

Service Manual

HP DesignJet 220 and  
HP DesignJet 200  
Plotters



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The procedures described in this manual are to be performed by HP-qualified service personnel only.

**Electrical Shock Hazard**

Serious shock hazard leading to death or injury may result if you do not take the following precautions:

- Ensure that the ac power outlet (mains) has a protective earth (ground) terminal.
- Disconnect the plotter from the power source prior to performing any maintenance.
- Prevent water or other liquids from running onto electrical components or circuits, or through openings in the enclosure.

**Electrostatic Discharge**

Refer to the beginning of Chapter 6 of this manual, for precautions you should take to prevent damage to the plotter circuits from electrostatic discharge.

**Safety Symbols**

General definitions of safety symbols are given immediately after the table of contents.

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Learning Products, Barcelona Division

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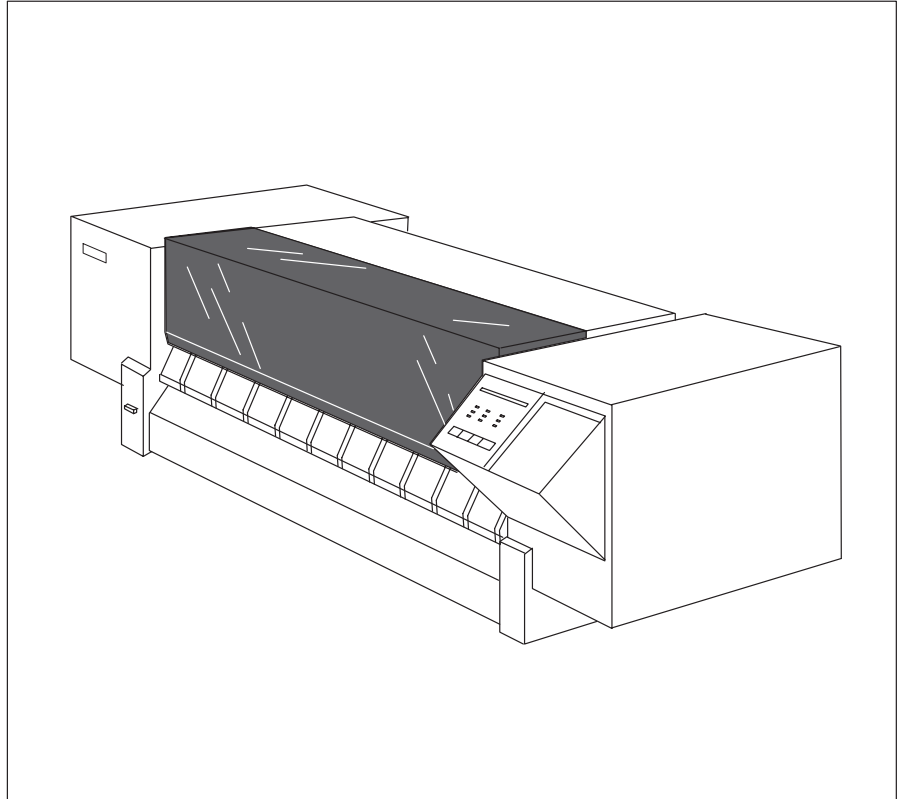
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# Service Manual



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## HP DesignJet 220 and HP DesignJet 200 Plotters

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## Using this Manual

### **Purpose**

This manual contains information necessary to test, calibrate and service

- HP DesignJet 200 plotters (models C3180A and C3181A)
- HP DesignJet 220 plotters (models C3187A and C3188A)

For information about using these plotters, refer to the corresponding user guides.

### **Readership**

The procedures described in this manual are to be performed by HP-qualified service personnel only.

### **Training**

The HP ongoing training course CEV2-TIJ provides training for HP Customer Engineers, on servicing the complete HP DesignJet series of large-format, thermal-inkjet plotters.

### **Part Numbers**

Part numbers for plotter options, accessories and service parts are located in chapter 10.

### **Conventions**

The term **D/A1-size plotters** refers generically to models C3180A and C3187A.

The term **E/A0-size plotters** refers generically to models C3181A and C3188A.

A small arrow **▶** is used to indicate other parts of the Service Manual or User's Guide where you can find information related to the topic you are consulting.

The **§** symbol is used to indicate the name of a referenced paragraph.

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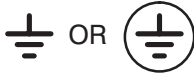
## General Definition of Safety Symbols



International caution symbol (refer to manual): the product is marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.



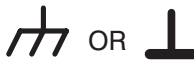
Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts must also be marked).



Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal that must be connected to ground before operating equipment.



Low-noise or noiseless, clean ground (earth) terminal. Used for a signal common, as well as providing protection against electrical shock in case of a fault. A terminal marked with this symbol must be connected to ground in the manner described in the installation (operating) manual, and before operating the equipment.



Frame or chassis terminal. A connection to the frame (chassis) of the equipment, which normally includes all exposed metal.



Alternating current



Direct current



Alternating or direct current

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**WARNING**

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The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury.



Take care not to cut yourself on the encoder strip inside the plotter.

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**CAUTION**

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The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

## Notes

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Product  
Information

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## Description

### Applications

HP DesignJet 200 and HP DesignJet 220 plotters are large-format, monochrome, ink-jet plotters that provide hardcopy output of computer program data.

Large-format plots of high resolution and quality are generated for applications such as

- Computer-aided design (CAD)
- Computer-aided manufacturing (CAM)
- Mapping
- Mechanical and architectural drawings
- General drafting

### Graphic Languages

The plotters accept drawing data from CAD software programs supporting the following languages:

- Hewlett-Packard Graphics Language (HP-GL), a vector language
- HP-GL/2, an enhanced version of HP-GL
- Hewlett-Packard Raster Transfer Language (HP-RTL), a raster language
- Printer Job Language (PJL)

The plotters support HP-GL/2 with both the Japanese Kanji and the Roman character sets.

### Interfaces

The plotters operate with a number of computer systems and graphic terminals, using either RS-232-C or Centronics/Bi-Tronics interfaces. (More [▶](#) chapter 5, § *Input/Output Interfaces*.)

### Network Connections

Customers can connect their plotters to a network through an optional HP JetDirect EX external network interface. The following network operating systems are then supported:

- Novell Netware (Ethernet and Token Ring networks)
- LAN Manager (Ethernet and Token Ring networks)
- TCP/IP (Ethernet networks only)
- Apple Ethertalk (Ethernet networks only)

### Memory

The plotters have a standard 2 megabytes of on-board random access memory (RAM). They also have one RAM-expansion socket, which can hold an optional 2-megabyte, 4-megabyte or 8-megabyte, single in-line memory module (SIMM). The maximum RAM is therefore 10 MB.



## Accuracy

The accuracy of the plotters in drawing a vector is  $\pm 0.38$  mm (0.015 in) or  $\pm 0.2\%$  of the specified vector length, whichever is greater, at 23 °C (73 °F) at 50-60% relative humidity, on HP special polyester film.

## Resolution

The resolution of the plotter output is measured in dots per inch (dpi). (Explanation [▶](#) chapter 5.) The plotter resolutions for different plot-quality settings are as follows:

Plot/Print Quality	HP DesignJet 200	HP DesignJet 220
Draft	300 x 300 dpi, dot depleted	300 x 300 dpi, dot depleted
Final	True 300 x 300 dpi	True 300 x 300 dpi
Enhanced	–	Addressable 600 x 600 dpi.

## Plotting Time

The plotting time for one plot on paper is as follows:

Plot/Print-Quality	HP DesignJet 200		HP DesignJet 220	
	D/A1-size plot	E/A0-size plot	D/A1-size plot	E/A0-size plot
Draft	approx 3.8 min	approx 7.5 min	approx 2.3 min	approx 3.9 min
Final	approx 5.0 min	approx 10.0 min	approx 3.1 min	approx 5.3 min
Enhanced	–	–	approx 6.5 min	approx 10.6 min

## Legs and Media Bin

The plotter legs and media bin are optional.

## Media Types

Media type	Characteristics	Cost
Plotter paper	Smooth surface, good for everyday use.	Low
Translucent bond	Good for diazo reproductions and preliminary drawings.	Low
Vellum	Diazo-reproducible, archivable, translucent.	Moderate
Single-matte inkjet polyester film	Diazo-reproducible, archivable, very stable, pencil-writable on the matte side.	High

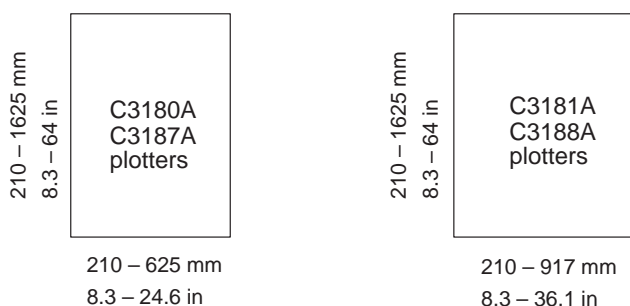
(Further advice [▶](#) User's Guide, chapter 2, § *Choosing and using media.*)

## Media Sizes

The plotters handle only sheet media, not roll media. Supported standard sizes are as follows:

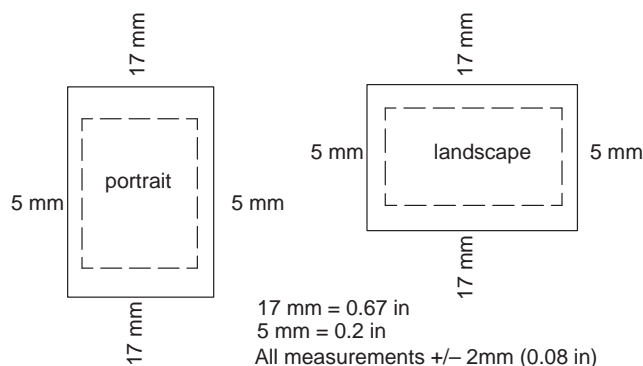
	D/A1-size plotters (C3180A and C3187A)	E/A0-size plotters (C3181A and C3188A)
ANSI	A, B, C, D	A, B, C, D, E
ISO	A4, A3, A2, A1	A4, A3, A2, A1, A0
Metric Oversize	A2, A1	A2, A1, A0
Architectural	C, D	C, D, E, E1
JIS	A4, A3, A2, A1 B4, B3, B2	A4, A3, A2, A1, A0 B4, B3, B2, B1, B0

The plotters handle media that does not exceed the following maxima and minima:



## Media Margins

The media margins define the real available plotting area on the media:



## Other Plotter Features

- Automatic media-edge sensing
- Automatic cartridge alignment, testing and servicing
- Built-in diagnostic and demonstration plots

## Upgrading a DesignJet 200

Users can order an upgrade kit to upgrade a DesignJet 200 to a DesignJet 220. The kit should be installed by HP-qualified service personnel only.

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Site Planning and  
Requirements

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## Power Requirements

HP C3180A and C3181A DesignJet 200 and HP C3187A and C3188A DesignJet 220 plotters have self-adjusting power supplies and do not require a voltage selector or switch settings prior to use. The table below lists the power requirements for the plotters.

Power Requirements		
Source Voltage Requirements:	Voltage	Max current (rms)
	100 V ac	1.4 A
	120 V ac	1.2 A
	220 V ac	650 mA
	240 V ac	600 mA
Frequency:	47-53 Hz and 57-63 Hz	
Consumption:	140 watts maximum	

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### WARNING

**The ac power outlet (mains) must have a protective earth (ground) terminal. Serious shock hazard leading to death or injury may result if the plotter is not properly grounded.**

The power cord supplied with the plotter should meet the plug requirements for the geographical area. However, different power cords (international options) are available. (Cable part numbers ▶ chapter 10.)

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## Choosing an Interface Cable

(Instructions ▶ User's Guide, chapter 1, § *Choosing an interface cable.*)

**Serial (RS-232-C) Interface** A short cable (less than 15 meters or 50 feet) is recommended for the RS-232-C interface. A longer cable is permissible, provided the load capacitance does not exceed 2500 picofarads.

**Parallel (Bi-Tronics/Centronics) Interface** Use a short cable (less than 2 meters or 6.6 feet) for the parallel interface.

(Interface descriptions ▶ Service Manual, chapter 5, § *Input/Output Interfaces.*)

(Pin specifications ▶ User's Guide, chapter 6, § *Interface specifications.*)

(Cable part numbers ▶ Service Manual, chapter 10.)

## Choosing a Suitable Plotter Environment

(Instructions ► User's Guide, chapter 1, § *Positioning the plotter.*)

### Environmental Specifications

Hardware:	Environmental Class B2	
<b>Operating environment:</b>	<b>Temperature</b>	<b>Relative Humidity</b>
Plotter	0 to 55°C (32 to 131°F)	20-80%
With cartridges and media:	10 to 40°C (50 to 104°F)	20-80%
Optimal print quality and media handling:	15 to 30°C (59 to 86°F)	20-80%
<b>Storage environment:</b>	<b>Temperature</b>	<b>Relative Humidity</b>
Plotter/media	-40 to +70°C (-40 to +158°F)	5-95%
Cartridges	-40 to +60°C (-40 to +140°F)	
<b>Acoustics:*</b>	<b>Sound Pressure</b>	<b>Sound Power</b>
Operating	54 dB (Acoustic)	6.5 bels (A)
Idle	< 20 dB (A)	< 3.6 bels (A)

\*These specifications are typical sound pressures at a one-meter bystander position. Idle specification assumes fan is off.

### Plotter Dimensions and Weight

Plotter Model:	C3180A/C3187A	C3181A/C3188A
Length	1076 mm (42.36 in)	1375 mm (54.13 in)
Depth	380 mm (14.96 in)	380 mm (14.96 in)
Height (window closed)	355 mm (13.97 in)	355 mm (13.97 in)
Height (window open)	505 mm (19.88 in)	505 mm (19.88 in)
Weight	39.1 kg (86.2 lbs)	46.7 kg (103.0 lbs)

**Notes**

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Installation and  
Configuration

## Unpacking and Assembling the Plotter

When the plotter arrives at the user site:

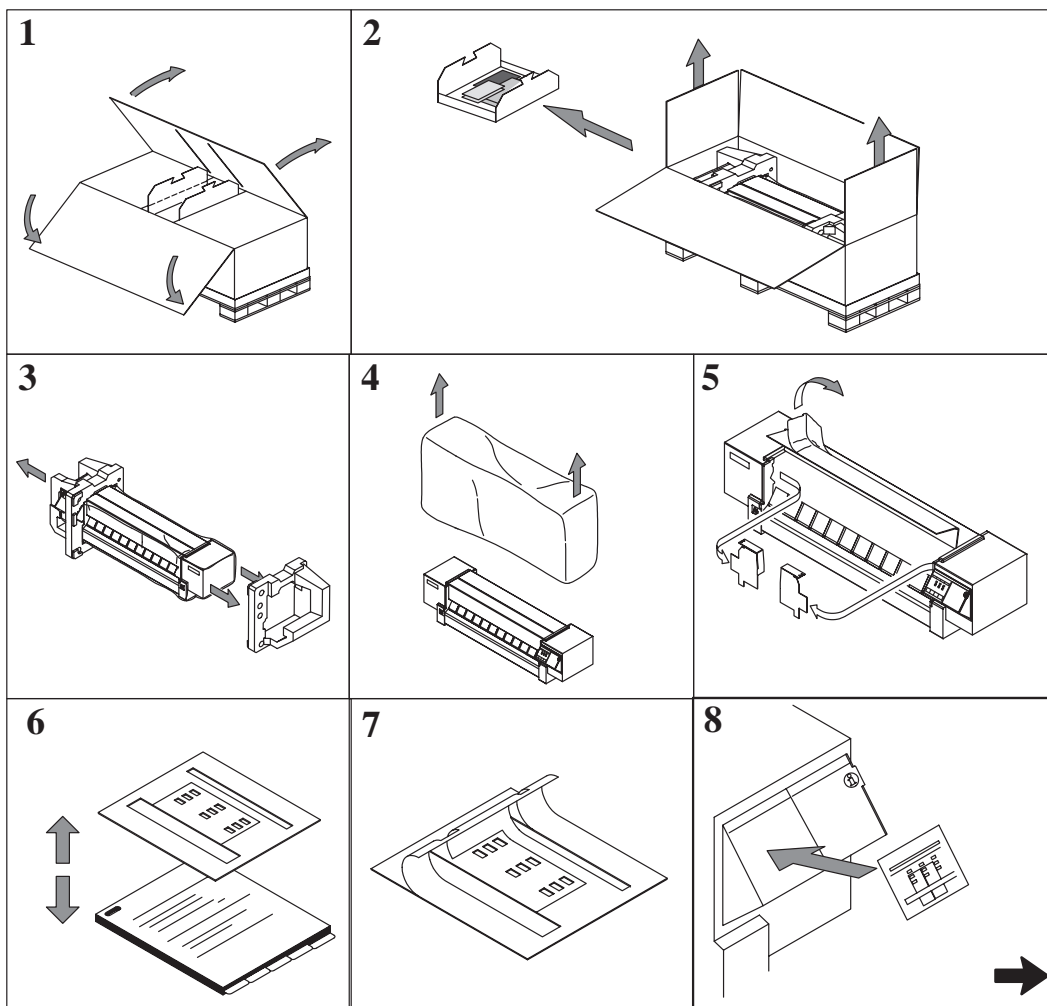
- 1 Inspect the shipping container for damage.

*If the shipping container shows signs of damage, retain it until you have checked the contents of the shipment and verified the performance of the plotter.*

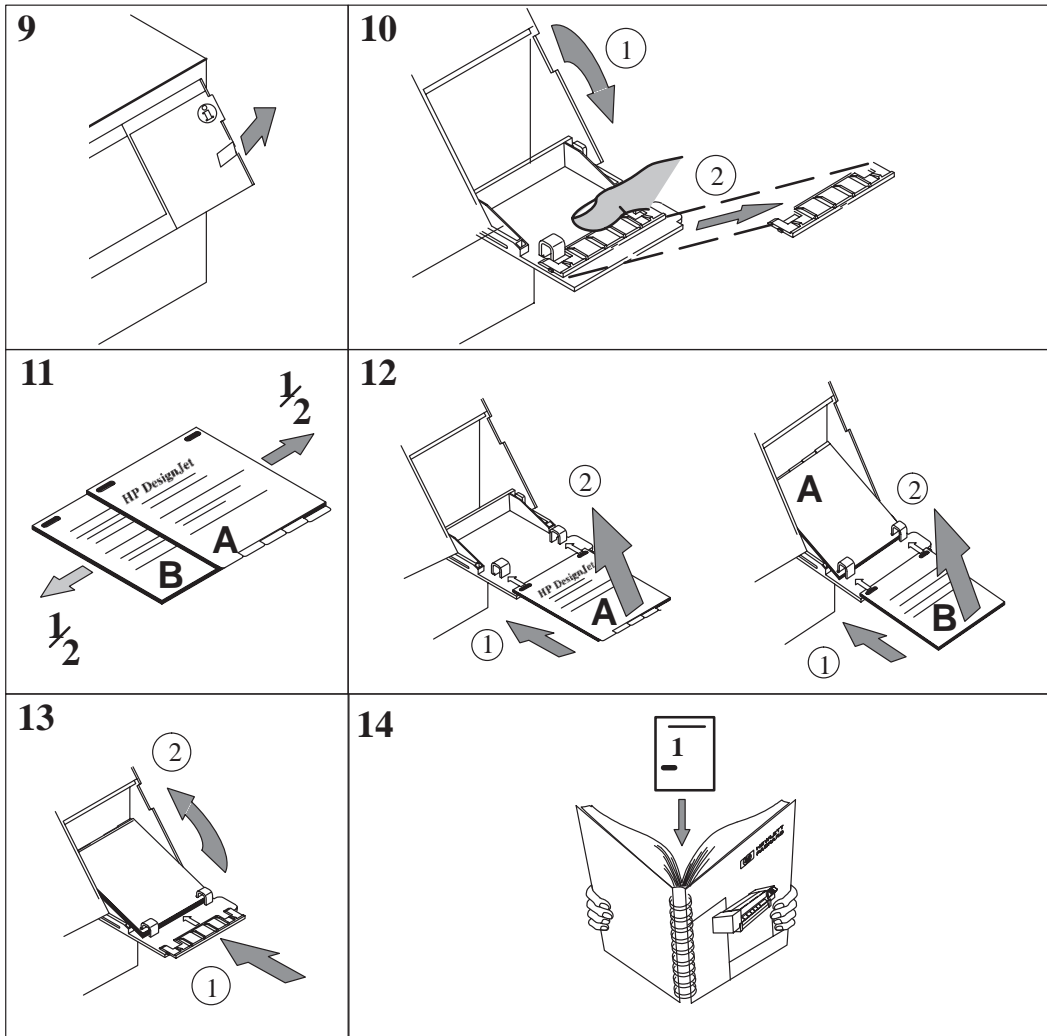
- 2 Unpack and assemble the plotter, following the series of illustrations below.

*The packaging is due to change in late 1994.*

*(Part number of future unpacking instructions ▶ Chapter 10)*







## Inspecting the Plotter for Damage

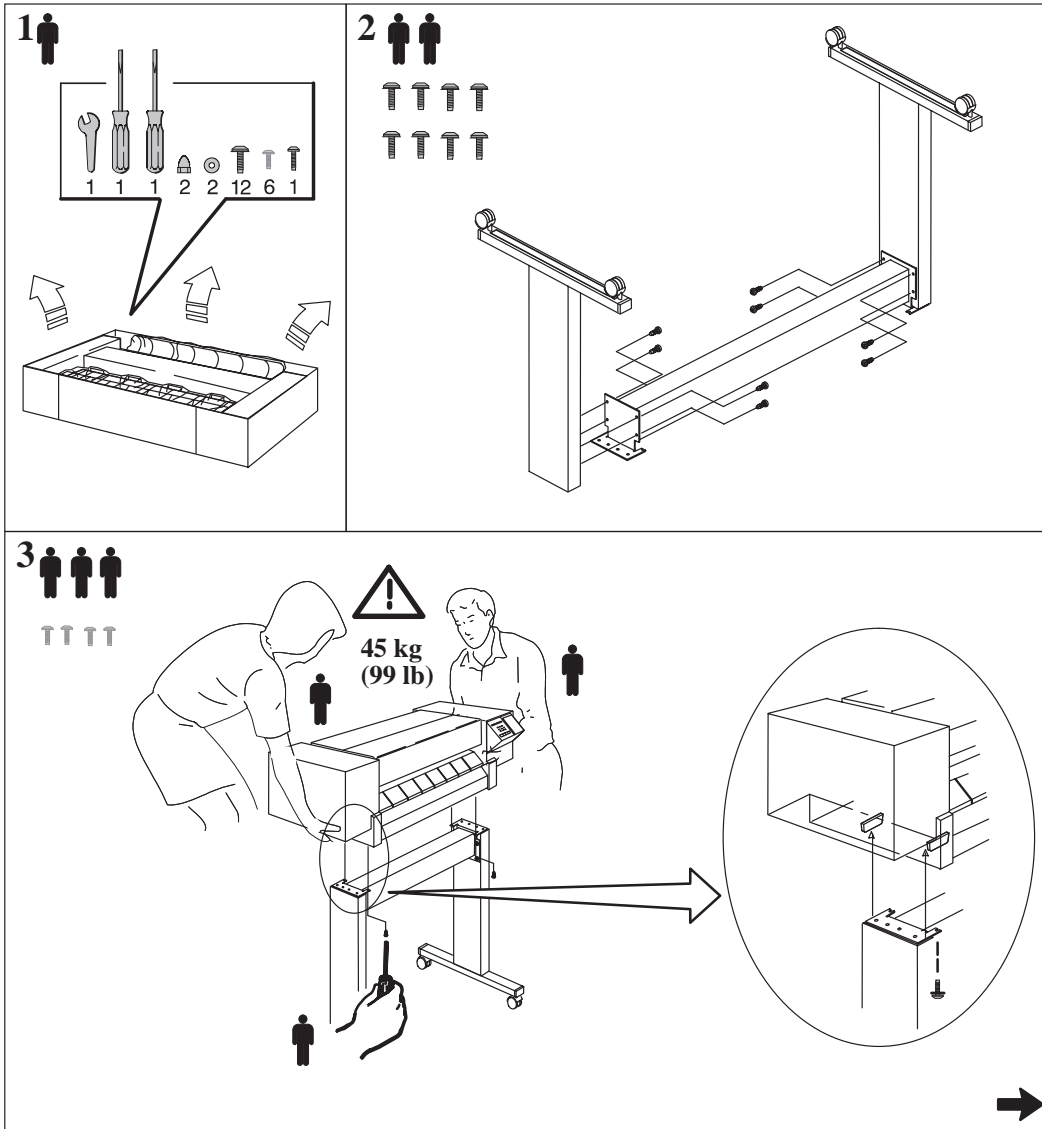
Visually inspect the plotter for damage, scratches, dents, or other mechanical defects. If the plotter is damaged in transit, notify the carrier and the nearest HP Sales and Support Office. Retain the shipping container and insulation material for the carrier's inspection. The Sales and Support Office will arrange for the repair or replacement of the plotter.

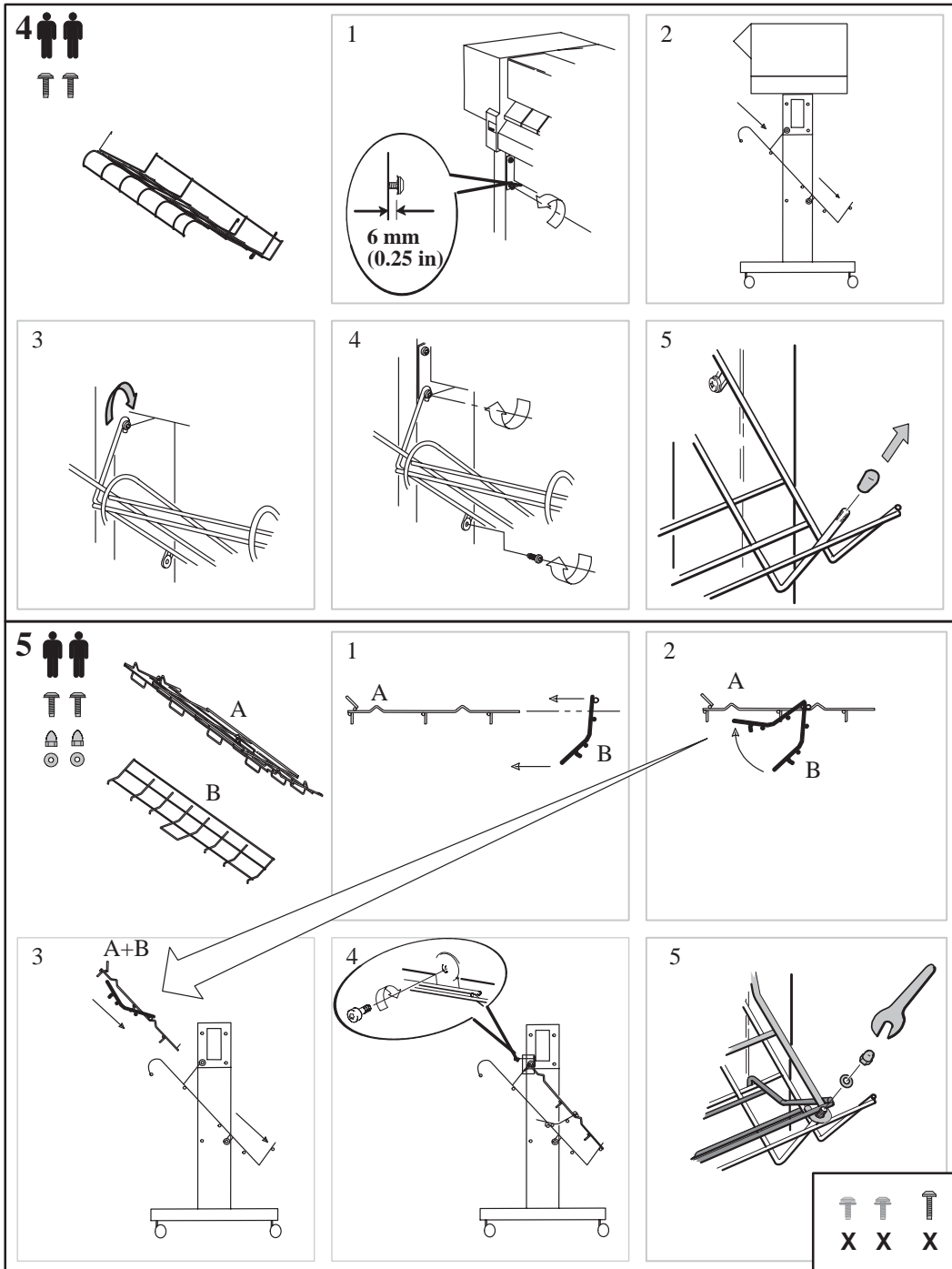
## Repacking the Plotter

You can order a repacking kit if you need to repack the plotter and don't have the shipping container and insulation material. (Part numbers ▶ chapter 10.)

## Assembling the Legs and Media Bin (Optional)

If the user has purchased the optional legs and media bin for the plotter, assemble them following the series of illustrations below:





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## Installing the Plotter

(Instructions ▶ User's Guide, chapter 1, *Setting up the plotter.*)

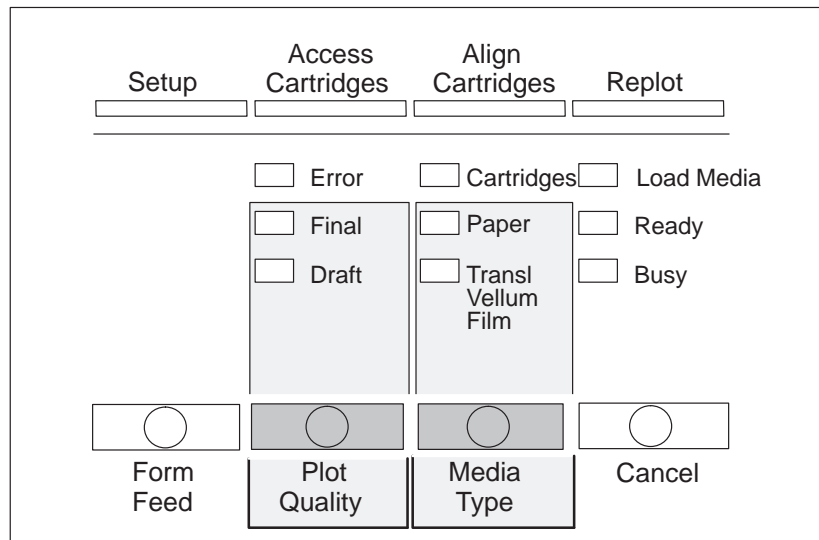
**Line-Cord Set** The power cord supplied with the plotter should meet the plug requirements for the geographical area. However, different power cords (international options) are available. (Cable part numbers ▶ Service Manual, chapter 10.)

---

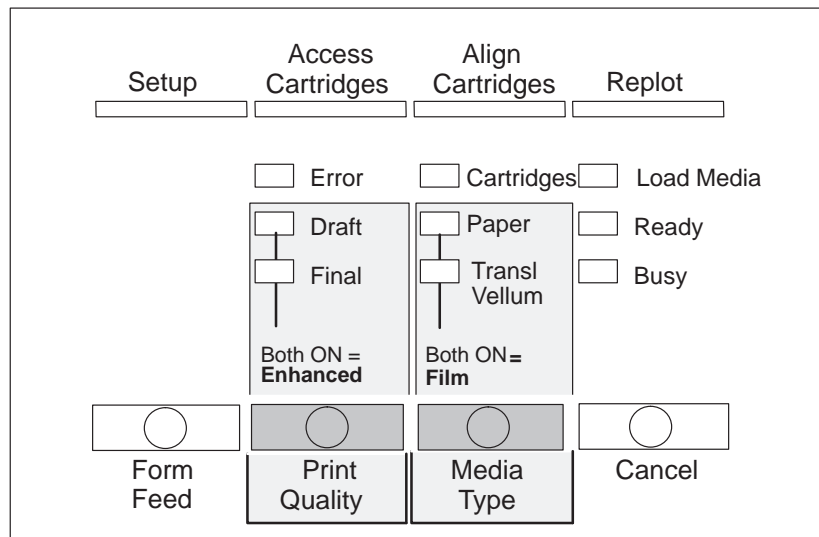
## Using the Plotter

(Instructions ▶ User's Guide, chapter 2, *Using the plotter.*)

### DesignJet 200 Front Panel



### DesignJet 220 Front Panel



---

## Configuring the Plotter

(Instructions ▶ User's Guide, chapter 2, § *Reconfiguring the plotter.*)

The User's Guide describes how to

- Switch Interface Ports
- Configure the following settings using a *setup sheet* :
  - Language of demonstration plot and setup sheet
  - Baud rate and parity of serial interface
  - Graphics language
  - HP-GL timeout period
  - Plot orientation (rotate and mirror)
  - Line merging
  - Pen-palette settings (width and density)

An example of a setup sheet is given on the following page.

---

## Verifying Plotter Operation

The plotters contain several types of internal operational checks and tests to ensure that the plotter is properly functioning and to help identify problems if any are detected.

### Power-On Self-Tests

Whenever you switch the plotter on, it automatically performs a series of internal self-tests and mechanical initialization sequences. If a failure occurs, an error is indicated on the front-panel LEDs. You can perform a failure analysis by interpreting the LED error code. (Details ▶ chapter 8.)

### Demonstration Plot

You can check proper plotter operation by plotting and examining the demonstration plot, which is resident in the plotters. This plot shows different plotter capabilities including pen line widths and shading. You can set the demonstration plot, to plot in any of the languages listed in the **Language** box of the setup sheet on the following page.

(Instructions ▶ User's Guide, chapter 1, § *Setting a language*,  
▶ User's Guide, chapter 1, § *Plotting a demonstration plot.*)

# Example of Setup Sheet

The following is a scaled version of a DesignJet 200 setup sheet:

## HP DesignJet 200

## Setup Sheet

For an explanation of all the parameters on this sheet, see the User's Guide.

RAM: 2MB Standard + 0 MB SIMM.  
Firmware Revision: A.01.00

1 → Current setting =  Pencil or black pen  
Desired setting =

1. Language	2. Serial Interface	3. Graphics Language	4. Page Format
<input type="radio"/> English <input type="radio"/> Français <input type="radio"/> Deutsch <input type="radio"/> Español <input type="radio"/> Italiano <input type="radio"/> Português <input type="radio"/> 日本語	<b>Baud Rate</b> <input type="radio"/> 1200 <input type="radio"/> 2400 <input type="radio"/> 4800 <input checked="" type="radio"/> 9600 <input type="radio"/> 19200 <input type="radio"/> 38400	<b>Parity</b> <input type="radio"/> None <input type="radio"/> Even <input type="radio"/> Odd <input type="radio"/> Mark	<b>Rotate</b> <input type="radio"/> 0° <input type="radio"/> 90°
		<input type="radio"/> HP-GL/2 <input type="radio"/> HP-GL (7586B), HP-GL <b>HP-GL Timeout</b> <input type="radio"/> 0.5 min <input type="radio"/> 1 min <input type="radio"/> 5 min <input checked="" type="radio"/> 30 min	<b>Mirror</b> <input type="radio"/> Off <input type="radio"/> On
			<b>5. Merge</b> <input type="radio"/> Off <input type="radio"/> On

6. Pen Settings

from software, or  
 from these tables

		Pen Number							
		1	2	3	4	5	6	7	8
Width (mm)	0.13	—	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	0.18	—	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	0.25	—	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	0.35	—	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
	0.50	—	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	0.70	—	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Density (%)	1.00	—	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	10		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	25		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	50		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	100		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2 →

3 → **Ready** →

3-8 Installation and Configuration

C3187-90000

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Preventive Maintenance

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## Cleaning the Plotter

To maintain the plotter in good operating condition, keep it free of dust accumulation, ink, and other contamination. Cleaning intervals are determined by the plotter environment and by the types of plotter supplies used. As with any precision electronics equipment, proper maintenance will help to ensure reliability and prolong product life.

---

### WARNING

**Disconnect the plotter from the power source prior to performing any maintenance. DO NOT allow water to run on to electrical components or circuits, or through openings in the enclosure, as this can create a shock hazard leading to death or injury.**

---

## General Cleaning

Proper general cleaning should include the following:

- 1 Blow away dust accumulation with compressed air if available.
- 2 Clean the outer surface of the plotter with a damp sponge or cloth. Use a mild soap and water solution if necessary. Do not use abrasive cleaners on the window.
- 3 Wipe the plotter dry with a soft lint-free cloth.

## Cleaning the Drive Roller

Due to the ink's reflectance, ink spilled on the roller can disrupt the plotter's edge-sensing function. To remove any ink from the roller, perform the following procedure:

- 1 Connect the plotter to the ac power source.
- 2 Switch the plotter ON and wait for it to finish initialization.
- 3 With the window closed and no media loaded, press **Form Feed** repeatedly until the stained area of the drive roller is positioned at the top where it can be cleaned.
- 4 Turn the plotter OFF, **disconnect it** from the ac power source and raise the window.
- 5 Apply any common household cleaning solution to a soft, lint-free rag and apply it to the drive-roller surface.
- 6 Thoroughly clean the roller surface.
- 7 If other areas of the roller have been stained by ink, repeat the above steps.
- 8 Allow the drive roller to dry.
- 9 Lower the window, reconnect the plotter to the ac source, turn the plotter on, and load paper to test that no ink reflections disrupt operation of media loading.



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## Functional Overview

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## Loading the Media

### Entry Platen

The media load path begins with the entry platen, which provides a loading surface. (Illustration ♦ page 10-23.)

When you assemble the plotter, it is important to correctly position the entry platen to ensure that the dashed lines exactly indicate the permitted right-edge loading area. The left side of the entry platen should be pressed up against the left side-plate. (Details ♦ chapter 6.)

(Loading Instructions ♦ User's Guide, chapter 2, § *Loading media*.)

