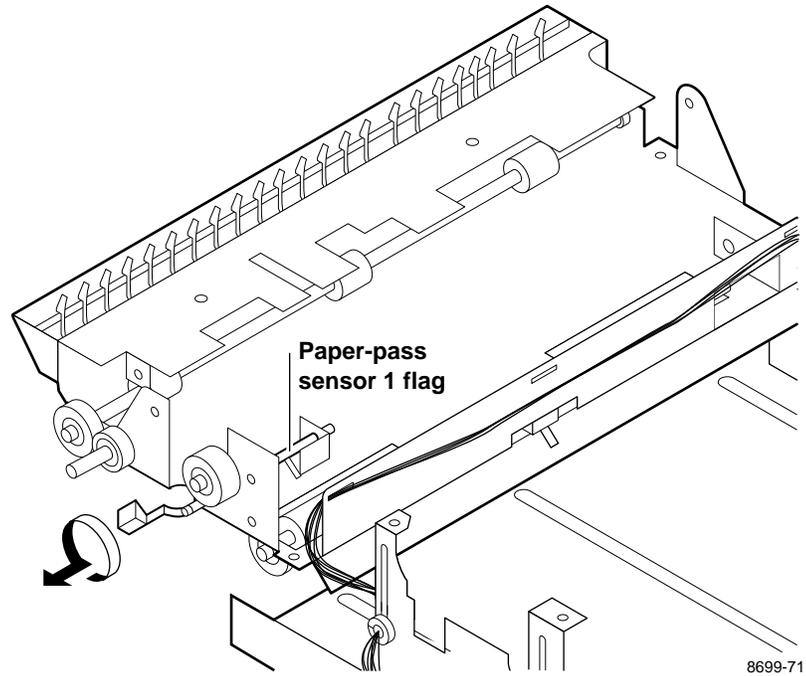
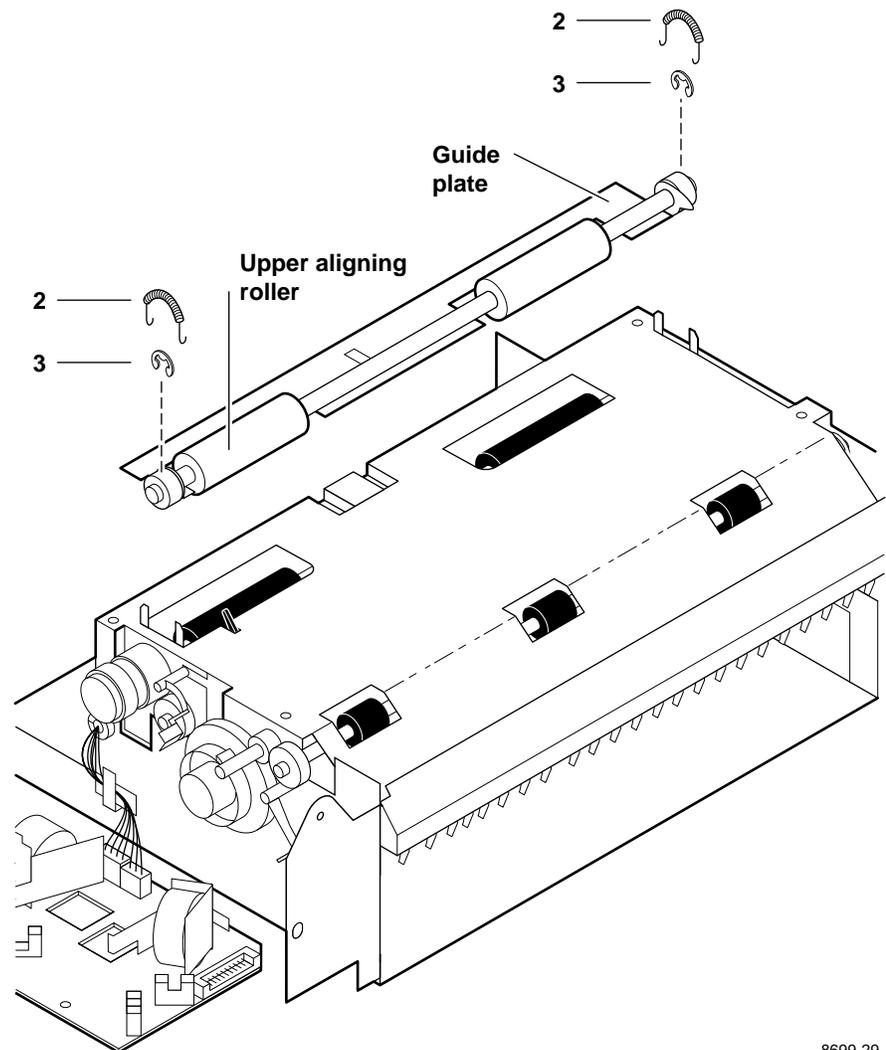


Figure 8-10 Removing the paper-pass sensor 1 flag

Removing the upper aligning roller

1. Flip over the upper half of the paper-feed unit to access the upper aligning roller (white nylon); refer to Figure 8-6.
2. Remove the two tensioning springs holding down each end of the upper aligning roller.
3. Remove the two E-rings securing the upper aligning roller. Remove the aligning roller from the guide plate and bronze bushings.



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Figure 8-11 Removing the upper aligning roller

Removing the feed roller

1. If not already upright, flip over the upper half of the paper-feed unit to access the feed roller; refer to Figure 8-6.
2. Remove the two E-rings securing the feed roller.
3. Remove the white nylon gear and its pin.
4. Remove the feed roller. If necessary, remove the right end bushing to create more clearance for removing the roller.

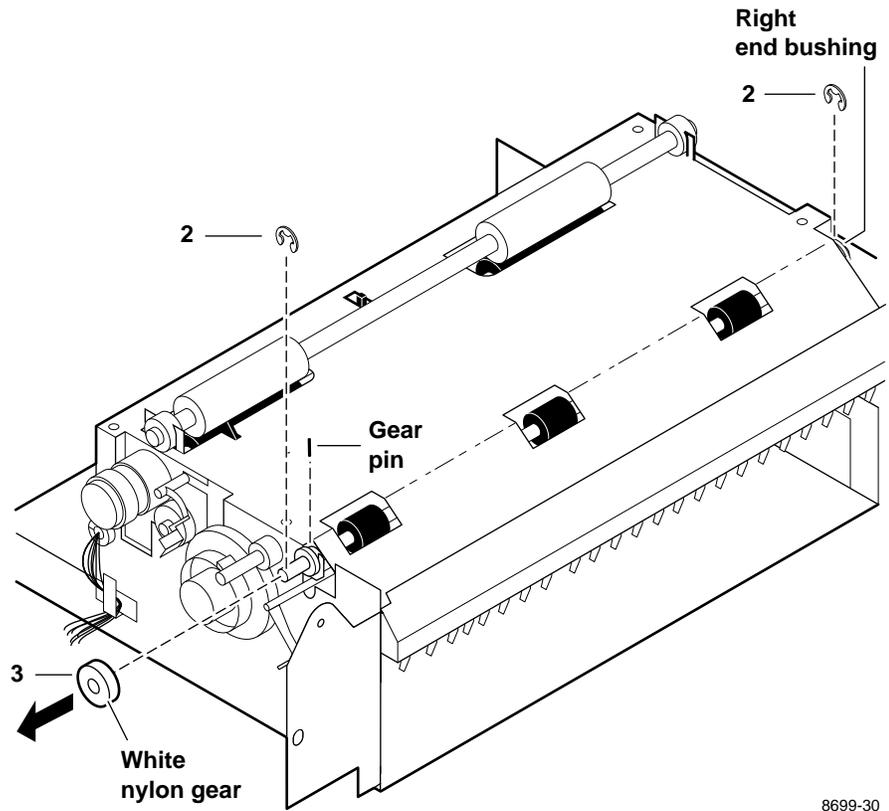


Figure 8-12 Removing the feed roller

For reassembly, reverse the steps you performed to reinstall the rollers.

Removing the exit rollers

1. Power down the printer and remove the power cord.
2. Open the top cover and remove the front access cover. Also, remove the top front, left and right side cabinet panels as described in “Printer cabinet panels” on page 8-3.
3. Lower exit roller: Remove the E-rings securing the lower exit roller pulley.
4. Remove the lower exit roller pulley, roller, bushings and the paper-eject belt.
5. Upper exit roller: Remove the E-rings securing the upper exit roller pulley. Also remove the E-ring securing the other end of the roller.
6. Remove the upper exit roller pulley, roller and bushings.

Reverse these steps to reinstall the exit rollers.

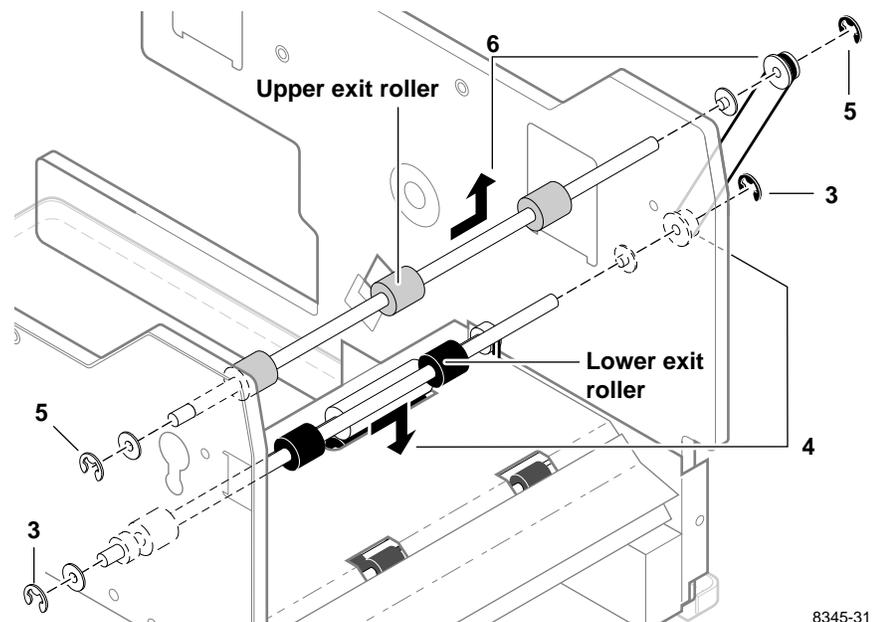


Figure 8-13 Removing the exit rollers

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Bail roller assembly

Tools required

#1 POSIDRIV® screwdriver

1. Power down the printer and remove the power cord. Open the top access cover and remove the transfer roll.
2. Remove the left and right side cabinet panels. Refer to the earlier topic “Printer cabinet panels” on page 8-3.
3. Remove the four screws securing the bail roller assembly (two at each end: one inside the frame and one outside) to the print engine frame.
4. Remove the bail roller assembly.

Reverse these steps to reinstall the bail roller.

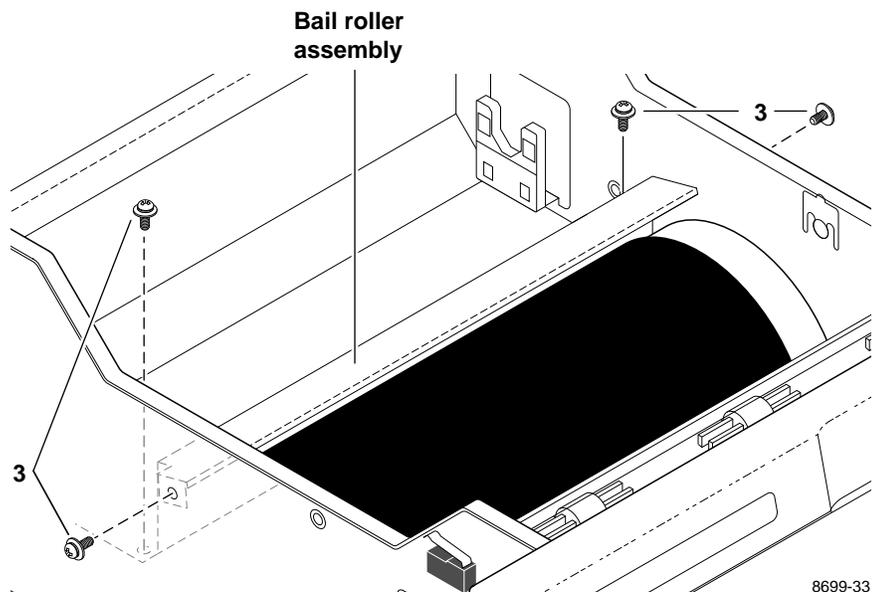


Figure 8-14 Removing the bail roller assembly

Note Upon reassembly, make sure that the bail roller assembly metal frame does not contact the drum's paper clamp.

Thermal head

Tools required

#1 POSIDRIV® screwdriver

1. Power down the printer and remove the power cord. Remove the top cabinet panel. Refer to the earlier topic “Printer cabinet panels” on page 8-3. Close the top cover.
2. Remove the screws securing the thermal head fan and move the fan out of the way so that you can access the thermal head's guide pin.
3. Remove the E-ring securing the thermal head's guide pin to the thermal head frame. (Newer Kyocera thermal heads do not use an E-ring. Also, the guide pin is screwed into the printhead block.)

Note *If you replace a thermal head with a Kyocera brand thermal head, cut out the two white, 0 $\frac{3}{4}$ resistors located at the center of the engine control board. Replace the head lift motor bracket. Ensure that the engine firmware is S401Y or later. Level “Y” prints out as firmware level “24” on the inspection/check test pattern.*

4. Remove the screw securing the grounding straps to the thermal head lift motor's frame.
5. Open the top cover. Remove the two springs securing the thermal head (one at each end) to the thermal head frame.
6. Disconnect the power and data interface wiring harnesses from the thermal head. Remove the thermal head.

Reverse these steps to reinstall the thermal head, then perform the Chapter 9 procedure “Adjusting for best print quality” on page 9-14. Route the grounding strap so that it does not interfere with the thermal head lift belt.

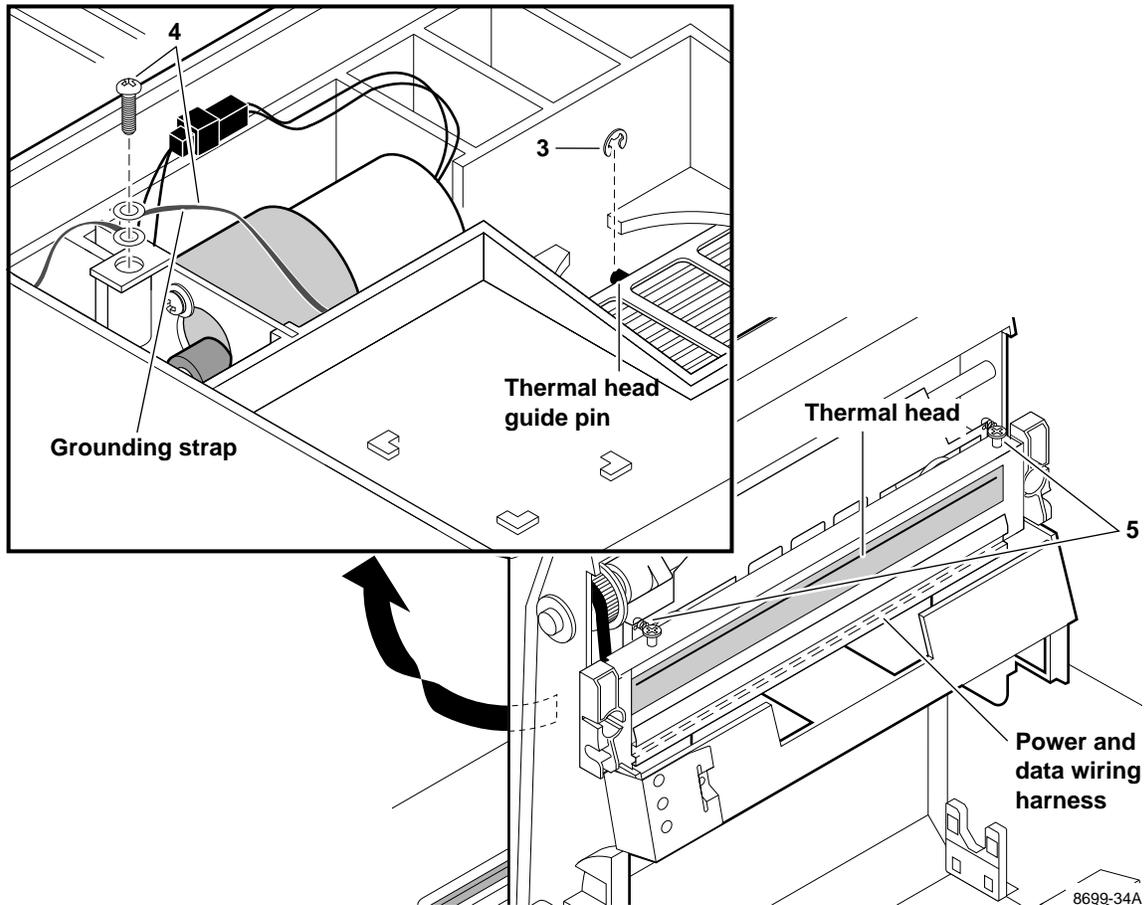


Figure 8-15 Removing the thermal head

Warning Do not disconnect the ground strap from the back of the thermal head; only disconnect it from the head lift motor bracket. Not reconnecting the ground strap will damage the thermal head upon power-up.

Drum

Tools required

- n #1 POSIDRIV® screwdriver
- n Needle-nose pliers
- n Small flat-blade screwdriver
- n 2 mm wrench

1. Power down the printer and remove the power cord. Open the top access cover and remove the transfer roll.
2. Remove the left and right side panels. Refer to the earlier topic “Printer cabinet panels” on page 8-3.
3. Loosen the drum belt tensioner set screw. Push the tensioner to loosen the drive belt and then tighten the set screw to hold the belt in its loosened position.
4. Remove the drum belt from the drum pulley.
5. Use a 2 mm hex wrench to loosen the two set screws securing the drum pulley in place. Remove the drum pulley, spring and washers. Also, remove the drum shaft's brass bushing. (For reassembly, note the two keyed portions of the drum shaft that the drum pulley's set screws tighten into.)

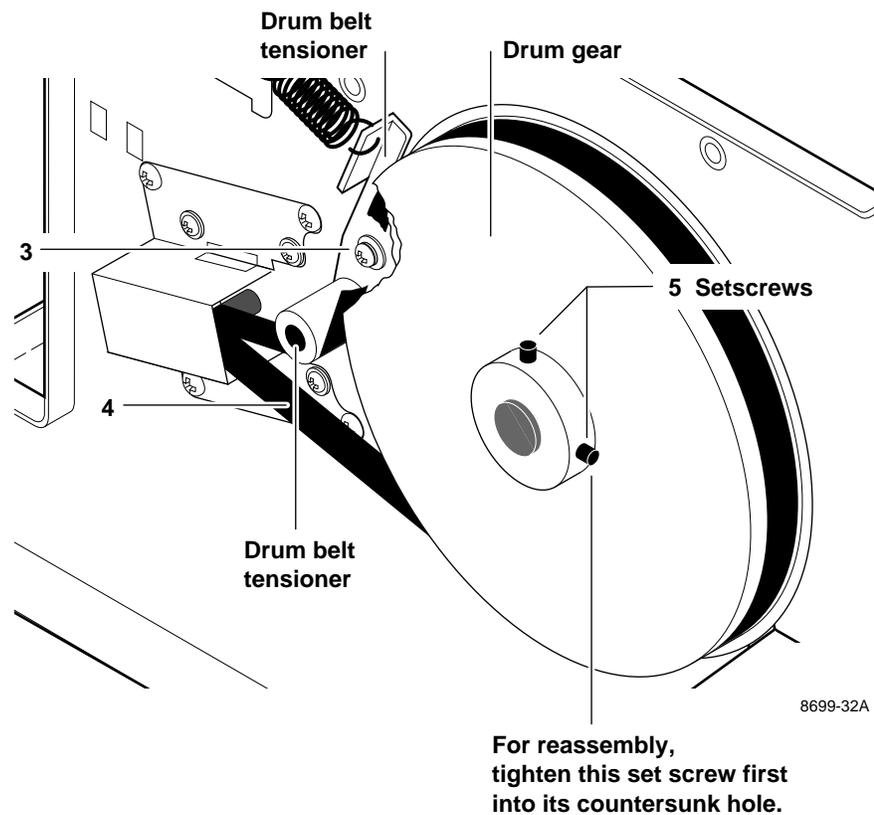


Figure 8-16 Removing the drum belt and pulley

6. Remove the E-rings and bronze bushings from each end of the front idler roller. Remove the roller.

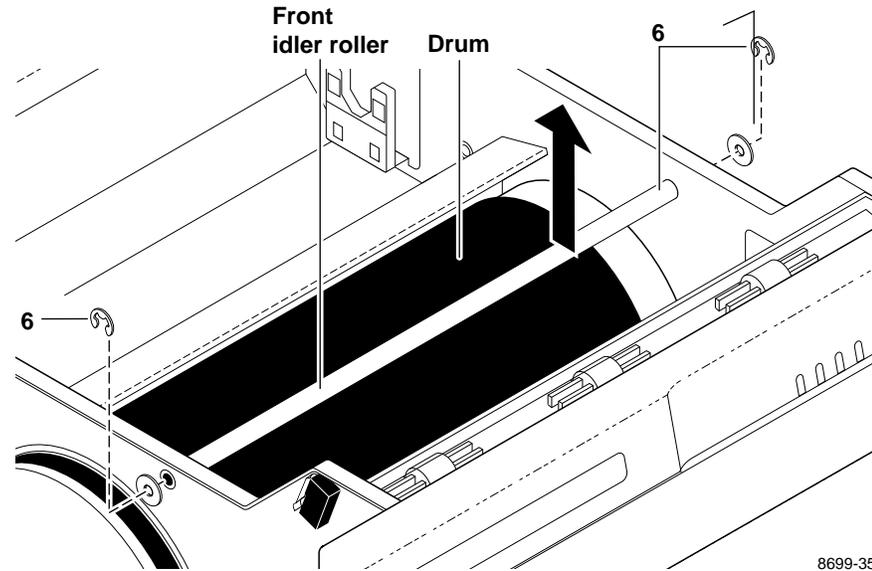


Figure 8-17 Removing the front idlerproller

7. Remove the bail roller assembly by removing the pair of screws at each end of the assembly.

8. Remove the E-ring securing the right end of the drum's shaft to the print engine frame. Also, remove the shaft's bronze bushing.

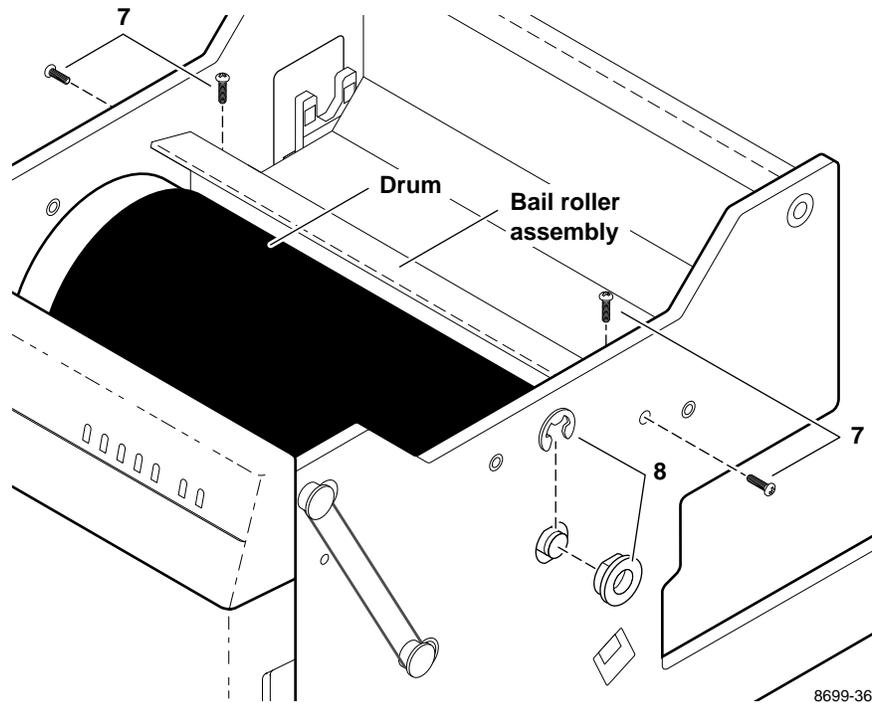


Figure 8-18 Removing the drum's right end bushing

Note During removal and replacement, be careful not to scratch or damage the drum. Defects in the surface of the drum can affect print quality.

9. Remove the drum. You will find it necessary to rotate the drum so that the paper clamp sensor flag (on the left end of the paper clamp) fits through a hole in the left-top side of the frame. This allows you to position the drum far enough to the left so that you can raise the right end of the drum and lift the drum out of the print engine.

Reverse these steps to reinstall the drum. Be sure to position the drum pulley on the drum shaft so that the set screws are positioned over the flat cutouts in the shaft. Tighten the set screw that goes into the countersunk hole first. Then tighten the set screw that sets against the other flat cutout. Otherwise, banding may occur in the prints if the drum pulley wobbles on the drum shaft.

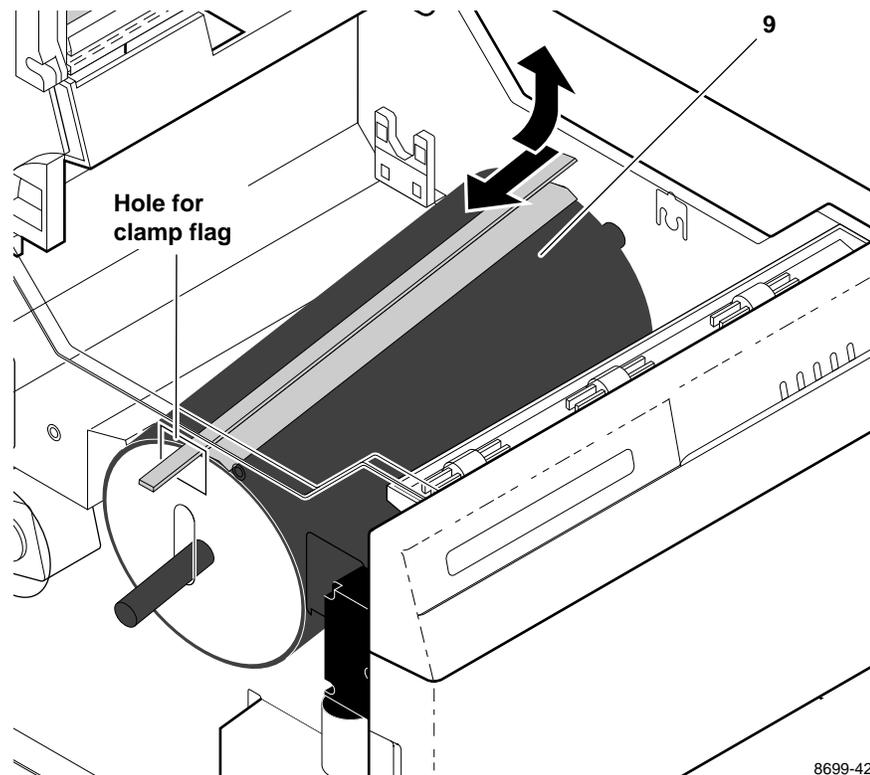


Figure 8-19 Removing the drum

Note After reassembly, make sure that the drum belt is properly adjusted. Refer to the topic “Drum belt tension adjustment” on page 9-11. If the belt is too loose, it will cause media pick and loading problems.

Also adjust the drum’s paper clamp with the two adjustments “Top margin adjustment” on page 9-12 and “Paper clamp adjustment (to correct misregistration)” on page 9-18.

Motors

Paper-feed motor

Tools required

n #1 POSIDRIV® screwdriver

1. Power down the printer and remove the power cord.
2. Remove the left side cabinet panel. Refer to the earlier topic “Printer cabinet panels” on page 8-3.
3. Disconnect the wiring harness leading to the paper-feed motor.
4. Remove the two screws securing the paper-feed motor to the print engine frame. Remove the motor.

Reverse these steps to reinstall the paper-feed motor.

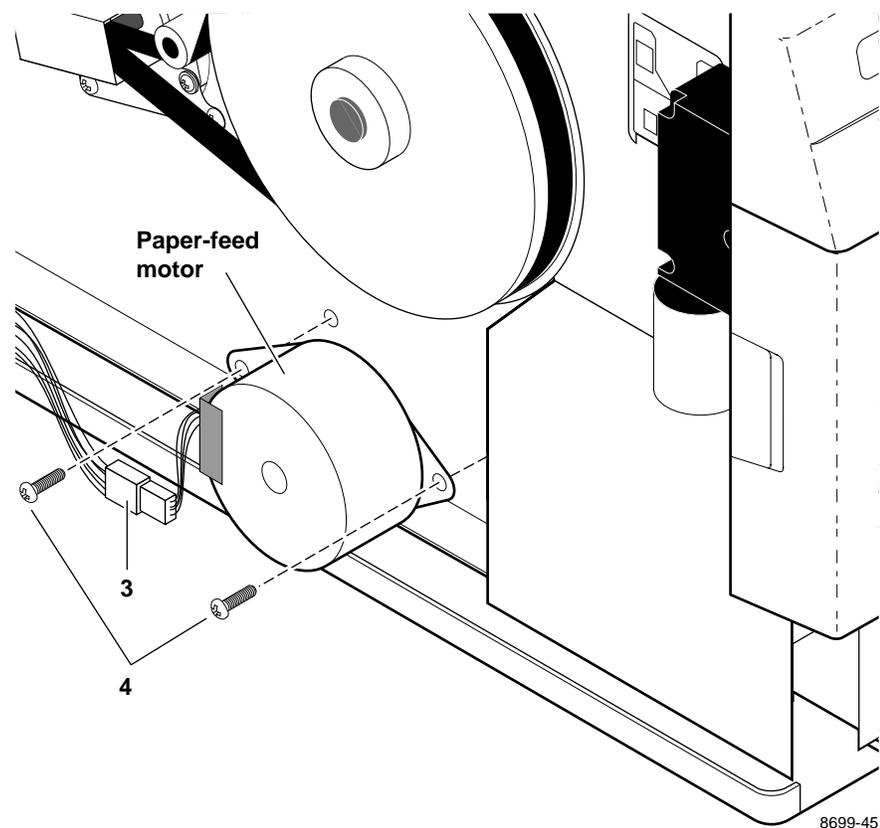


Figure 8-20 Removing the paper-feed motor

Drum motor

Tools required

n #1 POSIDRIV® screwdriver

1. Power down the printer and remove the power cord.
2. Remove the left side cabinet panel. Refer to the earlier topic “Printer cabinet panels” on page 8-3.
3. Loosen the drum belt tensioner set screw. Push the tensioner to loosen the drive belt and then tighten the set screw to hold the belt in its loosened position.
4. Remove the drum belt from the drum pulley.
5. Disconnect the drum motor's wiring harness leading to the print engine control board.
6. Remove the four outer screws securing the drum motor to the print engine frame. Remove the motor.

Reverse these steps to reinstall the drum motor.

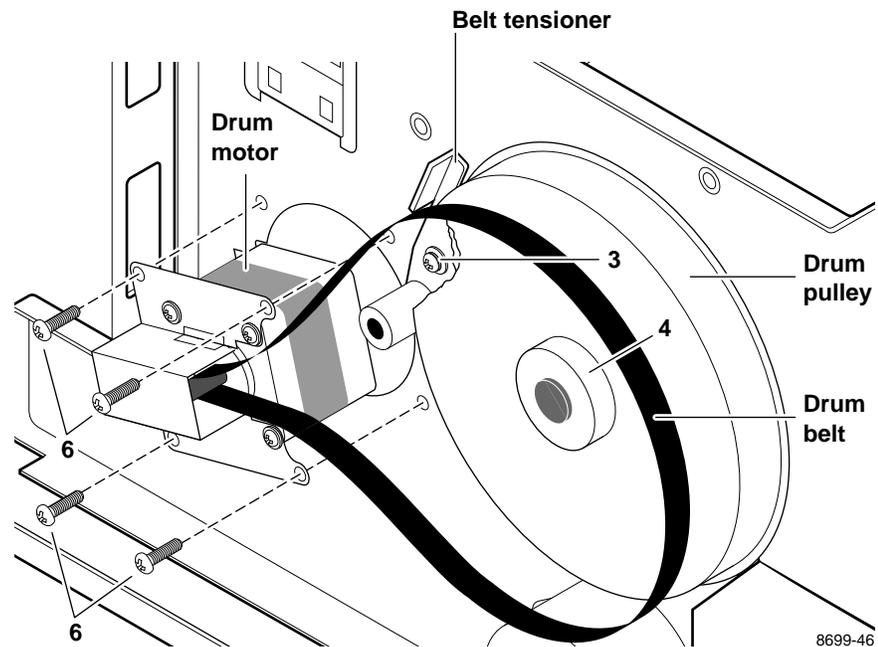


Figure 8-21 Removing the drum motor

Transfer roll take-up motor

Tools required

n #1 POSIDRIV® screwdriver

1. Power down the printer and remove the power cord.
2. Open the top access cover and remove the transfer roll.
3. Remove the left side cabinet panel. Refer to the earlier topic “Printer cabinet panels” on page 8-3.
4. On the inside of the printer, loosen the transfer roll take-up gear's two set screws. Remove the gear.

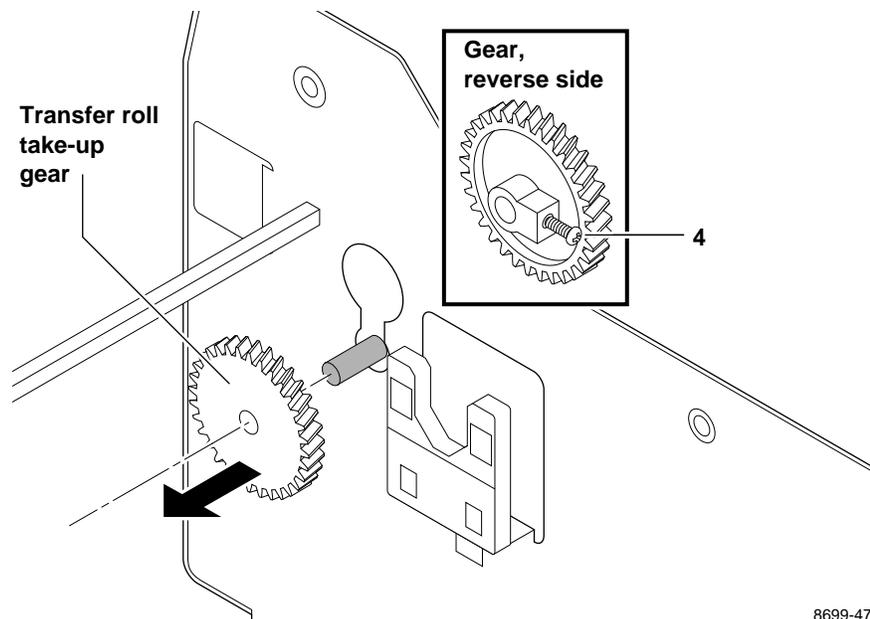


Figure 8-22 Removing the transfer roll take-up gear

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5. On the outside of the printer, disconnect the wiring harness leading to the transfer roll take-up motor.
6. Remove the two screws securing the transfer roll take-up motor to the print engine frame. Remove the motor.