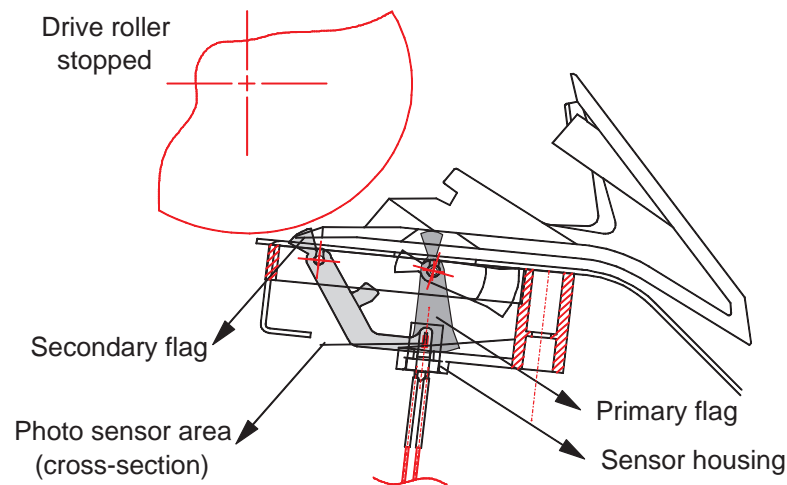
---

## Sensing Media Presence

### Media Sensor

The media sensor is an optosensor and is mounted towards the right end of the entry platen. (Illustration ♦ page 10-23). Two articulated levers block the optical path between emitter and receiver when media is not loaded. When media is loaded, both levers are rotated, thus clearing the optical path and changing the sensor state from *open* to *closed*. This double-lever system provides a leading and trailing edge-sensing capability (for media-length measurement) to the plotter. The media sensor is electrically connected to the main PCA.

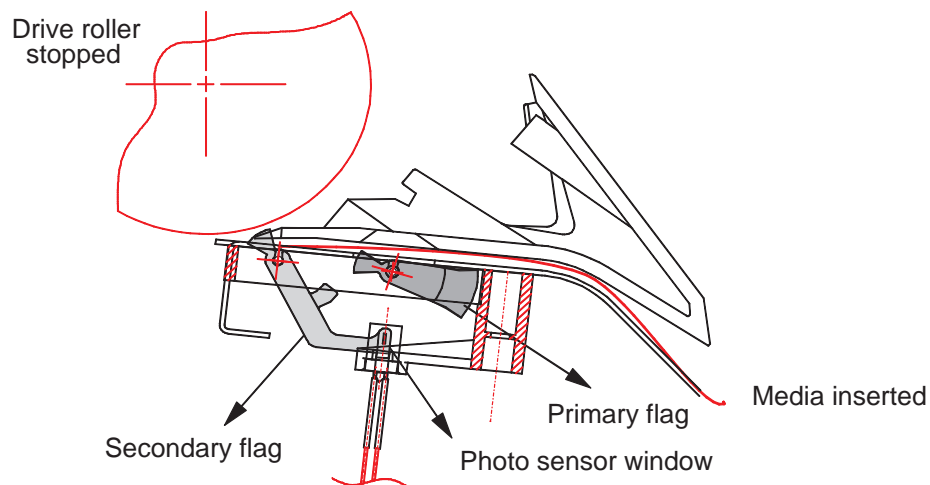
#### 1. Media Not Loaded



The media-not-loaded state can be summarized as follows:

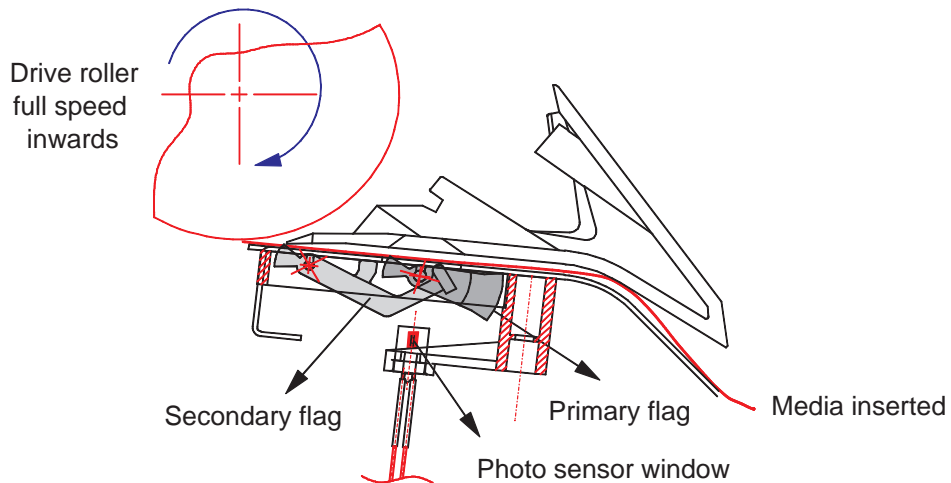
- Media: *not inserted or has not yet reached the primary flag*
- Primary flag: *vertical position (idle)*
- Secondary flag: *resting on plastic detector housing (idle)*
- Optical sensor: *optical path closed by both flags*
- Drive roller: *stopped*
- Front panel: *Load Media LED on*

## 2. Media Inserted (Beginning)



- Media: *inserted but has not yet reached the secondary flag*
- Primary flag: *rotated 90° counter clockwise (active)*
- Secondary flag: *resting on plastic detector housing (idle)*
- Optical sensor: *optical path blocked by secondary flag*
- Drive roller: *stopped*
- Front panel: *Load Media LED on*

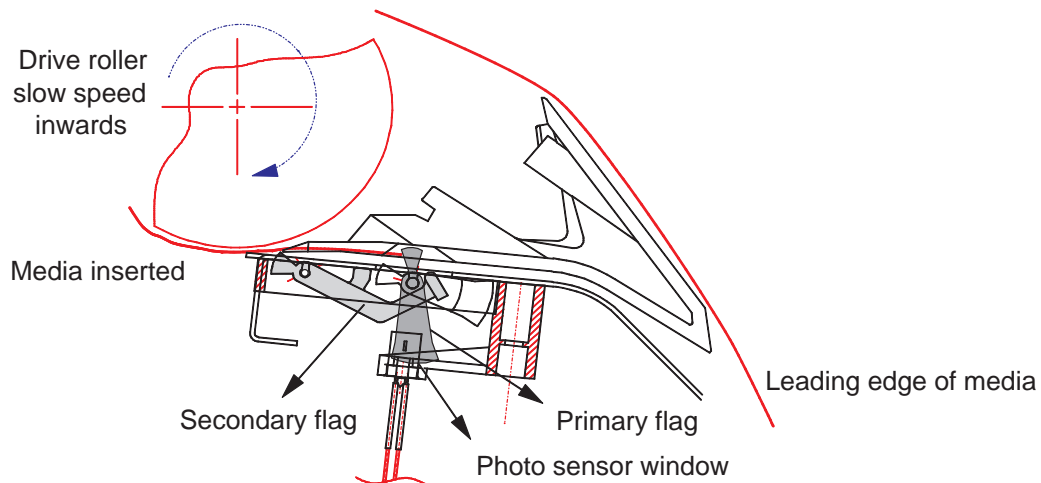
### 3. Front Edge Reaches Secondary Flag



- Media: *reaches the secondary flag*
- Primary flag: *rotated 90° counter clockwise (active)*
- Secondary flag: *rotated 35° counter clockwise (active)*
- Optical sensor: *optical path cleared by both flags*
- Drive roller: *full speed inwards, engaging media*
- Front Panel: *Load Media LED off, Busy LED on*
- Media Length Measurement: *front edge detected*

When the secondary flag clears the optical path, the roller is activated. As the secondary flag is closer to the roller, paper skew is minimized allowing a *deeper* media insertion

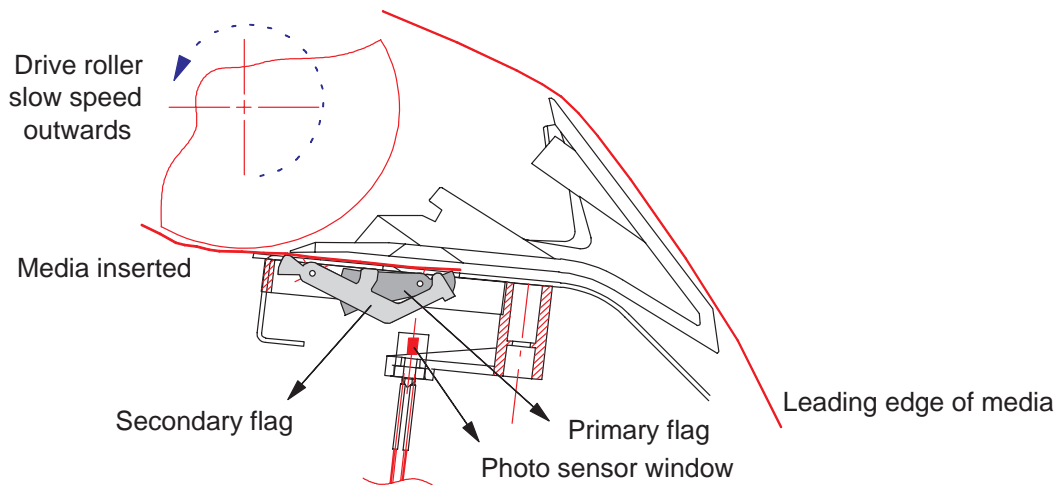
#### 4. Rear Edge Clears Primary Flag



- Media: *clears the primary flag*
- Primary flag: *rotates 90° clockwise (original position - active)*
- Secondary flag: *still in previous position (active)*
- Optical sensor: *optical path blocked by falling edge of primary flag*
- Driver roller: *slows down but still rotating inwards...*
- Front Panel: *Load Media LED off; Busy LED on*
- Media Length Measurement: *rear edge detected*

As soon as the optical sensor detects that the primary flag is back in its original position, the roller motion slows down but needs some time to overcome the system's inertia before being able to reverse the direction of rotation.

## 5. Rear Edge Measured



- Media: *pushes the primary flag*
- Primary flag: *rotates 90° clockwise (active)*
- Secondary flag: *still in previous position (active)*
- Optical sensor: *optical path cleared by primary flag*
- Driver roller: *rotates slowly outwards...*
- Front Panel: *Load Media LED off, Busy LED on*
- Media Length Measurement: *rear edge detected when primary flag clears the sensor*

The rear edge's position is located when the primary flag, pushed by the rear media edge, clears the optical path.

---

### CAUTION

If you pull the media parallel to the plotter length, while attempting to clear a media jam, you could break the flags.

---

## Gripping the Media

### Pinch Arms

When you load media, it is gripped by the pinch-arms. (Illustration ▶ page 10-27.)

### Pinch-Arm Sensor

The pinch-arm sensor is an optical sensor that is attached to the right side-plate. It is used to detect the position of the pinch-arm lever. Linkage, attaching the lever to a sensor flag, causes the flag to block and unblock the sensor as the pinch-arms are raised and lowered. The pinch-arm sensor is electrically connected to the main PCA.

---

## Advancing the Media

### Media-Drive Mechanics

The media is advanced by the media drive (X-drive) system. Components include:

- Media motor (X-axis motor)
- Worm pinion and helical drive-roller gear
- Drive roller

(Illustration ♦ page 10-23.)

The main component of the drive system is a full-width, 6.4-cm (2.5-inch) diameter roller with an elastomer skin. This roller directly drives the media and provides the surface that references the media to the print-head.

The media-motor position control uses an encoder feedback loop. The encoder wheel is mounted to the motor shaft, and the optical reader is mounted inside a bell housing attached to the back of the motor.

### Media-Drive Accuracy

The main purpose of the media drive system is to accurately move media such that the alignment of adjacent print swaths is of high enough precision that the plotter specifications are met and print quality is maintained. The media-drive accuracy (end-point accuracy, or X-axis accuracy) specifies how accurately a plotter can draw a line of a given length. (Specifications ♦ chapter 1.)

The configuration plot draws cross-hairs 500mm apart that you can use to measure the plotter's accuracy. (Details ♦ chapter 7, § *Accuracy Calibration*.)

### Contributors to the Accuracy

All the above components of the media drive system contribute to the media-drive accuracy. The following also contribute:

- Radius variations produced by the way the media wraps around the drive roller, and the way the pinch-wheels and star-wheels maintain this radius
- Errors in the media motor's optical-encoder feedback system (this system gives feedback to the motor-control circuitry)

Dimensional changes in the media will affect lines drawn in both axes either during plotting or after the plot is drawn. For this reason, media other than polyester film does not support the media-drive accuracy specification. Polyester film is the only media that maintains dimensional stability to within the plotter specification ranges.

---

## Providing a Force on Top of the Media

### **Bail**

The bail provides a normal force on top of the media. (Illustration ♦ page 10-25.) When the pinch-wheels grip the media and the drive roller advances it, the plotter raises the bail. This enables the leading edge of the media to pass below the bail. The plotter then lowers the bail and advances the media to the overdrive roller. The star wheels on the bail are coated with a substance resistant to wet ink, so that they do not leave marks on the media.

### **Bail-Lift Mechanism**

The bail features an automatic lift mechanism driven by the media motor using a series of gears and actuated by the cartridge carriage.

### **Operation**

(Part illustrations ♦ page 10-25)

- 1 The cartridge carriage presses down on the engaging lever.
- 2 The engaging-lever gear and cam gear (which are always in contact) engage the drive-roller gear on the left end of the drive roller.
- 3 The media-drive system drives the drive roller, and also the cam and engaging-lever gears. The auto-cam, which is attached to the cam gear, turns with the gear.
- 4 The auto-cam contacts the left bail bracket and pushes up on the bracket. As the bracket is pushed, the bail lifts.
- 5 The bail-sensor switch opens and the resulting bail logic level is sent to the main PCA.
- 6 The media-drive rotates the auto-cam to a detent position. The detent position allows the bail bracket to rest on the auto-cam after the carriage moves away from the engaging lever.
- 7 The media-drive drives the media through the media path.
- 8 Once the media has passed the bail, the carriage again engages the bail-lift mechanism to lower the bail.

### **Bail Sensor**

The bail sensor informs the processor of the bail position (Up or Down). It is a mechanical microswitch located on the right side-plate. (Illustration ♦ page 10-25)



---

## Stretching the Media

### Overdrive

The overdrive roller stretches the media slightly as it is moved through the plotter. It thus reduces bubbling and media cockle caused by media expansion due to the absorption of water-based ink into the media. Even though the geometry chosen for the plotters minimizes the occurrence of this phenomena, it still could occur on very dense plots.

### Operation

(Part illustrations ▶ page 10-25)

The overdrive roller is geared to the media-drive system and has a surface speed 10% greater than that of the drive roller. The lower star wheels on the bail provide a normal force between the media and the overdrive roller. The resulting friction force creates media tension in the area between the upper pinch-wheels and the overdrive roller (the print zone).

The overdrive roller is segmented into small rollers made of polyurethane. A clutch (overdrive gear assembly) is geared to the speed-ratio gear (overdrive gear cluster) and drives the overdrive roller in the forward direction only.

---

## Moving the Carriage

### Carriage-Drive Mechanics

The Carriage (Y-axis) drive consists of a DC motor driving the carriage by means of a dual, kevlar belt system incorporating three pulleys and two tensioner assemblies.

### Operation

(Part illustrations ▶ pages 10-19 and 10-21)

- 1 A gear pinion, pressed onto the carriage-motor shaft, drives a small belt tensioned with a self-compensating, spring-loaded idler.
- 2 The small belt drives a double pulley which transfers the motor drive to the main belt.
- 3 The main belt is attached to the carriage via friction-fit belt clamps. It is tensioned using a self-compensating, spring-loaded tensioner wedge and main idler. (Illustration ▶ page 10-15.) The belt moves the carriage along slider rods, which are part of the chassis assembly. The carriage bearing system consists of three bushings.
- 4 Positional feedback is obtained using a 150-line-per-inch linear encoder strip that is spring loaded and passes through the carriage where the small slots are read by an optical encoder. The feedback is used by the carriage-motor servo-control system.

---

## Detecting the Media Edges

### Line Sensor

The plotter detects the left and right media edges using the line sensor located on the carriage. The sensor is composed of

- Red LED
- Two lenses (caution required when handling)
- Collector plate

### Operation

- 1 The sensor finds the left media edge when it detects the light from the red LED reflected off the media surface. The black surface of the drive roller absorbs the light.

*Excessive ink deposits on the drive-roller can fool the sensor by reflecting the light.*

- 2 The sensor goes on to find the right media edge.
- 3 The media is advanced and the sensor checks for media skew (crooked loading).

### Other Functions

The line sensor on the cartridge carriage is also used to

- Detect and measure lines drawn on media when performing cartridge alignment
- Detect and measure lines drawn on media when performing accuracy calibration
- Scan the setup sheet

### Media Margins

Hard-clip side margins provide protection against writing on the drive roller due to media expansion/contraction or skew. Top and bottom margins are set according to the physical spacing between the pinch-wheels, overdrive and writing head. (Specifications ▶ chapter 1.)

### Media Sizes

You can use a wide variety of media sizes, due to the

- Continuous roller
- Spacing of the pinch-wheels and star-wheels
- Edge-detection capability

(Specifications ▶ chapter 1.)

---

## Providing Ink

(Carriage Illustration ▶ page 10-21)

### Print Cartridges

The plotters use two HP DeskJet-type cartridges, each containing 50 nozzles. The cartridges are staggered such that two nozzles on each one are not used.

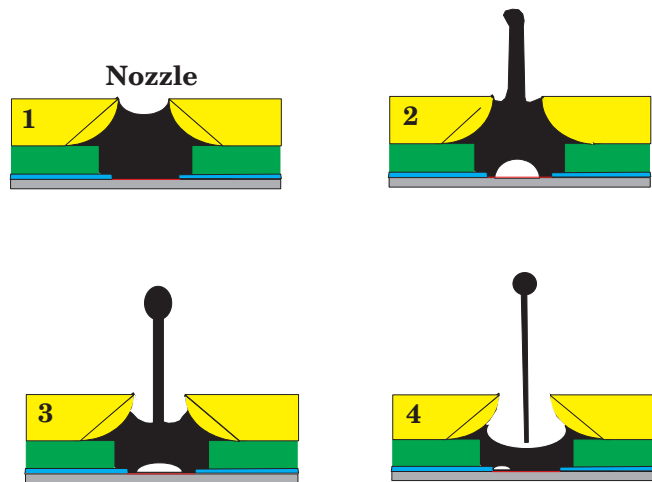
The main components of a cartridge are the

- Plastic housing
- Spring-bag ink reservoir
- Flex circuit

The spring bag provides a negative pressure inside the ink supply to prevent ink from flowing out through the nozzles. The print head (flex circuit), located on the cartridge, contains the cartridge interface (interconnect) and nozzles.

### Drop Growth

Inkjet cartridges invoke a thermal drop-on-demand technology.



- 1 A voltage is applied to a resistive area on the head superheating the bottom layer of the ink droplet and causing nucleation (similar to boiling water).
- 2 The ink boils producing a bubble of water vapor that forces the ink droplet out of the small nozzle orifice.
- 3 As the ink droplet leaves the orifice, the surface tension of the ink draws more ink into the chamber.
- 4 The bubble collapses as the water vapor cools.

### **Important Parameters**

The geometry of the nozzle is important to maintain drop shape and direction. The distance of the head from the writing surface can determine image sharpness. As the distance increases, the drop shape and directionality degrade and are more difficult to predict.

### **Cartridge Chutes**

The two black print cartridges snap into the cartridge chutes (carriage snaps).

### **Electrical Contact**

A gold-plated, dimpled flex circuit mates with the flat tab circuit on each cartridge to make the electrical contact between the plotter and the cartridges. The elastomer spring pads behind each flex circuit ensure the dimples contact the tab circuits with enough pressure.

### **Carriage PCA**

The carriage PCA is part of the carriage assembly. It connects to the main PCA through the trailing cable, which passes through a split torroid to reduce radio-frequency interference. The Carriage PCA contains

- Line sensor
- Thermistor circuit
- Linear encoder
- Cartridge nozzle firing circuit

The thermistor circuit informs the carriage processor if the temperature of the carriage PCA is above or below a certain value.

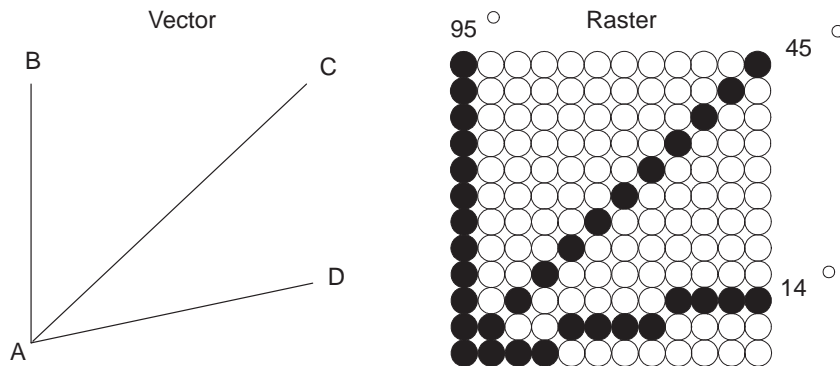
(Further information ▶ later in this chapter, § *Carriage PCA*.)

---

## Producing an Image

### Raster Technology

The plotters are raster based. They plot using dots to represent the data. Thus a line is made up of a series of dots.

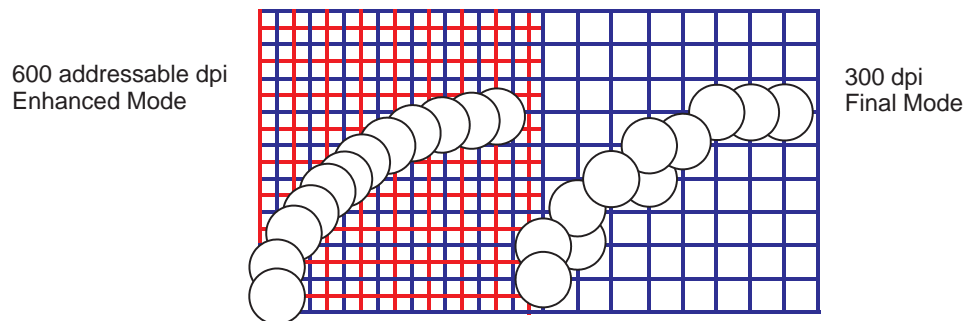


### Resolution (Dots Per Inch)

The resolution of a raster plotter is the number of dots per inch (dpi) it can place along one of two orthogonal axes.

**True Dpi** refers to the ability of the plotter to print a single dot at every location on a grid.

**Addressable Dpi** is the ability of the plotter to selectively position dots on a grid finer than the true-dpi grid. It is used to produce higher print quality output.



Both DesignJet 200 and DesignJet 220 plotters use two 300-dpi print cartridges. However, the DesignJet 220 has an *Enhanced* print mode enabling it to address a 600-dpi grid.

### **Dot Size**

Each dot produced by a 300-dpi cartridge has a diameter of 0.0055 in. The dot size must be larger than 1/300th of an inch (0.0033 in.) so that when a single-dot-wide line is printed, dots overlap and the line appears to be continuous.

### **Too Much Ink**

A 600-dpi grid contains four times as many dots as a 300-dpi grid. This means that four times as much ink can be laid down on a 600-dpi grid. Media cannot absorb that much ink effectively; it puddles, runs, and dries slowly.

**Dot Depletion** To solve the ink problem, sophisticated algorithms produce asymmetrical dot arrangements to selectively reduce (*deplete*) the number of dots placed on the addressable 600-dpi grid in enhanced mode. (The same happens on the 300-dpi grid in draft mode, but to increase plotting speed.) Dot size is not varied in any of the print modes.

### **Print Quality**

**Draft mode** is fast and uses half the ink of true 300-dpi resolution. Special algorithms control dot placement, creating a virtual 300-dpi image, rather than skipping every other dot. The image appears considerably lighter than the true 300-dpi print quality.

**Final mode** uses true 300-dpi resolution. Plotters set to plot on a 300x300-dpi grid directly map 90,000 raster image dots per square inch to 90,000 drops of ink.

**Enhanced mode** (on the DesignJet 220) uses addressable 600-dpi resolution. This involves 300-dpi cartridges on a 600x600-dpi grid. Dot depletion results in the same amount of drops used as in true 300-dpi mode. Print quality improves because the dot centers may be located anywhere on the 600-dpi grid. This results in smoother curves, straighter low-angle lines, smooth-edged area fills and easily readable small text.

## Print-Mode Characteristics

### DesignJet 200

Media Type	Print Quality	Resolution (DPI)	# of Passes	Carriage Speed	Swath Delay	Pass Density
Paper	Draft	300x300	1	24ips	0	50%
	Final	300x300	1	16.7ips	1sec	100%
Vellum/ Transl	Draft	300x300	1	24ips	0	50%
Vellum/ Transl/Film	Final	300x300	2	16.7ips	1sec	50%

### DesignJet 220

Media Type	Print Quality	Resolution (DPI)	# of Passes	Carriage Speed	Swath Delay	Pass Density
Paper	Draft	300x300	1	24ips	0	50%
	Final	300x300	1	16.7ips	1sec	100%
	Enhanced	addressable 600x600	2	16.7ips	0.5sec	50%
Vellum/ Transl	Draft	300x300	1	24ips	0	50%
	Final	300x300	2	16.7ips	1sec	50%
	Enhanced	addressable 600x600	4	16.7ips	0.5sec	25%
Film	Final	300x300	2	16.7ips	3sec	50%
	Enhanced	addressable 600x600	4	16.7ips	1.5sec	25%

A **swath** is the amount of data printed in one pass of the carriage. The **swath delay** is the time between completing one swath and beginning to print the next swath.

---

## Aligning the Cartridges

The cartridge-alignment system is composed of

- Stepper motor
- Adjustment linkage
- Adjustment cam
- Adjustable cartridge chute
- Carriage drive

(Illustrations ▶ pages 10-15 and 10-21.)

### Operation

The following operation is used to align one cartridge with respect to the other in the X-axis (media axis). (Y-axis and Z-axis realignments are done by varying the firing timing of each nozzle resistor.)

- 1 The stepper motor presses up on the lower link of the three adjustment-linkage pieces by means of the plastic actuator pressed onto the motor shaft.
- 2 This action lowers the top link of the adjustment linkage.
- 3 The carriage moves, and the adjustment cam, which comes into contact with the top link, is rotated.
- 4 The cam action causes the adjustable cartridge chute to move in either the plus or minus X-axis direction relative to the fixed cartridge chute.

(Instructions ▶ chapter 7, § *Cartridge Alignment*.)



---

## Servicing the Cartridges

### Service Station

(Illustration ▶ page 10-17.)

Various important cartridge-maintenance operations are performed at the service station:

- Cartridge wiping
- Cartridge capping
- Nozzle spitting

### Wiping

During operation of the cartridge, ink accumulates on the nozzle plate along with paper dust and other substances foreign to the cartridge. If not removed, this buildup can affect nozzle directionality and lead to nozzle failure.

Periodically during operation of the cartridge, this buildup is removed by dragging a wiper across the nozzle plate.

### Operation

(Illustration ▶ page 10-15.)

- 1 The stepper motor presses down on the lower link of the wiper assembly by means of the plastic actuator pressed onto the motor's shaft.
- 2 As the lower link is pushed down, the upper linkage is raised.
- 3 The carriage moves over the small rubber blade, attached to the top of the upper linkage, causing the blade to wipe excess ink and crusting from the nozzle plates.

## Capping

Ink evaporates if you expose non-firing nozzle plates to the open environment. Vapor loss changes the physical properties of the ink remaining in the area of the nozzle plate. The ink may form viscous plugs that fully or partially clog nozzles.

To reduce the loss of ink vapor and thus prevent the nozzles from drying out when the cartridges sit idle, the service station automatically places a cap over the nozzle plates.

### Operation

#### 1 Aligning the Caps

Alignment between the cartridge caps and the nozzles is necessary, because the cap seals on a very small area of the cartridge's plate. Misalignment can cause the ink to wick from the cartridge.

The spring-loaded sled aligns directly to the carriage by means of a beveled plate that mates to a notch on the carriage. This notch establishes X and Y alignment. A flat feature on the sled butts against the carriage to establish the Z alignment.

(Checking correct alignment ♦ chapter 8, § *Frequent Cartridge Failure*.)

#### 2 Sealing the Nozzles

- a The cartridge cap creates a closed volume of air around the nozzles, which is humidified by firing one drop per nozzle.
- b The air volume in the cap is compressed, resulting in a positive pressure at the nozzles. This pressure must be held within a set tolerance. Not enough pressure and the cartridges can leak, too much and the cartridges can deprime.

## Spitting

The cartridge fires (spits) ink droplets periodically to keep a clean nozzle condition. Spitting also takes place to humidify the cartridges before capping and to detect missing nozzles. The cartridges spit into spittoons located in the service station area.

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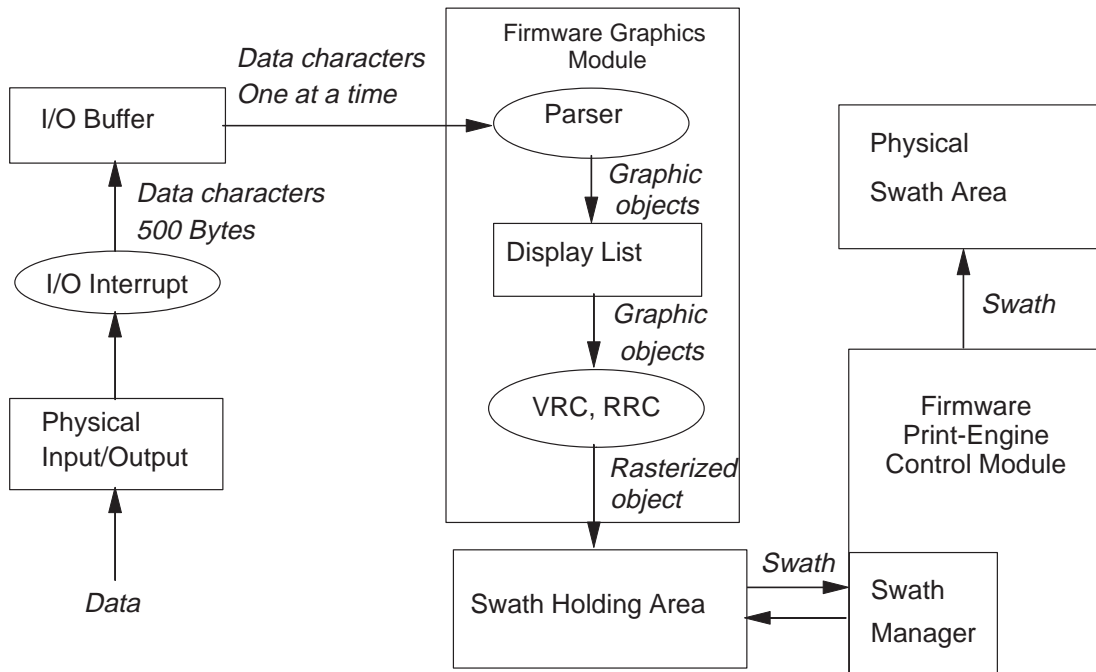
## Cooling the Electronics

### Fan

A single DC fan provides cooling for all electronics inside the electronics enclosure. The fan is processor controlled and runs only when the plotter is plotting. The fan connects to the Main PCA.

---

## System Data Flow



### Input/Output

The user's computer is connected to the plotter through a physical input/output (I/O) connection. The I/O interrupt process removes data from the I/O port, 500 bytes at a time, and places it into the I/O buffer.

### Parser

The parser removes data from the I/O buffer, one byte at a time, interprets the data and transforms it into graphic objects, which are mapped onto the display list. The parser can interpret either raster or vector data. It adds positional information to the data indicating where it is placed on the display list. It continues building the display list until the entire plot has been sent or until memory is full.

### Display List

The graphic objects are geometrical shapes (arcs, vectors, etc.), which are placed on the display list. The display list is a logical map. It is built in a swath format. The information that builds the display list is stored in DRAM (Dynamic Random-Access Memory). The more DRAM the system contains, the larger and more dense the display list can be.

## Converters

The vector-to-raster converter (VRC) or raster-to-raster converter (RRC), depending on the data format sent, rasterizes the data from the display list, swath by swath, and sends the swaths to a swath holding area.

## Swath Holding Area

The swath holding area is part of the DRAM that is specially allocated for this purpose. The swath holding area is large enough to hold up to three swaths at a time.

## Swath Manager

The swath manager firmware algorithm removes data from the swath holding area and reorganizes the data for more efficient plotting. This enables the plotter to sweep the carriage to areas that require ink and to conserve motion by not sweeping blank areas of the media. Variables are calculated and stored during this optimization.

The swath manager then replaces the data into the swath holding area.

## Print-Engine Controller

The print-engine controller removes the organized data from the swath holding area and copies it to the physical swath RAM area. The plotter's microprocessor has a feature called "burst mode," enabling data to be copied from one area of memory to another very quickly.

The print-engine controller uses the variables calculated by the swath manager to determine the stop and start positions of the swath and thus control the carriage movement.

## Swath RAM

The swath RAM is dedicated RAM memory and not part of the DRAM.

## Cartridge-Interface ASIC

The cartridge-interface ASIC (Application-Specific Integrated Circuit) controls the shuffling of pure swath data to the actual firing order of the cartridge nozzles. It fetches pixels from the physical swath RAM and sends it serially through the trailing cable to the carriage ASIC.

This sending of pixel data is initiated by means of a signal sent to the cartridge-interface ASIC by the processor-support ASIC, so as to synchronize the motion of the media motor and carriage motor with the firing of the print-head drivers.

## Carriage ASIC and Cartridge Drivers

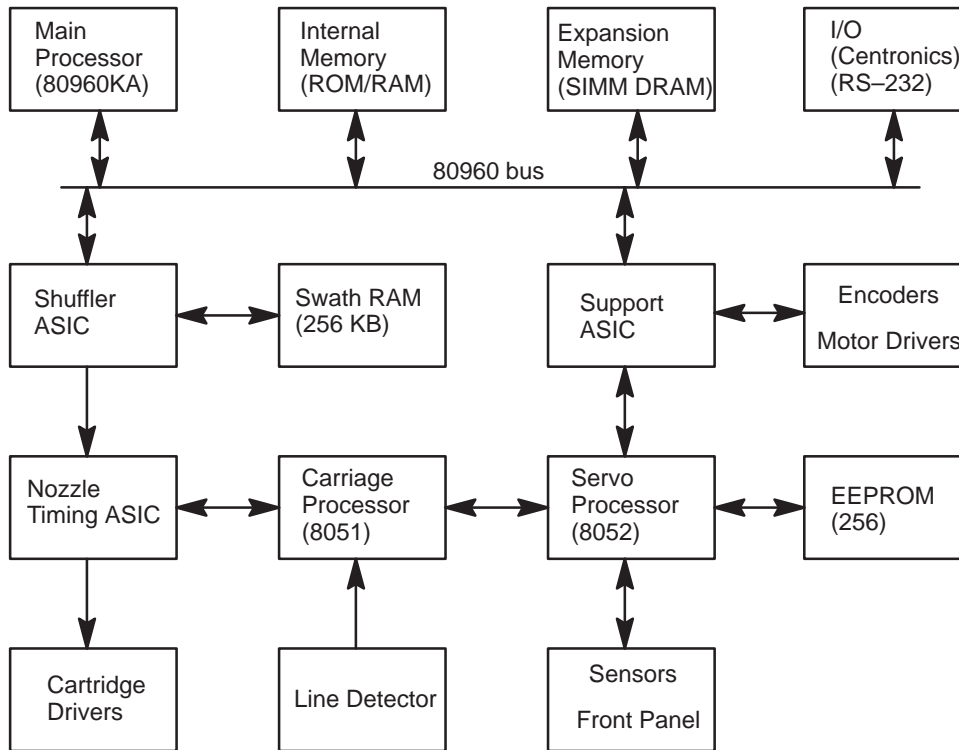
The carriage ASIC generates the *select* and *enable* signals to drive the cartridge-driver integrated circuits.

The cartridge drivers provide the firing pulses for the print-head nozzles.

---

## Plotter Architecture

The plotters have the multiprocessor architecture shown in the following diagram:



Plotter Architecture

The plotter electronics, besides sensors and cables, consist of the following assemblies:

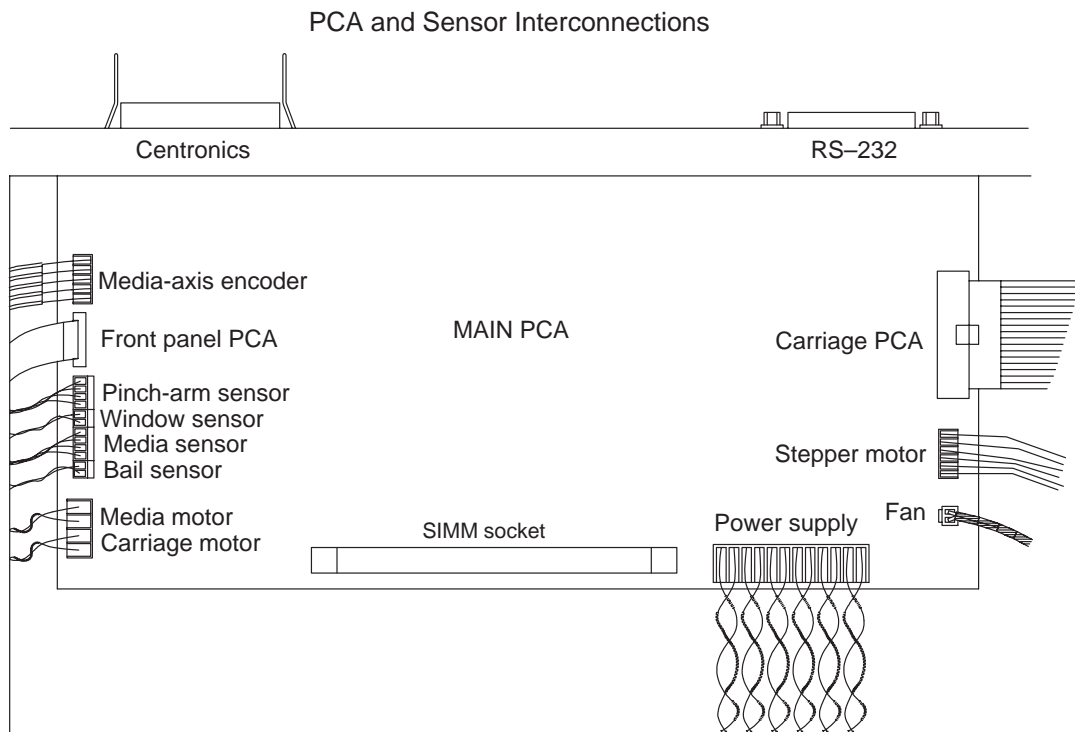
- Main PCA
- Carriage PCA
- Front-Panel PCA
- Power Supply

These are described on the following pages.

---

## Main PCA

(Part illustration ▶ page 10-9.)



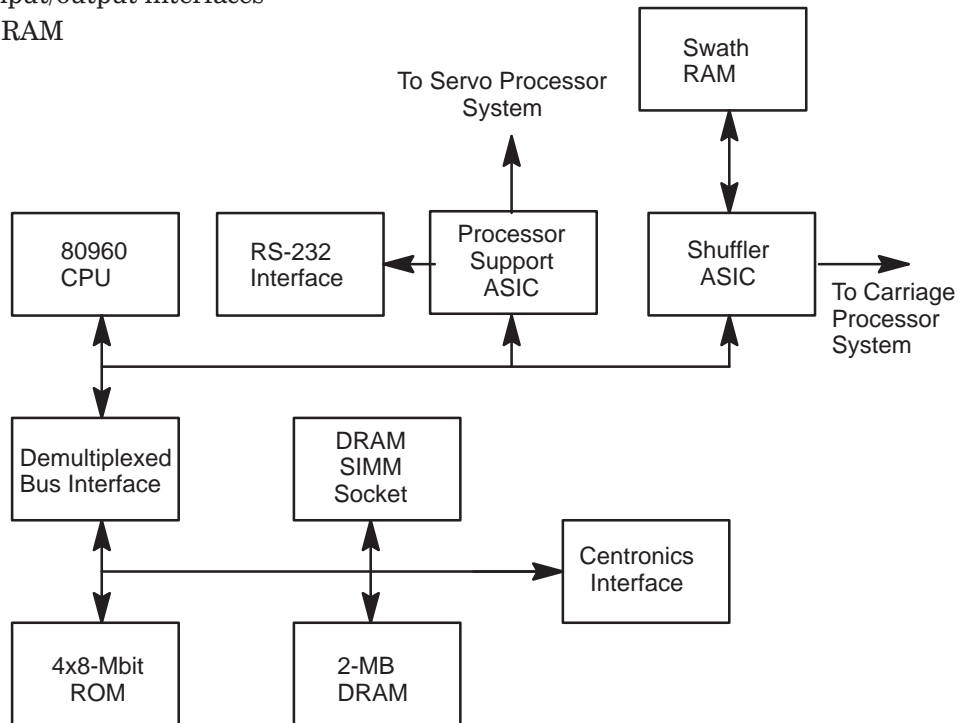
The main PCA contains most of the plotter electronics, that is:

- Main processor system
- Servo processor subsystem
- Some power components

## Main Processor System

The main processor system consists of the following:

- Main processor (80960)
- ROM
- Processor support ASIC
- Shuffler ASIC with swath memory
- Input/output interfaces
- DRAM



Main-Processor-System

### Main Processor

The main processor interprets graphics-language commands received through the input/output (I/O), prepares a bit map of the data to be printed, and issues commands to the servo processor to synchronize the carriage and roller movements for each swath printed.

### ROM

The firmware code is contained in either two masked ROMs or four EPROMs on the main PCA.

*The EPROM integrated circuits are socketed; Move them from the old Main PCA to the new one, when you replace the Main PCA.*

## Processor Support ASIC

The processor support ASIC provides support for the main processor, and an interface between the main processor and the servo processor.

## Shuffler ASIC and Swath Memory

The shuffler ASIC and the swath memory shuffle the row-oriented image data in the system memory into column-oriented nozzle data needed by the print cartridges. The shuffling is accomplished by copying an entire swath of image data from the system memory into the swath memory, then fetching the pixel data from swath memory for each cartridge nozzle according to the shuffle pattern in the ASIC address sequencer. The shuffled data is transferred serially to the nozzle-timing ASIC located on the carriage.

## Input/Output Interfaces

The plotters have both a parallel (Bi-Tronics) and a serial (RS-232) interface. These I/Os are controlled by the main processor.

**Parallel Input/Output Hardware** The parallel interface is compliant with IEEE standard 1284 (Bi-Tronics).

The parallel port has a standard female 1284-B 36-pin connector (the same connector as standard Centronics).

Hosts with 1284-compliant parallel interfaces (including standard PCs with the appropriate parallel-port software) are able to communicate with the plotter bidirectionally. Hosts with standard Centronics hardware (such as traditional PCs) are able to operate with the plotter as they do with standard Centronics devices.

**What is Bi-Tronics** Bi-Tronics is a signaling method for a speed-adaptive, fully interlocked, bidirectional parallel communications channel between a peripheral and a host. The features of Bi-Tronics are:

- Provides the capability to send data from the host computer to the plotter at a higher speed, by shortening the signal timing values.
- Provides a path for data to be sent from the plotter to the host, such as solicited and unsolicited status (media jam, plot finished, etc.)
- Reduced user interaction: The host software can request information of the plotter directly (such as “amount of available memory?”) instead of prompting the user.
- The specification allows PCs with existing parallel-port hardware to participate in bidirectional communication with a peripheral by installing new parallel-port driver software; no new PC hardware is necessary.

The IEEE-1284 specification provides for two levels of compliance for the electrical characteristics of an interface. The interface for the plotters meets the Level 1 electrical requirements.

The IEEE-1284 specification defines five modes of operations for an interface. The interface for the plotters implements Compatibility and Nibble modes.

Host-to-peripheral data-transfer handshaking is performed by a hardware state machine. Peripheral-to-host handshaking is performed by the main processor in response to an interrupt.



**Serial Hardware** The main processor controls the DTR (Data Terminal Ready) signal using a bit in the parallel I/O control register. Whenever the power to the plotter is on, RTS (Request To Send) is set active. No other modem signals are controlled or monitored.

**Serial Input/Output Initialization** The reset state of the DTR signal is undefined. During initialization, the main processor first sets the DTR control bit to 1, which signals the host that the interface cannot accept data. Later the processor sets the UART configuration register and the baud-rate select register using the configuration data from the EEROM.

### **DRAM**

Two MBytes of DRAM for system use and I/O data storage reside permanently on the Main PCA. In addition, a 72-pin socket for the industry-standard DRAM SIMM is provided for optional memory. The socket supports a DRAM SIMM of 2 MB, 4 MB, or 8 MB.

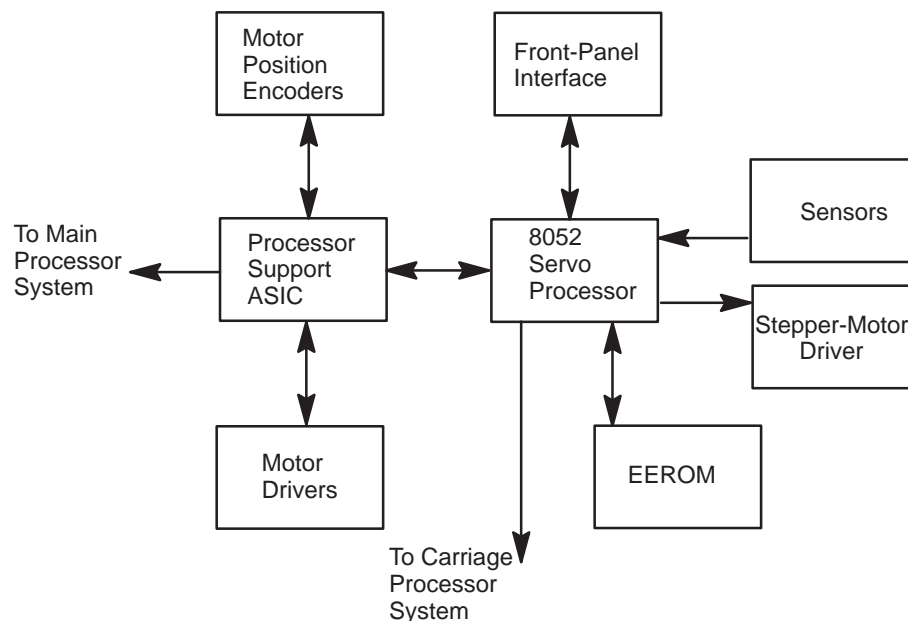
### **Power-On Reset Signals**

Power-on reset signals are used to initialize the processor-support ASIC, shuffler ASIC and servo processor. The processor support ASIC generates a reset signal to initialize the main processor. A power-on reset signal disables the EEROM to prevent loss of data during power transitions. The components that generate the reset signals guarantee valid signals once the logic supply (+5V) exceeds 2.0 V.

## Servo Processor System

The servo processor system consists of the following:

- Servo processor (8052)
- Processor support ASIC
- Front-panel interface
- Stepper-motor driver
- Carriage-processor interface
- Various sensor inputs
- EEROM



Servo Processor System

### Servo Processor

The servo processor controls all of the plotter actuators. Executing the commands issued by the main processor, it reads the carriage and roller position from the processor support ASIC and writes the needed control data to the PWM (Pulse Width Modulation) generators in that ASIC. Through a serial link, the servo processor sends nozzle-timing data to, and receives carriage-sensor data from, the carriage processor.

### Processor Support ASIC

The processor support ASIC provides support for the servo processor, and an interface between the main processor and the servo processor.

### **Front-Panel Interface**

The front panel consists of nine LEDs and eight switches. The servo processor interface to the front panel consists of nine control signals and two sense signals.

### **Stepper-Motor Driver**

The servo processor controls a stepper motor used for print-cartridge servicing and alignment.

### **Carriage-Processor Interface**

The servo-processor serial port is used to communicate with the carriage processor.

### **Sensors**

Four sensors provide input to the servo processor:

- The **window sensor** is a mechanical switch that detects if the window has been raised. This serves the purpose of a safety interlock. While the window is raised, the servo processor halts any carriage movement.
- The **media sensor** detects the presence of media in the media path. It is also used to determine media size.
- The **pinch-arm sensor** detects whether the pinch-arms have been raised. The servo processor uses the sensor to determine the pinch-arm position during the initialization sequence.
- The **bail sensor** detects whether the bail has been raised. The servo processor uses the sensor to determine the bail position during the initialization sequence.

### **EEROM**

A serial EEROM is used as nonvolatile storage for calibration and configuration data. This data is typically unique for the plotter. It includes the following information:

- RS-232 configurations
- Certain front-panel selections
- Pen-pallet information
- Constants created during the various plotter calibrations

The EEROM is soldered to the Main PCA (both new and rebuilt). Should the EEROM be cleared or the Main PCA replaced, perform all calibrations. (Details ♦ chapter 7.)

The servo processor drives the EEROM control signals, chip select and shift clock. A reset signal disables the chip select during power transitions to reduce loss of data.

## **Power Components**

The following are the power components on the main PCA:

### **Carriage and Media Motor Drivers**

Two motor driver ICs and heatsinks.

### **Print-Cartridge Voltage Regulator**

To regulate the amount of energy given to the print-cartridge heating resistors, a precise voltage regulator controls the print-cartridge voltage supply. The regulator power device is located on the main PCA, but the cartridge resistors and drivers are located on the carriage PCA. To reduce the effect of the long path between the voltage regulator output and the cartridge resistors, an active sense circuit on the carriage PCA feeds back an error signal to the main PCA. On the carriage PCA, the cartridge supply voltage is sensed by a precision resistor divider and compared with 2.5V reference. This error is amplified, buffered, and transmitted to the main PCA through the trailing cable. The voltage is regulated by a regulator on a heatsink.

### **Fan Driver**

The plotter electronics are cooled by a fan, which may be turned on and off by the main processor. A two-pin connector is used for the fan. Pin 1 connects to the black wire of the fan harness and to the drain of a driver FET on the Main PCA. Pin 2 connects to the red wire of the fan harness and to +12V on the Main PCA.

---

## Carriage PCA

The carriage PCA has four main functions:

- The nozzle-timing ASIC controls the firing of the print cartridges, using data from the shuffler ASIC on the main PCA.
- A linear encoder senses the carriage position.
- A line sensor enables automatic print-cartridge calibration.
- A thermistor monitors the temperature near the print cartridges.

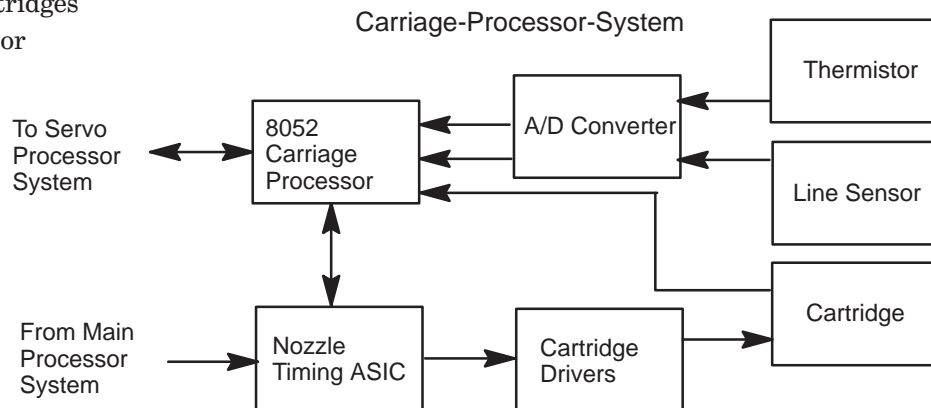
The carriage PCA is installed in the carriage assembly, component-side down to accommodate the operation of the linear encoder. A long 28-conductor cable (trailing cable) connects the carriage PCA to the main PCA.

**Voltage and Energy** The carriage PCA requires 5 V @ 670 mA and 20 V @ 61 to 218 mA. The regulator for the 20-V supply is located on the main PCA, but an active sense circuit on the carriage PCA senses the voltage at the high-frequency bulk charge source capacitors.

## Carriage Processor System

The carriage processor system consists of the following:

- Carriage processor
- Nozzle timing ASIC
- Servo processor interface
- Analog-to-Digital (A/D) Converter
- Print cartridges
- Line sensor



### Carriage Processor

The carriage processor's primary task is to configure the nozzle-timing ASIC. It receives the configuration data from the servo processor. It controls the A/D converter used in the line and temperature sensors, and senses print-cartridge identity and continuity. It returns status and sensor data to the servo processor.

### **Nozzle Timing ASIC**

The carriage processor dedicates its address/data bus to interface with the nozzle-timing ASIC. The ASIC is also connected to the shuffler ASIC by a synchronous serial channel. The nozzle-timing ASIC applies the shuffled data it receives from the shuffler ASIC to the cartridge drivers, controlling the firing time and sequence of the print-cartridge nozzles.

The outputs controlling the print cartridge drivers are disabled while the reset signal is active. A voltage supervisor monitors the logic supply (+5V) and generates a reset signal to prevent firing nozzles during power transitions. The falling threshold for reset is 4.71V worst case.

### **Servo Processor Interface**

The carriage-processor serial port is used to communicate with the servo processor. The servo processor controls the carriage-processor reset signal.

### **A/D Converter**

The carriage processor controls an eight-channel serial A/D converter. The processor drives the A/D-converter control signals, chip select and shift clock.

### **Print Cartridges**

**Nozzle Testing** The carriage processor can verify the firing of each print-cartridge nozzle. Firing a nozzle causes a voltage drop at the ballast resistor for that nozzle. A comparator senses the voltage drop at each ballast resistor and outputs a pulse to a processor counter. This enables the processor to determine whether each print cartridge is inserted properly.

**Temperature Sensing** A thermistor mounted on the carriage PCA allows the carriage processor to sense ambient temperature. The processor can adjust the amount of energy delivered to a print cartridge by changing the nozzle firing time through the nozzle timing ASIC. The plotters compensate for changes in ambient temperature and self heating of the print cartridges based on the data provided by the carriage processor.

### **Line Sensor**

The plotters calibrate the writing system to compensate for alignment errors due to mechanical tolerances using an optical line sensor. The sensor is capable of precisely measuring, within the field of view of the sensor, the position of one line relative to another. The sensor measures both horizontal and vertical line positions. The plotters also use this sensor to determine the location of the media edges in the carriage sweep axis.

**Operation** The sensor employs a quad photo diode array with illumination from a diffuse LED. A simple optical system employing two lenses forms an image of the test pattern on the photo diode array. A transimpedance amplifier converts the current generated in each photo diode to a voltage. The carriage processor samples the resulting voltage through the A/D converter.

**Accuracy** The accuracy of the line sensor after self-calibration when measuring lines spaced at 1/300 inches is 0.3 mil. When determining the position of the left or right media edge, the sensor accuracy is 6 mil.

---

## Front Panel PCA

The plotters use the same front-panel PCA as the DeskJet 550. The front-panel consists of nine LEDs and eight switches, mounted on the PCA, which is deeply recessed behind a plastic housing containing the key pad. The keys act on the switches through push rods. Light pipes transmit the light from the LEDs to the display area.

### LEDs

The LEDs are driven by drivers on the main board, under the control of the servo processor. The LED layout is shown below:

led[1]	led[4]	led[7]
led[2]	led[5]	led[8]
led[3]	led[6]	led[9]

Front-Panel LEDs

### Key Pad

The keypad layout is shown below:

led[2]	led[3]	led[6]	led[7]	
Switch[1]	Switch[2]	Switch[3]	Switch[4]	key[0]
Switch[5]	Switch[6]	Switch[7]	Switch[8]	key[1]

Front-Panel Key Pad

The switches are connected as a 4x2 matrix. The switch matrix, when scanned, is driven by the four LED control signals led[2], led[3], led[6] and led[7]. The servo processor scans the switch matrix by setting, in turn, each of the four control signals to '0' while holding the other three at '1'. While driving the switch matrix, the processor reads the signals key[0], and key[1]. A '1' on a key signal indicates a closed switch.

---

## Power Supply

An auto-ranging power supply is located in the electronics enclosure. It accepts and automatically adjusts to an ac input of 90 V through 264 V and produces regulated voltages of +5 V, +12 V and -12 V, and an unregulated +24 V. These voltages are used as follows:

Voltage	Use
+24 V	Motor drivers and voltage regulator on the main PCA. (Regulated +20 V for cartridge circuits on the carriage PCA).
+12 V	Fan power and RS-232 driver.
-12 V	RS-232 driver.
+5 V	IC power and sensors.

The primary portion of the supply contains fusing and input protection circuitry, line filters, and a rectifier. The primary output is converted to a pulse-width-modulated (PWM), unidirectional current by a flyback dc-to-dc converter.

The secondary portion of the power supply contains the four secondary windings of the transformer that convert the PWM current in the primary to four ac voltages, which are rectified to the +5 V, +12 V, -12 V and +24 V dc voltages required by the plotter. Standard +12 V and -12 V regulators are included in the secondary portion of the power supply.

---

### **WARNING**

**The primary side of the power supply contains rectified line voltage that can be lethal when touched even if the ON/OFF switch is OFF.**

**Remove the power plug before working inside the electronics enclosure. Also, leave the power-supply insulating door closed when you need to work on the main PCA only.**

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Removal and  
Replacement

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## Safety Precautions

(Safety symbols ▶ Immediately after the table of contents.)

Review WARNING and CAUTION symbols and instructions before you service the plotters. Follow these warnings and cautions for your protection and to avoid damaging the plotter.

- 
- WARNING**    **Serious shock hazard leading to death or injury may result if you do not take the following precautions:**
- Ensure that the ac power outlet (mains) has a protective earth (ground) terminal.**
  - Disconnect the plotter from the power source prior to performing any maintenance.**
  - Prevent water or other liquids from running onto electrical components or circuits, or through openings in the enclosure.**
- 

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## ESD Precautions

To prevent damage to the plotter circuits from high-voltage electrostatic discharge (ESD)

- 1** Do not wear clothing that is subject to static build-up.
- 2** Do not handle integrated circuits (ICs) in carpeted areas.
- 3** Do not remove an IC or a printed circuit assembly (PCA) from its conductive foam pad or conductive packaging until you are ready to install it.
- 4** Ground your body while disassembling and working on the plotter.
- 5** After removing a cover from the plotter, attach a clip lead between the PCA common and earth ground. Touch all tools to earth ground to remove static charges before using them on the plotter.
- 6** After removing any PCA from the plotter, place it on a conductive foam pad or into its conductive packaging to prevent ESD damage to any ICs on the PCA.

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## Reassembly

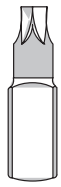
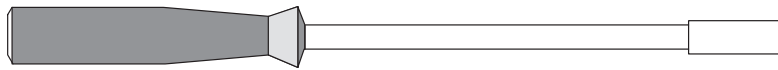
Most of the procedures in this chapter describe how to disassemble the plotter. Unless otherwise specified, reassemble the parts in the reverse order of disassembly.

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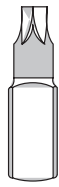
## Required Tools

The following are the tools required to disassemble and repair the plotters.

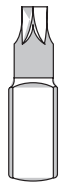
- Long Torx screwdriver with the indicated attachments:



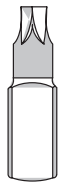
T8



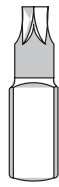
T9



T10



T15

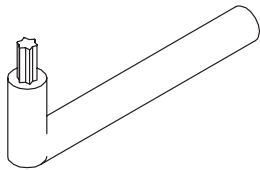


T20

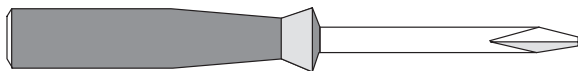


T25

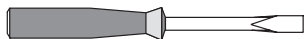
- 90° Torx-15 key:



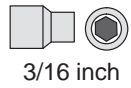
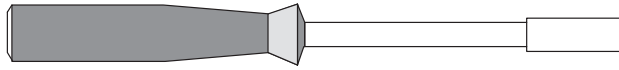
- Pozidriv PZ1 screwdriver:



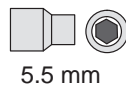
- Small flat-blade screwdriver:



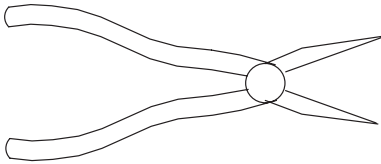
- Nut driver with indicated attachments:



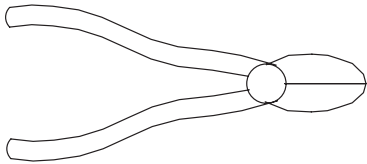
and



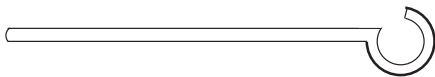
- Needle-nose pliers



- Cutting pliers



- Spring hook

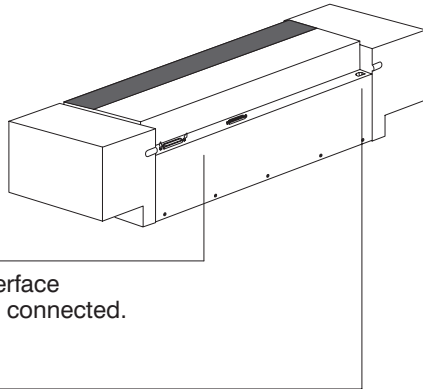


- Loopback connector (HP Part Number 07440-60302)
- 10X Magnifier

## Repair Procedures

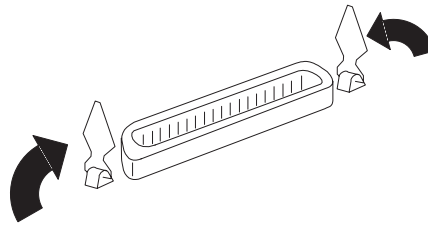
### Removing the Electronics-Enclosure Cover

- 1 Ensure that the plotter is switched **off** and that the power cord and interface cable(s) are not connected to it.



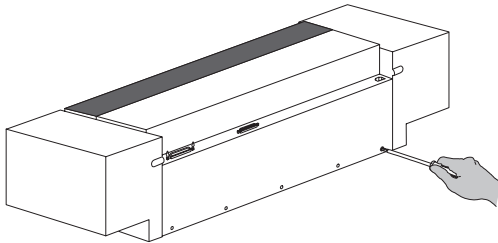
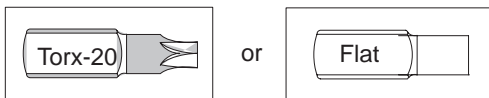
Power inlet: cord not connected

- 2 At the back of the plotter, ensure that the two small wire clamps of the parallel port are positioned vertically.

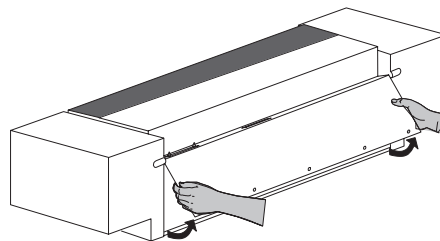


- 3 Remove the screws that attach the electronics-enclosure cover to the electronics enclosure.

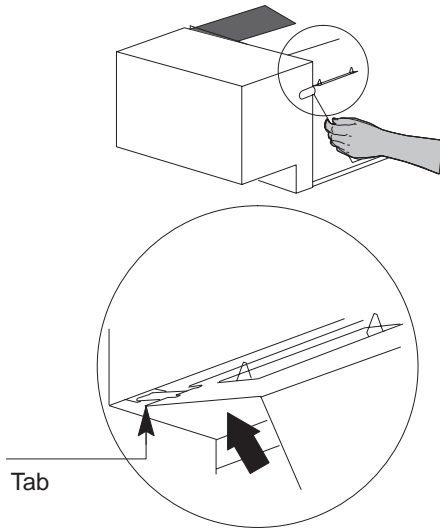
*D/A1-size plotters have four screws.  
E/A0-size plotters have five screws.*



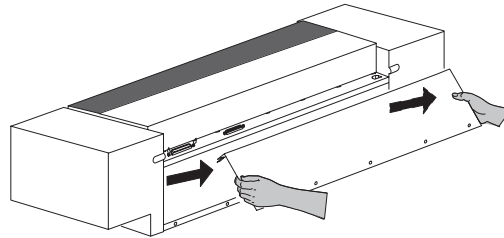
- 4 Gently lift open the electronics-enclosure cover to an angle of 45°.



- 5** Push the cover up so that its tabs can slide out of the slots at the top of the electronics enclosure.



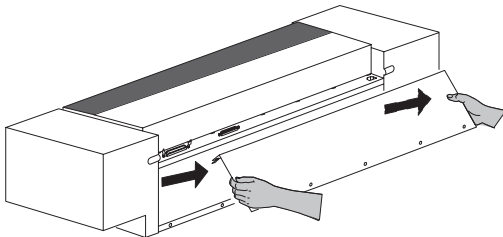
- 6** Carefully pull the cover clear of the plotter.



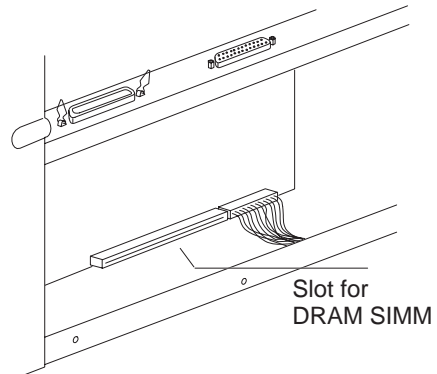
## Removing the Memory Module (DRAM SIMM)

The user may have installed an optional DRAM SIMM in the plotter. Perform the following procedure, if you need to remove it:

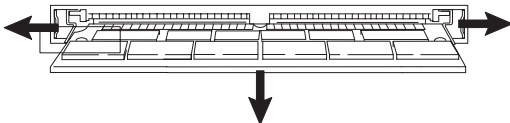
- 1 Read *ESD Precautions* ▶ page 6-2.
- 2 Remove the electronics-enclosure cover ▶ page 6-5.



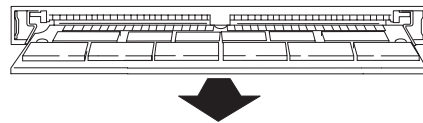
- 3 Locate the DRAM-SIMM slot at the bottom of the main PCA.



- 4 While pushing the two metal springs apart at the ends of the slot, tilt the outer edge of the DRAM SIMM downwards.

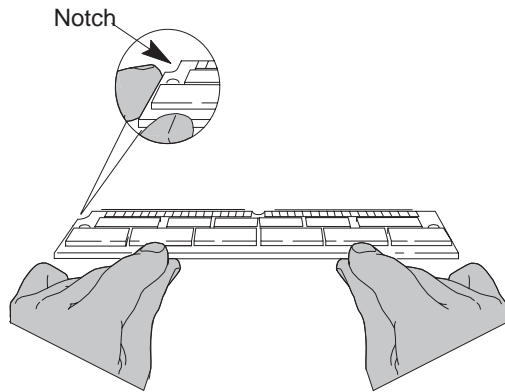


- 5 Once the DRAM SIMM is released from the springs, gently pull it clear of the slot.

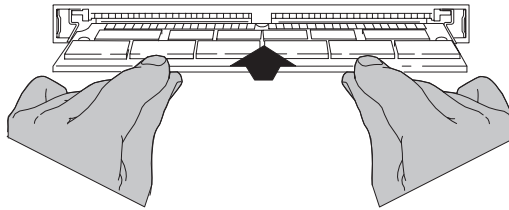


To reinstall the SIMM, perform the following procedure:

- 1 Hold the memory module by its edges with the non-metallic edge toward you and the notch to your left.




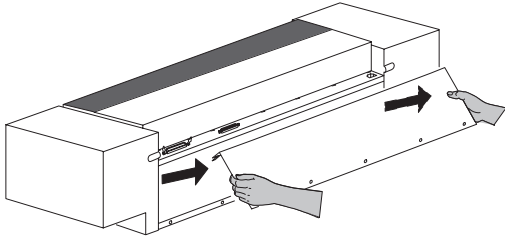
- 2 Tilt the non-metallic edge downwards and firmly push the module into the slot. Gradually tilt the module upwards and push it in until it clicks into place.



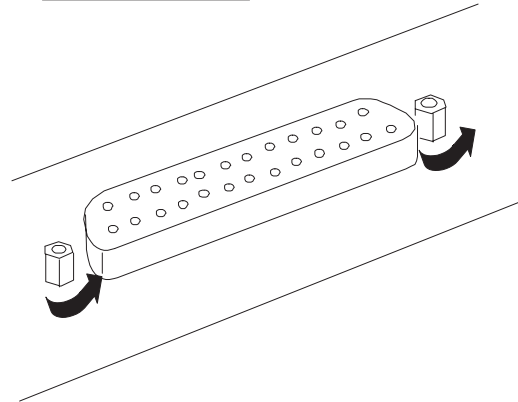
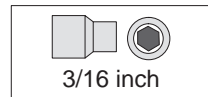


## Removing the Main PCA

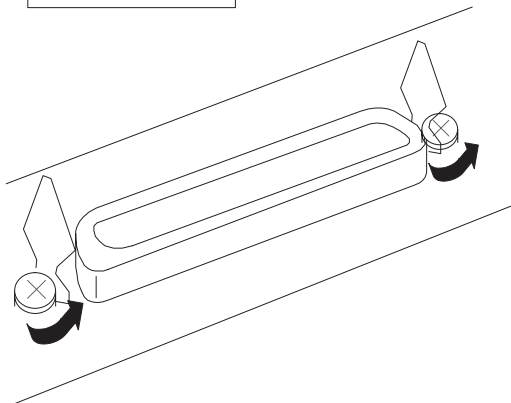
- 1 Remove the electronics-enclosure cover  page 6-5.



- 2 Remove the two screws from the serial (RS-232-C) connector.

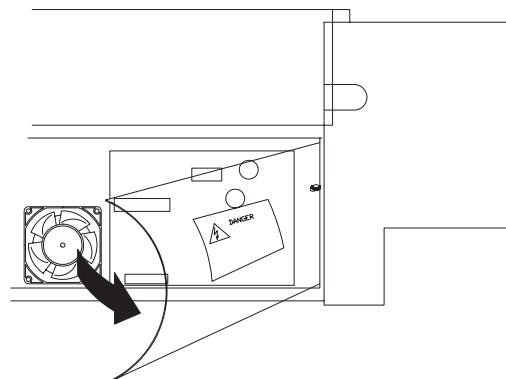


- 3 Remove the two screws from the parallel connector.



- 4 D/A1-size plotters only: Open the flexible, "DANGER HIGH VOLTAGE," insulation cover.

*Flex the cover to open it. Do not detach the cover from the plotter.*

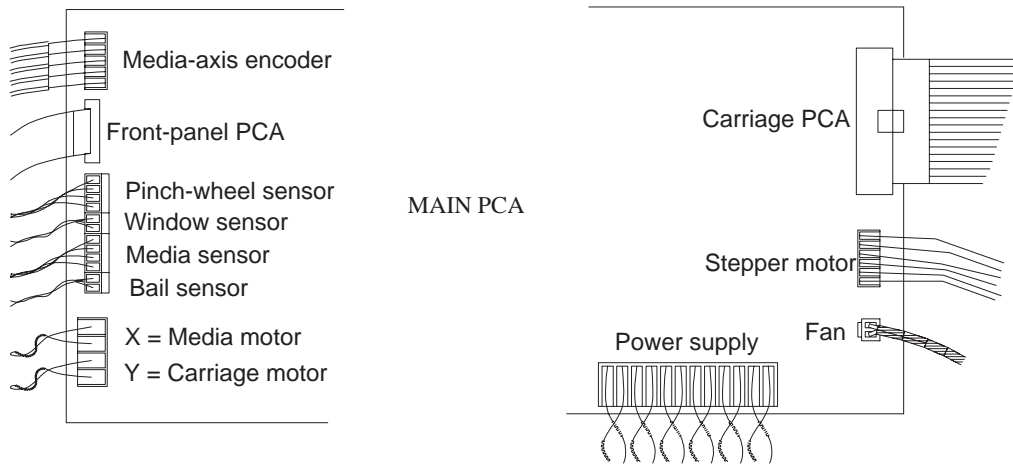


- 5 Disconnect all 12 cable connectors from the main PCA.

**CAUTION**

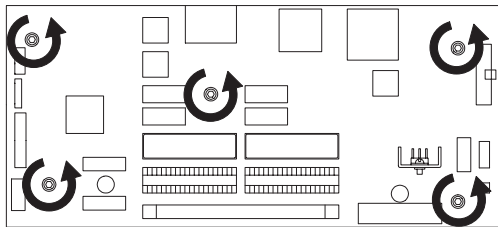
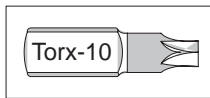
Do not force the front-panel PCA cable out of its clamp. First pull the clamp gently towards you to release the cable; then pull the cable easily out of the clamp.

**Reassembling:** Make sure to connect all cables in the correct orientation and to the correct sockets.

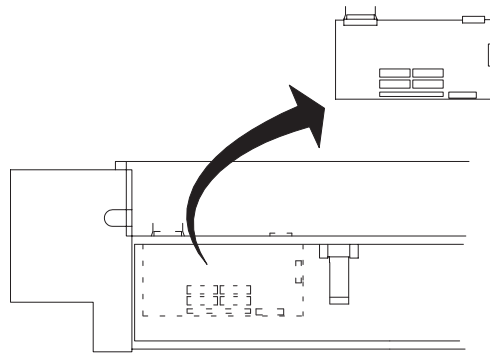


- 6 Remove the five screws that secure the main PCA to the electronics enclosure.

**Reassembling:** Temporarily leave the screws loose; tighten the serial and parallel connector screws first; then tighten the PCA screws.

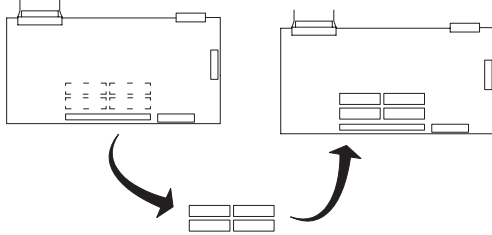


- 7 Lift the main PCA clear of the plotter.

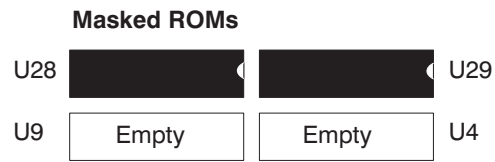
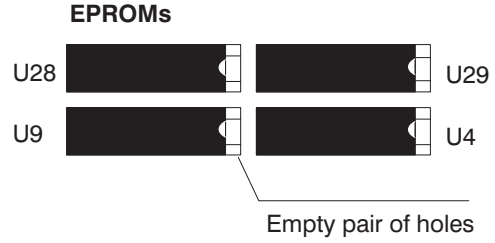


If you are installing a new PCA, perform the following extra steps:

- 8** Remove the original EPROMs or masked ROMs from their sockets, and install them on the new PCA.

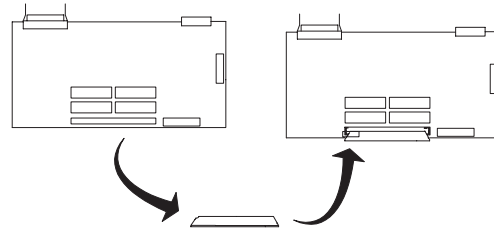


The original PCA contains **either** four EPROMs **or** two masked ROMs. The EPROMs each have one pair of pins less than the masked ROMs; if you are installing EPROMs, leave the rightmost pair of holes empty in each socket.



(Part numbers ▶ chapter 10.)

- 9** If a SIMM is installed on the original PCA, remove it and install it on the new PCA.

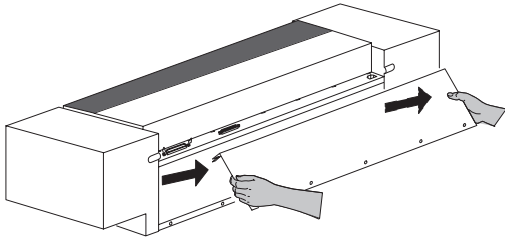


**Calibrations:** After having installed a new main PCA, perform the following calibrations in the given order (Details ▶ chapter 7):

1. Bail calibration
2. Media-sensor calibration
3. Cartridge alignment
4. Accuracy calibration
5. Setup-sheet calibration

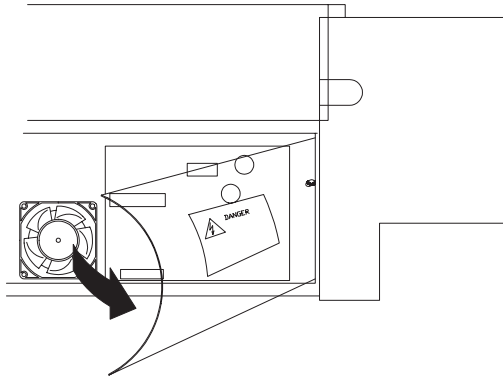
## Removing the Power-Supply PCA

- 1** Remove the electronics-enclosure cover → page 6-5.