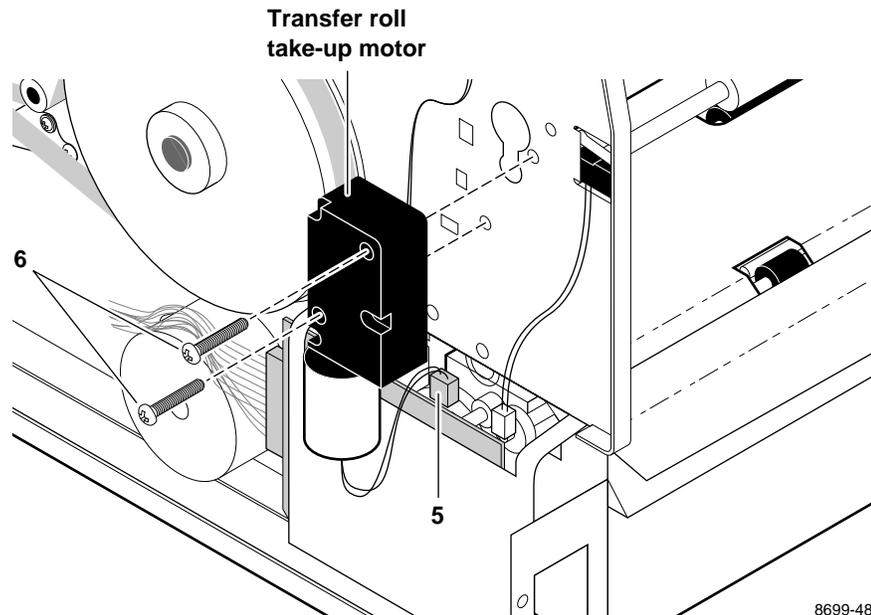


Figure 8-23 Removing the transfer roll take-up motor

Reverse these steps to reinstall the transfer roll take-up motor. When you install the take-up gear, be sure to position the gear's set screw over the keyed portion of the motor shaft.

Thermal head lift motor

Tools required

n #1 POSIDRIV® screwdriver

1. Power down the printer and remove the power cord. Remove the cabinet top. Refer to the earlier topic “Printer cabinet panels” on page 8-3.
2. Unloop the thermal head lift belt from the thermal head lift cam roller's pulley.
3. Remove the screw securing the bottom of the thermal head lift motor bracket. The transfer roll mark sensors are mounted to this bracket. Remove the transfer roll mark sensors shield.

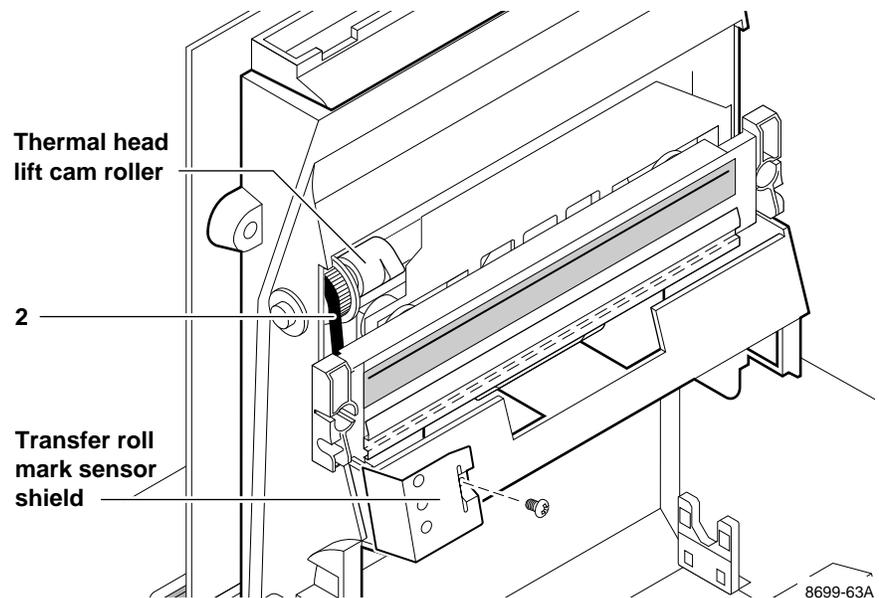


Figure 8-24 Freeing the thermal head drive belt and thermal head lift motor bracket

Note Since you remove the transfer roll mark sensors to gain access to the printhead lift motor, upon reassembly you should run the calibration procedure “Calibrating the transfer roll mark sensors (reflective sensors)” on page 9-10 to ensure that they are in proper adjustment.

4. Slip the thermal head lift cam belt off the pulley on the end of the thermal head lift motor shaft.
5. Remove the screw securing the thermal head lift motor in place. Remove the motor with an upward twisting motion.
6. Disconnect the thermal head lift motor's wiring harness.

Reverse these steps to reinstall the thermal head lift motor.

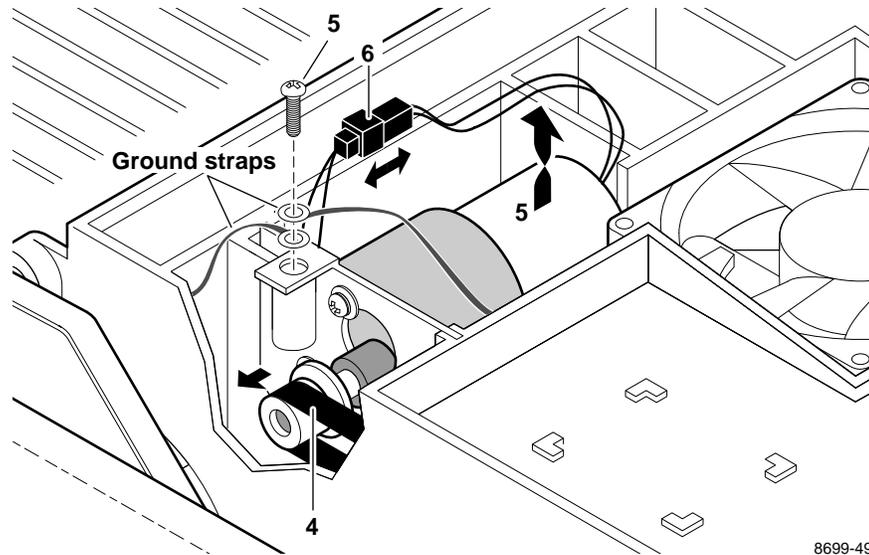


Figure 8-25 Removing the thermal head lift motor

Sensors and switches

The following topics explain how to remove sensors or switches that are difficult to reach, require considerable print engine disassembly, or require special cautions.

Paper-pass sensor 1 and paper-empty sensor

These sensors are located on the paper-feed module. The paper pass sensor 1 and the paper empty sensor are soldered on the paper-feed circuit board. The board must be replaced to replace the sensors. Refer to the earlier topic “Paper-feed module” on page 8-5.

Thermal head position sensors

These sensors are mounted on a small circuit board that attaches to the top-side of the top cover. It is easily accessible by removing the top cover panel.

Transfer roll mark sensors

The transfer roll mark sensor circuit board is mounted on the thermal head lift motor bracket. To access and remove the sensor board, remove the thermal head lift motor as explained in the previous procedure “Thermal head lift motor” on page 8-27. Upon reassembly run the calibration procedure “Calibrating the transfer roll mark sensors (reflective sensors)” on page 9-10 to ensure that they are in proper adjustment.

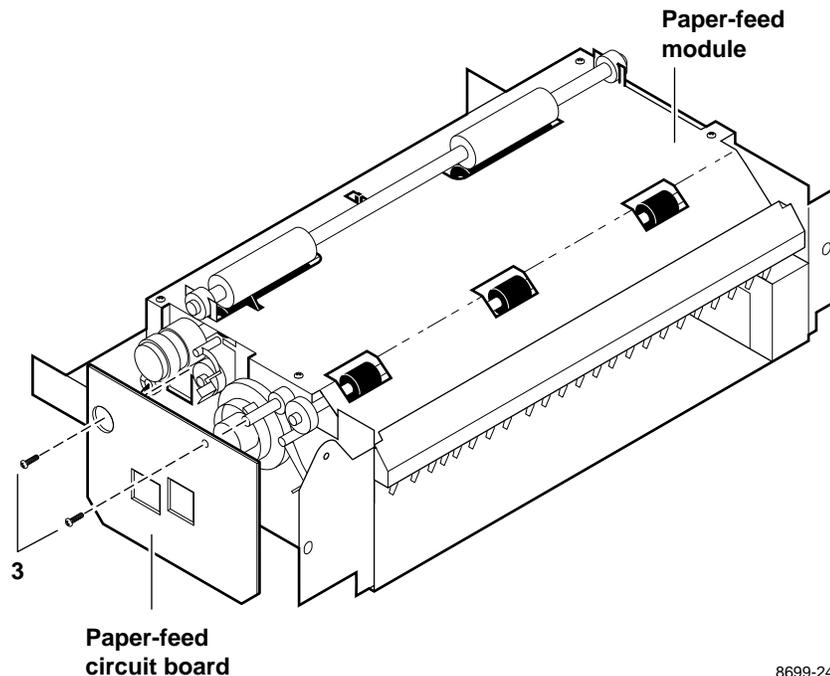
Paper-pass sensor 2 and tray sensor

Tools required

- #1 POSIDRIV® screwdriver

Paper-pass sensor 2 and the paper tray sense switches are located inside the paper-feed module. You follow the same basic procedure to access either sensor.

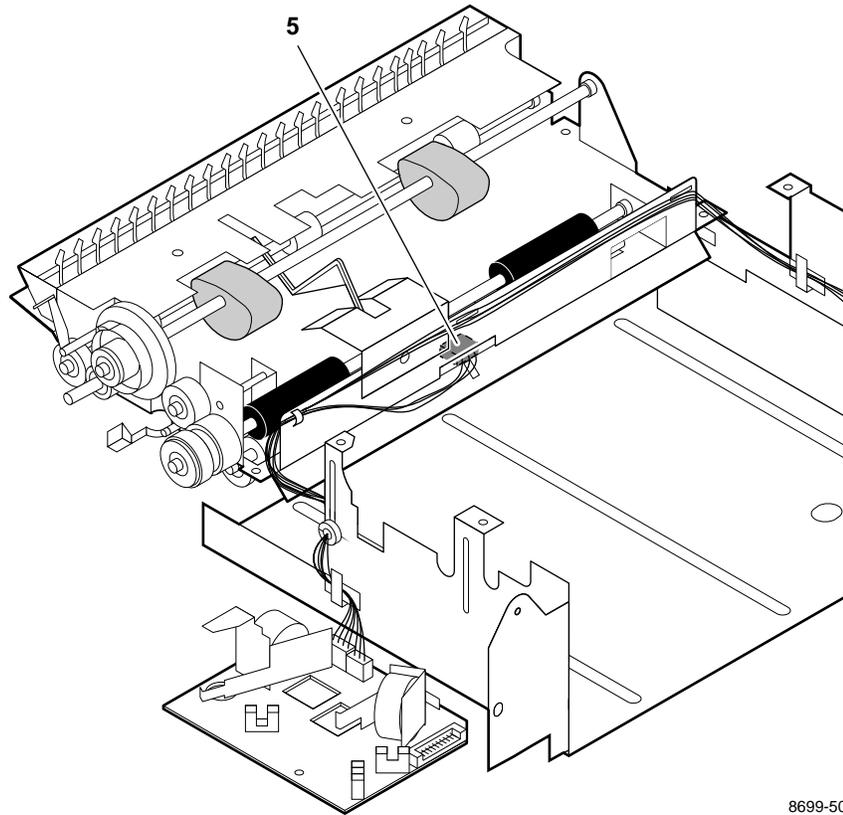
1. Power down the printer and remove the power cord.
2. Remove the paper-feed module as explained in the previous procedure “Paper-feed module” on page 8-5.
3. Remove the two screws securing the paper-feed circuit board to the paper-feed module. (One screw is reached through an access hole.) Slide the board out of the way.



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Figure 8-26 Removing the paper-feed circuit board

4. Remove the four screws securing the top half of the paper-feed module. Separate the two halves and flip over the upper half.
5. **Paper-pass sensor 2:** Unclip paper-pass sensor 2 and remove it and its wiring harness leading to the paper-feed circuit board.

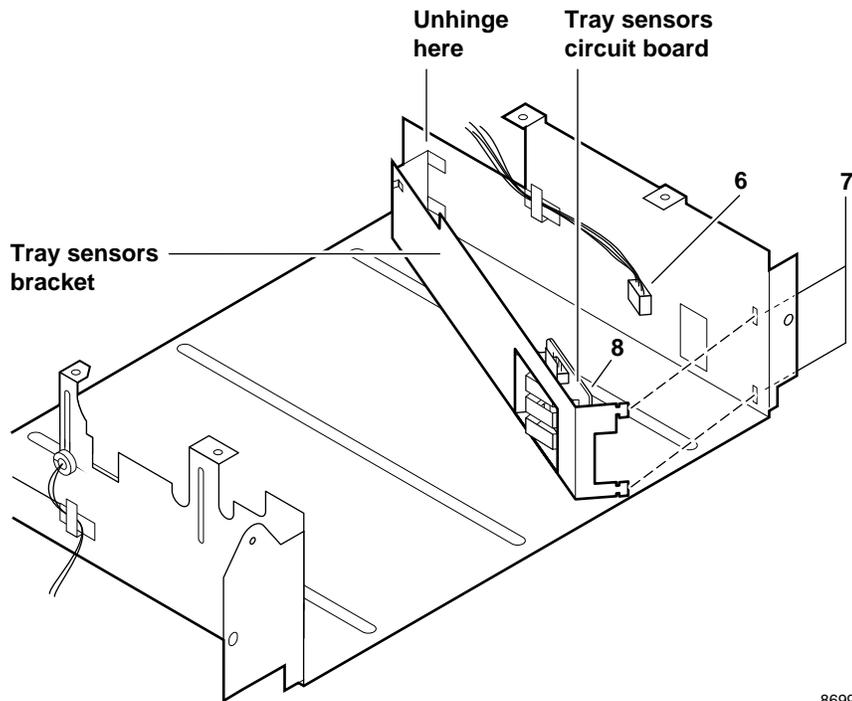


8699-50

Figure 8-27 Removing the paper-pass sensor 2

6. **Tray sensor circuit board:** Disconnect the tray sensors' wiring harness.
7. Straighten the two metal tabs securing the tray sensors' bracket to the paper-feed module. Unhinge the bracket to access the tray sensor circuit board.
8. Remove the screw securing the paper tray sensor circuit board to the bracket. Remove the circuit board.

Reverse these steps to reinstall paper-pass sensor 2 and the tray sensor circuit board.



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Figure 8-28 Removing the tray sensors circuit board

Transfer roll low sensor

Tools required

- n #1 POSIDRIV® screwdriver

This sensor is located inside the print engine near the power supply (below the supply-side transfer roll).

1. Power down the printer and remove the power cord.
2. Open the top access cover and remove the transfer roll.
3. Remove the card cage and power supply as explained in the later topic “Card cage and power supply” on page 8-35.
4. Disconnect the sensor's 3-wire wiring harness from the engine control board (CN7). Clip the tie wrap it shares with the other wiring harnesses.
5. Unclip the sensor from the print engine frame.
6. Reach through the rear of the printer to remove the sensor.

Reverse these steps to reinstall the transfer roll low sensor.

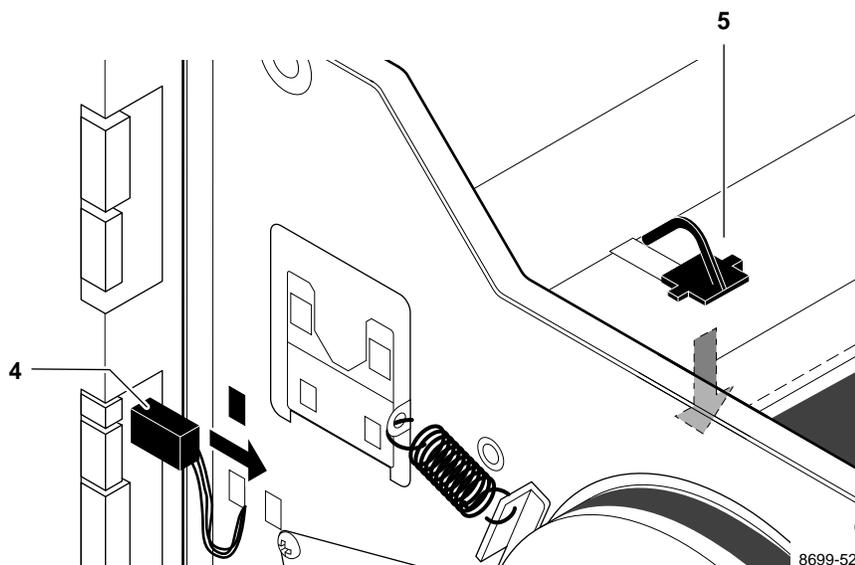


Figure 8-29 Removing the transfer roll low sensor

Paper clamp sensor

Tools required

- n #1 POSIDRIV® screwdriver

This sensor is located under the drum.

1. Power down the printer and remove the power cord.
2. Open the top access cover and remove the transfer roll.
3. Remove the drum as detailed in the earlier procedure “Drum” on page 8-19.
4. Disconnect the paper clamp sensor's wiring harness.
5. Remove the two screws securing the paper clamp sensor in place.