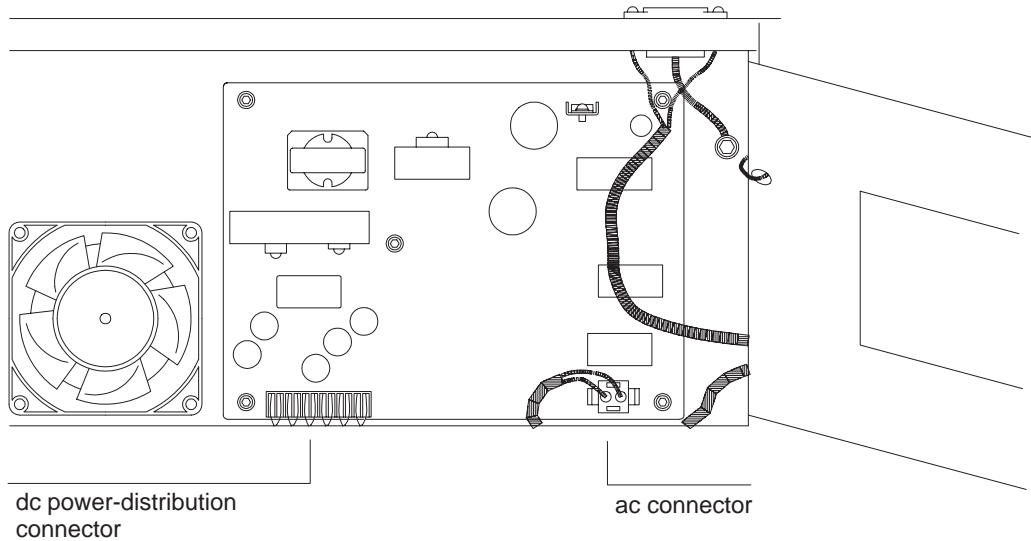


- 2** Open the flexible, “DANGER HIGH VOLTAGE,” insulation cover.

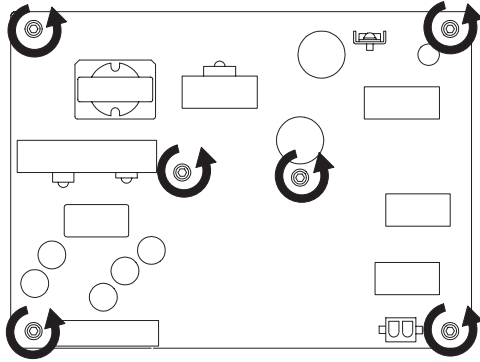
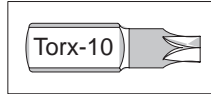
*Flex the cover to open it. Do not detach the cover from the plotter.*



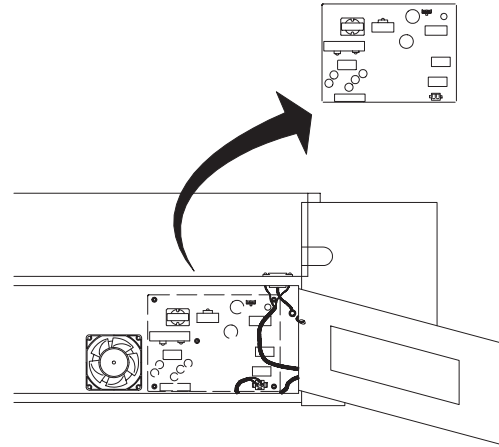
- 10** Disconnect the ac connector and the dc power-distribution connector from the power-supply PCA.



- 3** Remove the six screws that secure the power-supply PCA to the electronics enclosure.



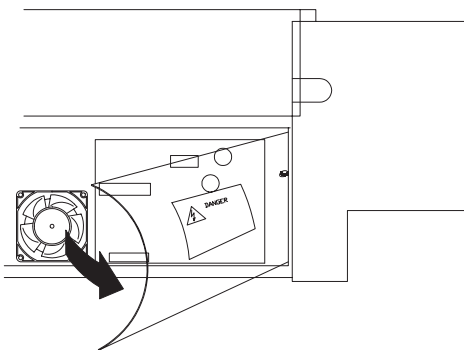
- 4** Lift the power-supply PCA clear of the plotter.



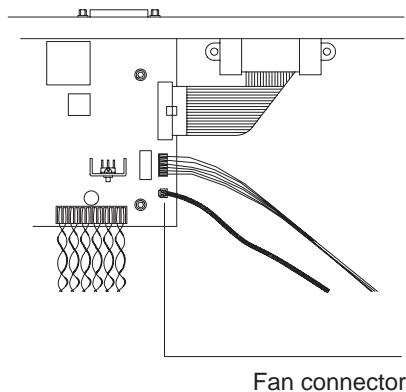
## Removing the Fan

- 1 Remove the electronics-enclosure cover ▶ page 6-5.
- 2 Open the flexible, “DANGER HIGH VOLTAGE,” insulation cover.

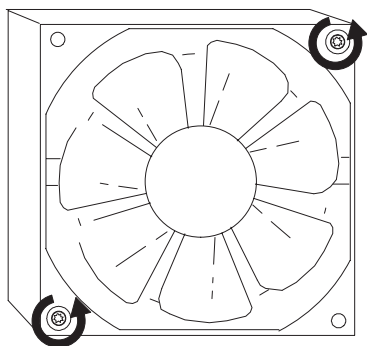
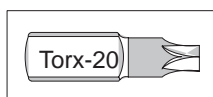
*Flex the cover to open it. Do not detach the cover from the plotter.*



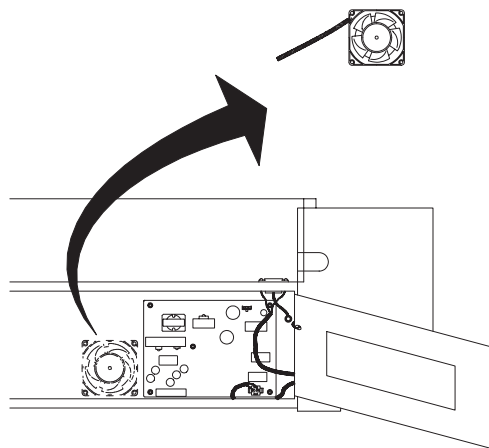
- 3 Disconnect the fan connector from the main PCA and holding clip.



- 4 Remove the two screws that secure the fan to the electronics enclosure.



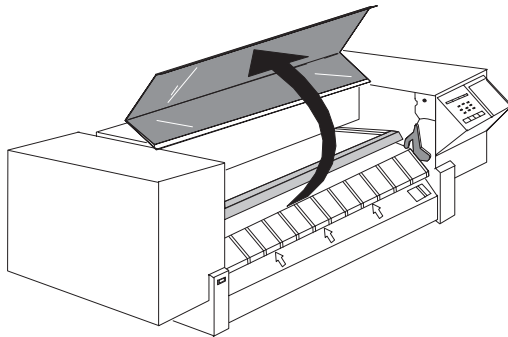
- 5 Lift the fan clear of the plotter.



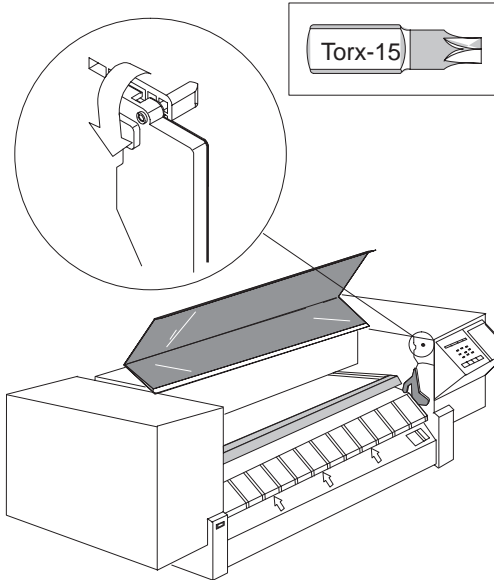
**Reassembling:** Airflow should be inwards. See indication on fan.

## Removing the Window

1 Open the window.

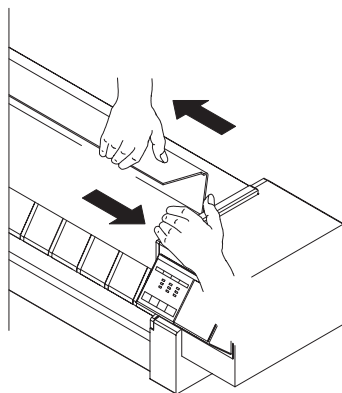


2 Loosen the top screw of the right front trim (two full turns).



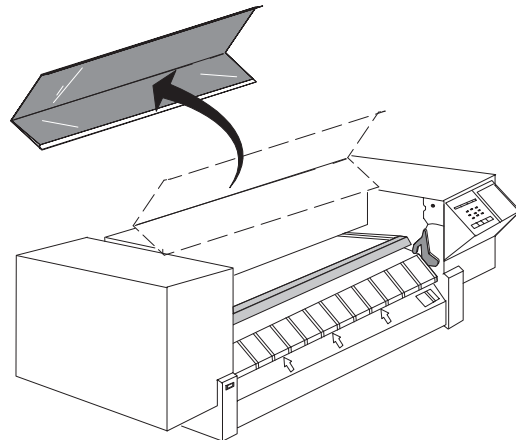
3 Carefully push the right endcover and the window apart, far enough to lift the window up so that the right pivot just clears its socket.

*Do not lever the window up more than is necessary, so as not to strain or break the left pivot.*



4 Move the window to the right so that the left pivot slides out of its socket, and lift the window clear of the plotter.

*Do not let the window-pivot springs drop out of the endcovers.*



## Removing the Center Cover

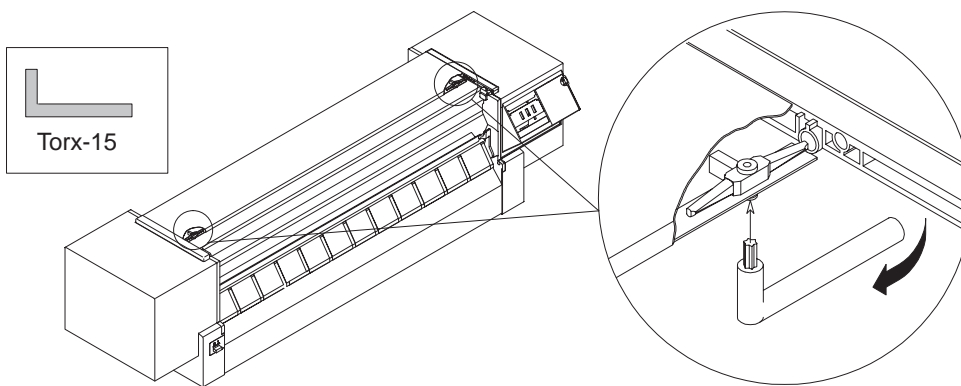
- 1 Remove the window ▶ page 6-15.

### WARNING

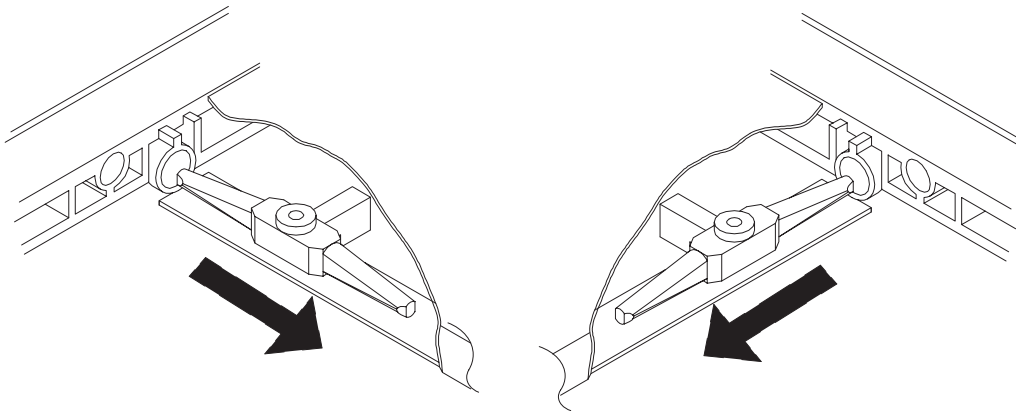


In the following steps, take care not to cut yourself on the encoder strip inside the plotter.

- 2 Loosen the two latch screws on the underside of the center cover.



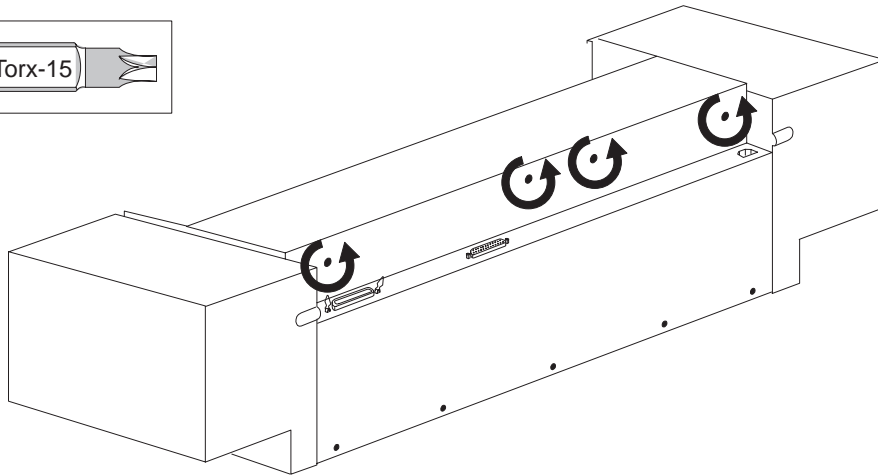
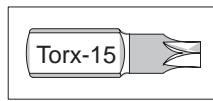
- 3 Slide the two latches horizontally towards the center of the plotter, clear of the two endcovers.



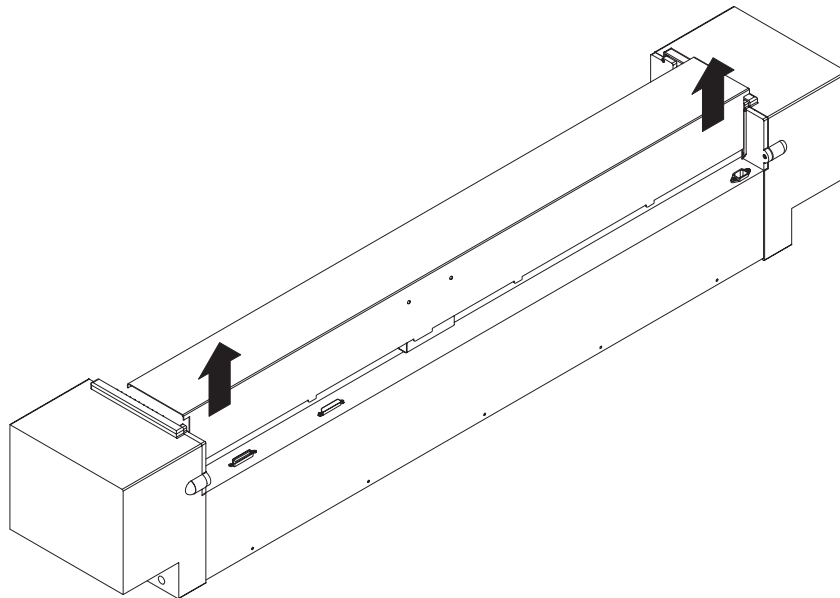


4 Remove the screws from the back of the center cover.

*D/A1-size plotters have two screws. E/A0-size plotters have four screws.*

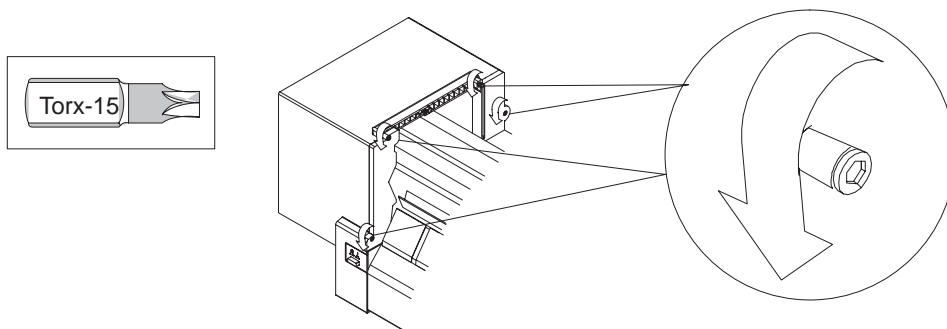


5 Slide the center cover vertically upwards, and lift it clear of the plotter.



## Removing the Left Endcover

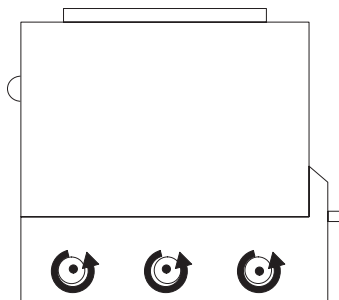
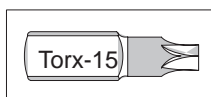
- 1 Remove the window [▶ page 6-15](#), and the center cover [▶ page 6-16](#).
- 2 Remove the two screws on the left front trim and the two screws on the left back trim.



### CAUTION

**Reassembling:** When replacing screws on any plastic part, always begin by gently twisting the screw in anticlockwise with your hand, until the screw finds the thread path and clicks, and then twisting the screw in clockwise with your hand, before using a screwdriver. This is to avoid cross-threading. Do not over-tighten the screws.

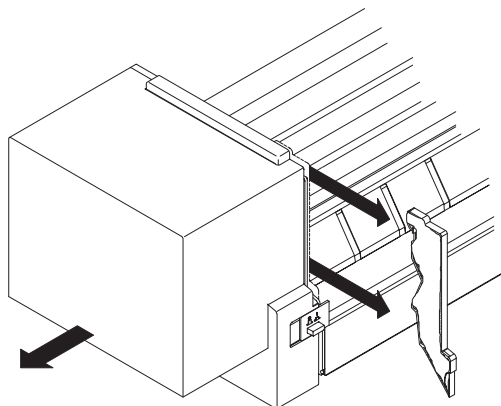
- 6 Remove the three screws from the left side of the left endcover.



- 3 If the plotter is mounted on legs, **loosen** the two left-hand screws that attach the plotter to the legs.

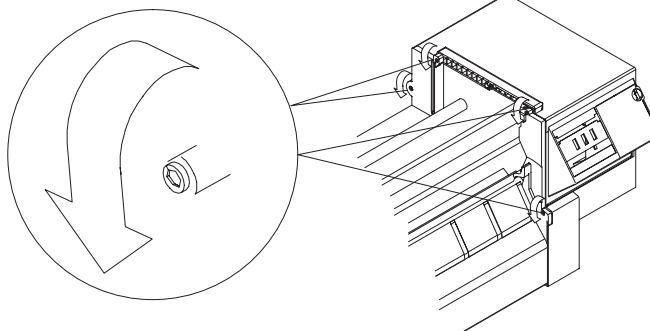
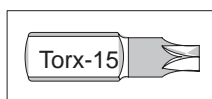
- 4 Maintaining an even pressure on the top and bottom of the endcover, pull it to the left, away from the plotter.

*Do not let the window-pivot spring drop out of the endcover.*



## Removing the Right Endcover

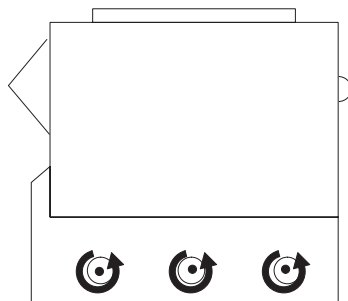
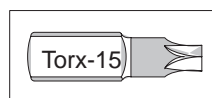
- 1 Remove the window [▶](#) page 6-15, and the center cover [▶](#) page 6-16.
- 2 Remove the two screws on the right front trim and the two screws on the right back trim.



### CAUTION

**Reassembling:** When replacing screws on any plastic part, always begin by gently twisting the screw in anticlockwise with your hand, until the screw finds the thread path and clicks, and then twisting the screw in clockwise with your hand, before using a screwdriver. This is to avoid cross-threading. Do not over-tighten the screws.

- 5 Remove the three screws from the right side of the right endcover.



- 3 If the plotter is attached to a plotter stand, **loosen** the two right-hand screws that attach the plotter to the stand.

- 4 Maintaining an even pressure on the top and bottom of the endcover, pull it to the right, away from the plotter.

### CAUTION

Do not stress or apply pressure to the front-panel assembly.

*Do not let the window-pivot spring drop out of the endcover.*

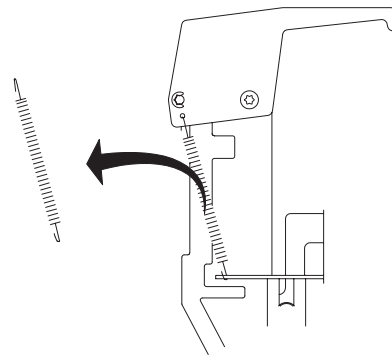
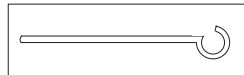
**Reassembling:** Note the upper and lower grooves the endcover engages on the front panel.

## Removing the Automatic Cartridge-Adjust Linkage

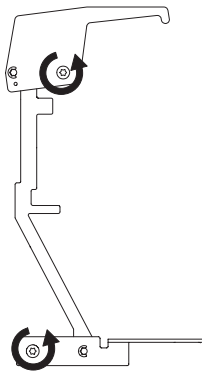
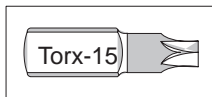
- 1 Remove the window ▶ page 6-15.
- 2 Remove the center cover ▶ page 6-16.
- 3 Remove the left endcover ▶ page 6-18.

- 4 Detach the linkage spring from the Y-tensioner bracket.

**Reassembling:** Attach the spring through the two small holes, as in the diagram.



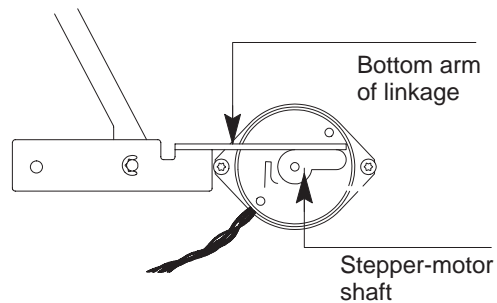
- 5 Remove the two shoulder screws that attach the automatic cartridge-adjust linkage to the left sideplate and lift the linkage clear of the plotter.



### CAUTION

**Reassembling:** Do not cross-thread or over-tighten the screws.

**Reassembling:** Rest the bottom arm of the linkage on top of the stepper-motor shaft.

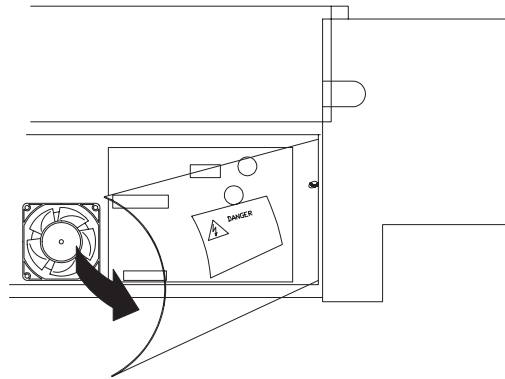


## Removing the Stepper Motor

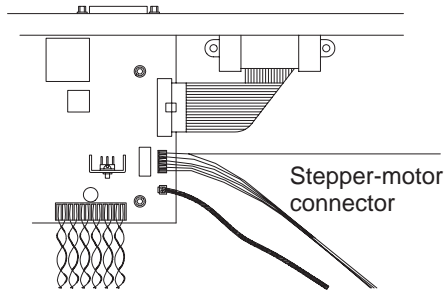
- 1 Remove the electronics-enclosure cover ▶ page 6-5.
- 2 Remove the window ▶ page 6-15.
- 3 Remove the center cover ▶ page 6-16.
- 4 Remove the left endcover ▶ page 6-18.

- 5 Open the flexible, “DANGER HIGH VOLTAGE,” insulation cover.

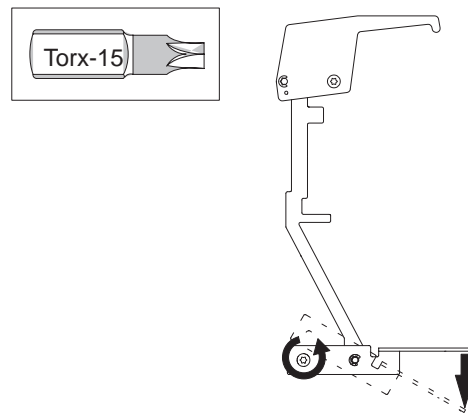
*Carefully flex the cover to open it. Do not detach the cover from the plotter.*



- 6 Disconnect the stepper-motor cable connector from the main PCA and the holding clip.

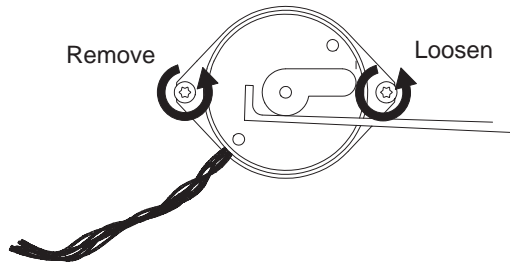
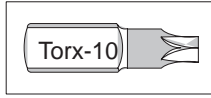


- 7 Remove the bottom shoulder screw on the cartridge-adjust linkage, and lower the lever arm below the stepper motor.



**Reassembling:** Rest the bottom arm of the linkage on top of the stepper-motor shaft.

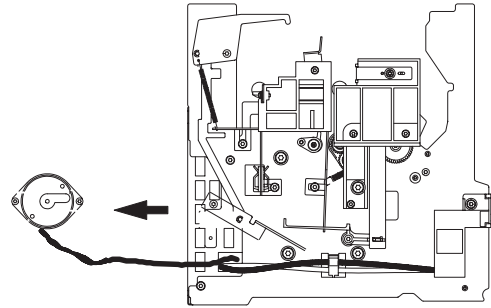
- 8** Loosen the right screw and remove the left screw that attaches the stepper motor to the left sideplate.



**CAUTION**

**Reassembling:** Do not cross-thread or over-tighten the screws.

- 9** Move the stepper motor toward the rear of the plotter.



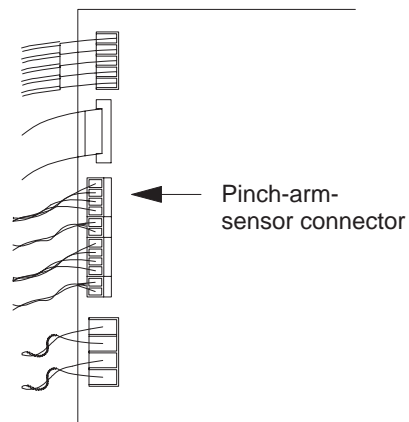
- 10** Pull the stepper-motor cable gently out from the electronics enclosure, through the hole in the left side of the electronics enclosure, and lift it and the stepper motor clear of the plotter.

## Removing the Pinch-Arm Sensor

- 1 Remove the electronics-enclosure cover ▶ page 6-5.
- 2 Remove the window ▶ page 6-15.
- 3 Remove the center cover ▶ page 6-16.
- 4 Remove the right endcover ▶ page 6-19.

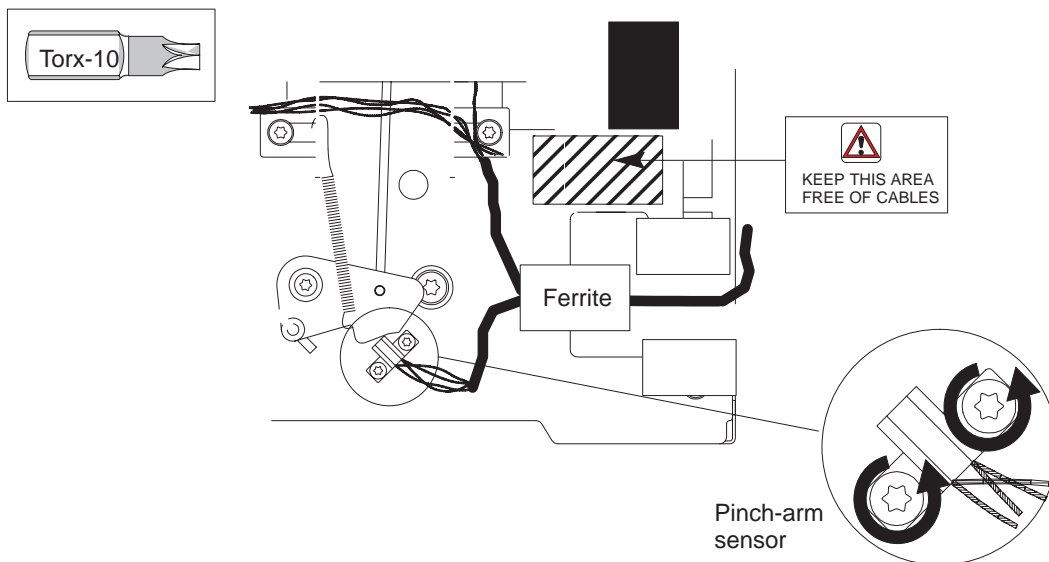
- 5 Disconnect the pinch-arm-sensor cable connector from the main PCA and from the ferrite on the right sideplate.

*The ferrite holder opens from the top.*



**Reassembling:** *The cable goes through the ferrite indicated in the diagram below.*

- 6 Remove the two screws that attach the pinch-arm sensor to the right sideplate.

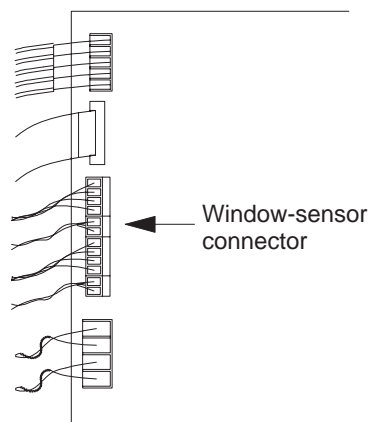


- 7 Lift the pinch-arm sensor, with cable, clear of the plotter.

## Removing the Window Sensor

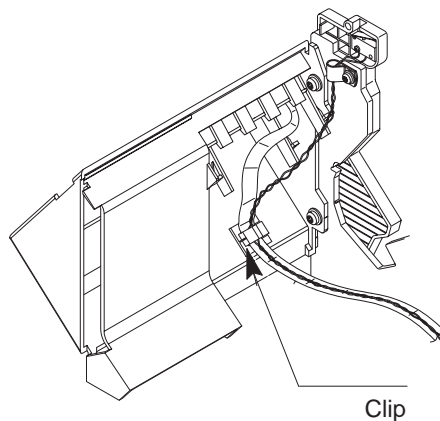
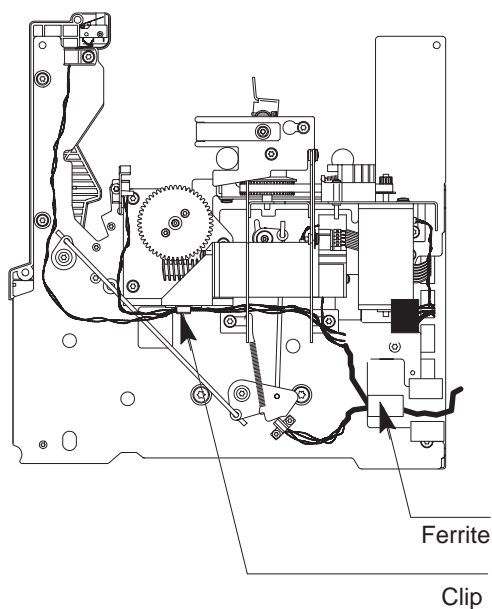
- 1 Remove the electronics-enclosure cover ▶ page 6-5.
- 2 Remove the window ▶ page 6-15.
- 3 Remove the center cover ▶ page 6-16.
- 4 Remove the right endcover ▶ page 6-19.

- 5 Disconnect the window-sensor cable connector from the main PCA.



- 6 Carefully feed the window-sensor cable out from the electronics enclosure and from under the motor assemblies, unclipping it from the holding clips and ferrite.

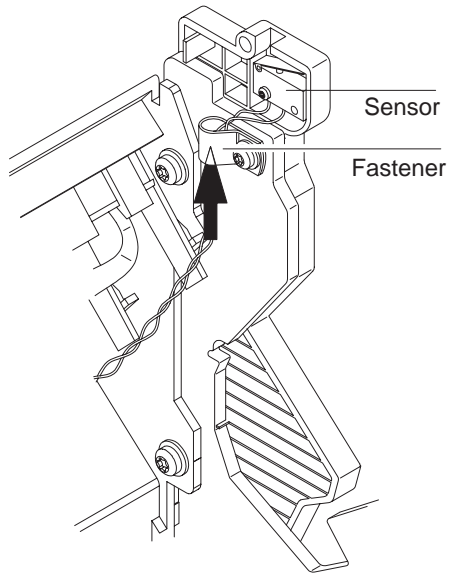
*The ferrite holder opens from the top.*



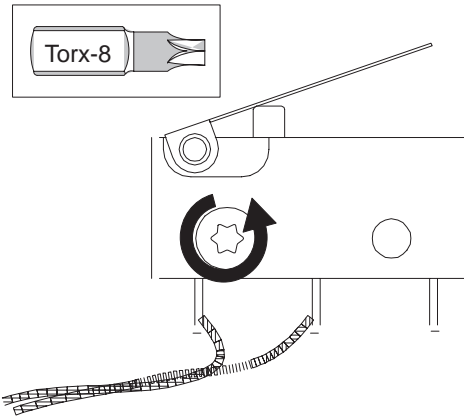
**Reassembling:** Position the cable correctly as indicated. Incorrect positioning could cause obstruction of the cartridge carriage or motor gears.



- 7 Slide the cable and connector up through the fastener near the right front trim.



- 8 Remove the screw that attaches the window sensor to the right front trim.



**CAUTION**

**Reassembling:** Do not cross-thread or over-tighten the screw.  
Torque = 3 lb in. ( $\approx$  0.35 Nm)

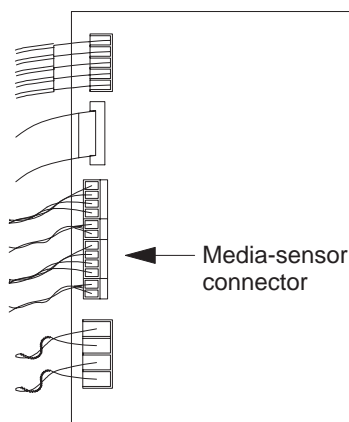
- 9 Lift the sensor, with cable, clear of the plotter.

## Removing the Media Sensor

- 1 Remove the electronics-enclosure cover ▶ page 6-5.
- 2 Remove the window ▶ page 6-15.
- 3 Remove the center cover ▶ page 6-16.
- 4 Remove the right endcover ▶ page 6-19.

- 5 Disconnect the media-sensor cable connector from the main PCA, and from the holding clip and ferrite on the right sideplate.

*The ferrite holder opens from the top.*

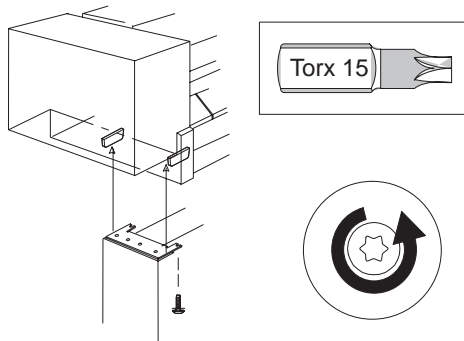


**Reassembling:** *The cable goes through the same ferrite as for the window sensor ▶ page 6-24.*

- 10 If the plotter is mounted on legs, remove the four screws that attach it to the legs.

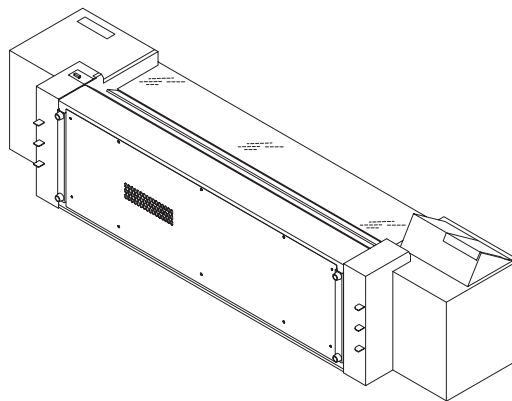
### **WARNING**

**Take care that the plotter does not fall and injure you.**



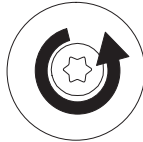
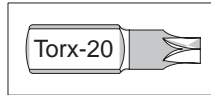
- 6 Place the plotter on a flat surface and turn it on its back.

*It requires two people to lift the plotter.*

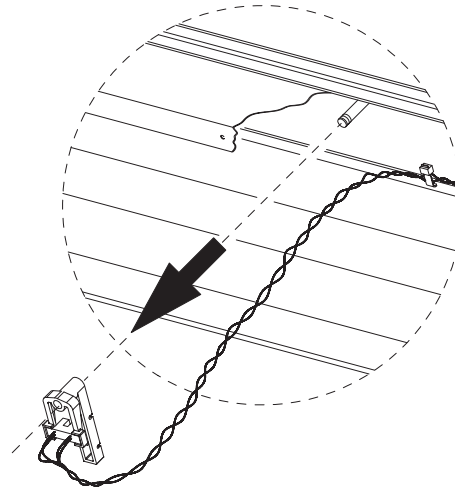


- 7 Remove the screws that attach the bottom cover to the plotter, and lift the cover clear of the plotter.

*D/A1-size plotters have 8 screws.  
E/A0-size plotters have 10 screws.*



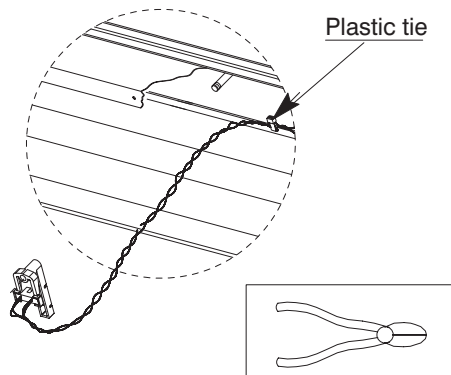
- 8 Pull the media sensor straight out towards you, freeing it from the underside of the entry platen.



- 9 Cut the plastic tie that fastens the media-sensor cable to the underside of the entry platen.

**CAUTION**

Take care not to cut the media-sensor cable itself.



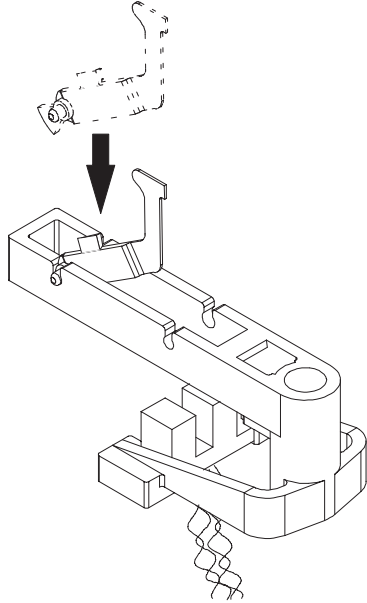
- 10 Lift the media sensor and cable clear of the plotter

**Reassembling:** Ensure that the two flags on the media sensor are correctly positioned (see following procedure).

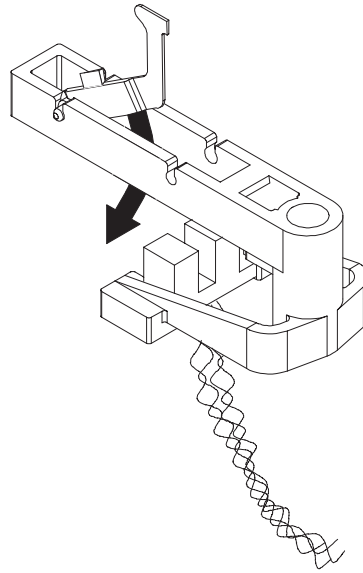
**Calibration:** After having reassembled the plotter, perform the media-sensor calibration (Details ▶ chapter 7).

## Replacing the Media-Sensor Flags

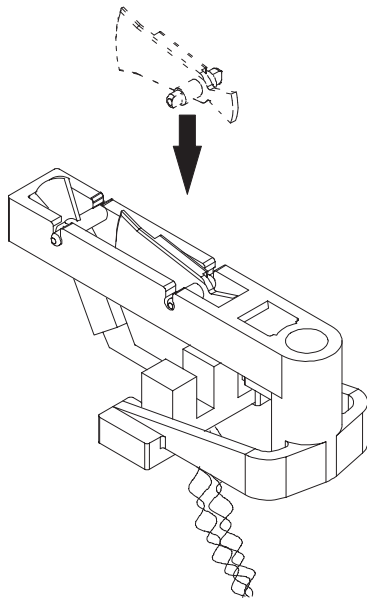
- 1** Insert the t-shaped flag in the indicated position.



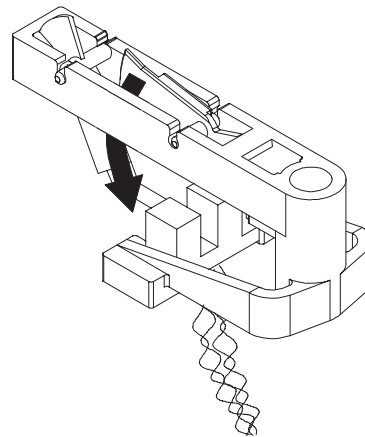
- 2** Let the t-shaped flag rotate to its correct position.



- 3** Insert the bell-shaped flag in the indicated position.



- 4** Let the bell-shaped flag rotate to its correct position.

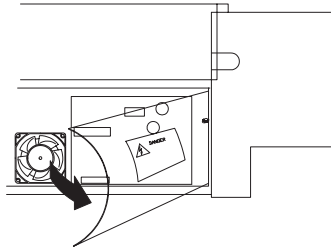


## Removing the Trailing Cable

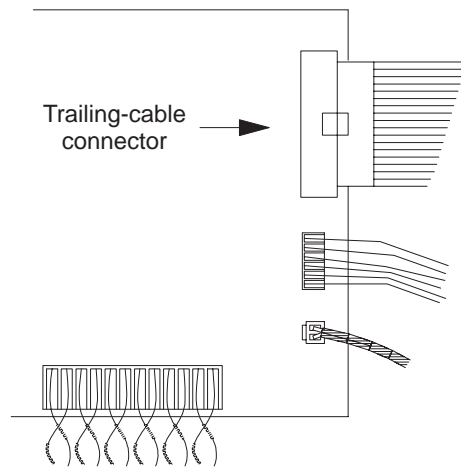
*If you are installing a new trailing cable, make sure the main PCA is compatible with it. (Details ▶ chapter 9.)*

- 1 Remove the electronics-enclosure cover ▶ page 6-5.
- 2 Remove the window ▶ page 6-15.
- 3 Remove the center cover ▶ page 6-16.
- 4 D/A1-size plotters only: Open the flexible, DANGER HIGH VOLTAGE, insulation cover.

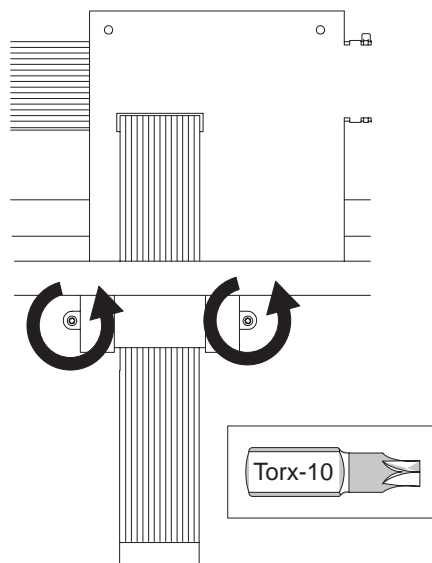
*Flex the cover to open it. Do not detach the cover from the plotter.*



- 5 Disconnect the trailing-cable connector from the main PCA.



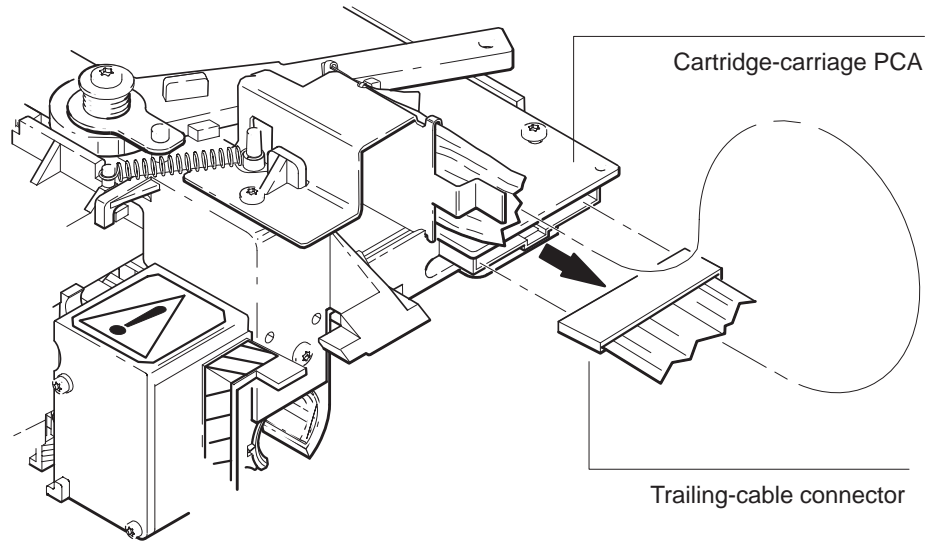
- 6 Remove the two screws that attach the toroid to the rear of the electronics enclosure.



- 7 Pull off the two endcaps of the toroid and remove the toroid from the trailing cable.

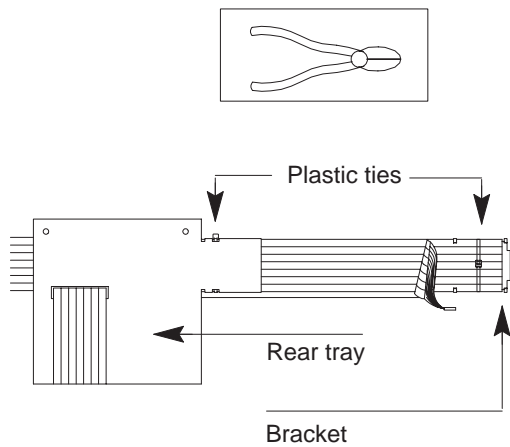


8 Disconnect the trailing-cable connector from the cartridge-carriage PCA.



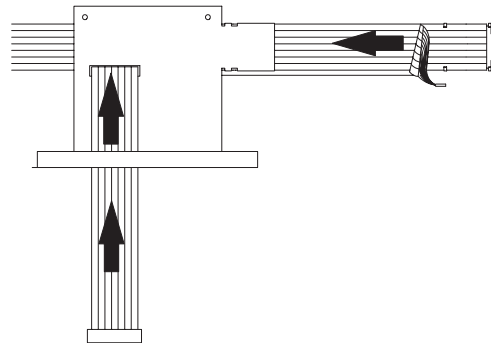
9 If you need to change the trailing cable:

a Cut the two plastic ties that hold the cable to the rear tray and bracket.



**Reassembling:** Replace the ties with new ones.

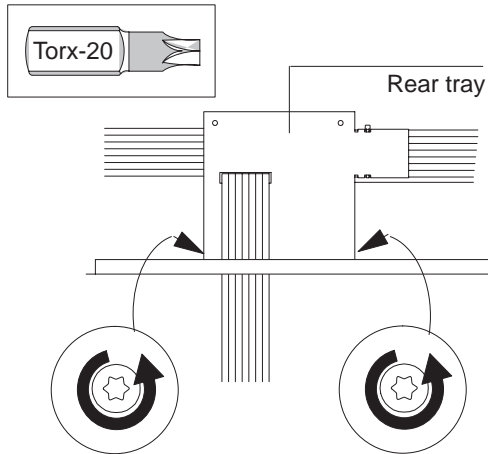
b Free the cable from the rear tray and bracket, pulling it up through the slot at the top of the electronics enclosure assembly.



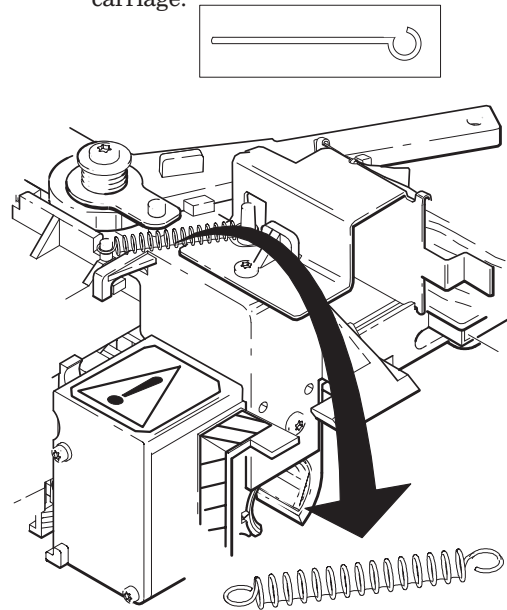
c Use the old trailing cable as a template to bend and crease the new trailing cable to exactly match the creases in the old trailing cable.

**10** If you don't need to change the trailing cable, but do need to remove it to access other parts:

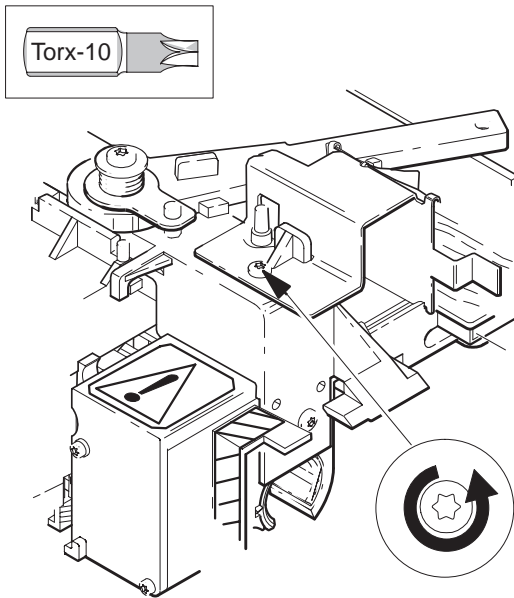
**a** Remove the two screws that attach the trailing-cable rear tray to the top of the electronics enclosure.



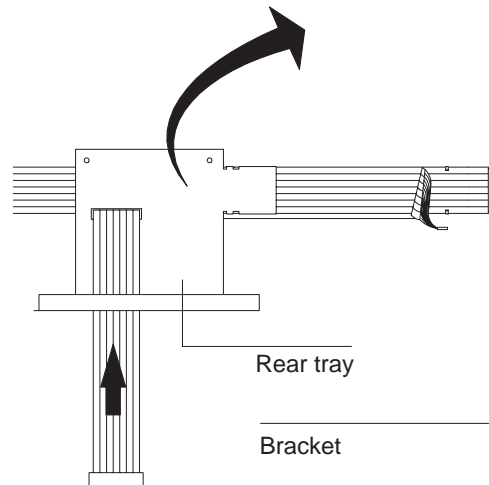
**b** Carefully remove the right-hand cartridge spring from the cartridge carriage.



**c** Remove the trailing-cable-bracket screw from the cartridge carriage.



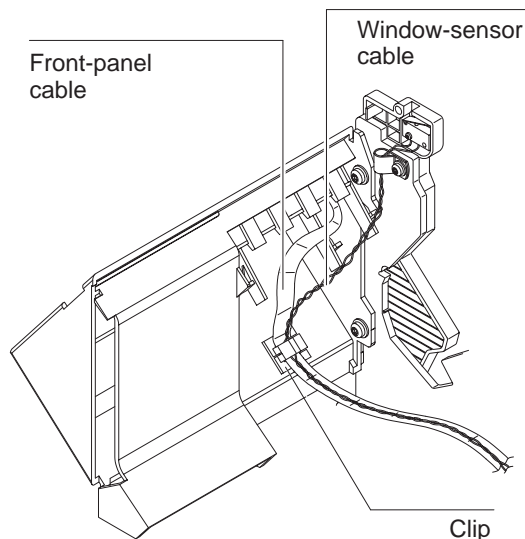
**d** Pull the trailing cable up through the slot at the top of the electronics enclosure assembly and lift it, with rear tray and bracket, from the plotter.



## Removing the Front-Panel Assembly

- 1 Remove the electronics-enclosure cover ♦ page 6-5.
- 2 Remove the window ♦ page 6-15.
- 3 Remove the center cover ♦ page 6-16.
- 4 Remove the right endcover ♦ page 6-19.
- 5 Take note of the correct positioning of the front-panel cable for reassembling. Incorrect positioning could cause obstruction of the cartridge carriage or motor gears.

- 6 Unclip the window-sensor cable and front-panel cable from their holding clip on the underside of the front-panel assembly.

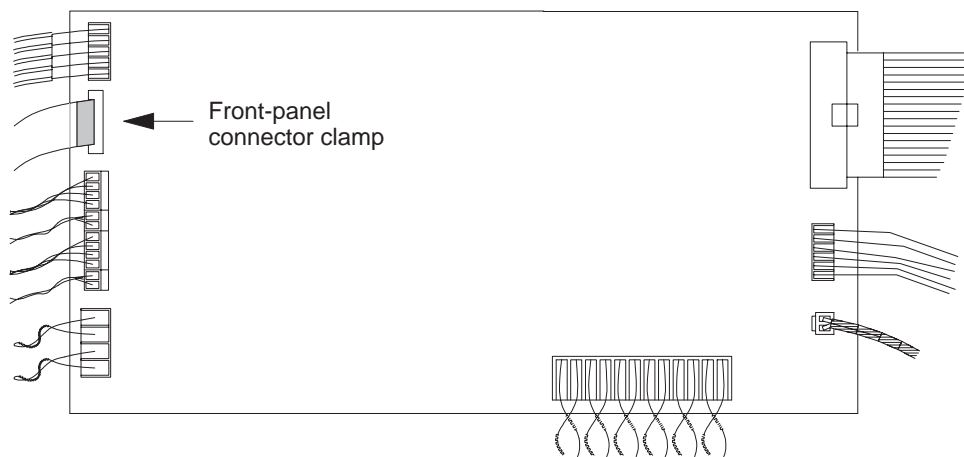


- 7 Release the front-panel cable from its clamp on the main PCA, and from its holding clip on the right side of the plotter.

### **CAUTION**

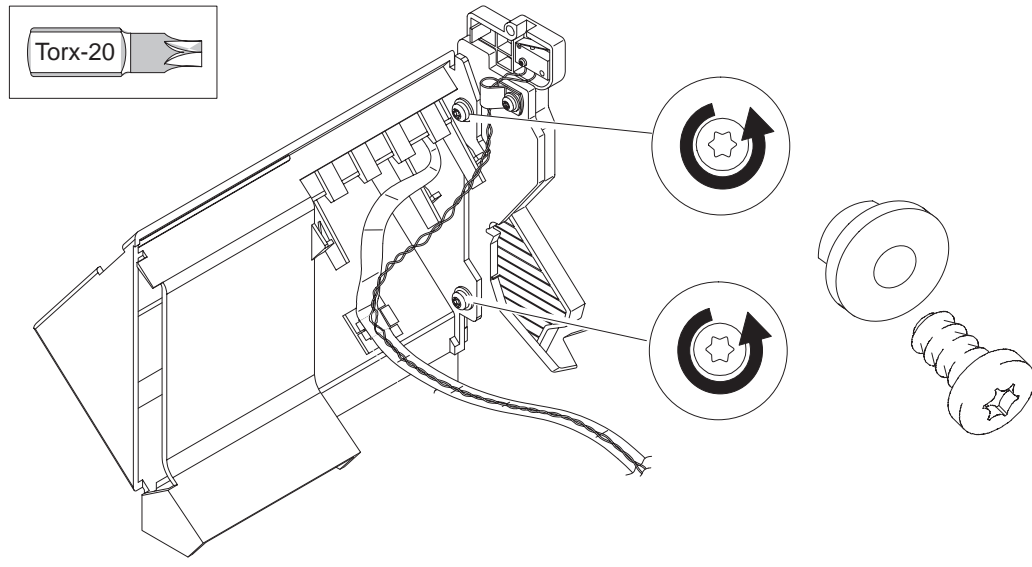
Do not force the cable out of its clamp. First pull the clamp gently towards you to release the cable; then pull the cable easily out of the clamp.

*Do not release the front-panel cable from its clamp on the front-panel PCA.*



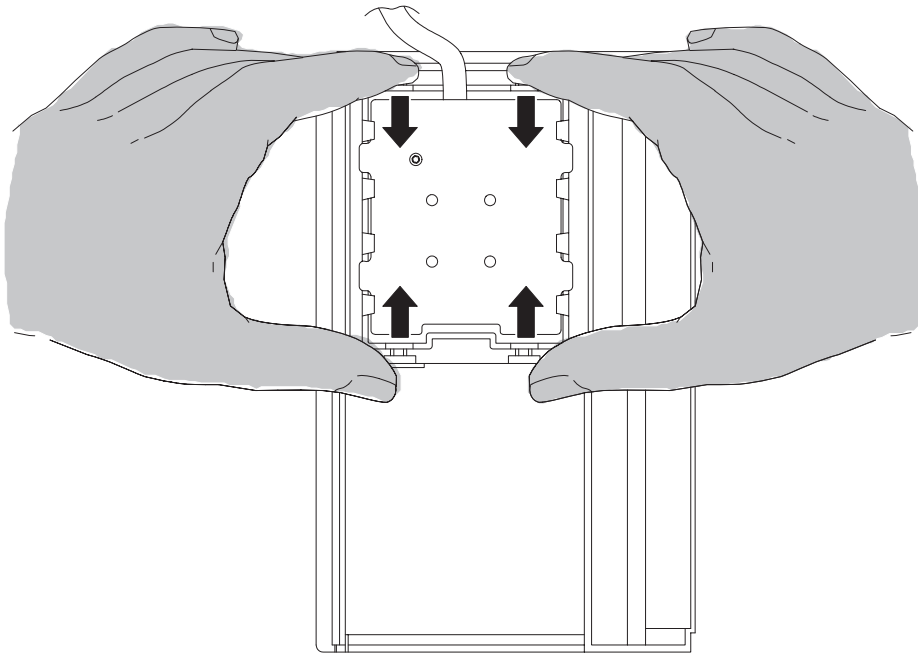


- 8 Carefully feed the front-panel cable out from the electronics enclosure, through the flat ferrite on the right sideplate, and out from under the motor assemblies.
- 9 Remove the two screws and washers that attach the front-panel assembly to the right side-plate, and lift the front-panel assembly, with cable, clear of the plotter.



## Removing the Front-Panel PCA and LED Assembly

- 1 Remove the electronics-enclosure cover ♦ page 6-5.
- 2 Remove the window ♦ page 6-15.
- 3 Remove the center cover ♦ page 6-16.
- 4 Remove the right endcover ♦ page 6-19.
- 5 Remove the front-panel assembly ♦ page 6-32.
- 6 On the underside of the front-panel assembly, press the four transparent plastic tabs inwards and remove the PCA and LED assembly.

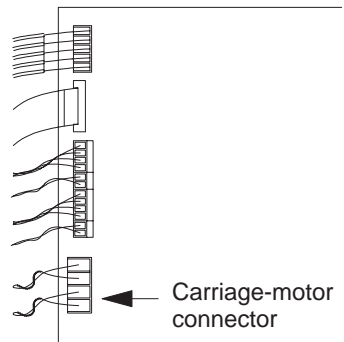


*The front-panel PCA and LED assembly (keyboard assembly) is one orderable part, which includes the front-panel keys and the cable.*

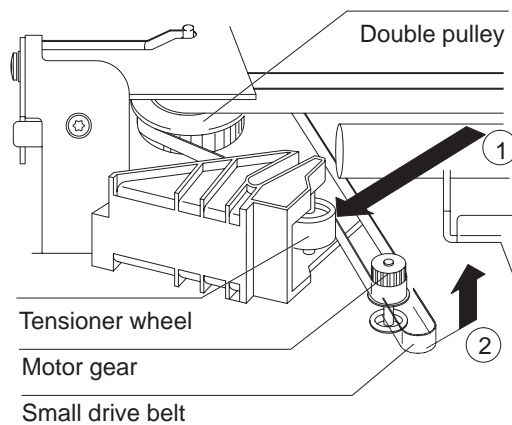
## Removing the Carriage (Y-Axis) Motor

- 1 Remove the electronics-enclosure cover ▶ page 6-5.
- 2 Remove the window ▶ page 6-15.
- 3 Remove the center cover ▶ page 6-16.
- 4 Remove the right endcover ▶ page 6-19.

- 5 Disconnect the carriage-motor cable from the main PCA (connector labelled Y), and from the lowest ferrite holder on the right-hand side of the plotter.

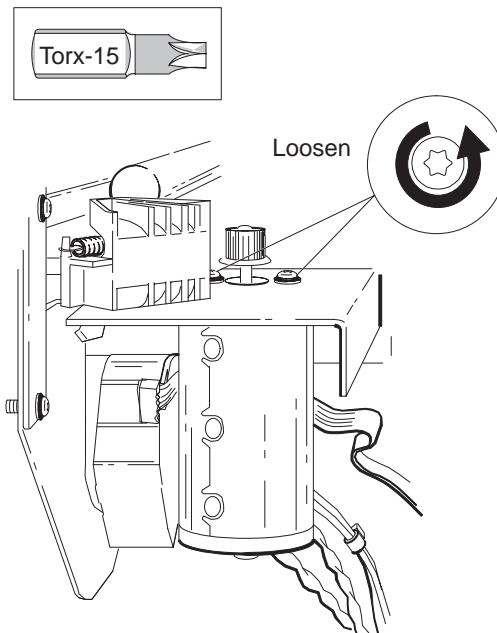


- 6 Pressing the small drive belt against the tensioner wheel in the belt tensioner to loosen the belt, slide the belt off of the motor gear; then carefully release your hand from the the tensioner wheel.

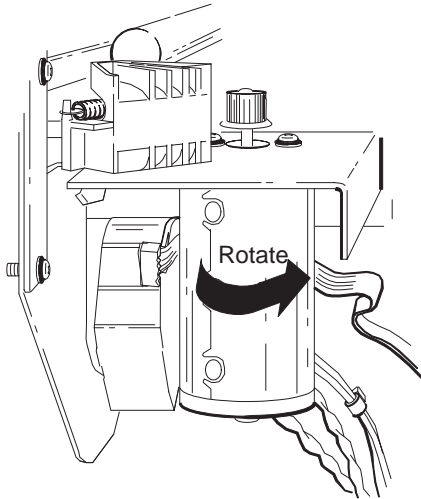


**Reassembling:** Ensure that the belt is correctly positioned around the carriage-motor gear and the lower part of the double pulley.

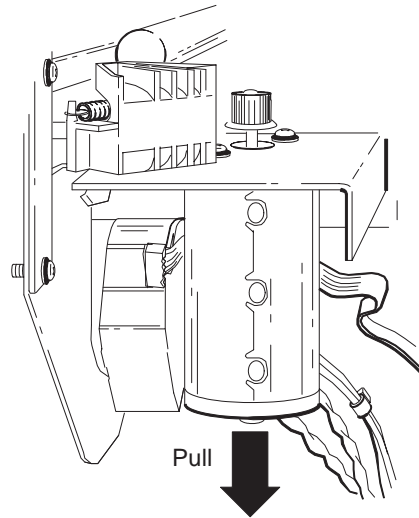
- 7 Loosen the two carriage-motor screws about 1/2 cm (about 1/4 inch).



**8** Rotate the motor in the indicated direction.



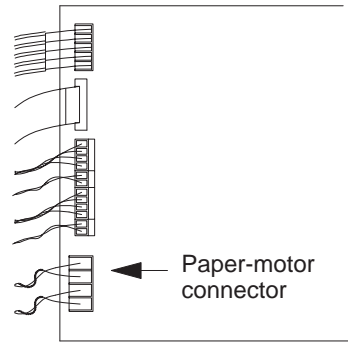
**9** Pull the motor down, clear of its bracket.



## Removing the Media (X-Axis) Motor

- 1 Remove the electronics-enclosure cover ▶ page 6-5.
- 2 Remove the window ▶ page 6-15.
- 3 Remove the center cover ▶ page 6-16.
- 4 Remove the right endcover ▶ page 6-19.
- 5 Remove the front-panel assembly ▶ page 6-32.
- 6 Remove the carriage motor ▶ page 6-35.

- 7 Disconnect the media-motor cable from the main PCA (connector labeled X) and from the uppermost ferrite holder on the right-hand side of the plotter.

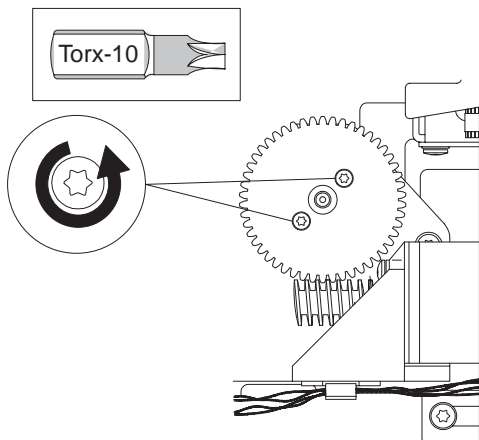


### WARNING



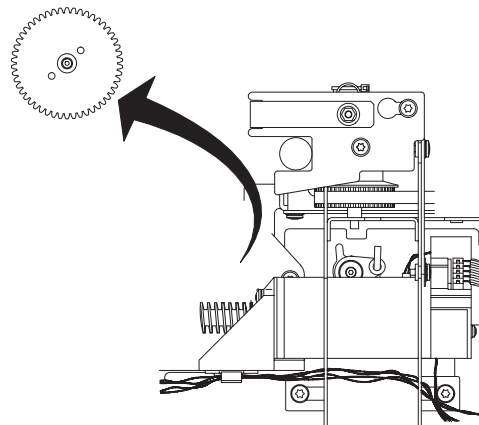
**In the following steps, take care not to cut yourself on the encoder strip.**

- 8 Remove the two screws that secure the drive-roller gear to the drive-roller shaft.



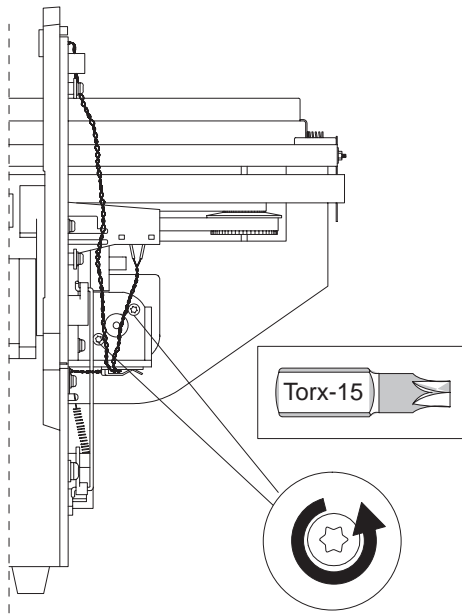
- 9 Remove the drive-roller gear from the drive-roller shaft.

*The gear may be stiff to remove.*



**Reassembling:** Push the gear onto the shaft as far as it will go. Align the holes on the gear with the holes on the shaft.

- 10** Remove the two screws that secure the media motor to the media-motor mount.



- 11** Pull the media motor towards the rear of the plotter.
- 12** Disconnect the flat encoder cable from the motor, and lift the motor clear of the plotter.

**Reassembling:** *The worm pinion and drive-roller gear mesh slightly during use. Don't install a new motor and an old gear, or vice versa: **install the gear that comes with the motor.** Apply the grease that comes with the new motor to the worm pinion and drive-roller gear.*

**Calibration:** *After having reassembled the plotter, perform the accuracy calibration (Details ↗ chapter 7.)*

## Removing the Encoder Strip

### WARNING



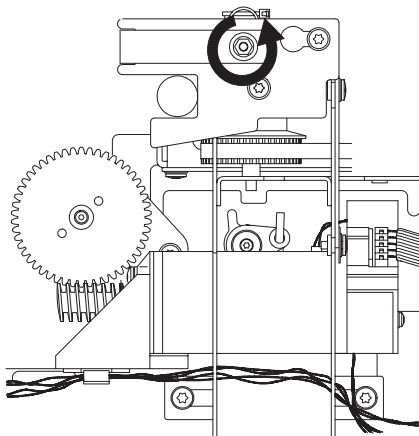
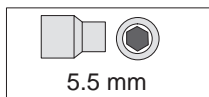
The encoder strip has very sharp edges; exercise care when handling to avoid personal injury.

### CAUTION

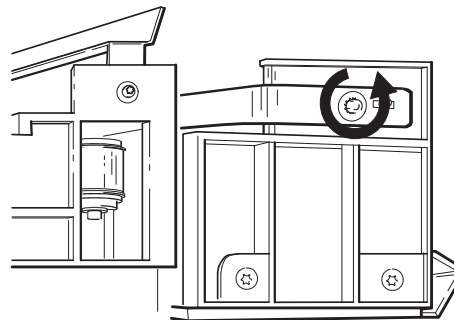
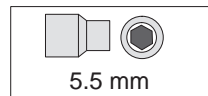
The encoder strip is fragile. Do not damage it. Lay it on a flat surface when it is not in the plotter.

- 1 Remove the window ▶ page 6-15.
- 2 Remove the center cover ▶ page 6-16.
- 3 Remove the right endcover ▶ page 6-19
- 4 Remove the left endcover ▶ page 6-18.

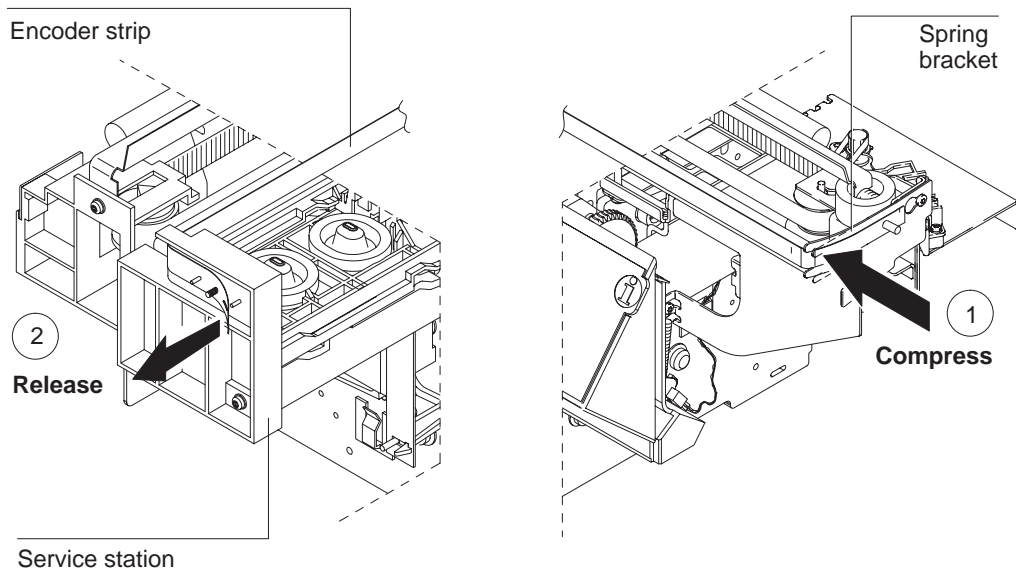
- 5 Remove the nut and washer that secure the encoder strip to the encoder spring-bracket on the right side of the plotter.



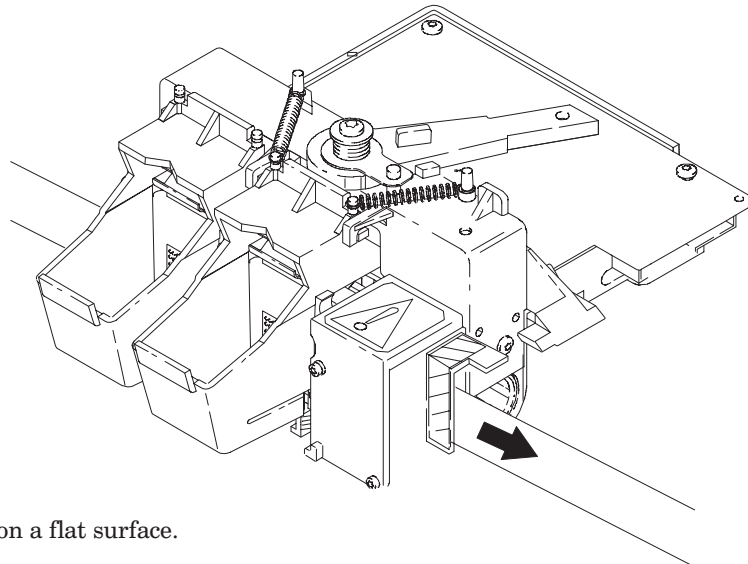
- 6 Remove the nut and washer that secure the encoder strip to the service station on the left side of the plotter.



- 7 Compressing the encoder spring-bracket to release tension on the encoder strip, carefully release the encoder strip from the service station.



- 8 Carefully pull the encoder strip through and out of the carriage assembly.



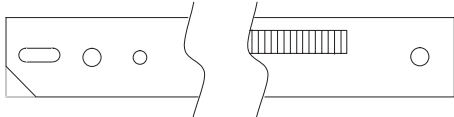
- 9 Lay the encoder strip on a flat surface.

**Reinstalling:** See following procedure.

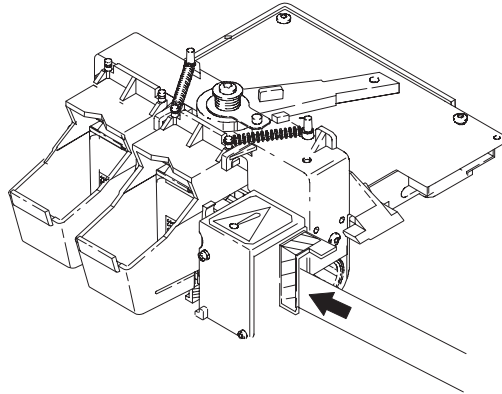


## Reinstalling the Encoder Strip

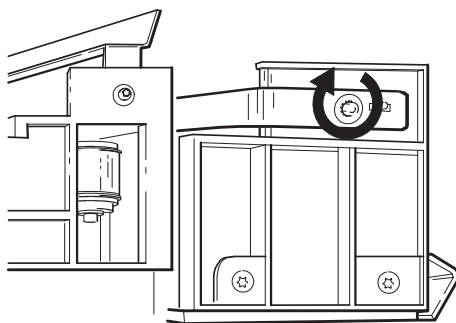
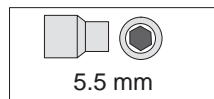
- 1** Ensure that the encoder strip is oriented with the transparent area up, and with three holes on the left side and one hole on the right side.



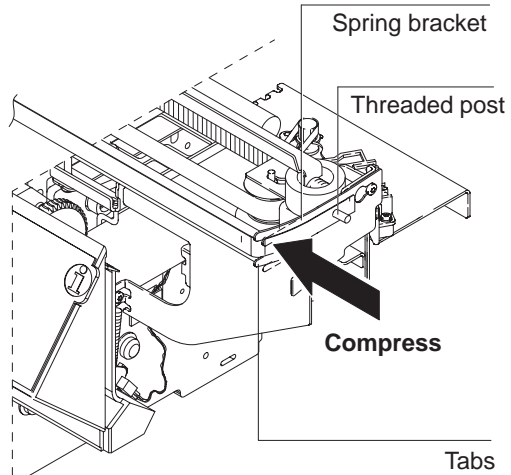
- 2** Thread the strip through the apertures in the cartridge-carriage assembly.