Reverse these steps to reinstall the paper clamp sensor. Run the calibration check “Calibrating the paper clamp sensor (reflective sensor)” on page 9-10 to ensure the sensor is properly adjusted

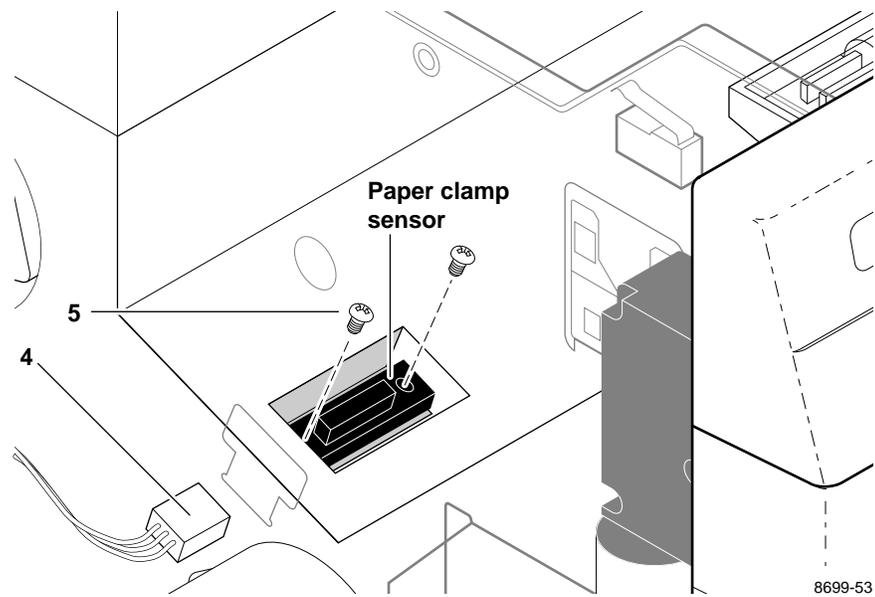


Figure 8-30 Removing the paper clamp sensor

Card cage and power supply

Tools required

n #1 POSIDRIV® screwdriver

1. Power down the printer and remove the power cord. Disconnect all host interface connectors.
2. Remove the rear and side cabinet panels. Refer to the earlier topic “Printer cabinet panels” on page 8-3.
3. Disconnect all wiring harnesses from the card cage.
4. Disconnect the four screws securing the card cage to the print engine frame (two screws each on the left and the right sides).

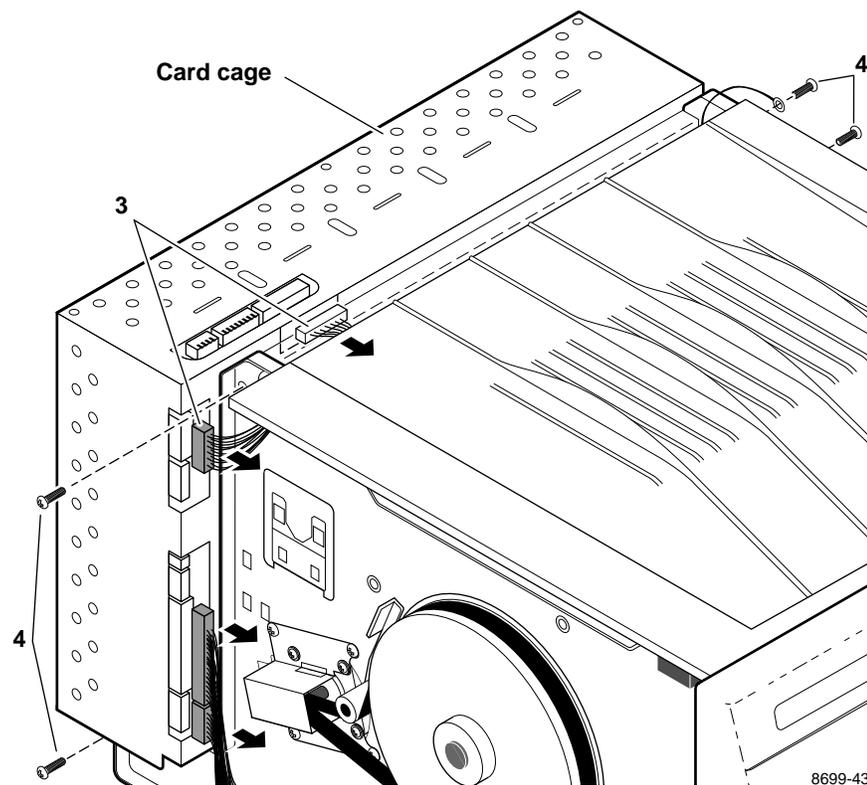


Figure 8-31 Disconnecting the wiring harnesses and removing the card cage

5. Disconnect the power supply wiring harness leading to the printhead. Cut the cable ties securing the harness in place.
6. Slide the card cage and power supply out the rear of the print engine. As you slide the card cage out you can disconnect the thermal head power supply harness from the power supply.

Fuses: Note the location of the power supply's fuses.

Engine fan: Note that the engine fan blows into the card cage.

Reverse these steps to reinstall the power supply and card cage.

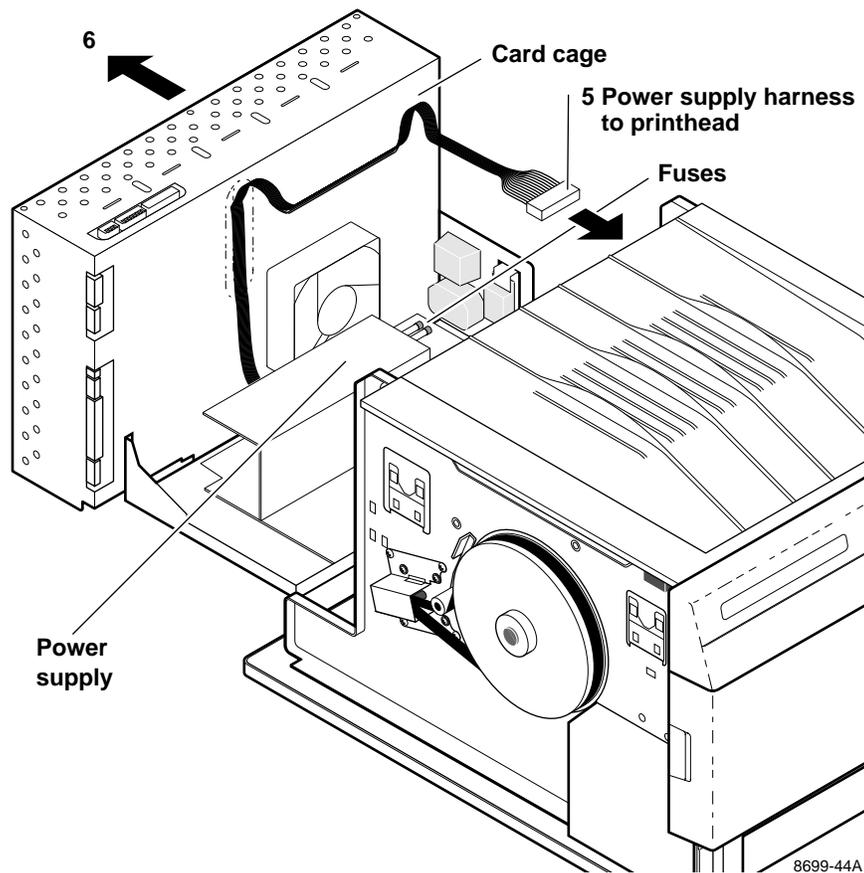


Figure 8-32 Removing the card cage and power supply

Circuit boards

Power supply circuit board

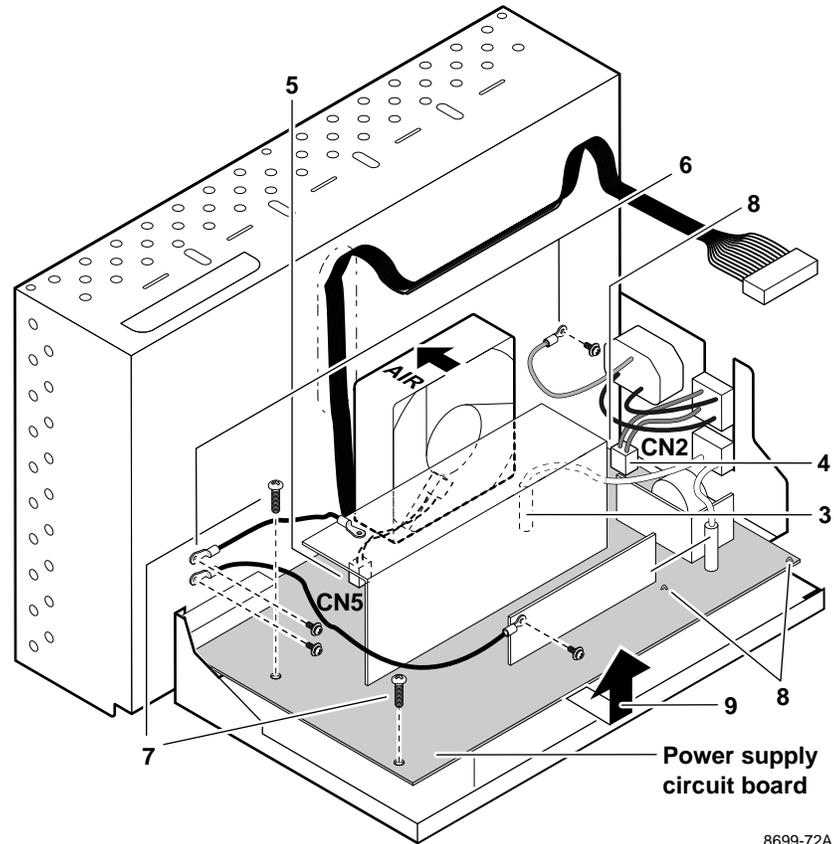
Tools required

n #1 POSIDRIV® screwdriver

Warning *Unplug the power cord to remove a possible electric shock hazard.*

1. Power down the printer. Unplug the power cord.
2. Remove the power supply as detailed in the previous procedure “Card cage and power supply” on page 8-35.
3. Disconnect the AC line voltage select switch's input connectors from the power supply circuit board. Mark the lines so that you can reconnect them properly; otherwise, you'll reverse the 115/220 AC settings.
4. Disconnect the AC voltage wiring harness from CN2 (next to the fuses) of the power supply circuit board.
5. Disconnect the fan wiring harness from CN5 of the power supply circuit board.
6. Disconnect the ground cables leading from the power supply circuit board to the card cage.
7. Remove the two screws securing the power supply circuit board to the bottom pan of the card cage.
8. Squeeze the three snap-pins to release the power supply circuit board from the bottom pan of the card cage.
9. Slide the power supply circuit board away from the card cage to disconnect it from the card cage interconnect board.

Reverse these steps to reinstall the power supply. After replacing the power supply, run the adjustment "Thermal head temperature adjustment" on page 9-14 to ensure that the printhead is calibrated to the new power supply.



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Figure 8-33 Removing the power supply circuit board

Paper-feed circuit board

The paper-feed circuit board can be removed as a part of the paper-feed module disassembly procedure. Refer to the earlier procedure “Paper-feed module” on page 8-5.

Engine control board

Tools required

n #1 POSIDRIV® screwdriver

1. Power down the printer. Leave the power cord plugged in to provide a ground path for static discharges.
2. Remove the left side and top-rear cabinet panel. Refer to the earlier topic “Printer cabinet panels” on page 8-3.
3. Disconnect the wiring harnesses leading to the engine control board.

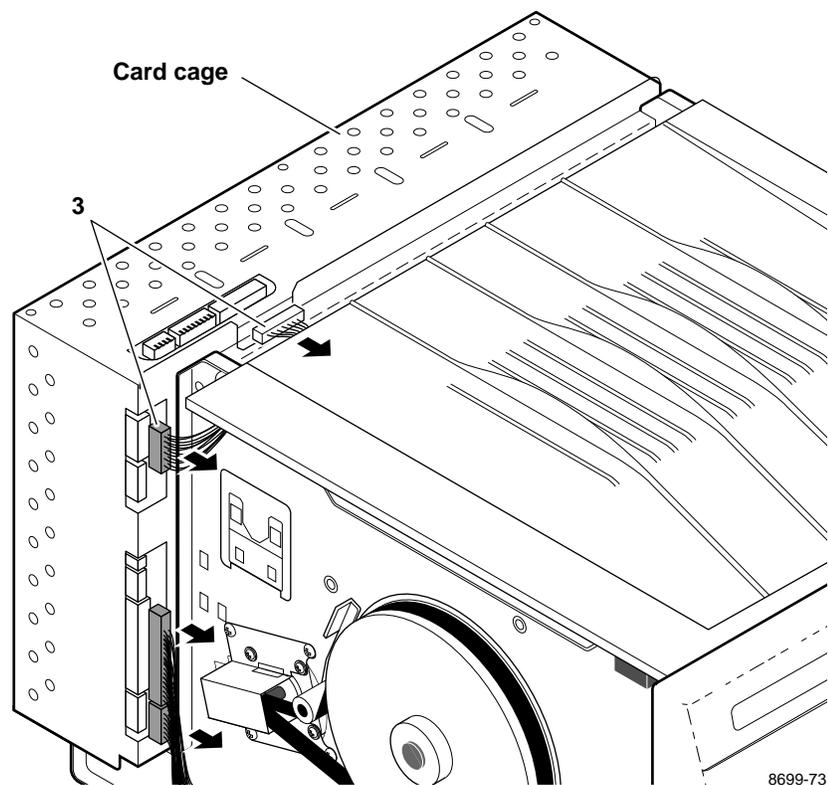


Figure 8-34 Disconnecting the wiring harnesses

4. Remove the card cage top (held by 3 screws).
5. Flip over the hinged card cage top.
6. Lift out the engine control board.

Note *If you exchanged an old engine control board for a new engine control board, be sure to exchange the NVRAM (IC 5) from the old board into the new board. The NVRAM IC contains the printhead temperature and sensor calibration setting. If, for some reason, you must reprogram the NVRAM IC, perform the procedures “Thermal head temperature adjustment” on page 9-14 and “Reflective sensor auto-calibration” on page 9-7.*

Reverse these steps to install the engine control board.

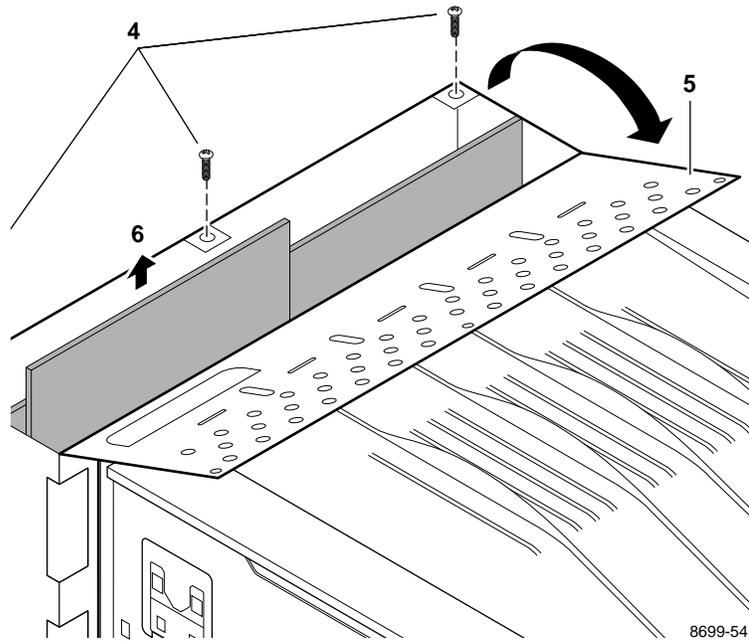
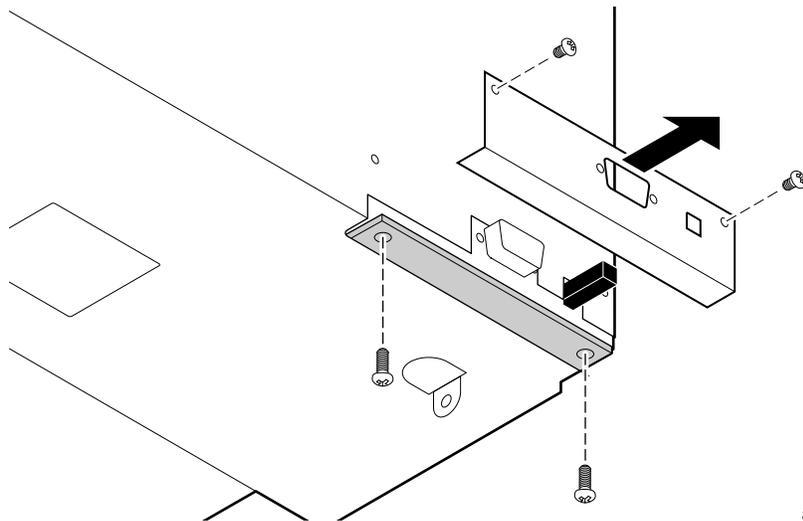


Figure 8-35 Removing the engine control board

Card cage interconnect board

1. Power down the printer. Leave the power cord plugged in to provide a ground path for static discharges. Remove all interface cables.
2. Remove the left side, right side and top-rear cabinet panels. Refer to the earlier topic “Printer cabinet panels” on page 8-3.
3. Remove the engine control board and the image processor board from the card cage. Refer to the procedures “Engine control board” on page 8-39 and “Image processor board” on page 8-43.
4. Remove the card cage and power supply assembly as explained in the earlier procedure “Card cage and power supply” on page 8-35.
5. Remove the two screws securing the shield plate to the card cage.
6. From underneath the card cage, remove the two screws securing the interconnect board in place. Remove the board.