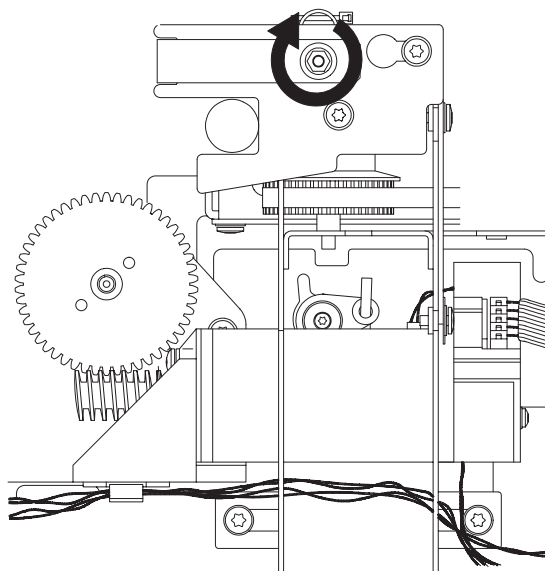
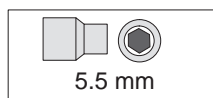
- 3** With washer and nut, secure the encoder strip to the service station.



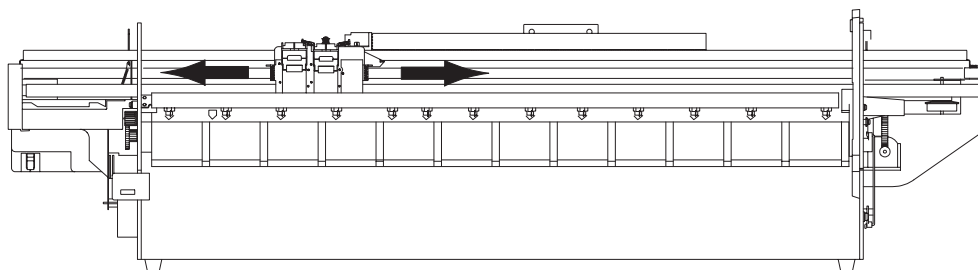
- 4** Press the forward end of the encoder spring-bracket slightly inward and place the encoder strip between the tabs and over the threaded post on the encoder spring-bracket.



5 With washer and nut, secure the encoder strip to the encoder spring-bracket.



6 Slide the carriage back and forth the length of its travel to ensure free movement.  
**The encoder strip should not bind or rub on the carriage.**



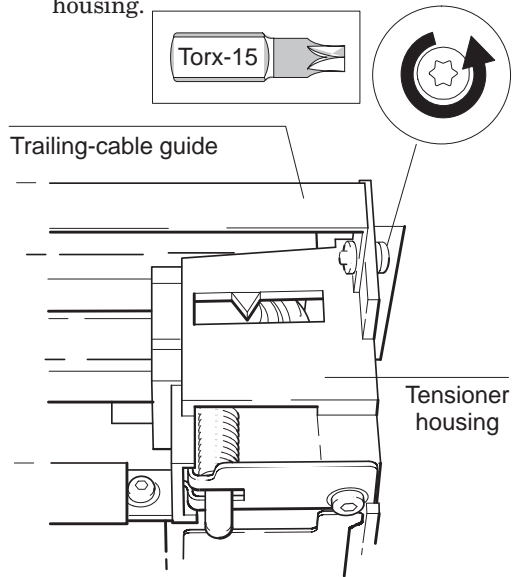
## Removing the Trailing-Cable Guide

### CAUTION

Handle the trailing cable and the trailing-cable guide with care.

- 1 Remove the window ▶ page 6-15.
- 2 Remove the center cover ▶ page 6-16.
- 3 Remove the left endcover ▶ page 6-18.
- 4 Remove the right endcover ▶ page 6-19.
- 5 If the maintenance you need to perform requires you to remove the trailing cable as well as the trailing-cable guide, then remove the trailing cable now ▶ page 6-29.

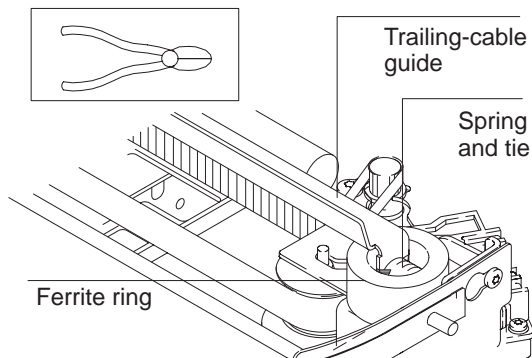
- 6 Remove the screw that attaches the trailing-cable guide to the tensioner housing.



### CAUTION

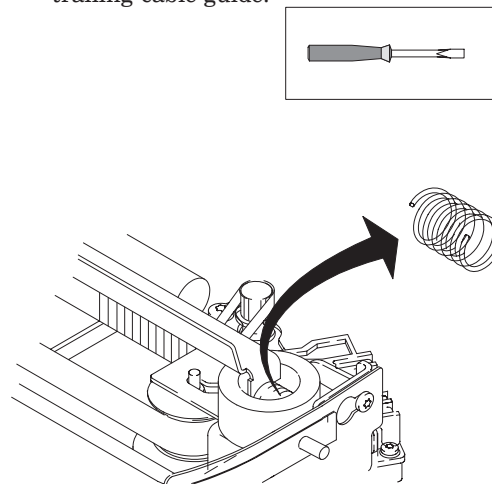
Exercise care to avoid damaging the ferrite ring when carrying out the following instructions.

- 7 Cut the plastic tie, on the spring in the ferrite ring, located where the trailing-cable guide attaches to the Y-drive bracket.

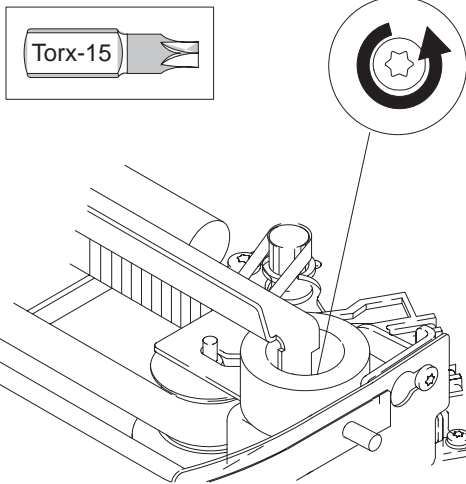


**Reassembling:** Attach a new plastic tie.

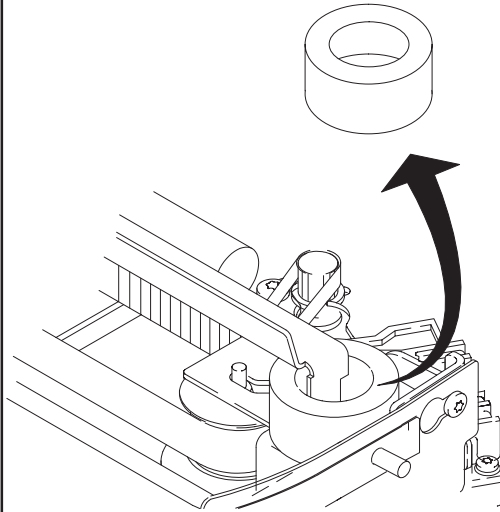
- 8 Using a screwdriver, compress and release the spring from between the inside surface of the ferrite ring and the trailing-cable guide.



**9** Remove the screw inside the ferrite ring.



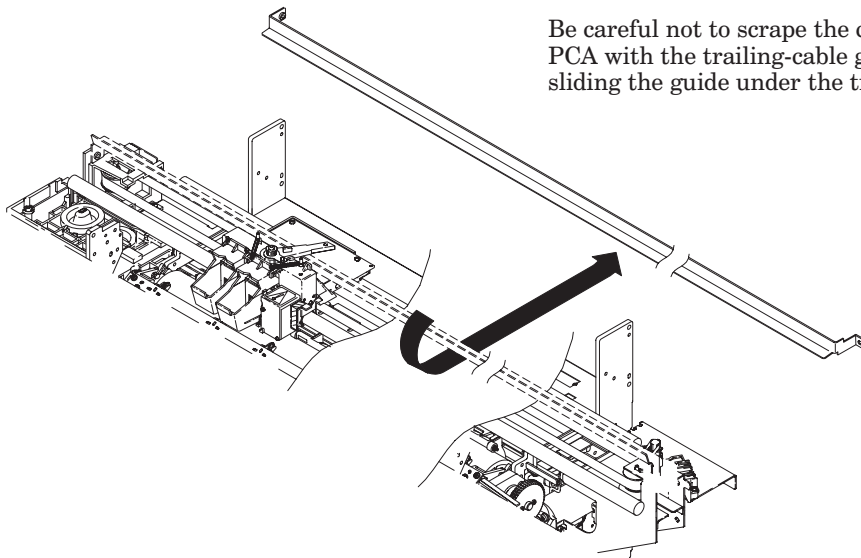
**10** Slightly lift up the guide and carefully remove the ferrite ring.



**11** Move the trailing-cable guide towards the rear of the plotter, rotate it to clear the arm of the cartridge-adjustment cam on the cartridge carriage, and lift the trailing-cable guide clear of the plotter.

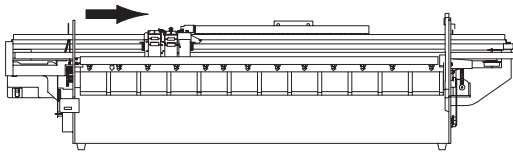
**CAUTION**

Be careful not to scrape the cartridge-carriage PCA with the trailing-cable guide if you are sliding the guide under the trailing cable.

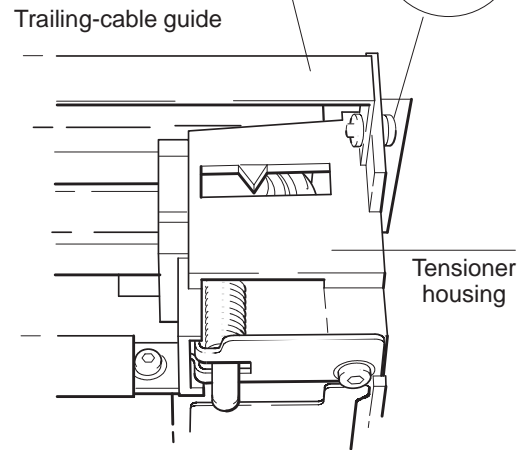
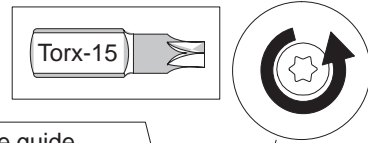


## Removing the Y-Tensioner and Housing

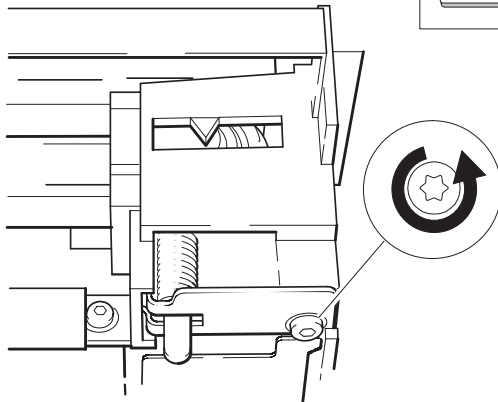
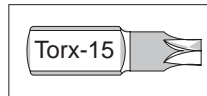
- 1 Remove the window ▶ page 6-15.
- 2 Remove the center cover ▶ page 6-16.
- 3 Remove the left endcover ▶ page 6-18.
- 4 Slide the cartridge carriage towards the center of the plotter in order to access the tensioner.



- 5 Remove the screw that attaches the trailing-cable guide to the tensioner housing.



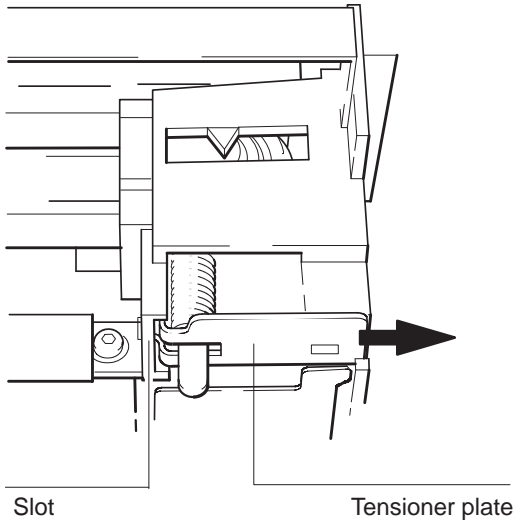
- 6 Remove the tensioner-plate screw.



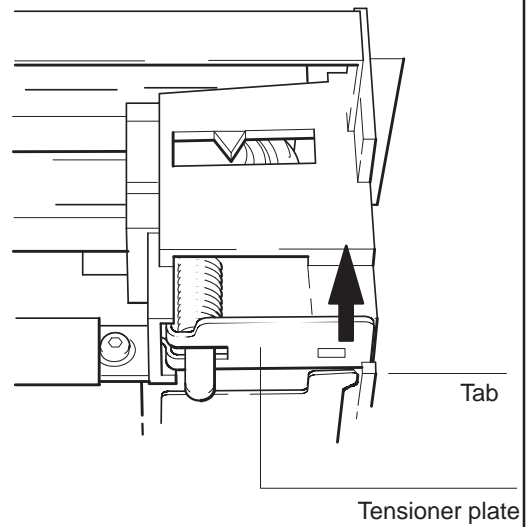
### CAUTION

The tensioner plate is under spring tension. Ensure that the plate does not spring back suddenly. Hold the right end (viewed from the rear) of the tensioner plate to keep the tensioner spring compressed.

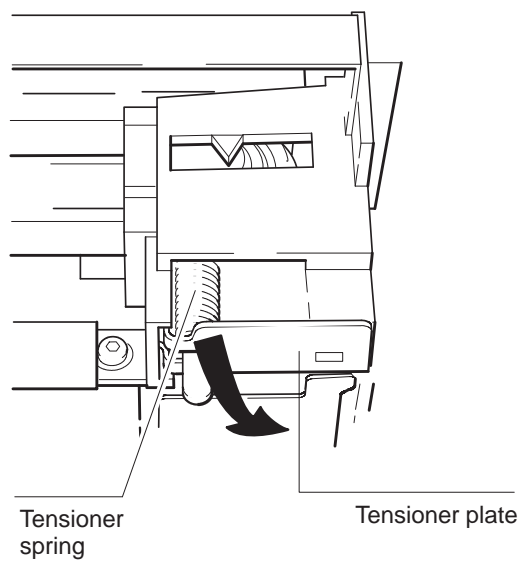
**7** Carefully move the tensioner plate to the right until it clears the slot in the housing.



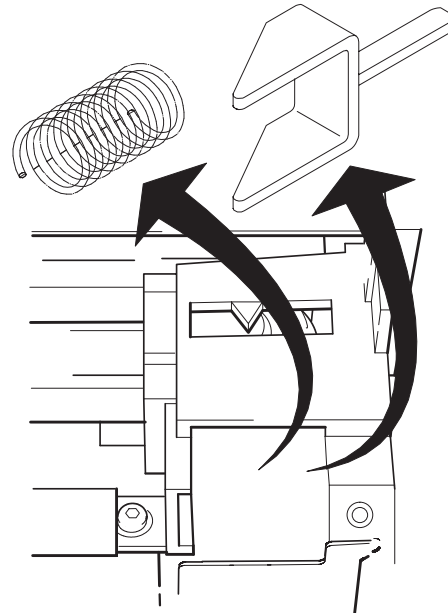
**8** Carefully move the right end of the tensioner plate up and clear of the retaining tab.

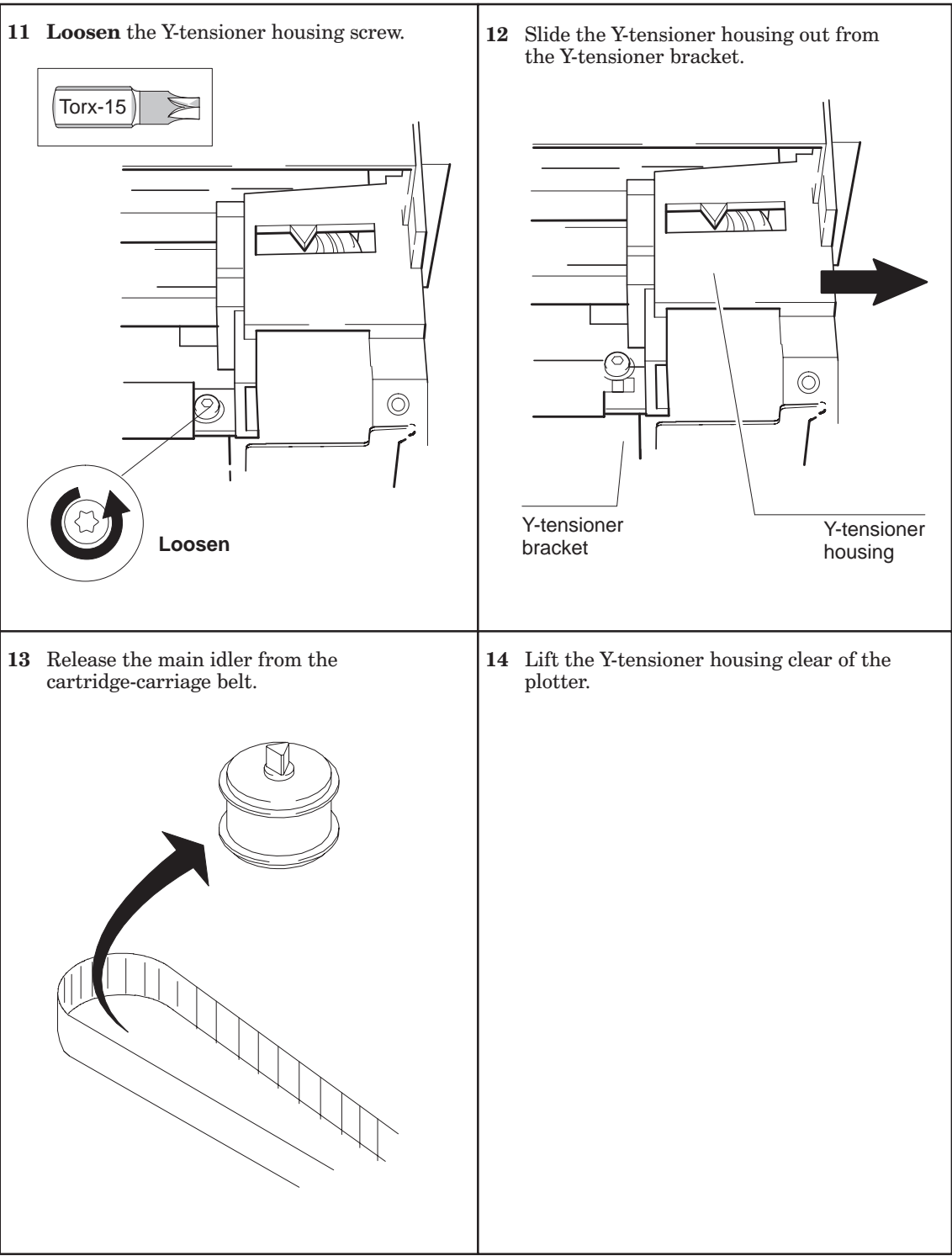


**9** Decompress the tensioner spring by allowing the tensioner plate to move toward the rear of the plotter.



**10** Remove the Y-tensioner spring and Y-tensioner from the housing.





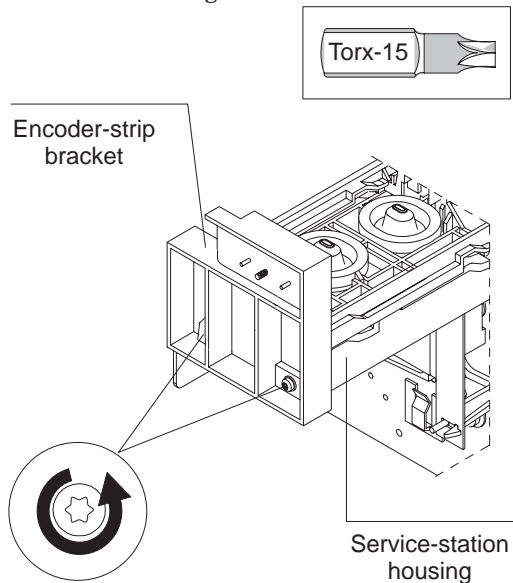
## Removing the Cartridge Carriage and Main Drive Belt

### CAUTION

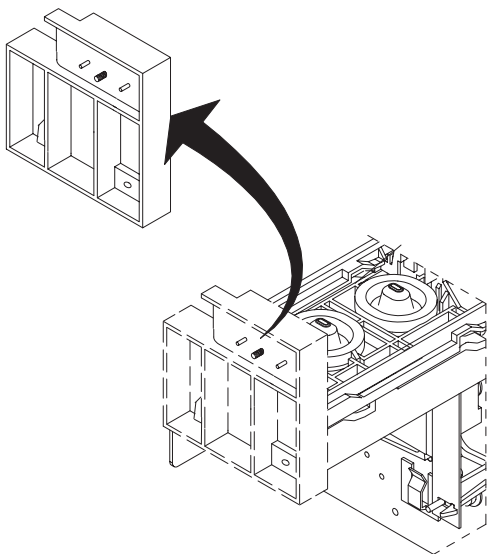
If you are installing a new cartridge carriage or a new carriage PCA, ensure that the plotter firmware is compatible with it. Incompatibilities could destroy the cartridges. (Details ▶ chapter 9.)

- 1 Remove the window ▶ page 6-15.
- 2 Remove the center cover ▶ page 6-16.
- 3 Remove the left endcover ▶ page 6-18.
- 4 Remove the right endcover ▶ page 6-19.
- 5 Remove the encoder strip ▶ page 6-39.
- 6 Remove the trailing-cable guide ▶ page 6-43.
- 7 Remove the Y-tensioner and housing ▶ page 6-45.

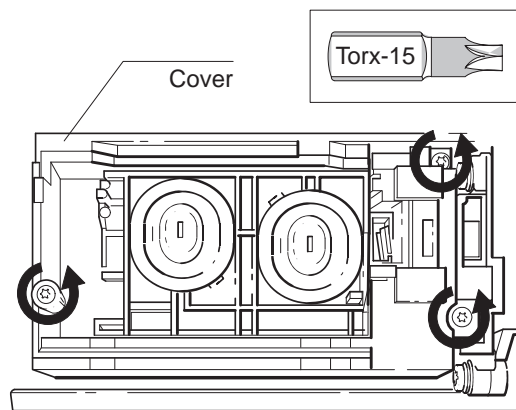
- 8 Remove the two screws that secure the encoder-strip bracket to the service-station housing.



- 9 Lift the encoder-strip bracket clear of the plotter.



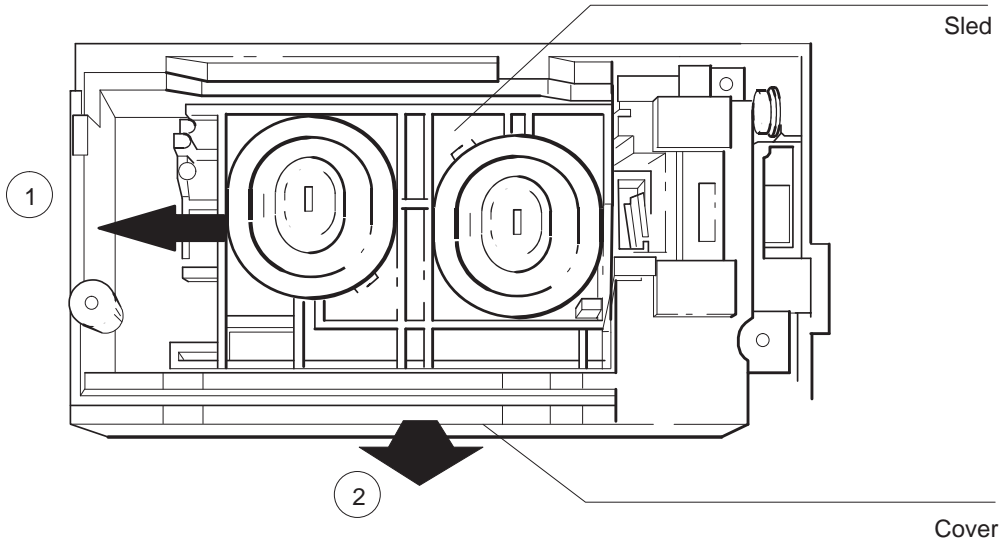
- 10 Remove the three screws that secure the service-station cover to the service-station housing.



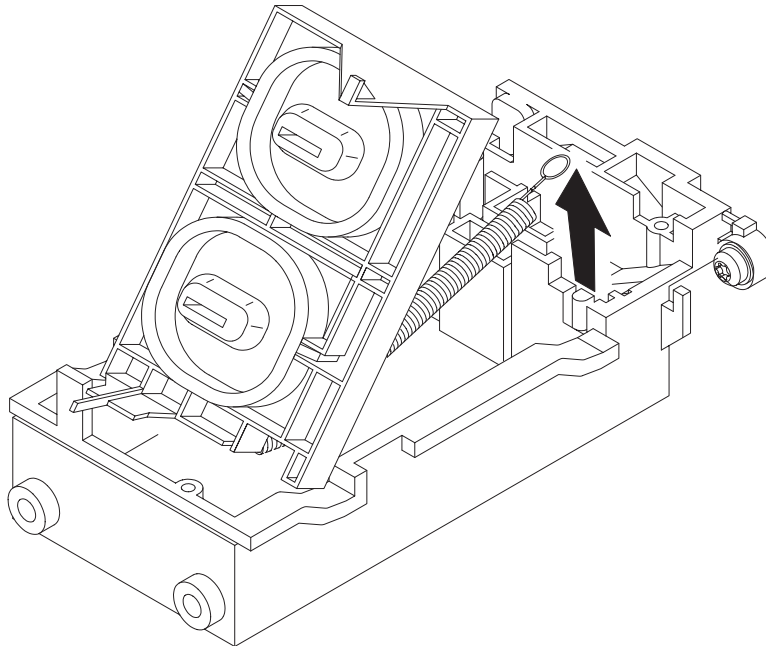
**Reassembling:** Do not over-tighten the three screws. Manually move the service-station sled to ensure that it moves freely beneath the cover.



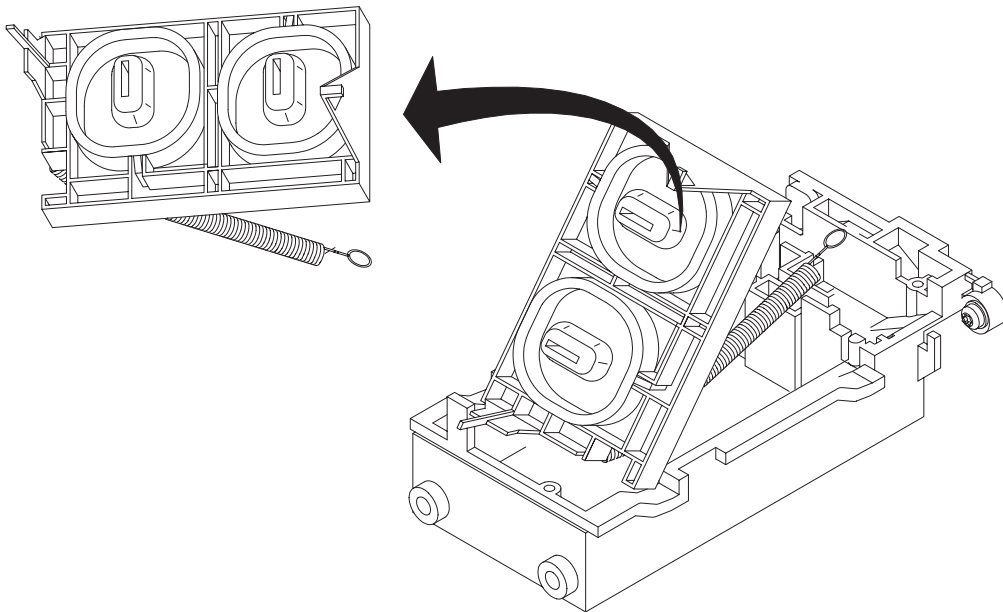
- 11** Holding the service-station sled about 1 cm (or about 1/2 inch) to the left of its normal position with one hand, tilt the forward edge of the service-station cover up and lift the cover clear of the service-station housing.



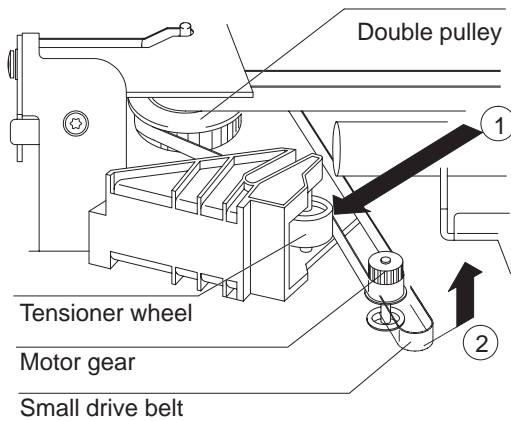
- 12** Lift the service-station sled up slightly and release the sled spring from the service-station housing.



**13** Lift the service-station sled clear of the service-station housing and the plotter.

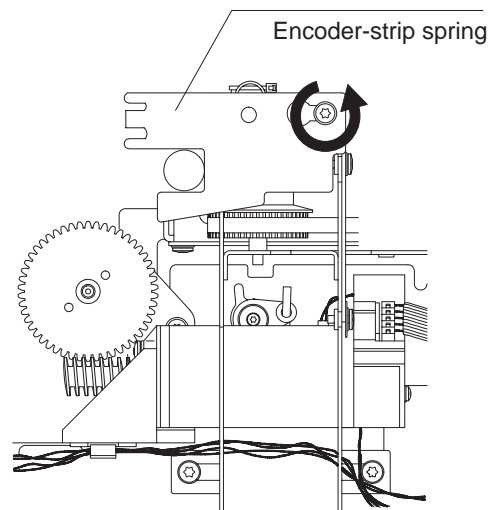
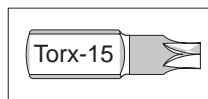


**14** Move to the right side of the plotter. Pressing the small drive belt against the tensioner wheel to loosen the belt, slide the belt off of the motor gear; then carefully release your hand from the the tensioner wheel.

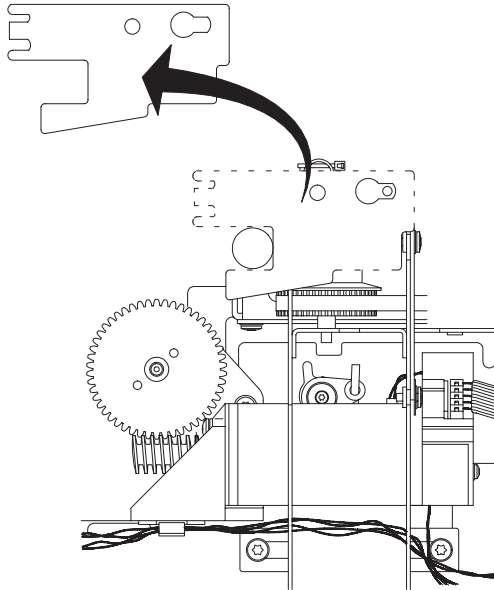


**Reassembling:** Ensure that the belt is correctly positioned around the carriage-motor shaft and the lower part of the double pulley.

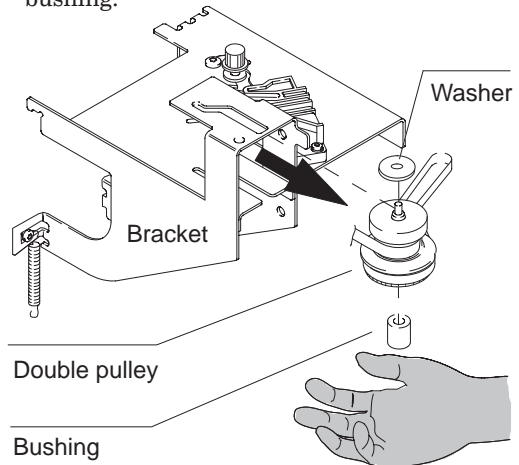
**15** Remove the screw and washer that attach the encoder-strip spring to the spring bracket.



**16** Remove the encoder-strip spring.

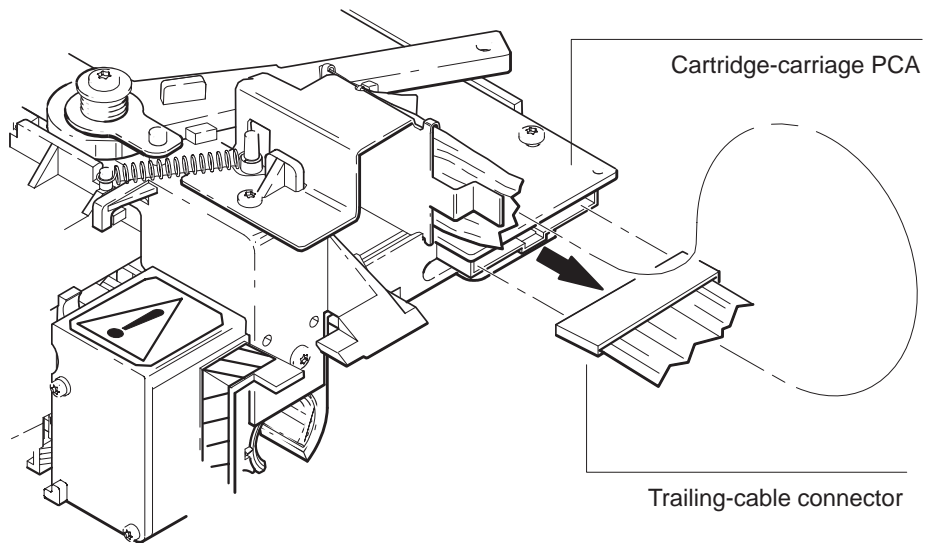


**17** Remove the double pulley from the Y-drive bracket. While doing this keep the palm of one hand beneath the double pulley to catch the double-pulley bushing.

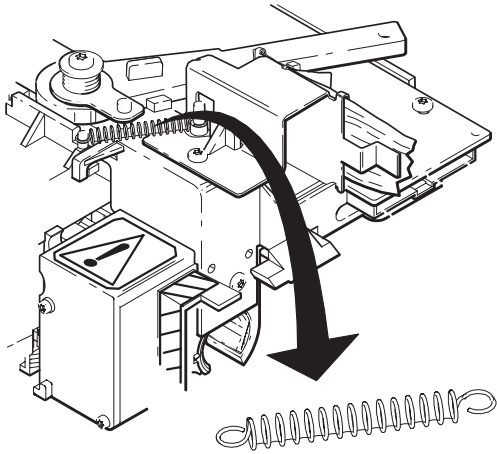
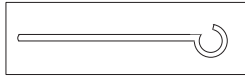


**Reassembling:** Don't forget the bushing. Also, ensure that the belt is correctly positioned around the carriage-motor gear and the lower part of the double pulley.

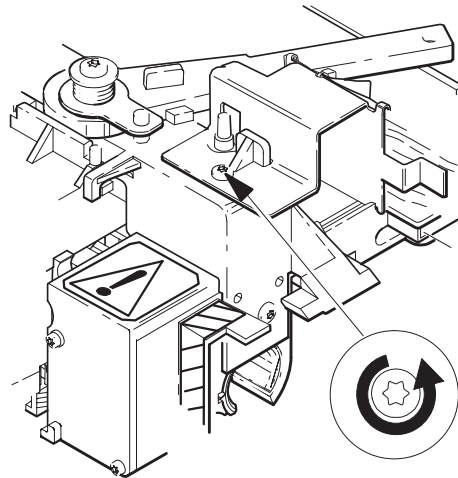
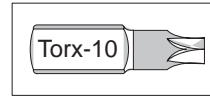
**18** Disconnect the trailing-cable connector from the cartridge-carriage PCA.