Reverse these steps to reinstall the interconnect circuit board.



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Figure 8-36 Removing the interconnect board

I/O board

Tools required

- n #1 POSIDRIV® screwdriver

1. Power down the printer. Leave the power cord plugged in to provide a ground path for static discharges. Remove the interface cables.
2. Remove the top-rear and rear cabinet panels. Refer to the earlier topic “Printer cabinet panels” on page 8-3.
3. Remove the screws securing the I/O board to the card cage.
4. Disconnect the I/O board’s ribbon cable from the image processor board. Remove the I/O board.

Reverse these steps to reinstall the I/O board and the image processor board.

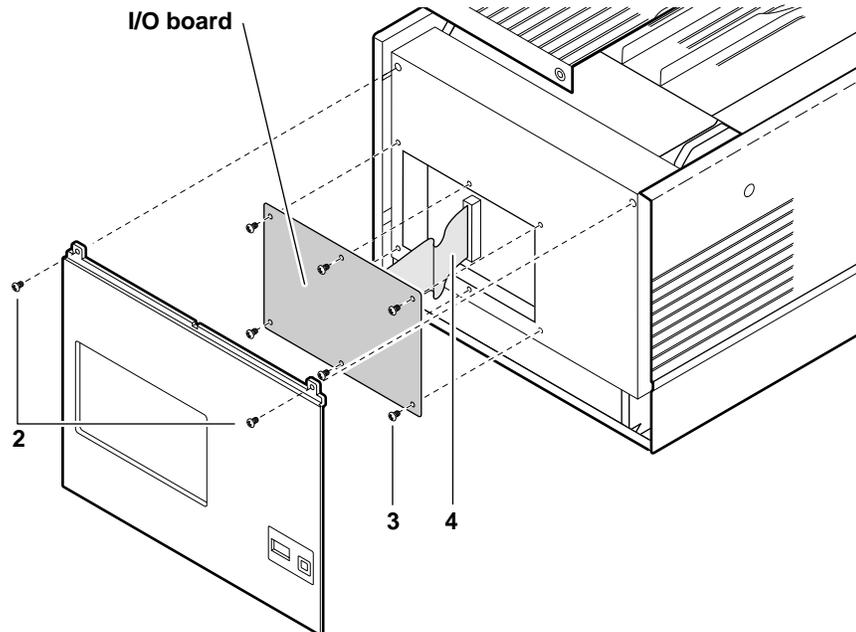


Figure 8-37 Removing the I/O board

Image processor board

Tools required

n #1 POSIDRIV® screwdriver

1. Power down the printer. Leave the power cord plugged in to provide a ground path for static discharges. Remove the interface cables.
2. Remove the top-rear and rear cabinet panels. Refer to the earlier topic “Printer cabinet panels” on page 8-3
3. Remove the card cage top (3 screws).
4. Flip over the hinged card cage top.
5. Remove the I/O board as explained in the previous procedure “I/O board” on page 8-42.
6. Lift out the image processor board.

Note *If you are replacing an old image processor board for a new board, swap the NVRAM IC (U672) from the old board into the new board. The IC is a small, 8-pin socketed IC located near the RAM SIMMs. This IC may not be socketed on early production printers.*

Reverse these steps to reinstall the I/O board and the image processor board. When you reinstall the card cage top, ensure that the tabs on the top edge of the image processor board fit into the slots in the card cage top.

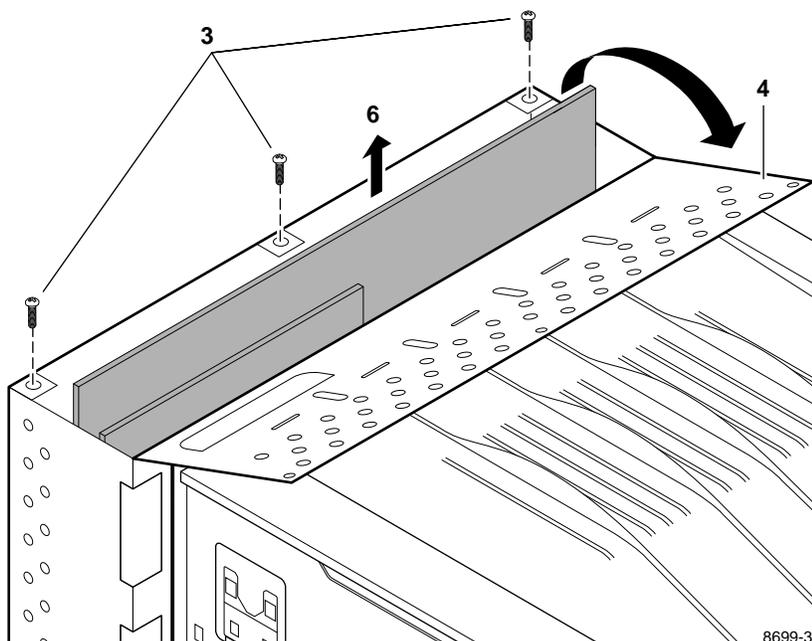


Figure 8-38 Removing the image processor board

RAM SIMM

Tools required

n #1 POSIDRIV® screwdriver

1. Power down the printer. Leave the power cord plugged in to provide a ground path for static discharges. Remove the interface cables.
2. Remove the I/O board and the image processor board as explained in the previous procedure “I/O board” on page 8-42 and “Image processor board” on page 8-43.
3. Insert a memory module in connector J6 (a), and tilt the module upright until it locks in place (b).

When properly inserted, a tab on each end of the connector slips into a hole on each end of the RAM SIMM. Also, a pawl on each end of the connector latches around each end of the RAM SIMM to lock it in place.

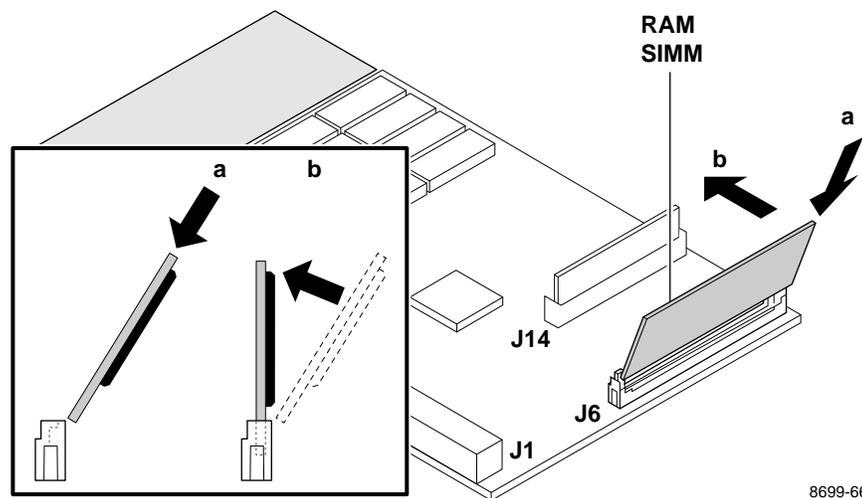


Figure 8-39 Installing the RAM SIMM on the image processor board

4. Reinstall the image processor board in the card cage.
5. Reinstall the I/O board.
6. Reinstall the card cage top and the rear cabinet panels.
7. Reconnect the host interface cables. Turn on the printer and make a test print.

Font module

Tools required

n #1 POSIDRIV® screwdriver

1. Power down the printer. Leave the power cord plugged in to provide a ground path for static discharges. Remove the interface cables.
2. Remove the I/O board and the image processor board as explained in the previous procedures “I/O board” on page 8-42 and “Image processor board” on page 8-43.
3. Insert the font module in connector J14 (a), and tilt the card upright until it locks in place (b).

When properly inserted, a tab on each end of the connector slips into a hole on each end of the module. Also, a pawl on each end of the connector latches around each end of the module to lock it in place.

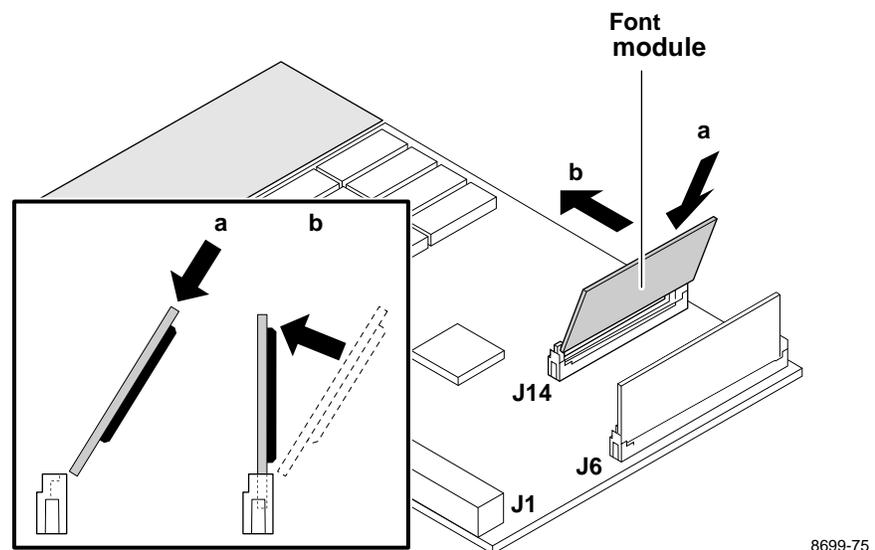


Figure 8-40 Installing the font SIMM on the image processor board

4. Reinstall the image processor board in the card cage.
5. Reinstall the I/O board.
6. Reinstall the card cage top and the rear cabinet panels.
7. Reconnect the host interface cables. Turn on the printer and make a test print.

Checks and Adjustments

This chapter describes how to make mechanical and electrical adjustments to the DECcolorwriter 1000 print engines. It also describes how to maximize print quality.

Required tools summary

- n Magnetic tip screwdriver -- 8.5 ins.
 - n Extension tip
 - n #1 POSIDRIV® tip
 - n #2 POSIDRIV® tip
- n Tweezer
- n Hex wrench kit
- n G-311S lubricating grease
- n Antistatic mat
- n Needle-nose pliers
- n $\frac{7}{32}$ -inch nutdriver
- n Small flat-blade screwdriver
- n Flat-blade screwdriver
- n Volt-ohm-meter such as a Tektronix DM250 Multimeter
- n Magnifying lens Such as Micronta (Radio Shack) Cat# 63-851

Printing test patterns

Note *Do not print test patterns using the Black Transfer Roll; many patterns will print blank.*

Checking and adjusting the printer often involves printing the printer's built-in test patterns. The following procedure explains how to select and print a test pattern.

1. Turn off the printer.
2. Remove the top rear cabinet panel to access the engine control board. Refer to the Chapter 8 topic "Printer cabinet panels" on page 8-3.
3. Set all the DIP 1 Switches *off*.
4. Press and hold the **TEST** button and turn on the printer. Release the **TEST** button. The printer is now in service mode.
5. Select the desired test pattern, using DIP Switches 1-4 through 1-7, as detailed in Table 9-1.
6. Toggle DIP Switch 1-8 *on* then *off* to start the print. Leaving DIP Switch 1-8 *on* prints the selected pattern continuously. Alternatively, you can press and hold the **TEST** button for 5 seconds to start the selected pattern.

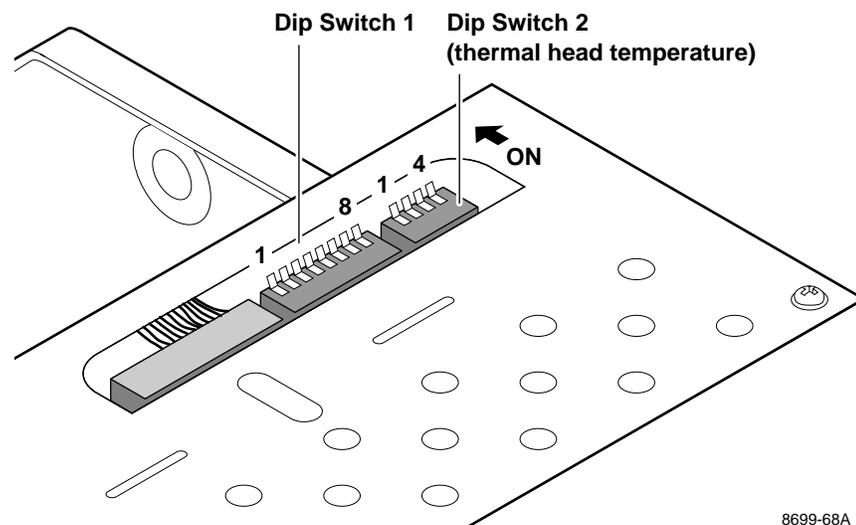


Figure 9-1 Engine control board DIP switches

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Table 9-1 Selecting self-test print patterns

Dip switches				Print pattern and tests	Color
1-4	1-5	1-6	1-7		
				Test Pattern 0: Speckle detect	CMY
			↑	Test Pattern 1: Rag patch (full step)	CMY
		↑		Test Pattern 2: Bridging detect (orange)	MY
		↑	↑	Test Pattern 3: Composite black fill (C, M, Y)	CMY
	↑			Test Pattern 4: 25% fill	CMY
	↑		↑	Test Pattern 5: Dither	CMY
	↑	↑		Test Pattern 6: Wrinkle 1	CM
	↑	↑	↑	Test Pattern 7: Rag patch (half step)	CMY
↑				Test Pattern 8: Wrinkle 2	CMY
↑			↑	Test Pattern 9: Bridging detect (3 color)	CY
↑		↑		Test Pattern A: Wrinkle detect (trucks)	CMY
↑		↑	↑	Test Pattern B: Wrinkle detect (memo)	CMY
↑	↑			Test Pattern C: Check/inspection (full step)	CMY
↑	↑		↑	Test Pattern D: Check/inspection (half step)	CMY
↑	↑	↑		Test Pattern E: Continuous print mode 1	CMY
↑	↑	↑	↑	Test Pattern F: Continuous print mode 2	CMY

↑ indicates switch is on.

Printer self-checks

Table 9-2 summarizes using DIP Switches 1-4 through 1-7 to select self-check modes to adjust and calibrate the print engine's sensors and mechanisms. The topics following Table 9-2 explain when and how to use each check mode. The printer must be in service mode to execute self-checks.

Note Turn off the printer and reenter service mode between each test.

Turning Switch 1-3 *on* starts the selected test. Turning it *off* stops the test.

Table 9-2 Self-check mode summary

Dip Switch				Check or adjustment mode
1-4	1-5	1-6	1-7	
				Thermal head in print/standby position.
			↑	Transfer roll feeds continuously.
		↑		Second feeder connection test.
		↑	↑	Paper path check (pick, feed, clamp, and eject).
	↑			Leading edge margin tolerance adjust (generally a manufacturing adjustment).
	↑		↑	Paper tray select.
	↑	↑		Aging test (manufacturing test).
	↑	↑	↑	Auto-calibrates all reflective-type sensors.
↑				Mechanical switch check 1: cover open switches, reset switch, second feeder.
↑			↑	Mechanical switch check 2: head lift sensors and transfer roll core sensors.
↑		↑		Mechanical switch check 3: standard paper tray switches and tray-empty switch.
↑		↑	↑	Mechanical switch check 4: optional paper tray switches and tray-empty switch.
↑	↑			Mechanical switch check 5: paper-pass sensors, paper exit sensor, drum home sensor.
↑	↑		↑	Mechanical switch check 6: transfer roll half used sensor.
↑	↑	↑		Transfer roll mark sensor adjust.
↑	↑	↑	↑	Paper clamped sensor adjust.

↑ indicates switch is *on*.

Thermal head motor check

1. Turn off the printer.
2. Remove the rear cabinet panel to access the engine control board. Refer to the Chapter 8 topic “Printer cabinet panels” on page 8-3.
3. Press and hold the **TEST** button and turn on the printer. Release the **TEST** button. The printer is now in service mode.
4. Set all the DIP 1 Switches *off*.
5. Set DIP Switch 1-3 *on* to start the test. LEDs ERROR and JAM blink rapidly to indicate that the test is active.
6. Toggle DIP Switch 1-8 to make the thermal head move to its print position. LED READY blinks rapidly.
7. Toggle DIP Switch 1-8 again to make the thermal head move to its standby position. LED READY turns off.
8. Set DIP Switch 1-3 *off* to stop the test.

Transfer roll feed check

Note *Don't run this test for a prolonged period of time since it consumes the transfer roll.*

1. Turn off the printer.
2. Remove the rear cabinet panel to access the engine control board. Refer to the Chapter 8 topic “Printer cabinet panels” on page 8-3.
3. Press and hold the **TEST** button and turn on the printer. Release the **TEST** button. The printer is now in service mode.
4. Set all the DIP 1 Switches *off*.
5. Set DIP Switch 1-7 *on*.
6. Set DIP Switch 1-3 *on* to start the transfer roll motor. LEDs ERROR and JAM blink rapidly to indicate that the test is active. You should be able to observe the transfer roll in motion as it would act on the take-up roll. At the left side of the print engine, you can also observe the rotating shaft end of the transfer roll motor.
7. Set DIP Switch 1-3 *off* to stop the motor and the test.

Paper-path check

1. Turn off the printer. Ensure that the paper tray is filled.
2. Remove the rear cabinet panel to access the engine control board. Refer to the Chapter 8 topic “Printer cabinet panels” on page 8-3.
3. Press and hold the **TEST** button and turn on the printer. Release the **TEST** button. The printer is now in service mode.
4. Set all the DIP 1 Switches *off*.
5. Set DIP Switches 1-6 and 1-7 *on*.
6. Set DIP Switch 1-3 *on* to start the test. LEDs ERROR and JAM blink rapidly to indicate the test is active.
7. Toggle DIP Switch 1-8 to make the print engine perform each of the following actions:
 - n paper pick
 - n paper clamp
 - n paper eject
8. Set DIP Switch 1-3 *off* to stop the test.

Tray select

Use this mode to select from which tray (if the optional lower tray is installed) the printer will pick paper from during the self-checks.

1. Turn off the printer.
2. Remove the rear cabinet panel to access the engine control board. Refer to the Chapter 8 topic “Printer cabinet panels” on page 8-3.
3. Press and hold the **TEST** button and turn on the printer. Release the **TEST** button. The printer is now in service mode.
4. Set all the DIP 1 Switches *off*.
5. Set DIP Switches 1-5 and 1-7 *on*.
6. Set DIP Switch 1-3 *on* to start the test. LEDs ERROR and JAM blink rapidly to indicate that tray selection is active.
7. Toggle Dip Switch 1-8 *on* to select the tray you want.
8. LED READY will blink rapidly if the second feeder tray is selected.

9. LED READY will turn off if the standard tray is selected.
10. Set DIP Switch 1-3 *off* to exit the mode.

Reflective sensor auto-calibration

This procedure automatically calibrates the transfer roll mark sensors and the paper clamped sensor. These sensors can also be individually calibrated in the later procedures “Calibrating the transfer roll mark sensors (reflective sensors)” on page 9-10 and “Calibrating the paper clamp sensor (reflective sensor)” on page 9-10. Place one or more sheets of paper in the active tray and make sure that a 3-Color transfer roll is installed.

1. Turn off the printer.
2. Remove the rear cabinet panel to access the engine control board. Refer to the Chapter 8 topic “Printer cabinet panels” on page 8-3.
3. Press and hold the **TEST** button and turn on the printer. Release the **TEST** button. The printer is now in service mode.
4. Set all the DIP 1 Switches *off*.
5. Set DIP Switches 1-5, 1-6 and 1-7 *on*.
6. Set DIP Switch 1-3 *on* to start the test. LEDs ERROR and JAM blink rapidly to indicate the mode is active.
7. Press the *TEST* button. The print engine advances the transfer roll to “read” the transfer roll marks and calibrate the transfer roll mark sensors for the contrast between the marks and the black stripe on the edge of the transfer roll. LED READY blinks rapidly when the calibration completes.
8. Press the *TEST* button again to make the printer pick a sheet of paper and process it through the paper path. The test calibrates the paper clamped sensor for the white level of the paper it passed through the print engine. If the sensors all work properly, LED COVER blinks rapidly when the calibration completes.
9. Set DIP Switch 1-3 *off* to stop the test.

Switch and interrupt sensor checks

There are six switch check modes to test a total of 21 switches and interrupt sensors. The modes test the following switches:

Note *Figure 1-3 illustrates the locations of the print engine's sensors.*

Mode 1	Cover open sensor Cover open sensor TEST button Second feeder installed sensor
Mode 2	Head lift sensor 1 Head lift sensor 2 Transfer roll core sensor 1 (left) Transfer roll core sensor 2 (right)
Mode 3	Tray switch 1 (standard) Tray switch 2 (standard) Tray switch 3 (standard) Paper empty sensor (standard tray)
Mode 4	Tray switch 1 (second feeder) Tray switch 2 (second feeder) Tray switch 3 (second feeder) Paper empty sensor (second feeder tray)
Mode 5	Paper-pass sensor 1 Paper-pass sensor 2 Paper exit sensor Drum home position sensor
Mode 6	Transfer roll low sensor

1. Turn off the printer.
2. Remove the rear cabinet panel to access the engine control board. Refer to the Chapter 8 topic “Printer cabinet panels” on page 8-3.
3. Press and hold the **TEST** button and turn on the printer. Release the **TEST** button. The printer is now in service mode.
4. Set all the DIP 1 switches *off*.
5. Select the test mode you want from the list above and then set the DIP switches to activate the test mode you want:

Mode 1: Set DIP Switch 1-4 *on*.

Mode 2: Set DIP Switches 1-4 and 1-7 *on*.

Mode 3: Set DIP Switches 1-4 and 1-6 *on*.

Mode 4: Set DIP Switches 1-4, 1-6 and 1-7 *on*.

Mode 5: Set DIP Switches 1-4 and 1-5 *on*.

Mode 6: Set DIP Switches 1-4, 1-5 and 1-7 *on*.

6. Set DIP Switch 1-3 on to start the test. LEDs ERROR and JAM blink rapidly to indicate the mode is active.
7. Actuate the switches corresponding to the test mode you selected. LEDs PAPER, TRANSFER ROLL, COVER, or READY blink rapidly when each switch is actuated.

Table 9-3 Mechanical and interrupt switch check summary

Test mode	LED	Switch
Mode 1	PAPER TRANSFER ROLL COVER READY	Top and front cover open sensor (open either the top or front cover) Top and front cover open sensor (open either the top or front cover) TEST button (press it) Optional feeder installed sensor (unplug the second feeder from the rear of the print engine)
Mode 2	PAPER TRANSFER ROLL COVER READY	Head lift sensor 1 (open the top cover to access the switches. Rotate the head lift cam to actuate the switch) Head lift sensor 2 (do the same as head lift sensor 1) Transfer roll core sensor 1 (actuate the switch at the left end of the supply roll) Transfer roll core sensor 2 (actuate the switch at the right end of the supply roll)
Mode 3	PAPER TRANSFER ROLL COVER READY	Tray switch 1 (standard feeder — top switch) Tray switch 2 (standard feeder — middle switch) Tray switch 3 (standard feeder — lower switch) Paper empty sensor (standard tray empty — remove the tray and actuate the paper empty flag) All the LEDs blink if the tray is not installed
Mode 4	PAPER TRANSFER ROLL COVER READY	Tray switch 1 (second feeder — top switch) Tray switch 2 (second feeder — middle switch) Tray switch 2 (second feeder — bottom switch) Paper-empty sensor (second feeder tray empty — remove the tray and actuate the paper empty flag) All the LEDs blink if the second feeder or its tray is not installed
Mode 5	PAPER TRANSFER ROLL COVER READY	Paper-pass sensor 1 (located in front of aligning rollers, on the left end of the rollers) Paper-pass sensor 2 (actuate by slipping a sheet of paper through the aligning rollers) Paper exit sensor (remove the front cover to access the sensor) Drum home position sensor
Mode 6	PAPER TRANSFER ROLL COVER READY	Transfer roll low sensor (remove the transfer roll) Transfer roll low sensor Transfer roll low sensor Transfer roll low sensor

8. Set DIP Switch 1-3 off to stop the test.

Calibrating the transfer roll mark sensors (reflective sensors)

1. Turn off the printer. Ensure that a 3-Color transfer roll is installed.
2. Remove the rear cabinet panel to access the engine control board. Refer to the Chapter 8 topic “Printer cabinet panels” on page 8-3.
3. Press and hold the **TEST** button and turn on the printer. Release the **TEST** button. The printer is now in service mode.
4. Set all the DIP 1 Switches *off*.
5. Set DIP Switches 1-4, 1-5 and 1-6 *on*.
6. Set DIP Switch 1-3 *on* to start the test. LEDs ERROR and JAM blink rapidly to indicate that the sensor test is active.
7. Press the **TEST** button to advance the transfer roll and calibrate the sensors for the amount of reflected light they detect from the white reflection plate (located beneath the sensors). LED READY will blink rapidly.
8. Set DIP Switch 1-3 *off* to exit the mode.

Calibrating the paper clamp sensor (reflective sensor)

1. Turn off the printer. Ensure that the paper tray is filled.
2. Remove the rear cabinet panel to access the engine control board. Refer to the Chapter 8 topic “Printer cabinet panels” on page 8-3.
3. Press and hold the **TEST** button and turn on the printer. Release the **TEST** button. The printer is now in service mode.
4. Set all the DIP 1 switches *off*.
5. Set DIP Switches 1-4, 1-5, 1-6 and 1-7 *on*.
6. Set DIP Switch 1-3 *on* to start the sensor test. LEDs ERROR and JAM blink rapidly to indicate that the test is active.
7. Push the **TEST** button. The printer will pick a sheet of paper and pass it through the paper path. LED READY will blink rapidly as the paper clamp sensor is calibrated.
8. Set DIP Switch 1-3 *off* to stop the test.

Drum belt tension adjustment

Tools required

- #1 POSIDRIV® screwdriver

This adjustment should be made whenever the drum or drum belt has been removed or replaced.

1. Power down the printer.
2. Remove the left-side cabinet panel. Refer to the Chapter 8 topic “Printer cabinet panels” on page 8-3.
3. Loosen the drum belt tensioner set screw. The tensioner spring will automatically adjust the belt to the correct tension.
4. Rotate the drum pulley slightly to ensure that the belt is fully tensioned.
5. Tighten the drum belt tension set screw.
6. Reinstall the cabinet panels.

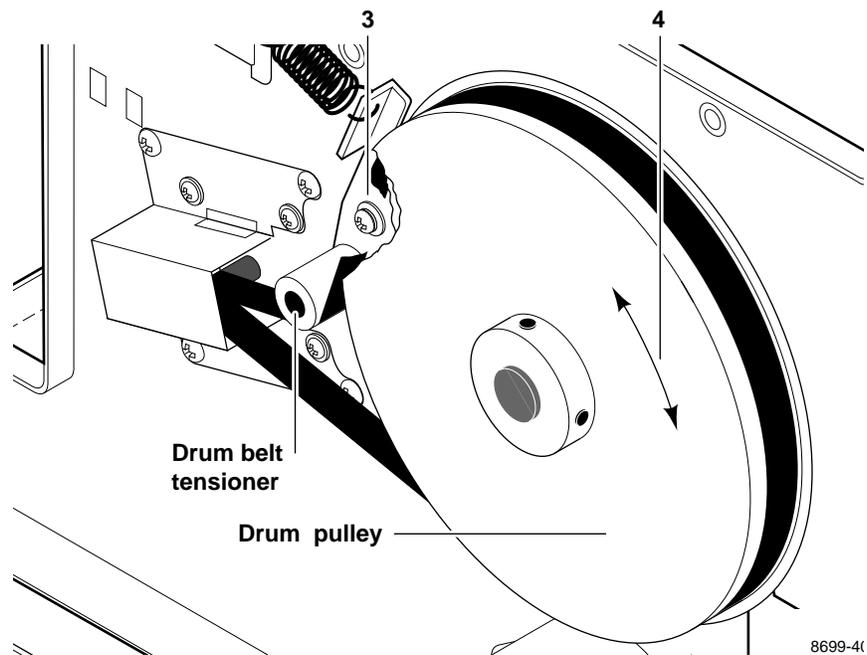


Figure 9-2 Tensioning the drum belt

Top margin adjustment

Note *Top margin refers to the top edge of test prints produced by the print engine; the top edge of the test print is the edge inserted into the paper clamp. Prints made via the image processor insert the bottom edge of the print into the paper clamp.*

This adjustment sets how far a sheet of media is inserted into the paper clamp before it is clamped. Consequently, it also set the print's top margin by forcing printing to begin at the top of a page. The further the media is inserted into the paper clamp, the larger the top margin will be. The margin specification (all four sides) is 5 μ mm, μ \pm 3 μ mm.

1. Turn off the printer. Ensure that the paper tray is filled.
2. Remove the rear cabinet panel to access the engine control board. Refer to the Chapter 8 topic "Printer cabinet panels" on page 8-3.
3. Press and hold the **TEST** button and turn on the printer. Release the **TEST** button. The printer is now in service mode.
4. Set DIP 1 Switches 1-3, 1-4,1-6 and 1-7 *off*.
5. Set DIP Switches 1-5 *on*.
6. Set DIP Switch 1-3 *on* to start the test. LEDs ERROR and JAM blink rapidly to indicate the test is active. LEDs TRANSFER ROLL, COVER, and READY blink to indicate the currently set top margin adjust value as indicated in the chart below.

Table 9-4 Top margin adjust settings

TRANSFER ROLL	COVER	READY	Top margin adjust value	DIP Switches		
				1-5	1-6	1-7
o	o	o	-3 mm			
o	o	Z	-2 mm			↑
o	Z	o	-1 mm		↑	
o	Z	Z	0		↑	↑
Z	o	o	1 mm	↑		
Z	o	Z	2 mm	↑		↑
Z	Z	o	3 mm	↑	↑	
Z	Z	Z	4 mm	↑	↑	↑

7. Set DIP Switches 1-5, 1-6 and 1-7 to correspond to the desired top margin adjustment. Positive numbers increase the distance the paper is inserted into the paper clamp, thereby increasing the top margin. The bottom margin will get correspondingly smaller. Conversely, negative numbers decrease the distance the paper is inserted into the paper clamp.
8. Press the **TEST** button to store the new value into the printer's memory. The MEDIA LED blinks when the value is stored. LEDs TRANSFER ROLL, COVER, and READY blink to indicate the newly entered top margin value.
9. Set DIP Switch 1-3 *off* to stop the test.
10. Print a test print to check the margins and paper clamping.

Adjusting for best print quality

Thermal head temperature adjustment

This adjustments sets the reference pulse duration for the strobe pulses that drive each thermal head element during printing. The longer the pulse duration is, the hotter the element. During printing, the engine alters the pulse duration slightly to compensate for ambient temperature, thermal head temperature, the color being printed, the history of nearby printed dots and dot density. Properly adjusting the thermal head temperature is the most significant adjustment you can make to maximize the printer's print quality.

1. Power down the printer. Remove the upper rear panel to access the engine control board.
2. Refer to Table 9-4. Set DIP Switches 2-1 through 2-4 to the setting that matches the resistance value printed on the thermal head.

This step sets a nominal value for the thermal head. You may change the switch setting to achieve the best print quality.

3. Print a dither pattern (test pattern 5). Refer to the earlier topic "Printing test patterns" on page 9-2.
4. With a properly adjusted thermal head you should see 14 steps or color shade changes. (See Figure B-2.) If you don't see 14 steps, the thermal head temperature is set too high and must be lowered. Set the thermal head to the next available setting; use Table 9-4 to determine the setting.
5. Repeat Steps 4 and 5 until you see 14 steps in the saturation dither pattern. Magenta is the color you should judge color levels by. Do not try to achieve 14 steps with the color yellow. The human eye is somewhat insensitive to shade changes to the color yellow. On rare occasions, it may be difficult to achieve 14 levels of cyan or magenta. It may be necessary to compromise those shades to 13 levels.

Use test pattern 5 to check and make the thermal head temperature adjustment.

Table 9-5 Setting thermal head temperature (based on thermal head resistance)

Dip Switches				Resistance (Ω) printed on thermal head
2-1	2-2	2-3	2-4	
				1315
			↑	1316 to 1345
		↑		1346 to 1375
		↑	↑	1376 to 1405
	↑			1406 to 1435
	↑		↑	1436 to 1465
	↑	↑		1466 to 1495
	↑	↑	↑	1496 to 1525
↑				1526 to 1555
↑			↑	1556 to 1585
↑		↑		1586 to 1615
↑		↑	↑	1616 to 1645
↑	↑			1646 to 1675
↑	↑		↑	1676 to 1705
↑	↑	↑		1706 to 1735
↑	↑	↑	↑	1736

↑ indicates the switch is *on*.

Thermal head pitch (to correct speckle and wrinkle)

Tools required

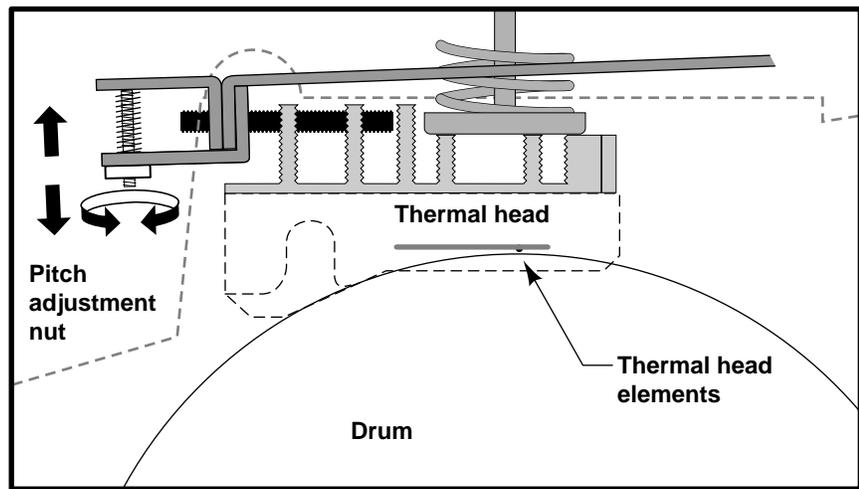
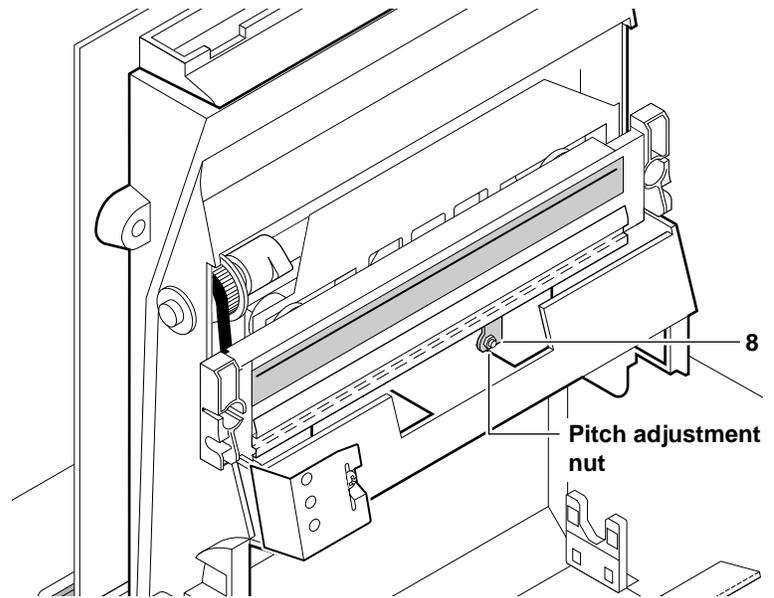
- n #1 POSIDRIV®
- n 7/32-inch nutdriver
- n screwdriver
- n cement compound

This adjustment corrects for speckles in the prints. This adjustment allows you to set the pitch or tilt of the thermal head's elements in relation to the drum surface as illustrated in Figure 9-3. Properly setting the pitch of the thermal head places the printing elements in optimum contact with the drum, eliminating speckles and wrinkling.