**19** Remove the right spring from the cartridge-carriage assembly.

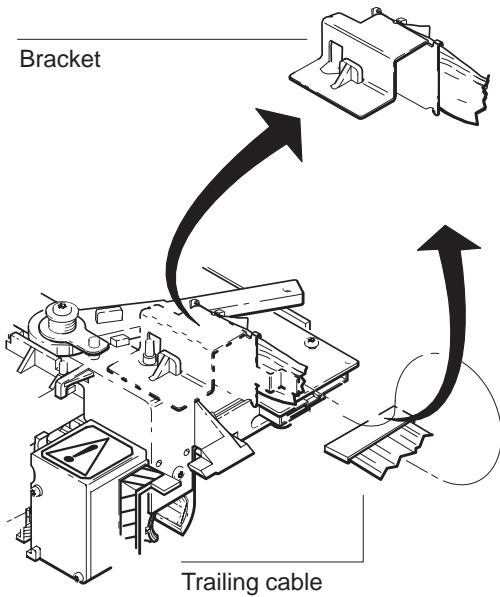


**20** Remove the screw that attaches the trailing-cable bracket to the carriage assembly.



**21** Lift the trailing-cable and bracket clear of the carriage assembly.

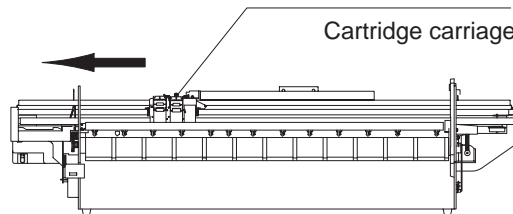
Bracket



Trailing cable

**22** Slide the cartridge carriage to the left side of the plotter.

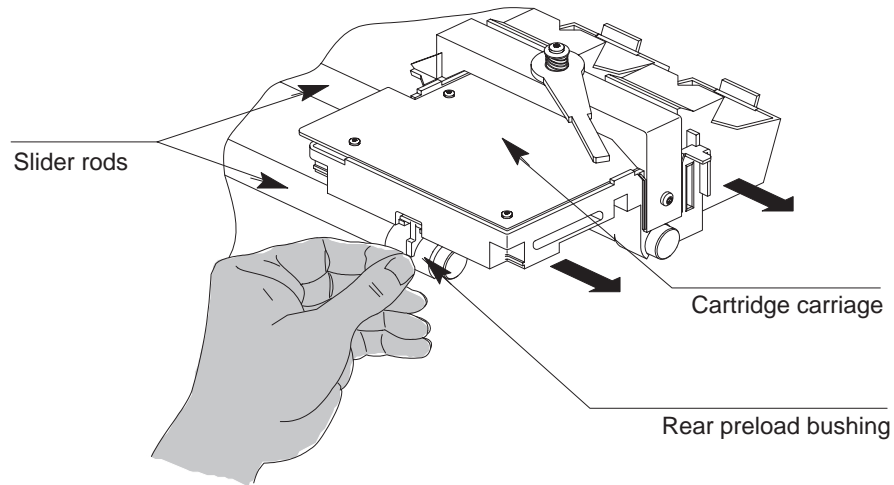
Cartridge carriage



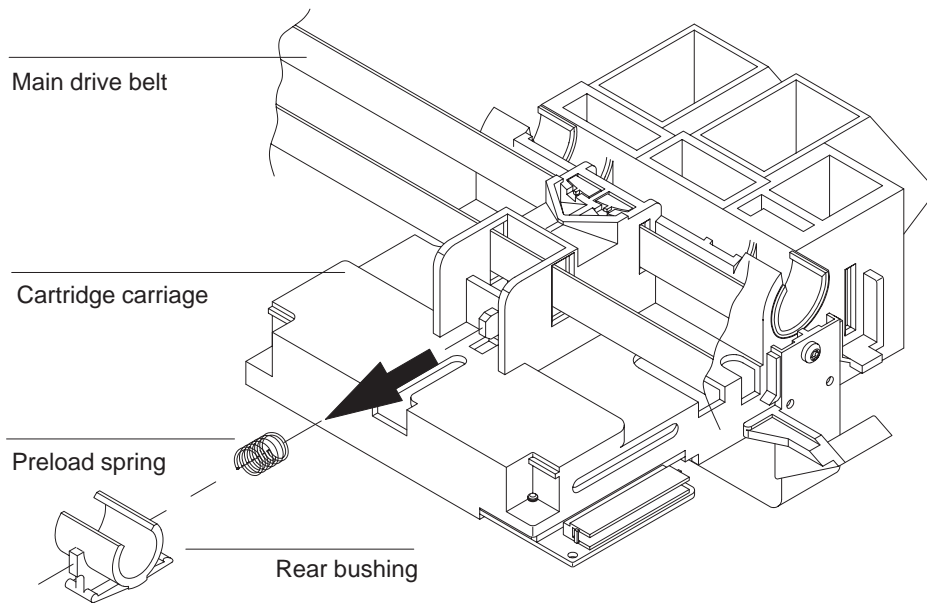
**CAUTION**

In the following step, take care when moving the cartridge-carriage over the plastic projection at the top left end of the service-station housing. Too much force may damage the housing or the carriage.

- 23** Grasp the carriage rear preload bushing (rides on the rear slider rod), and move the carriage to the left and free of the slider rods.



- 24** Separate the rear bushing and preload spring from the carriage assembly, and carefully remove the carriage assembly and main drive belt from the plotter.

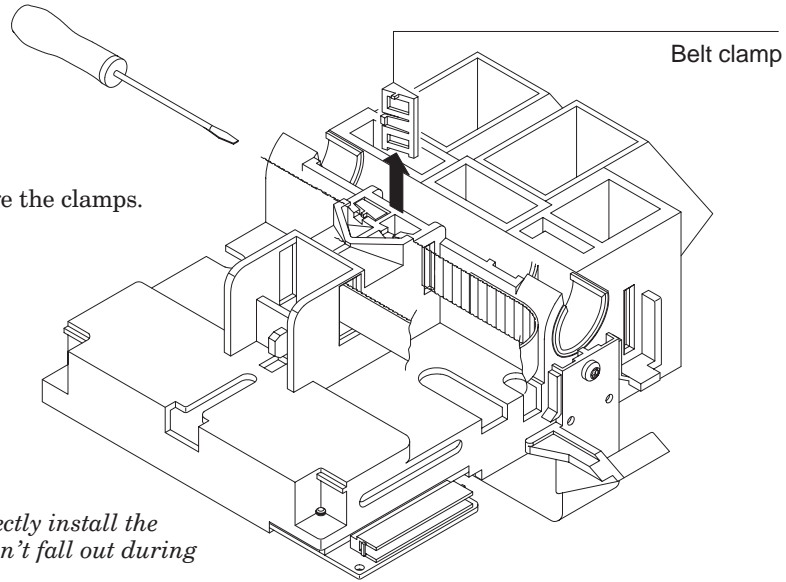


25 Set the carriage assembly upside-down on a flat surface.

26 Using a small, standard screwdriver, remove the left and right belt clamps from the carriage assembly.

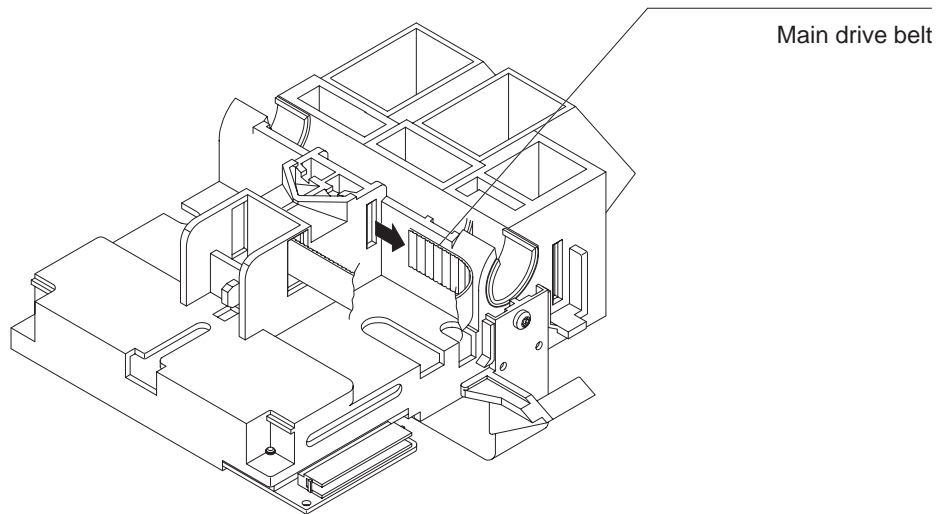
**CAUTION**

Be careful not to damage the clamps.



**Reassembling:** Correctly install the clamps, so that they don't fall out during plotter operation!

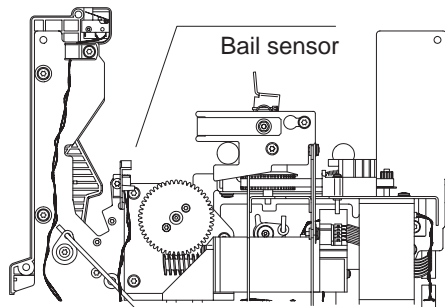
27 Remove the main drive belt from the carriage assembly.



**Calibration:** After having reassembled the plotter, perform the cartridge-alignment routine ♦ chapter 7.

## Removing the Bail Sensor

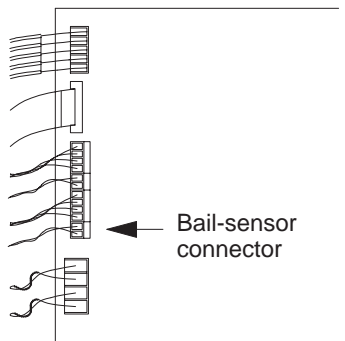
- 1 Remove the electronics-enclosure cover ▶ page 6-5.
- 2 Remove the window ▶ page 6-15.
- 3 Remove the center cover ▶ page 6-16.
- 4 Remove the right endcover ▶ page 6-19.



- 5 Note the position of the bail-sensor cable for reassembly. Incorrect positioning could cause obstruction of the cartridge carriage and motor gears.

- 6 Disconnect the bail-sensor cable connector from the main PCA, and from its ferrite and holding clip on the right sideplate.

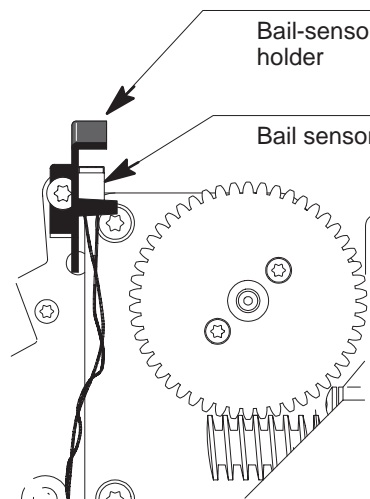
*The ferrite holder opens from the top.*



**Reassembling:** *The cable goes through the same ferrite as for the window-sensor cable ▶ page 6-24.*

- 7 Carefully feed the bail-sensor cable out from the electronics enclosure and from under the motor assemblies.

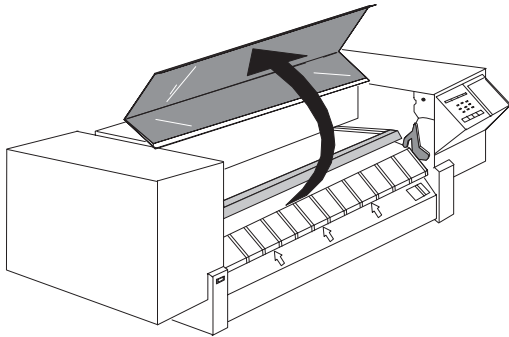
- 8 Unclip the bail sensor from its holder, and lift it, with cable, clear of the plotter.



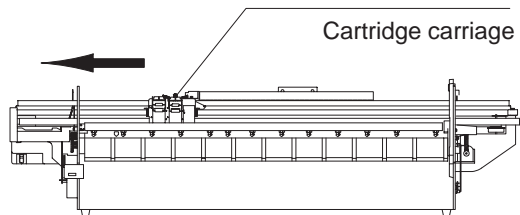
**Calibration:** *After having reassembled the plotter, perform the bail calibration ▶ chapter 7.*

## Removing The Bail

1 Open the window.



2 Move the cartridge-carriage to the extreme left.



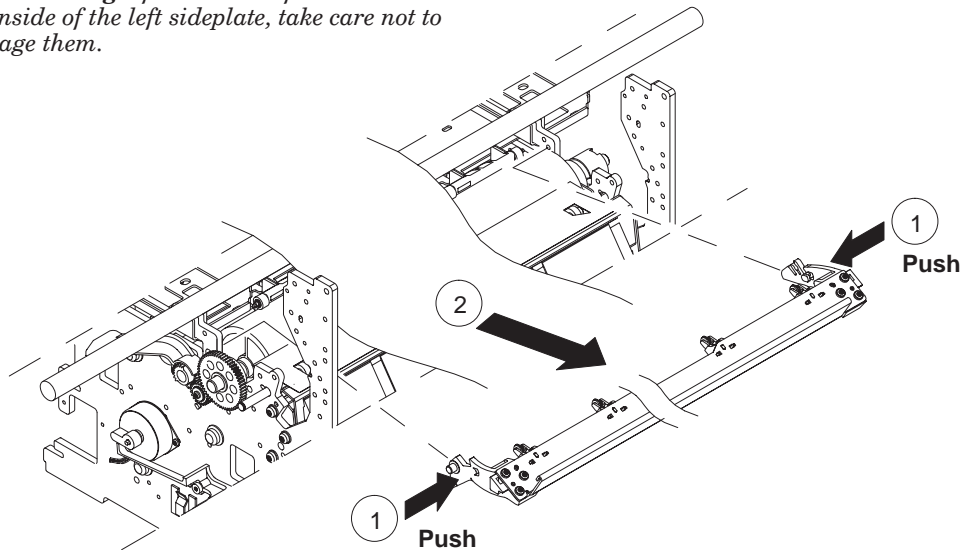
### WARNING



In the following step, take care not to cut yourself on the encoder strip.

3 Push both of the plastic ends of the bail towards each other to release them from the holes in the sideplates, and lift the bail up and clear of the plotter.

**Reassembling:** If there are Teflon washers on the inside of the left sideplate, take care not to damage them.

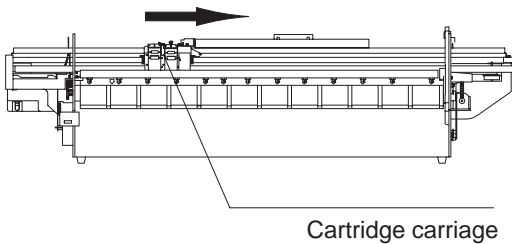




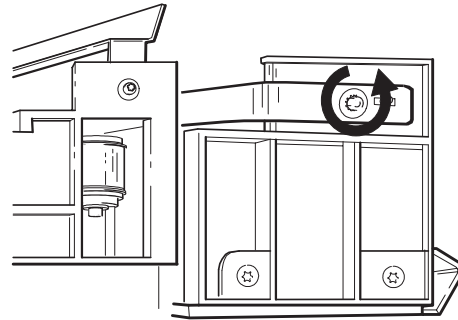
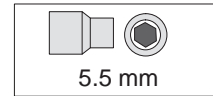
## Removing the Service Station

*In performing this procedure, be careful to avoid staining your hands and clothing with ink deposited in the service station.*

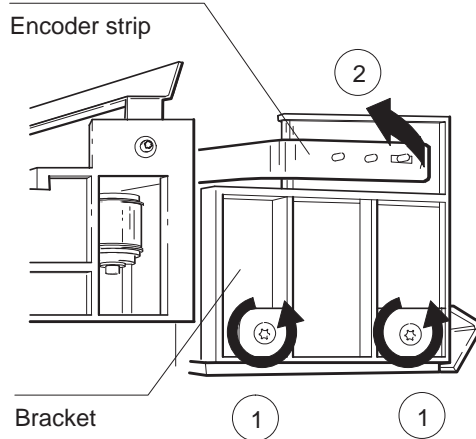
- 1 Remove the window [◆](#) page 6-15.
- 2 Remove the center cover [◆](#) page 6-16.
- 3 Remove the left endcover [◆](#) page 6-18.
- 4 Move the cartridge carriage to the center of its travel.



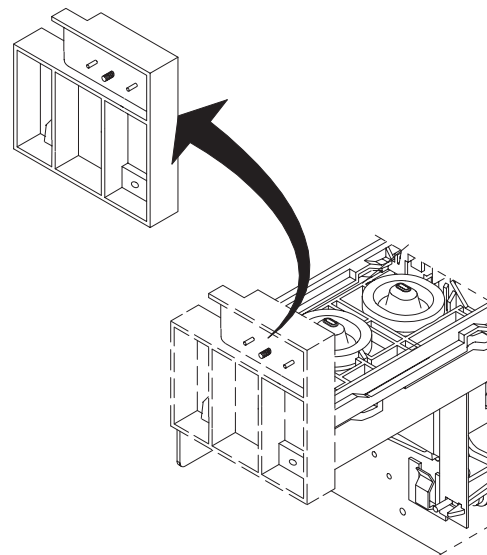
- 5 Remove the nut and washer that attach the encoder strip to the encoder-strip bracket.



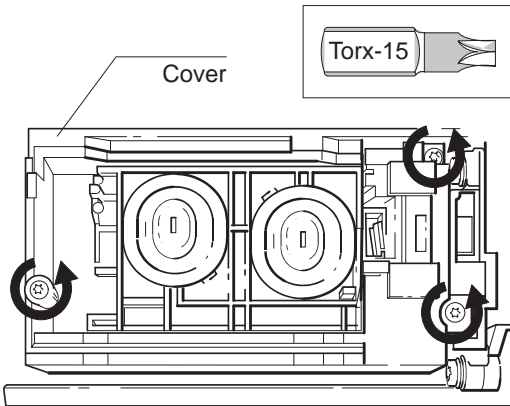
- 6 Loosen the two screws that attach the encoder-strip bracket to the service-station assembly, until tension can be relieved on the encoder strip, and it can be detached from the bracket.



- 7 Remove the encoder-strip bracket from the service station.

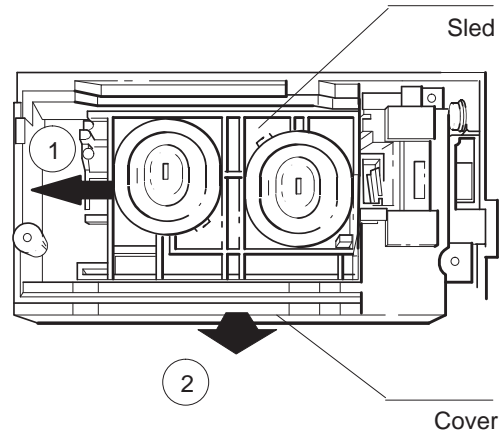


- 8 Remove the three screws that secure the service-station cover to the service-station housing.

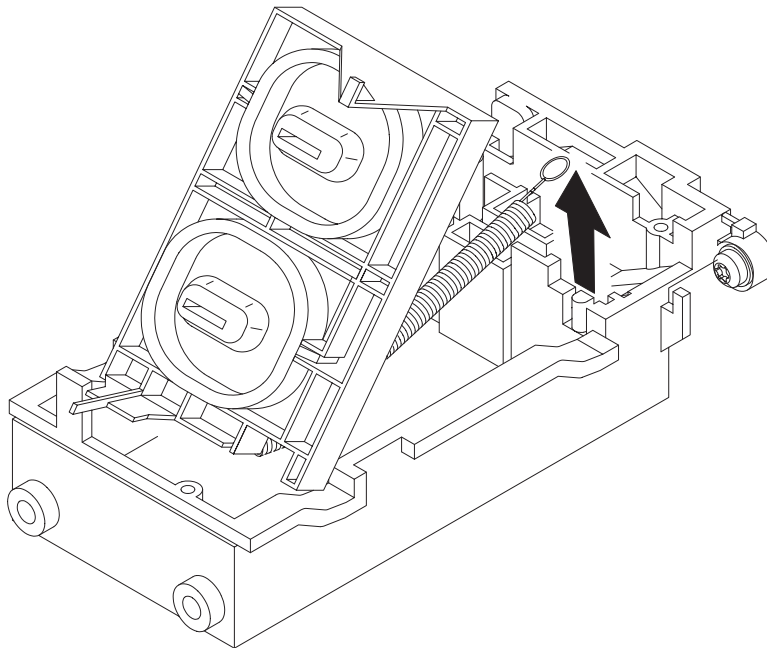


**Reassembling:** Do not over-tighten the three screws. Manually move the service-station sled to ensure that it moves freely beneath the cover.

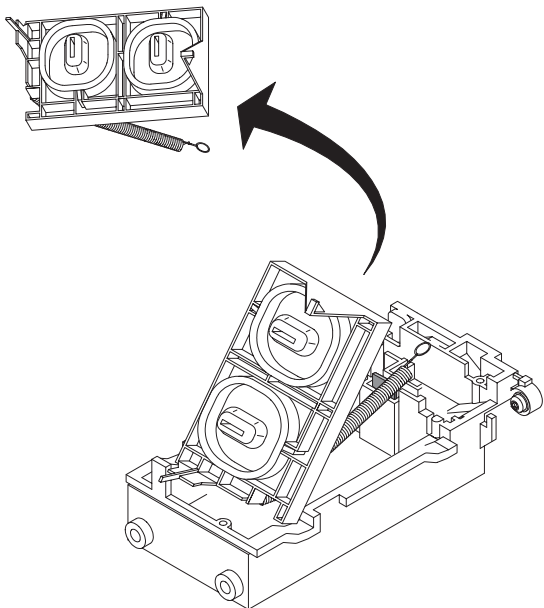
- 9 Holding the service-station sled about 1 cm (or about 1/2 inch) to the left of its normal position with one hand, tilt the forward edge of the service-station cover up and lift the cover clear of the service-station housing.



- 10 Lift the service-station sled slightly up and release the sled spring from the service-station housing.

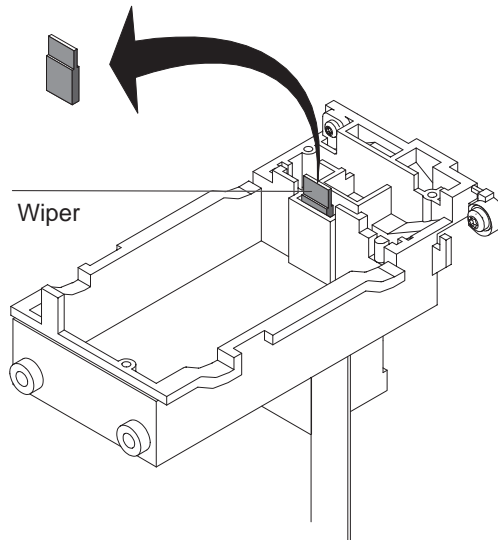


- 11** Lift the service-station sled clear of the service-station housing and the plotter.

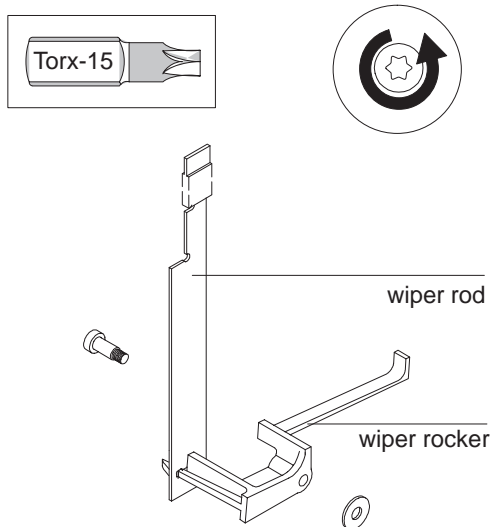


- 12** Remove any wet ink from the wiper in the service-station housing.

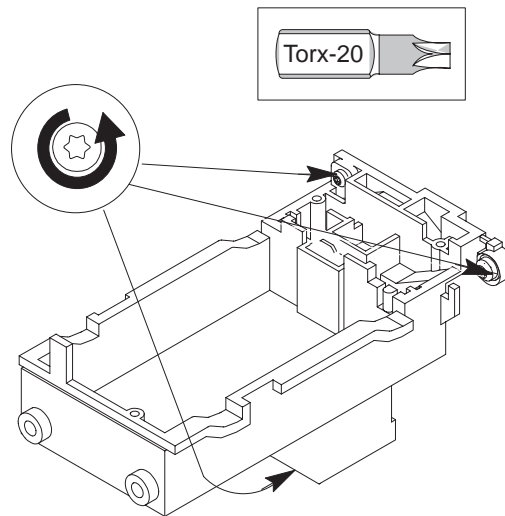
- 13** Remove the wiper from the top of the wiper rod by pulling the wiper up.



- 14** Remove the screw and washer that secure the wiper rod and rocker to the left sideplate, and lift the rod and rocker clear of the plotter.

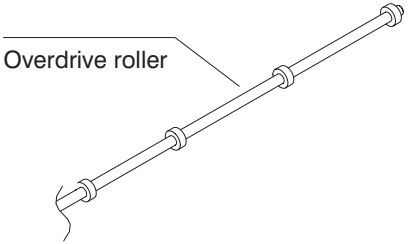
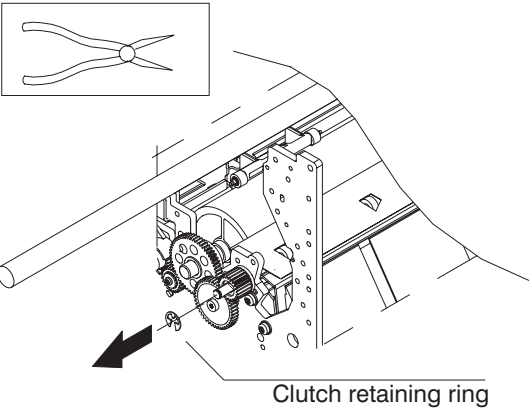
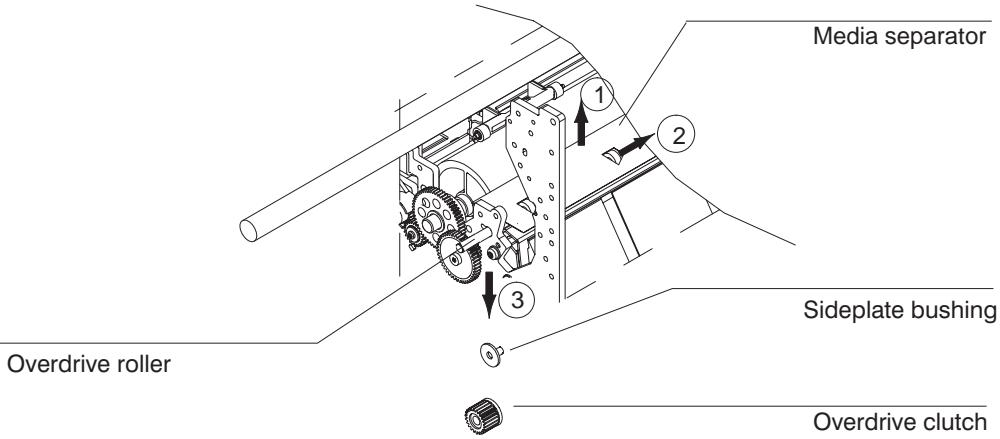


- 15** Remove the three screws that attach the service-station housing to the left sideplate.

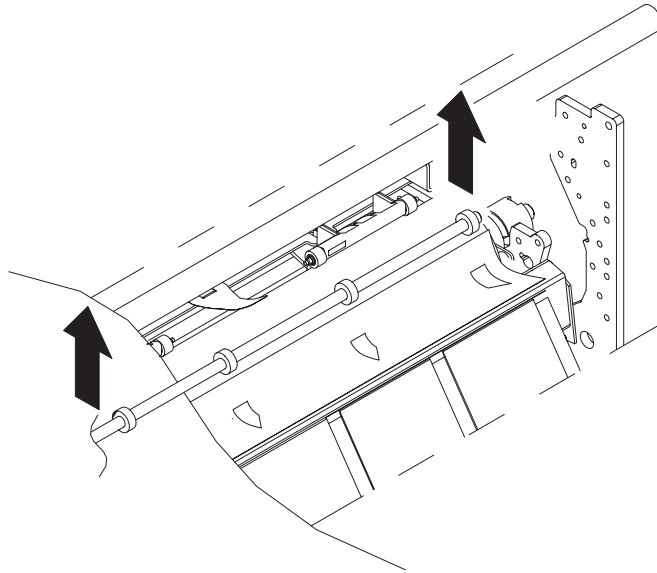


- 16** Lift the service-station housing slightly up and pull it clear of the left sideplate.

## Removing the Overdrive Roller

 <p>Overdrive roller</p> <ol style="list-style-type: none"><li>1 Remove the window ▶ page 6-15.</li><li>2 Remove the center cover ▶ page 6-16.</li><li>3 Remove the left endcover ▶ page 6-18.</li><li>4 Lift the left front trim clear of the plotter.</li><li>5 Remove the bail ▶ page 6-56.</li></ol>	<p><b>6</b> Remove the clutch retaining ring that secures the overdrive clutch to the overdrive roller.</p> <p><i>You can do this with a needle-nose pliers, <b>without</b> having to remove the service station. (The service station is not shown in the diagram.)</i></p>  <p>Clutch retaining ring</p>
<p><i>Note the position and orientation of the overdrive clutch. When correctly installed, the overdrive roller can be manually rotated forward only.</i></p> <p><b>7</b> While flexing the media separator upwards, slide the overdrive roller horizontally to the right until the overdrive clutch and sideplate bushing can drop free of the roller.</p>  <p>Media separator</p> <p>Sideplate bushing</p> <p>Overdrive roller</p> <p>Overdrive clutch</p>	

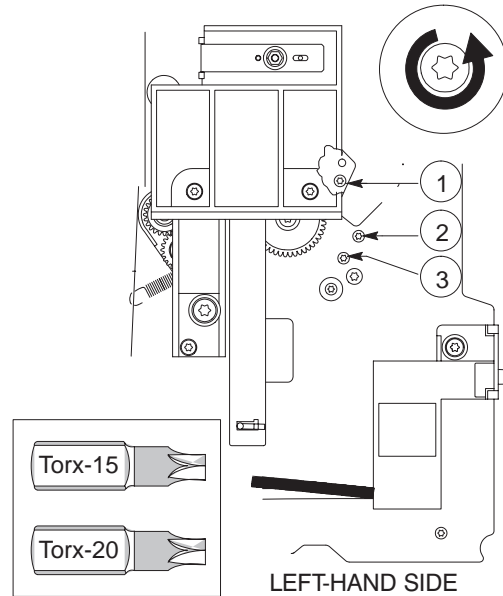
- 8** Move the overdrive roller to the right until it has completely cleared the left sideplate but not entered the hole in the right sideplate.
- 9** Release the overdrive roller from the overdrive bushing (small black clips underneath the media separator), and lift the overdrive roller clear of the plotter.



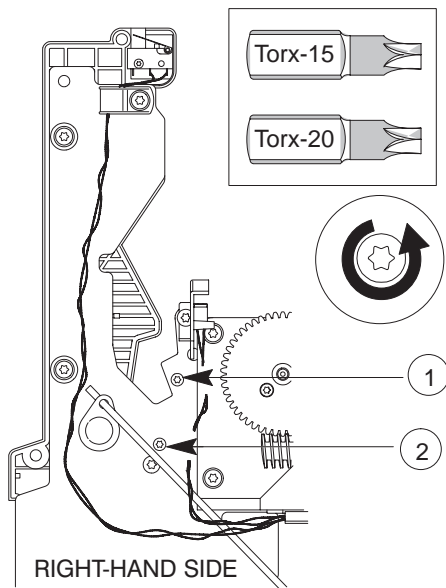
## Removing the Overdrive Enclosure

- 1 Remove the window page 6-15.
- 2 Remove the center cover page 6-16.
- 3 Remove the left endcover page 6-18.
- 4 Remove the right endcover page 6-19.
- 5 Remove the overdrive roller page 6-60.

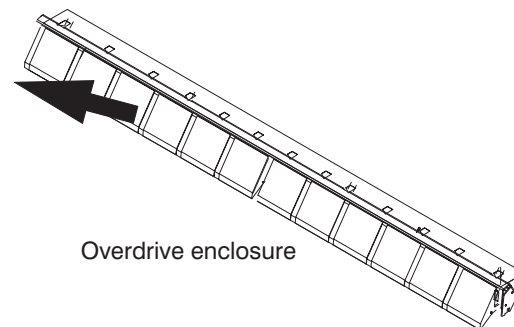
- 6 Remove the three indicated screws from the left sideplate.



- 7 Remove the two indicated screws from the right sideplate.



- 8 Lift the overdrive enclosure clear of the plotter.



**Reassembling:** See following procedure.

## Re-installing the Overdrive Enclosure

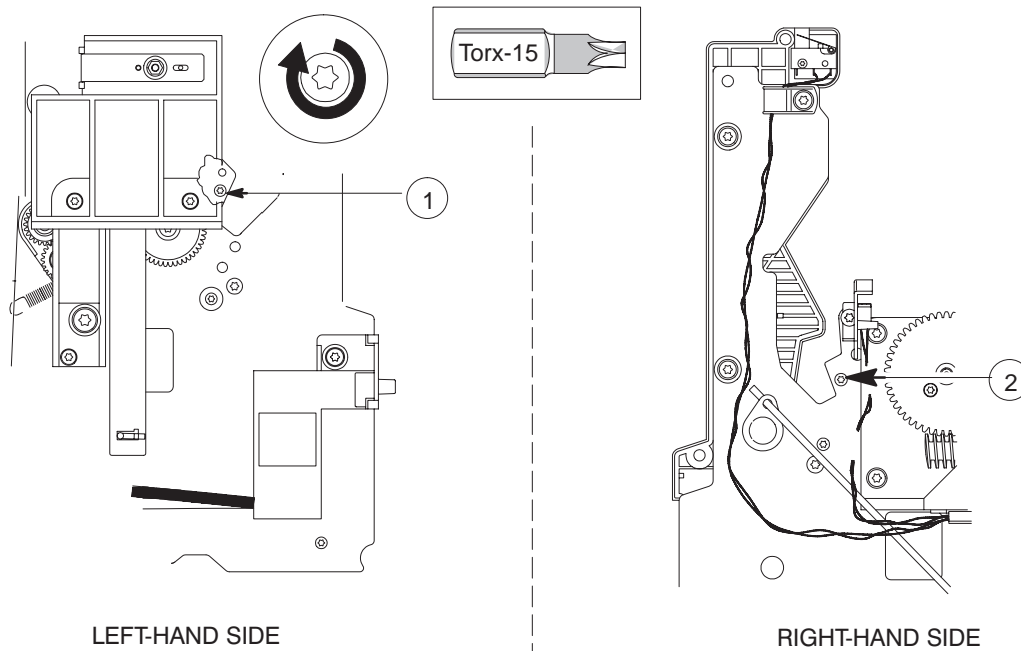
*The order in which you replace the screws on the overdrive enclosure is important.*

- 1 Position the overdrive enclosure between the two sideplates.

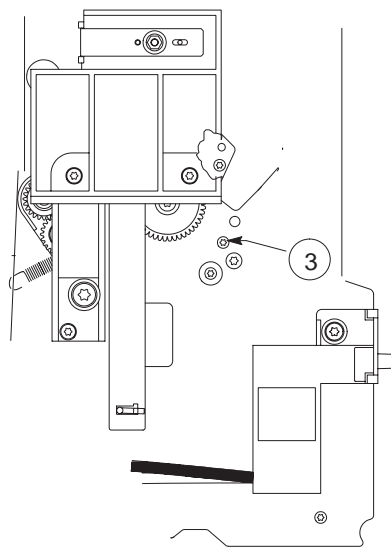
### CAUTION

Take care not to damage the media-sensor flags. The overdrive enclosure should not touch them.

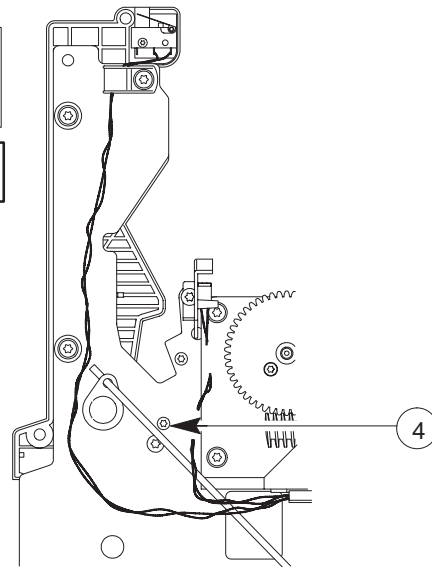
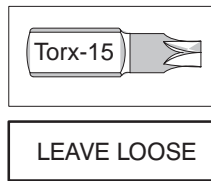
- 2 Replace the two indicated screws. (**Short** dog-point screws.)



**3** Insert the two indicated screws, but **DO NOT** tighten them. (**Long** dog-point screws.)

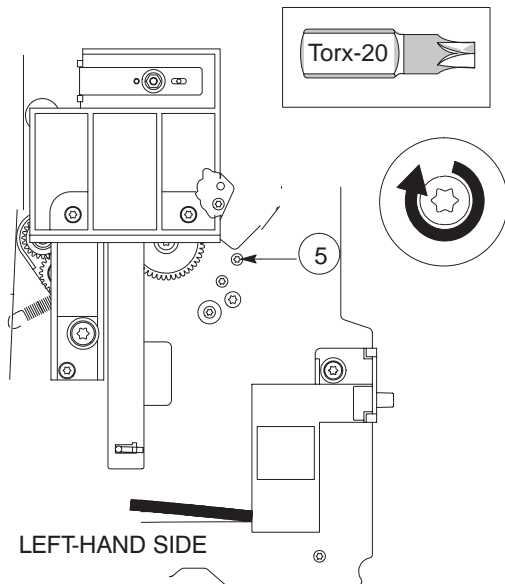


LEFT-HAND SIDE



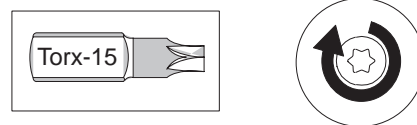
RIGHT-HAND SIDE

**4** Replace the indicated screw and tighten it, thus aligning the overdrive enclosure with the left sideplate.



LEFT-HAND SIDE

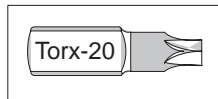
**5** Tighten the two screws you inserted in step 3.





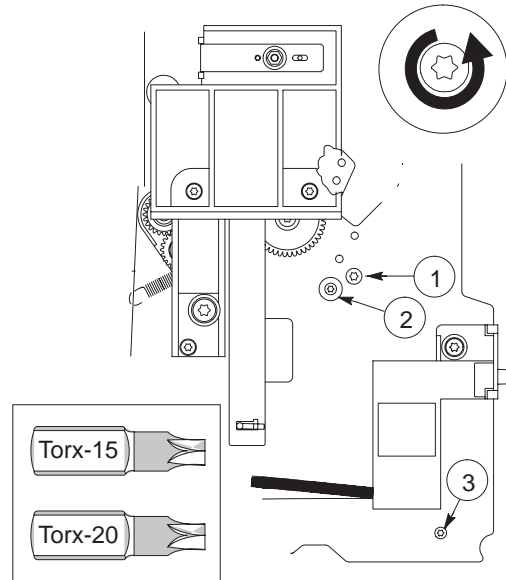
## Removing the Entry Platen

- 1 Remove the window [▶](#) page 6-15.
- 2 Remove the center cover [▶](#) page 6-16.
- 3 Remove the left endcover [▶](#) page 6-18.
- 4 Remove the right endcover [▶](#) page 6-19.
- 5 Remove the overdrive roller [▶](#) page 6-60.
- 6 Unscrew the pinch-arm lever and right front trim and lift them clear of the entry platen, taking care not to damage the window sensor.

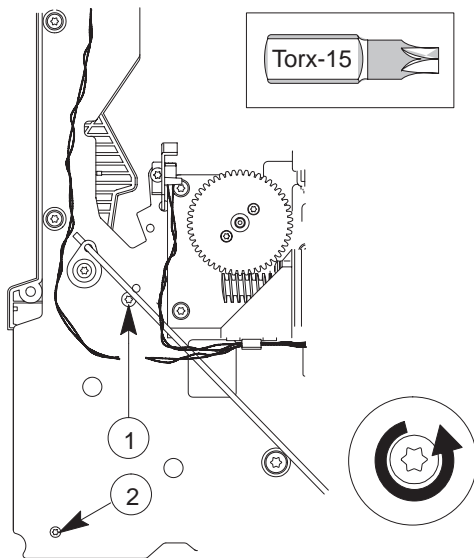


- 7 Remove the overdrive enclosure [▶](#) page 6-62.