1. Turn off the printer.
2. Remove the top rear cabinet panel to access the engine control board. Refer to the Chapter 8 topic "Printer cabinet panels" on page 8-3.
3. Set all the DIP 1 Switches *off*.
4. Press and hold the **TEST** button and turn on the printer. Release the **TEST** button. The printer is now in service mode.
5. Select test pattern 0 "Speckle," by ensuring that all DIP 1 switches are *off*.
6. Toggle DIP Switch 1-8 *on* then *off* to start the print.
7. Examine the print for speckle. Speckles appear as pale blue dropouts in the blue field of the print. If speckle appears, go to Step 10. Otherwise, go to Step 8.

Caution *The pitch adjustment rotates about four turns from stop to stop. Do not force the nut past the stops; you may damage the printer.*

8. With a 7/32-inch nutdriver, turn the pitch adjustment nut 1/2 turn *counterclockwise*.
9. Print out another speckle test print and examine it for speckles. Repeat Step 8 and 9 until speckles first appear.
10. Now that speckle are apparent in the test prints, rotate the pitch adjustment nut 1/2 turn *clockwise*. Print out a speckle test pattern. Continue this adjustment until you reach the point in which speckles disappear from the test prints.
11. Rotate the pitch adjustment nut an additional 1/2 turn *clockwise* to finish the adjustment.
12. Apply cement compound to the nut to lock it in its current position.
13. Close the top cover and turn off the printer. Reinstall the rear top cabinet panel.



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Figure 9-3 Adjusting the thermal head pitch

Paper clamp adjustment (to correct misregistration)

Before making this adjustment, be sure that the thermal head leaf spring (which presses against the right end of the thermal head when it's in its print position) is in good contact with the thermal head. If it isn't, bend the leaf spring until it makes good contact and keeps the thermal head from making any side-to-side motion during printing.

This adjustment corrects for misregistration in the prints. Rake-like fingers on the paper clamp force down a "bubble" that can form in the paper along the length of the clamp as it holds the paper. This bubble can cause misregistration. To minimize misregistration, you must ensure that the clamp holds the paper evenly across the width of the paper.

1. Turn off the printer.
2. Remove the left and right cabinet panels to access each side of the drum. Refer to the Chapter 8 topic "Printer cabinet panels" on page 8-3.
3. Rotate the drum so that the paper clamp is in the 12:00 position.
4. With a spring removal tool (which resembles a crochet hook), unhook the clamp springs from each end of the drum to unload the paper clamp.

Caution *Be sure to loosen the lock screws before rotating the eccentric nuts.*

5. Through an access hole on each side of the printer, loosen the lock screw securing the eccentric nut on each end of the drum.
6. At each end of the drum, rotate the eccentric nut to raise or lower the paper clamp. Note the mark on the eccentric nut that denotes its high side. When the mark faces straight up, the paper clamp is raised away from the drum. When the mark faces straight down, the paper clamp is lowered to the drum. The mark should face toward the front of the printer between these two extremes. Set the eccentric nut to position the clamp so that the fingers of the paper clamp gently scuff the drum's rubber surface. The fingers of the paper clamp should deflect slightly off of the surface of the paper clamp as they touch the surface of the drum.
7. Tighten the lock screws to secure the eccentric nuts in the desired positions.
8. Reinstall the drum springs.
9. Reinstall the side cabinet panels.
10. Turn on the printer and make a test print.

If the clamp grips the paper too tightly, misregistration can occur. This is characterized by magenta and cyan shifting (fringing) with respect to yellow in the two top corner crosshatch patterns of the inspection/check test pattern. (These are the corners closest to the paper clamp.)

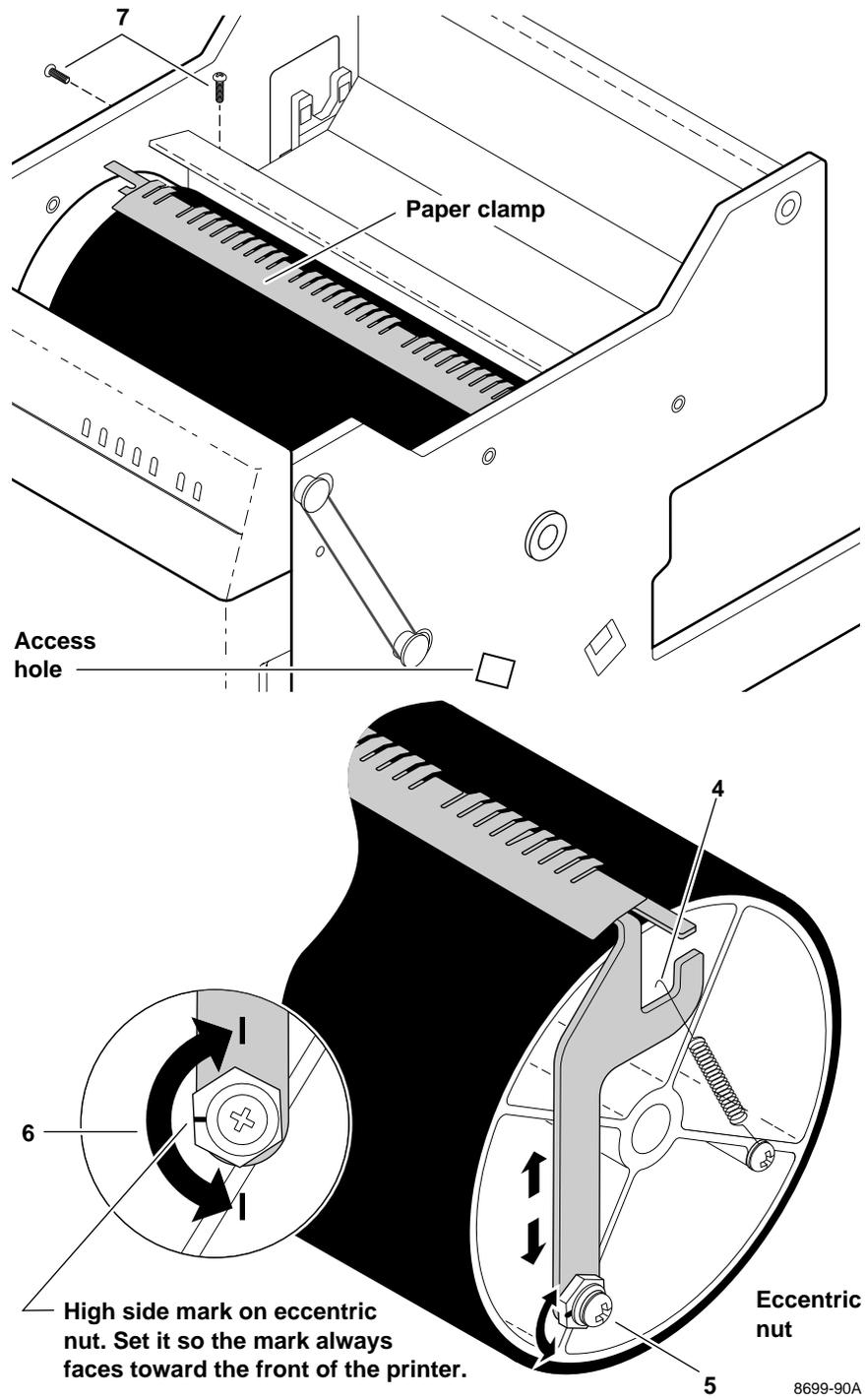


Figure 9-4 Setting the paper clamp adjustment

A

Field Replaceable Units List

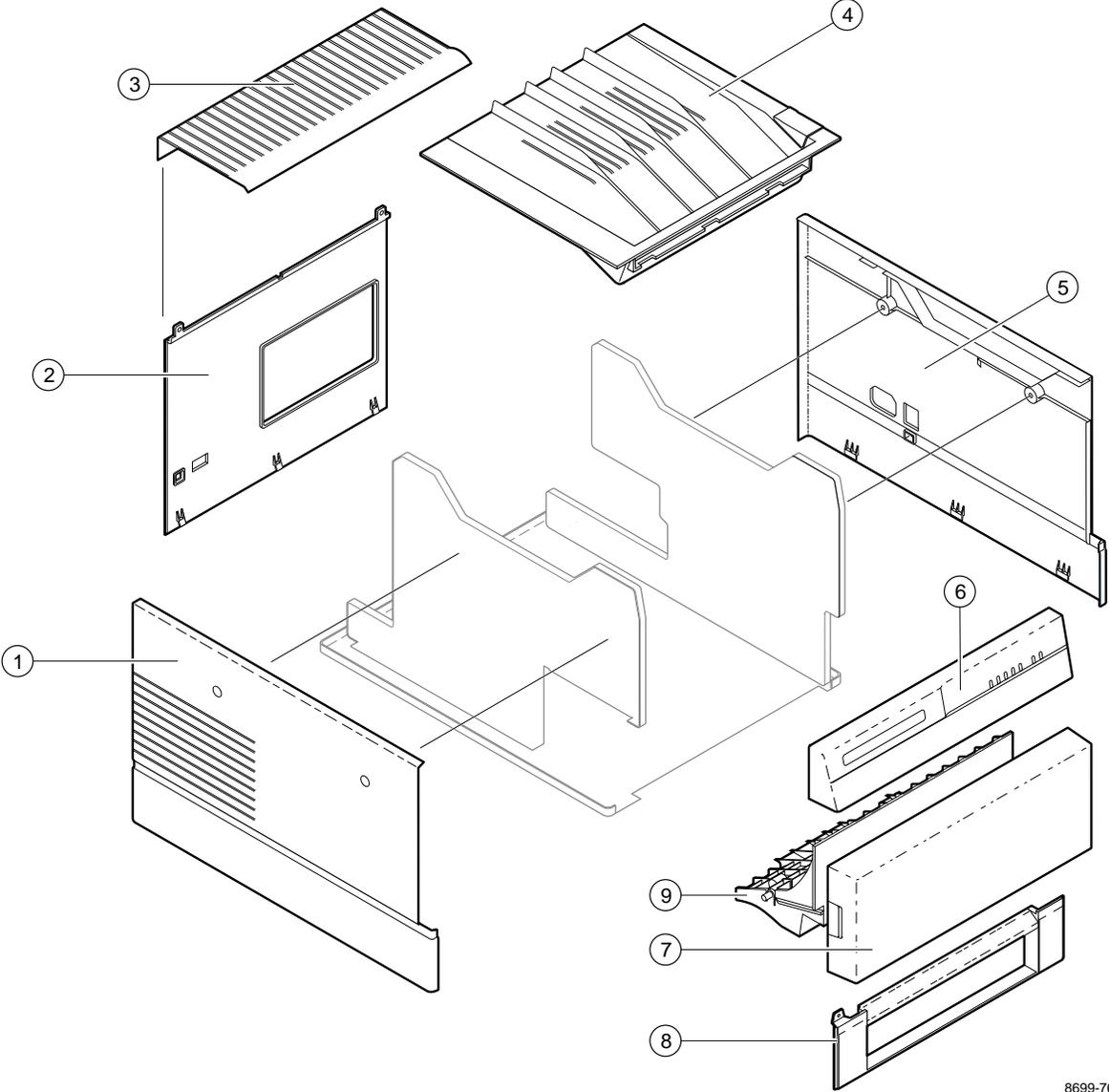
This appendix provides a list of field replaceable units for the DECcolorwriter 1000 Color Printer.

Changes to the instruments are made to accommodate improved components as they become available. It is important when ordering parts to include the following information:

- n Component's order number.
- n Instrument type or number.
- n Instrument serial number.
- n Modification number, if any.

Table A-1. FRU exterior parts list

Figure	Digital Part Number	Vendor Part Number	Quantity	Name and description
A-1-1		118-8938-00	1	CABINET: LEFT SIDE
A-1-2		118-8937-00	1	CABINET: BACK LOWER
A-1-3		118-8936-00	1	CABINET: BACK UPPER
A-1-4		118-8932-00	1	CABINET TOP: WITH OPEN LEVER
A-1-5		118-8939-00	1	CABINET: RIGHT SIDE
A-1-6		118-8933-00	1	CABINET FRONT: UPPER WITHOUT LED BOARD
A-1-7		118-8934-00	1	CABINET FRONT: CENTER
A-1-8		118-8935-00	1	CABINET FRONT: LOWER
A-1-9		118-8841-00	1	DOOR: FRONT ACCESS



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Figure A-1. The printer exterior FRUs

Table A-2. FRU interior parts list

Figure	Digital Part Number	Vendor Part Number	Quantity	Name and description
A-2-1		671-3169-00	1	CIRCUIT BD ASSY: I/O BOARD
A-2-4		118-8930-00	1	FAN: POWER SUPPLY
A-2-5		118-8931-00	1	FAN: THERMAL HEAD
A-2-6	30-41596-08	671-1561-01	1	CIRCUIT BD ASSY: 4MB SIMM
A-2-7	30-41596-07	671-2412-00	1	FONT ROM CKT. BD. ASSY.
A-2-8	29-31557-01	671-3168-00	1	CIRCUIT BD ASSY: IMAGE PROCESSOR BOARD
A-2-9	29-31561-01	118-9049-00	1	CIRCUIT BOARD: PRINT ENGINE CONTROL BOARD
A-2-11		118-8856-00	1	CIRCUIT BOARD: INTERCONNECT, EMI CAGE
A-2-12	29-31562-01	118-8858-00	1	POWER SUPPLY
A-2-13		118-8850-00	1	TRANSFER ROLL LOW SENSOR
		118-8851-00	1	PAPER EJECT SENSOR
A-2-14		118-8847-00	1	PAPER CLAMP SENSOR
A-2-15	29-31567-01	118-8840-00	1	BELT KIT
A-2-16	29-31560-01	118-8845-00	1	DRUM ASSY KIT
A-2-17		118-8852-00	1	CIRCUIT BOARD: SENSOR,RIBBON MARK
A-2-18	29-31563-01	118-8853-00	1	MOTOR,HEAD LIFT
A-2-19		118-8854-00	1	CIRCUIT BOARD: SWITCH, HEAD POSITION
A-2-20	29-31565-01	118-8844-00	1	MOTOR,DRUM
A-2-21		118-8846-00	1	SWITCH KIT: INTERLOCK MICRO
A-2-22	29-31564-01	118-8843-00	1	MOTOR,PAPER
A-2-23	29-31559-01	118-8842-00	1	MOTOR ASSEMBLY: RIBBON TAKE UP
A-2-24	29-31568-01	118-8849-00	1	TORGUE LIMITER
A-2-25		118-8860-00	1	BAIL ROLLER SPR
A-2-26	29-31566-01	118-8855-00	1	THERMAL HEAD AS
A-2-27		118-8848-00	1	SENSOR: HOME POSITION
A-2-28		118-8859-00	1	FRONT PANEL: LED UNIT
A-2-29		118-8838-00	1	CLUTCH KIT: ALIGNING ROLLER,
A-2-30		118-8839-00	1	CLUTCH KIT: PAPER PICK UP ROLLER,
A-2-31	29-31558-01	118-8835-00	1	PAPER FEED UNIT
A-2-32		118-8837-00	2	D ROLLER: RUBBER ONLY,
A-2-33			1	DRUM, PAPER CLAMP
		118-8836-00	1	FLAG SENSOR KIT
		118-8840-00	1	HARDWARE KIT

A *Field Replaceable Units List*

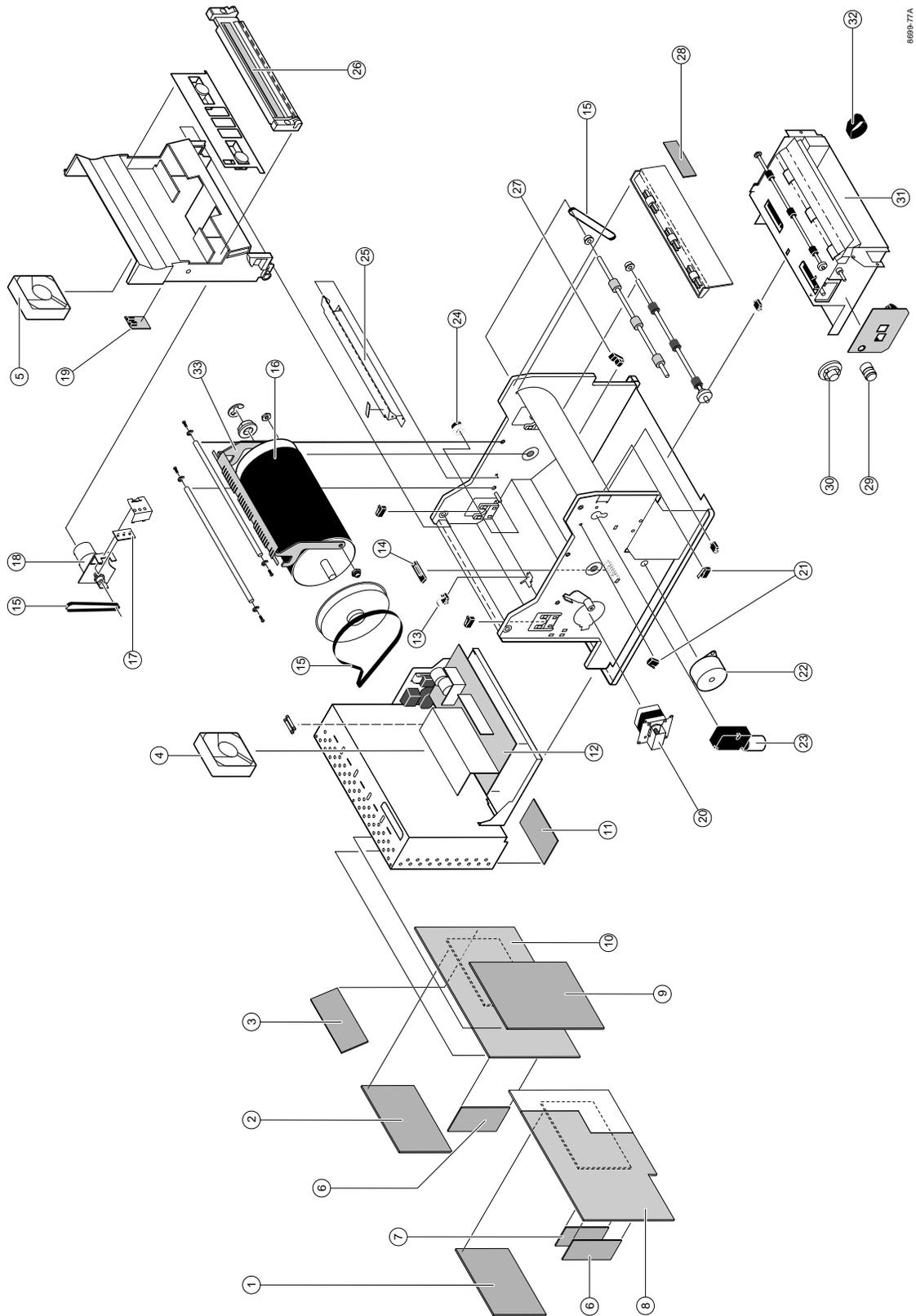


Figure A-2. Exploded view of the printer

Table A-3. Printer accessories

Figure Number	Digital Part Number	Vendor Part Number	Quantity	Description
.				
	LF02X-TE	436-0275-00	1	TRAY, INPUT, PLAIN PAPER, LETTER
	LF02X-TF	436-0276-00	1	TRAY, INPUT, PLAIN PAPER, A4-SIZE
	LF02X-TC	436-0273-00	1	TRAY, INPUT: PAPER PERF, LETTER
	LF02X-TD	436-0274-00	1	TRAY, INPUT: PAPER PERF, A4-SIZE
	LF02X-TA		1	TRAY, FEEDER: LOWER TRAY FEEDER with a LETTER TRAY
	LF02X-TB		1	TRAY, FEEDER: LOWER TRAY FEEDER with an A4 tray
	EK-LF02E-UM	070-8931-00	1	MANUAL,TECH: USER, DECcolorwriter 1000
	EK-LF02A-UM	070-8936-00		Contains one each of the following manuals: French, Italian, German, Spanish. The EK numbers are for reference only.
	EK-LF02F-UM		1	MANUAL,TECH: USER, DECcolorwriter 1000, FRENCH ONLY. DON'T ORDER
	EK-LF02I-UM		1	MANUAL,TECH: USER, DECcolorwriter 1000, ITALIAN ONLY. DON'T ORDER
	EK-LF02G-UM		1	MANUAL,TECH: USER, DECcolorwriter 1000, GERMAN ONLY. DON'T ORDER
	EK-LF02S-UM		1	MANUAL,TECH: USER, DECcolorwriter 1000, SPANISH ONLY. DON'T ORDER
	EK-LF02E-TR	070-8932-00	1	MANUAL,TECH: DECcolorwriter 1000 SW PRINTER TOOLS REFERENCE
	LF02X-AD	016-1288-70	1	CLEANING KIT
	29-31587-01	063-1737-00	1	DRIVERS/UTILITIES S/W

C

Wiring Diagrams

The tables below detail the signals carried through several of the print engine's wiring harness connectors at the print engine control board. Figure C-1 illustrates the print engine's control board connectors.

Table C-1. Connector CN2

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	CVOPN1-0	10	PSS-0	19	FA2-0	28	+5 VDC
2	PEJCT-0	11	+5 VDC	20	FAN2-0	29	GND
3	CVOPN2-0	12	GND	21	FB2-0	30	RTYP2
4	DRMT-0	13	PS1-0	22	FBN2-0	31	no connect
5	PE-0	14	PS2-0	23	GND	32	no connect
6	PIN-O	15	PS3-0	24	PCLMP	33	no connect
7	P-GND	16	PPASS2	25	+5 VDC	34	no connect
8	24S	17	FCOM	26	DRMHP		
9	PFS-0	18	FCOM	27	GND		

Table C-2. Connector CN3

Pin	Signal	Pin	Signal
1	DRMCOM	4	DRMAN-0
2	DRMCOM	5	DRMB-0
3	DRMA-0	6	DRMBN-0

Table C-3. Connector CN4

Pin	Signal	Pin	Signal
1	DHED-0	8	RMK1
2	24S	9	+5 VDC
3	DHFAN-0	10	RMK2
4	24S	11	GND
5	HLFTA	12	RMK3
6	GND	13	STHR
7	HLFTB	14	no connect

Table C-4. Connector CN5

Pin	Signal	Pin	Signal
1	+5 VDC	5	LJAM-0
2	LCOV-0	6	LERR-0
3	LTROLL-0	7	LRDY-0
4	LPAP-0	8	LPWR-0

Table C-5. Connector CN6

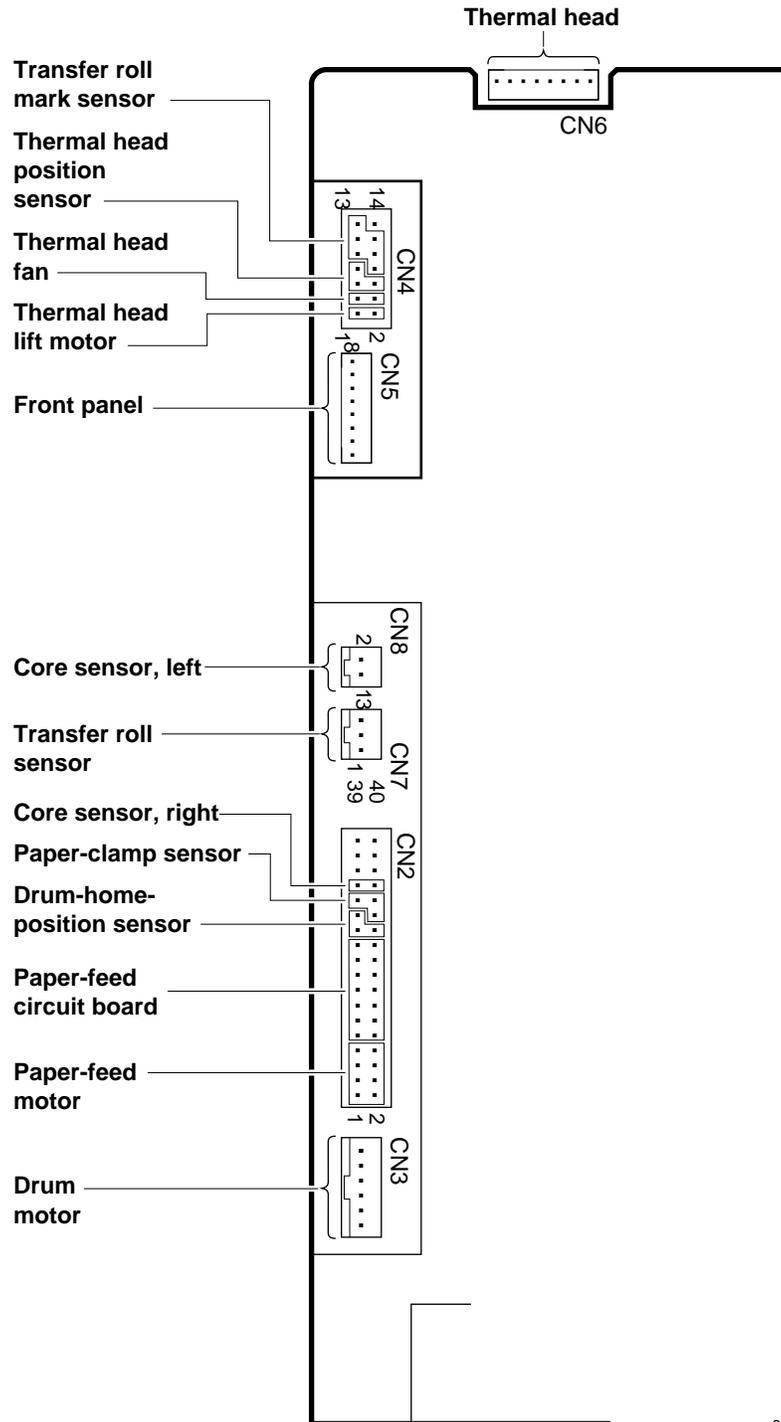
Pin	Signal	Pin	Signal
1	HTHR	8	GND
2	HTHRR	9	+5 VDC
3	STROBE4-0	10	LATCH-0
4	STROBE3-0	11	DATA2
5	STROBE2-0	12	DATA1
6	STROBE1-0	13	no connect
7	CLOCK	14	B.E.O

Table C-6. Connector CN7

Pin	Signal	Pin	Signal
1	RHLFR	3	RHLF
2	GND		

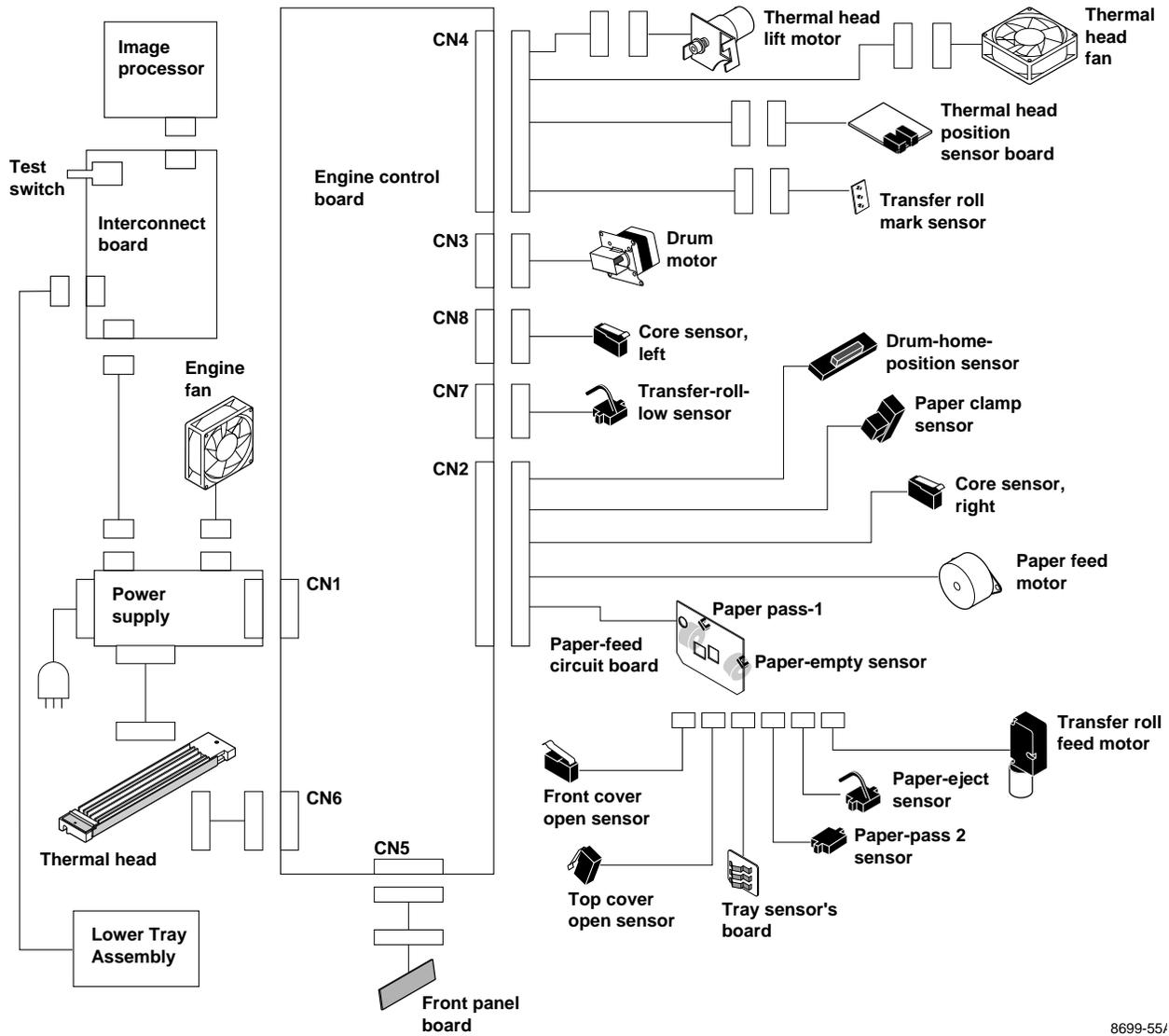
Table C-7. Connector CN8

Pin	Signal	Pin	Signal
1	RTYP1	2	GND



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Figure C-1. Print engine control board connector diagram



8699-55/

Figure C-2. Print engine wiring diagram

D

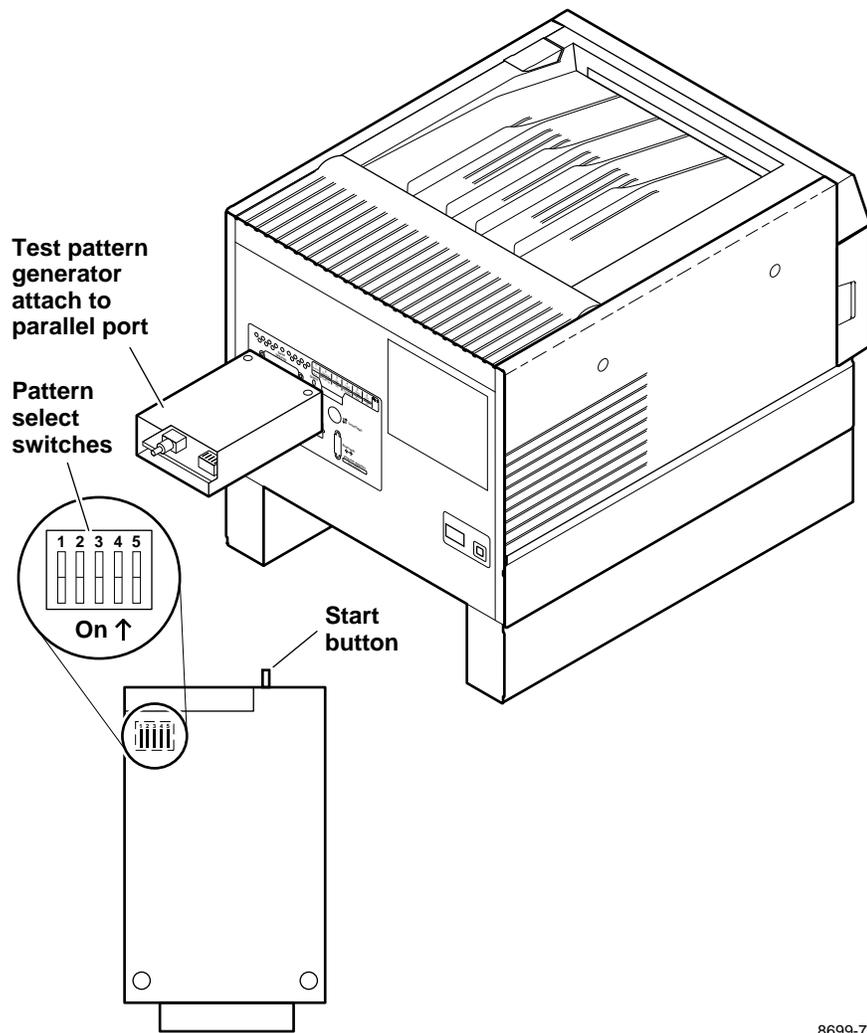
Test Pattern Generator

The Test Pattern Generator allows you to test a printer as if it was receiving a file from a host computer. In the case of the DECcolorwriter 1000, the PostScript script causes the printer's image processor to forward a command to the print engine which generates and prints the test pattern.

Note *The Test Pattern Generator is NOT AVAILABLE in the field and was only used for engineering development. It has been shown here as a reference only.*

To use the Test Pattern Generator, do the following:

1. Select a test pattern to be printed using the Test Pattern Generator's five DIP switches. The following tables lists the available test patterns.
2. Plug the Test Pattern Generator onto the printer's parallel port. You do not have to turn the printer off; you can plug-in the Test Pattern Generator "hot."



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Figure D-1. Plugging the Test Pattern Generator into the printer's parallel port

3. Press the Test Pattern Generator's **START** button. Its green LED flashes as you press the button.
4. The printer will print the transmitted print file.

Besides print files, the test pattern generator also allows you to turn off and on the printer's startup page.

Table D-1. Test Pattern Generator DIP Switch settings for DECcolorwriter 1000

Pattern or function	1	2	3	4	5
25% fill	On	On	On	On	On
3-color bridging test	Off	On	On	On	On
Inspection/composite	On	Off	On	On	On
Saturation dither	Off	Off	On	On	On
Wrinkle pattern	On	On	Off	On	On
Rag patch	Off	On	Off	On	On
Speckle pattern	On	Off	Off	On	On
Enable startup page	Off	Off	Off	On	On
Disable startup page	On	On	On	Off	On

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