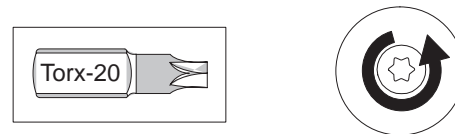
- 8 Remove the three indicated screws from the left sideplate.



- 9 Remove the two indicated screws from the right sideplate.

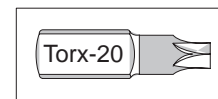


- 10 Underneath the plotter, remove the screws from the **front** of the bottom cover.

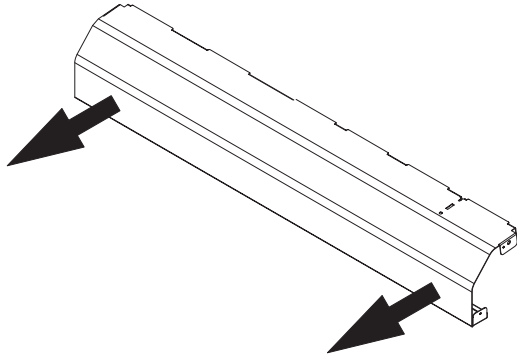


*D/A0-size plotters have four screws.  
E/A1-size plotters have five screws.*

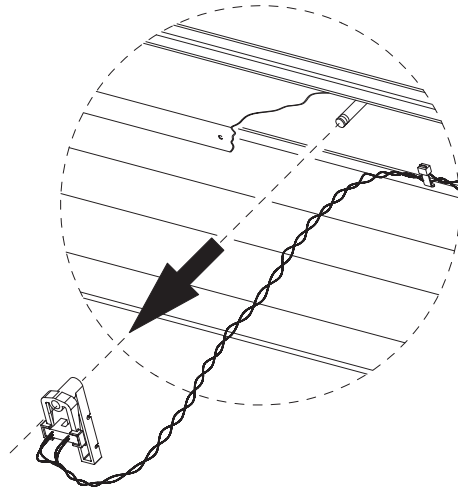
- 11 Unscrew the power switch from the left sideplate.



- 12** Pull the entry platen out from the plotter in order to access the media sensor.



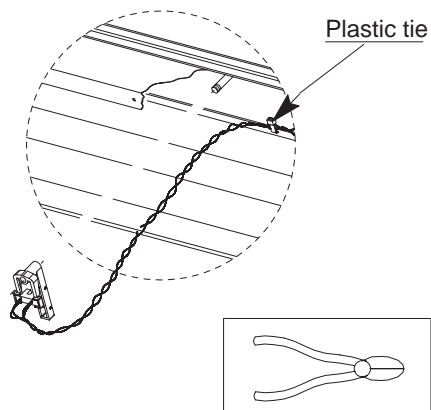
- 13** Detach the media-sensor holder from the underside of the entry platen by pulling the holder straight out.



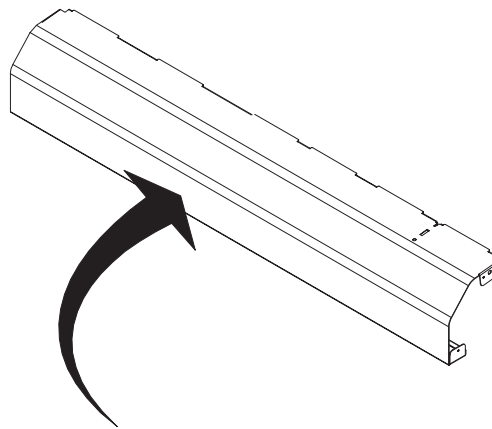
- 14** Cut the plastic tie that fastens the media-sensor cable to the underside of the entry platen.

**CAUTION**

Take care not to cut the media-sensor cable itself.



- 15** Lift the entry platen clear of the plotter.



**Reassembling:** See following procedure.

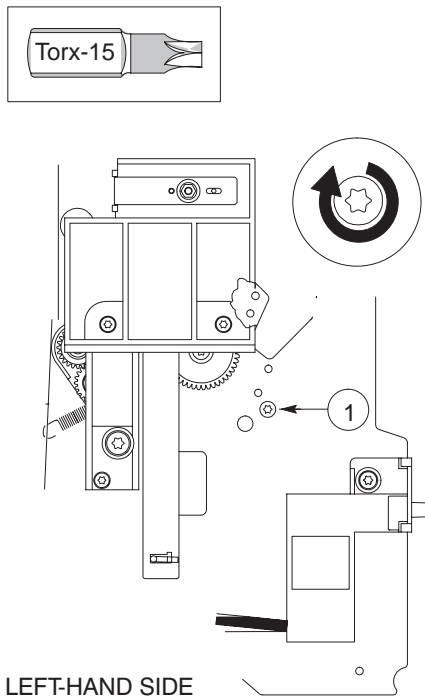
## Re-installing the Entry Platen

*The order in which you replace the screws on the entry platen is important.*

- 1 If the plotter is attached to a support, detach it.
- 2 Turn the plotter on its back.
- 3 Reconnect the media sensor to the entry platen (see also page 6-26).
- 4 Position the entry platen between the two sideplates.

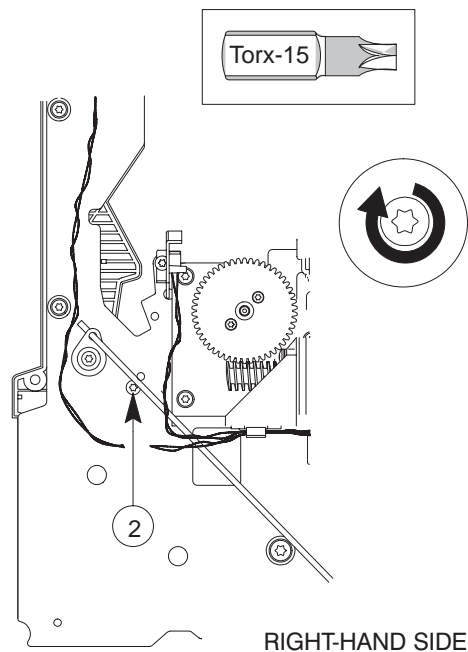
*Position the top of the entry platen under all of the small pivots on the inside of both sideplates, except the back pivot. Rest the entry platen against the back pivot. Position the bottom of the entry platen above the bottom cover of the plotter.*

- 5 Replace the indicated screw on the left-hand side. (**Long** dog-point screw.) Tighten this screw, making sure that the entry platen is aligned tight against the **left** sideplate.

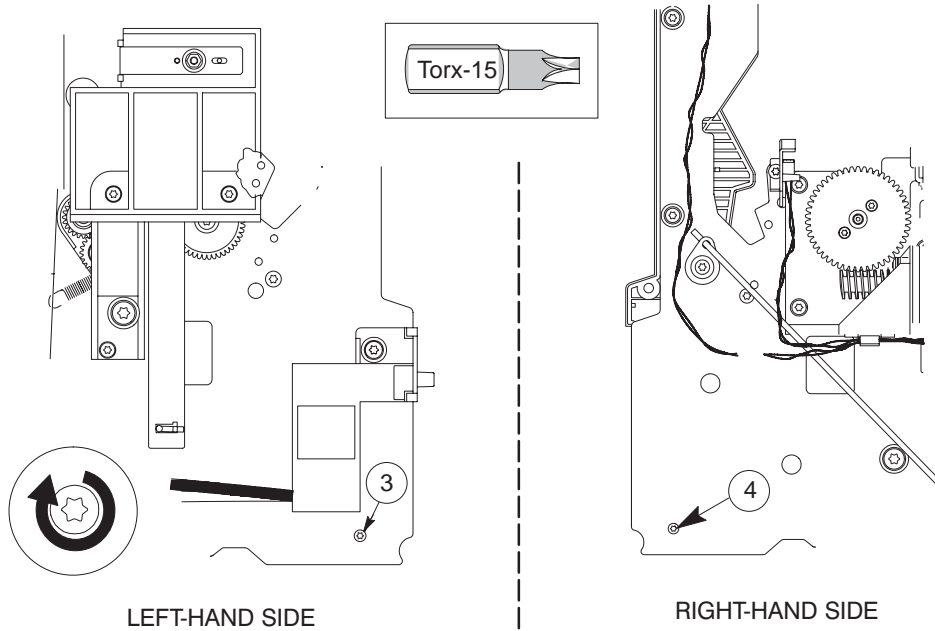


- 6 Replace the indicated screw on the right-hand side. (**Long** dog-point screw.)

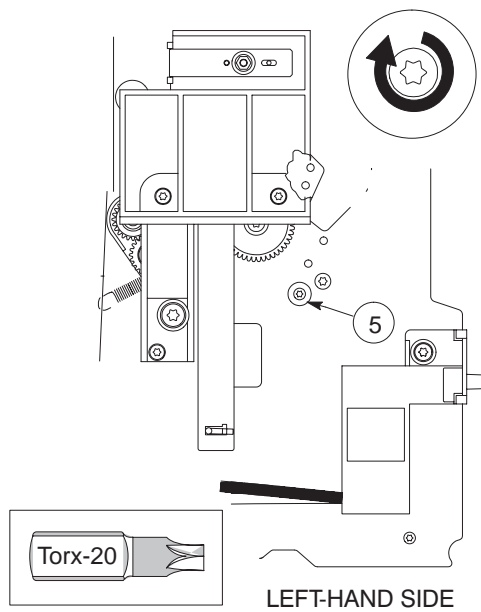
*There must be no space between the entry platen and the **left** sideplate. It doesn't matter if there is a small space between the entry platen and the **right** sideplate.*



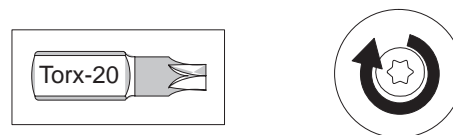
**8** Replace the two indicated screws. (**Long** dog-point screws.)



**7** Replace the indicated screw.



**9** Replace the screws on the bottom cover.



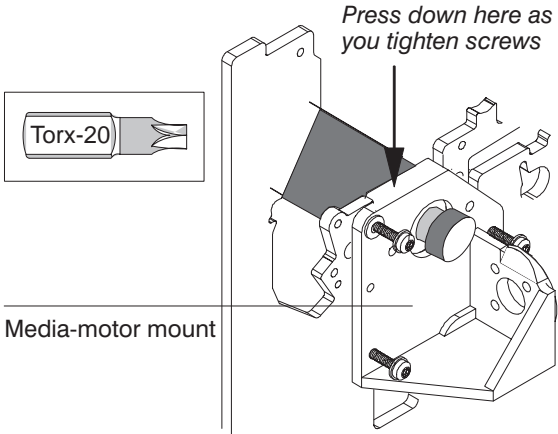
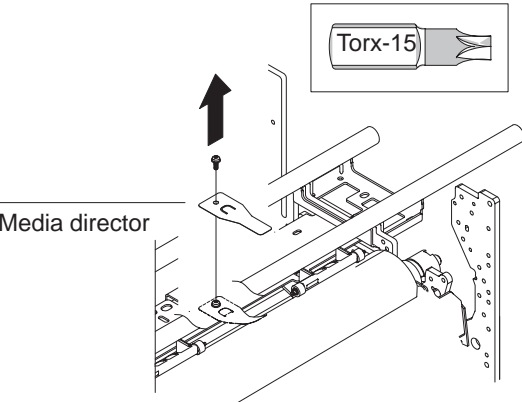
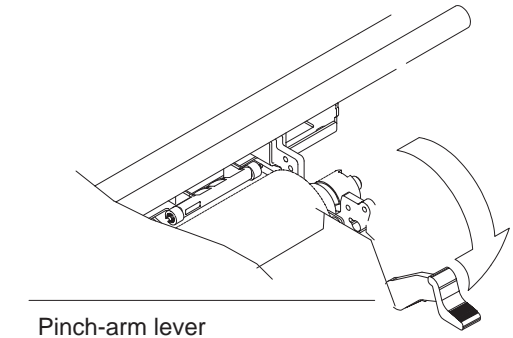
*D/A1-size plotters have four screws.  
E/A0-size plotters have five screws.*

**10** Turn the plotter to its correct position.

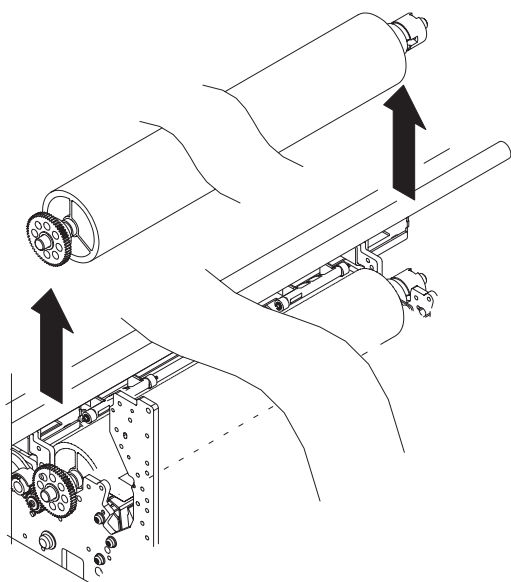
*Before re-installing the overdrive enclosure, ensure that both flags on the media sensor move freely when you pass a sheet of media over them.*

**Calibration:** *After having reassembled the plotter, perform the media-sensor calibration.*

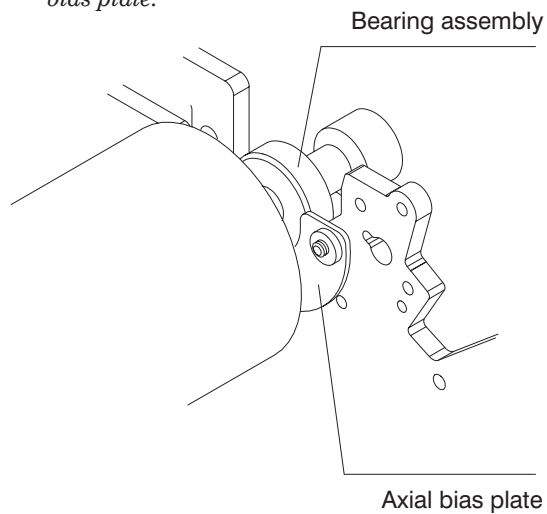
## Removing the Drive Roller

<ol style="list-style-type: none"> <li>1 Remove the electronics-enclosure cover <a href="#">▶</a> page 6-5.</li> <li>2 Remove the window <a href="#">▶</a> page 6-15.</li> <li>3 Remove the center cover <a href="#">▶</a> page 6-16.</li> <li>4 Remove the left endcover <a href="#">▶</a> page 6-18.</li> <li>5 Lift the left front trim clear of the plotter.</li> <li>6 Remove the right endcover <a href="#">▶</a> page 6-19.</li> <li>7 Remove the front-panel assembly <a href="#">▶</a> page 6-32.</li> <li>8 Remove the carriage motor <a href="#">▶</a> page 6-35.</li> <li>9 Remove the media motor <a href="#">▶</a> page 6-37.</li> <li>10 Remove the encoder strip <a href="#">▶</a> page 6-39.</li> <li>11 Remove the bail <a href="#">▶</a> page 6-56.</li> <li>12 Remove the service station <a href="#">▶</a> page 6-57.</li> <li>13 Remove the overdrive roller <a href="#">▶</a> page 6-60.</li> </ol>	<p><b>CAUTION</b> In the following step, take care not to damage the bail sensor.</p> <p>14 Remove the three screws that attach the media-motor mount to the right sideplate.</p> <p><b>Reinstalling:</b> <i>Press down on the media mount as you replace the three screws. This is to ensure correct spacing between the drive roller and the cartridge nozzles. (Details <a href="#">▶</a> chapter 9.)</i></p> 
<ol style="list-style-type: none"> <li>15 Unclip the cables from the holding clip underneath the media-motor mount.</li> <li>16 Lift the mount clear of the plotter.</li> <li>17 Remove the screw that attaches the media director to the chassis assembly and remove the media director.</li> </ol> 	<p>18 Pull the pinch-arm lever forward to raise the pinch-arm assembly.</p> 

19 Remove the drive roller from the plotter.



**Reassembling:** Ensure that the bearing assembly at the right end of the drive roller is seated in the right sideplate and completely on the right side of the axial bias plate.

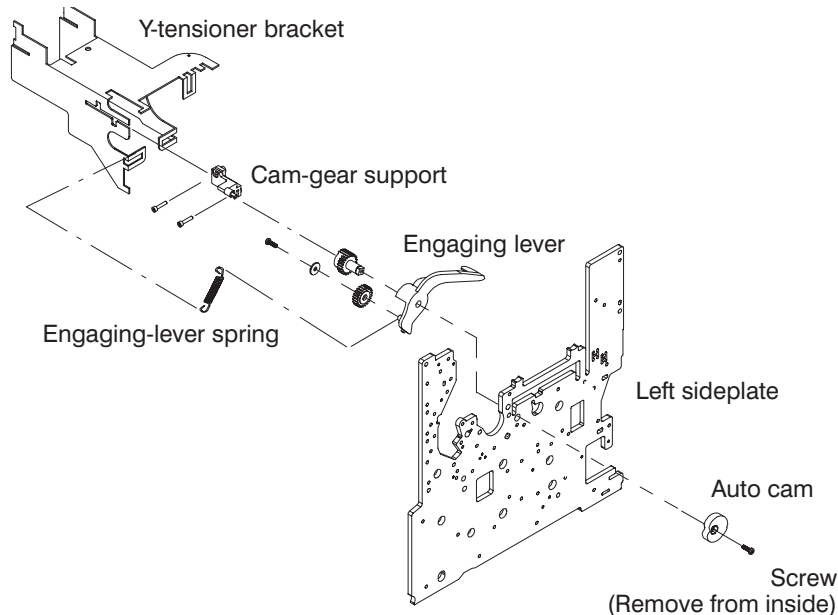


**Calibration:** Perform the accuracy calibration after installing the drive roller. (Details ▶ chapter 7.)

## Removing the Automatic Bail-Lift Mechanism

The cam-gear support is a new part, introduced with the DesignJet 220 to help solve failures in the bail-lift mechanism. It replaces the Teflon-washer solution of the DesignJet 200.

A service note describes how to remove the Teflon washers and install the cam-gear support and associated parts on a DesignJet 200. (Details ▶ chapter 9.)



To remove the bail-lift mechanism, perform the following procedure:

- 1 Remove the drive roller ▶ page 6-69.
- 2 Remove the engaging-lever spring.

**Reinstalling:** Connect the spring to the **upper** rung on the leg of the Y-tensioner bracket. Connecting to one of the lower rungs overtightens the spring and can cause failure of the bail-lift mechanism.

- 3 Remove the two screws from the cam-gear support. (Torx 15)

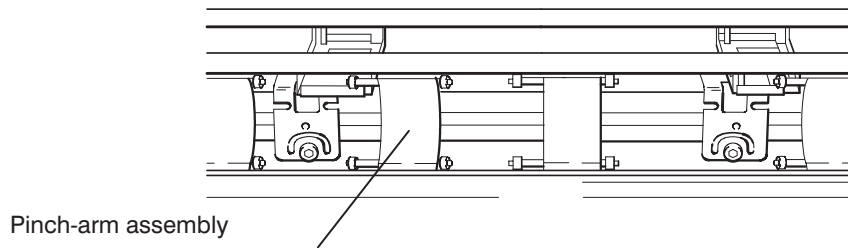
**Reinstalling:**

- a. Remove the screw from the front leg of the Y-tensioner bracket. (Torx 20)
- b. Reinstall the two screws on the cam-gear support. (Torx 15)
- c. Reinstall the screw on the Y-tensioner bracket. (Torx 20)

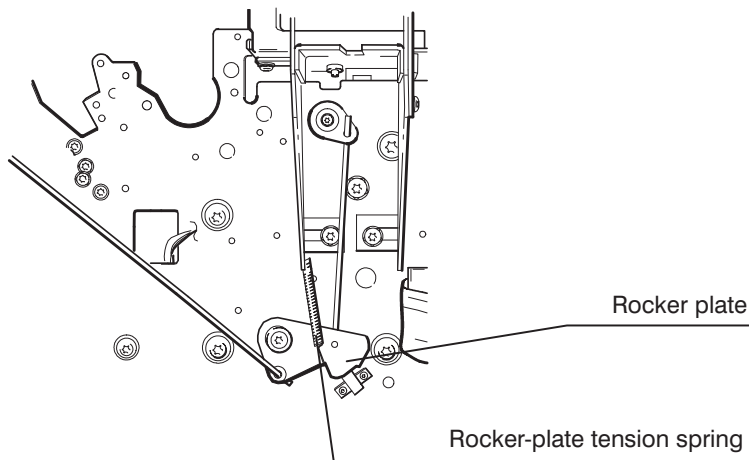
- 4 Slide the support to the left.
- 5 Remove the engaging-lever screw from inside the left sideplate. (Torx 15)
- 6 On the inside of the left sideplate, pull the cam to the right and off the lever assembly.
- 7 Remove the engaging-lever assembly from the plotter.

**Calibration:** Perform the bail calibration after reassembling the plotter. (Details ▶ chapter 7.)

## Removing the Pinch-Arm Lift Mechanism

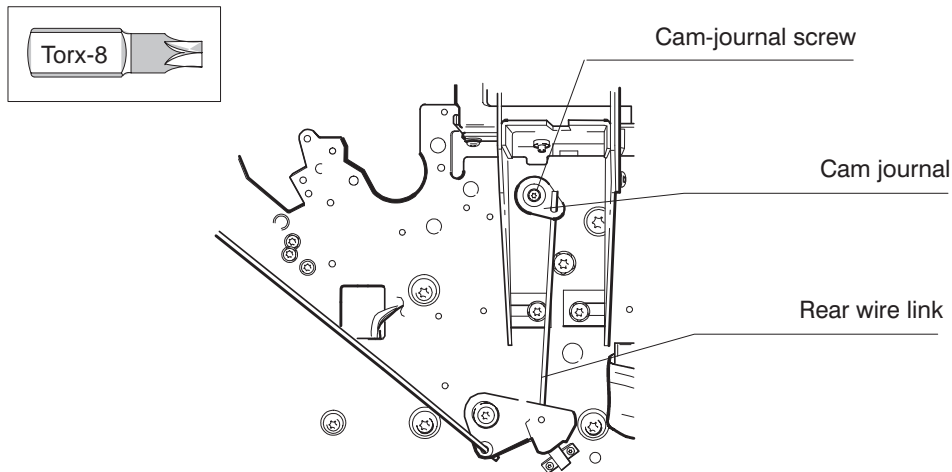


- 1 Remove the drive roller [page 6-69](#).
- 2 Push the pinch-arm lever (located on the right side of the entry platen) into the vertical position.
- 3 Remove the screws on the entry platen, [page 6-65](#), and pull it slightly forward.
- 4 On the right side of the plotter, disconnect the rocker-plate tension spring to relieve any remaining tension on the pinch-arm lift mechanism.





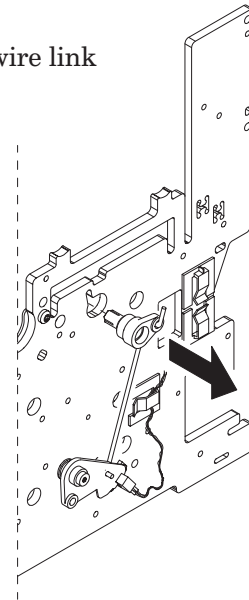
- 5 On the right side, loosen the cam-journal screw 12 turns counter-clockwise and push the screw in towards the center of the plotter.



- 6 Repeat the previous step and try to pull the cam journal and rear wire link to the right and clear of the bar cam.

*If unsuccessful, turn the cam-journal screw two more turns counter-clockwise, push the screw in towards the center of the plotter, and try again to pull the journal and rear wire link to the right and clear of the bar cam. Repeat these actions until successful.*

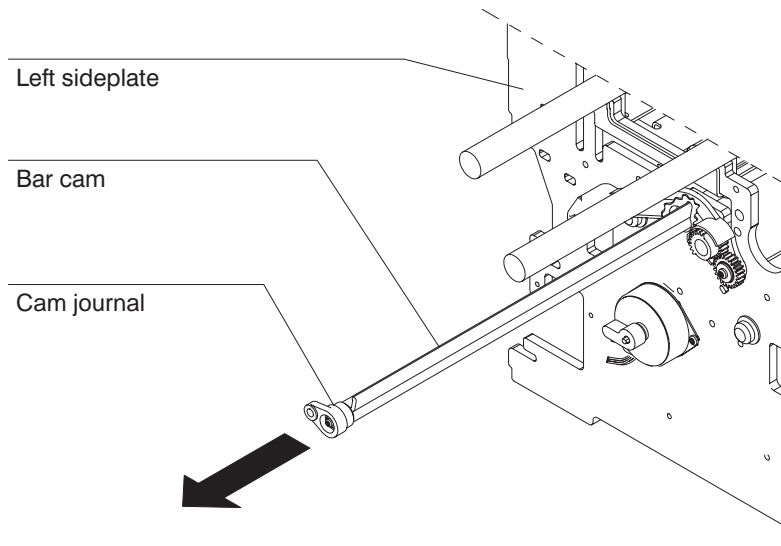
**Reassembling:** Before reinstalling the cam journal, tighten the nut and screw just to the point where the nut is inside the journal. Reinstall the journal and slightly tighten the screw.



## CAUTION

**Reassembling:** Do not overtighten the cam-journal screw. Doing so could break the journal, cause the bar cam to enter the sideplate hole, and thus restrict the action of the pinch-arm lever.

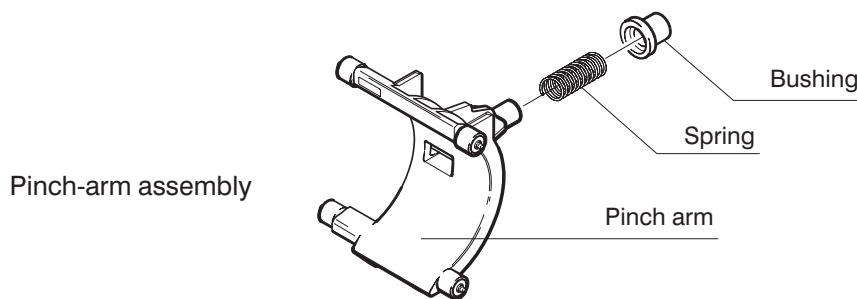
- 7 Grasp the cam journal on the left side of the plotter with your left hand.
- 8 Reach around to the front of the plotter and push the top of the bar cam slightly towards the rear of the plotter, simultaneously pulling the cam journal to the left, so that the bar cam can begin to slide out of the left sideplate.



**Reassembling:** Position the bar cam **between** the left and right sideplates, or the lift mechanism will not work.

- 9 While pressing the right-most pinch-arm assembly towards the rear of the plotter against its spring tension, slide the bar cam left until it clears that pinch-arm assembly.
- 10 Remove the pinch-arm assembly and spring from the chassis.

*Take care that the spring does not fall.*



- 11 Repeat the previous two steps until all of the pinch-arm assemblies have been removed or until you have removed the pinch-arm assembly that is to be replaced.

---

Calibrations

## When to Calibrate the Plotter

Indications or Repairs Performed	Calibration Required
Jagged lines on plots	Cartridge Alignment
Cartridges are reseated or replaced	Cartridge Alignment
Drive roller is removed or replaced	Accuracy Calibration
Media (X-axis) motor is replaced	Accuracy Calibration
Configuration-plot X-mark distance is not 500mm ( $\pm 1$ mm)	Accuracy Calibration
Carriage or carriage LED is removed or replaced	Cartridge Alignment and Setup-Sheet Calibration
Edge-detect failures occur	Cartridge Alignment
Bail failures occur during media loading	Bail Calibration
Bail sensor is removed or replaced	Bail Calibration
Bail-lift mechanism is removed or replaced	Bail Calibration
Media sensor is removed or replaced	Media-Sensor Calibration
Leading and trailing margins of a plot are greater than 17 mm (0.67 in)	Media-Sensor Calibration
Problems occur scanning a setup sheet.	Setup-Sheet Calibration
EEROM is cleared or main PCA is replaced	(In this order: 1. Bail Calibration 2. Media-Sensor Calibration 3. Cartridge Alignment 4. Accuracy Calibration 5. Setup-Sheet Calibration)

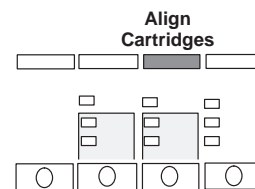
## Service Mode

### Entering Service Mode

- 1 Switch the plotter off.
- 2 While holding the **Align Cartridges** key down, switch the plotter on.
- 3 Once the **Busy** LED lights up, release the **Align Cartridges** key.

*The plotter performs the normal power-on self tests and mechanical initialization.  
The plotter is now in service mode.*





**DesignJet 220 plotters:** *Four LEDs (Draft, Final, Paper and Trans/Vellum) flash when you enter service mode. Press any key and they stop flashing.*



## Front-Panel Keys in Service Mode

Pressing any single front-panel key in service mode performs the same operation as in normal mode. However, in service mode, you can also use combinations of keys, to perform the various service tests and calibrations. With this intent, the **Replot** key acts as a **SHIFT** key, and the **Cancel** key acts as an **ALT** key.

The following illustration indicates which service tests and calibrations are assigned to which front-panel keys. A front-panel overlay is provided with this manual; you can place it over the actual keys on the plotter. The designation of keys for service tests is also shown on the service configuration plot.

Bail Sensor Test	Bail Cycle Test	Bail Calibration	← with ALT
Service Configuration	Electrical Test	Accuracy Calib. Print	← with SHIFT
			SHIFT
Service Monitor with Shift + Alt			
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			
Servo/Encoder Test	Setup-Sheet Calibration	Media-Sensor Calibration	← with ALT
Accuracy Calib. Read	Input/Output Test	Stepper Motor Test	← with SHIFT

To check whether a DesignJet 220 plotter is in service mode, press the **ALT** and **SHIFT** keys together, and then release them. If the plotter is in service mode, four LEDs (**Draft**, **Final**, **Paper** and **Transl/Vellum**) flash. Press any key and they stop flashing.

## Performing Tests and Calibrations

The general procedure to perform a service test or calibration is as follows:

- 1 Once in service mode (see previous page), hold down the **SHIFT** or **ALT** key, whichever is appropriate for the service test you want to perform.
- 2 Without releasing the **SHIFT** or **ALT** key, press the key corresponding to the service test or calibration you want to perform.
- 3 Release the keys once the **Busy** LED lights up.

Procedures specific to each calibration are given on the following pages. (Service tests ▶ chapter 8.)

---

## Cartridge Alignment

### When to Align Cartridges

If you suspect that the plotter is not producing plots of the highest quality, you can run a simple cartridge-alignment routine that will ensure that the print cartridges are aligned. Perform this routine also after clearing a media jam.

The alignment is also automatically performed after each time you replace or reseal the print cartridges. In this case, the plotter uses the first sheet of media that you load to perform the alignment.

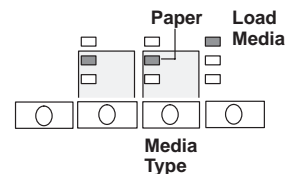
### Carriage-LED Calibration

The cartridge-alignment routine includes calibration of the carriage LED. This is the optical sensor on the cartridge carriage, used to find the left and right media edges during media loading. (This calibration is independent of the setup-sheet calibration. The setup-sheet calibration calibrates the same LED, but the values stored are used only for scanning a setup sheet and are separate from the values stored during the cartridge alignment.)

### Aligning Cartridges

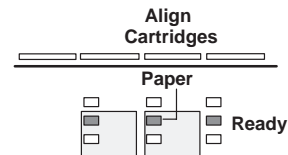
You do **not** have to enter service mode to align cartridges.

- 1 With the plotter *switched on*, ensure the media-jam lever (pinch-arm lever) is *up* and the window *down*. The **Load Media** light should be on.



- 2 Choose the correct **Media Type** on the front panel: If you are using plotting paper, as recommended in the following step, turn the **Paper** LED on. The **Final** and **Draft** lights have no significance for this procedure and either can be on.
- 3 Load an A-size or A4-size sheet of good quality plotting paper. (You can also use larger media sizes.) The **Ready** LED lights up.
- 4 Press the **Align Cartridges** key.

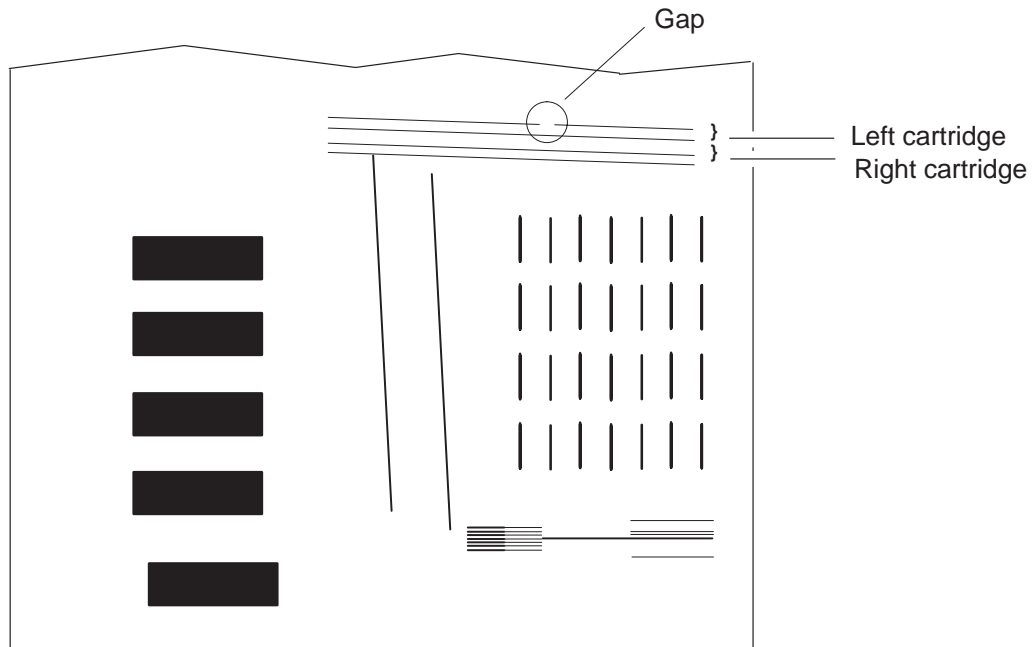
*The plotter takes 3 to 4 minutes to perform its alignment routine using the sheet of paper you have just loaded. In the course of the routine, it draws lines and shaded areas and then ejects the paper.*



- 5 Wait one minute for the ink to dry and unload the paper.

*The lines on the paper serve two purposes: Some lines have already been optically read by the plotter and used to perform cartridge alignment; others are now to be inspected by you.*

*An example of the cartridge-alignment plot sheet is shown below. The two pairs of lines that you should inspect are indicated on this example.*



- 6** If any of the left-cartridge or right-cartridge lines includes gaps, then the corresponding print cartridge should be either cleaned or replaced as appropriate.

---

## Accuracy Calibration

### Purpose

The accuracy calibration procedure is used to correct the end-point accuracy of the media axis. The cartridge axis does not require calibration and is used to calibrate the media axis.

Perform the accuracy calibration whenever the:

- EEROM is erased
- Main PCA is replaced
- Drive roller is removed or replaced
- Media (X-axis) motor is replaced

### What is the End-Point Accuracy Specification ?

The end-point accuracy specifies how accurately a plotter can draw a given length of line. The end-point accuracy specification for the plotters is  $\pm 0.38$  mm (0.015 in) or  $\pm 0.2\%$  of the specified vector length, whichever is greater, at 23°C (73°F), at 50-60% relative humidity on HP special polyester film. Use the following formula to calculate the plotter's accuracy:

$$\frac{\text{Measured length} - \text{Desired length}}{\text{Desired length}} \times 100 = \% \text{Error}$$

### What can Affect the End-Point Accuracy ?

Various part tolerances inside the plotter affect the accuracy (in particular the drive roller). Other outside influences include:

- Media thickness. Thicker media creates longer lines.
- Media expansion. As the media grows, so do the lines.
- Application software. The software may be instructing the plotter to draw an incorrect line length.
- The EEROM has been cleared. The accuracy constants are stored in this non-volatile memory component.

(Further information ▶ chapter 5, § *Media-Drive Accuracy*.)



## Performing the Accuracy Calibration

- 1 Enter service mode ▶ page 7-2.
- 2 Plot a service configuration plot ▶ page 8-23.
- 3 Measure the distance between the centers of the “X” marks on the configuration plot.

An accuracy calibration is needed if this distance is not 500 mm (20 in)  $\pm$ 1 mm (0.04 in) under normal environmental conditions.

If the measured accuracy, media thickness, or environmental conditions vary greatly from the factory standards, recalibrate the plotter by continuing with the following steps.

- 4 Place a sheet of media (preferably inkjet polyester film) over the top of the plotter for 10 minutes to let the sheet stabilize to the environmental conditions.

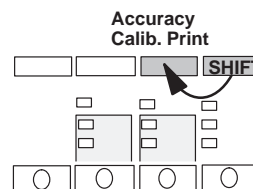
*Use a sheet approximately 61 x 91 cm (24 x 36 in).*

- 5 Select the appropriate **Media Type** on the front panel.
- 6 Load the media in portrait orientation into the plotter.

*If using inkjet polyester film, load the film with the matte (dull) side down.*

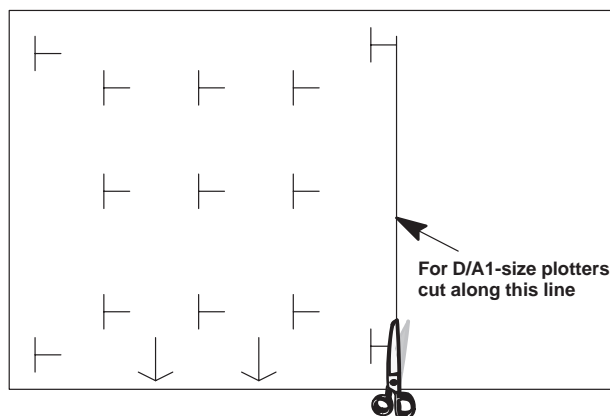
- 7 When the **Ready LED** lights up, hold down the **SHIFT** key and press **Accuracy Calib. Print**.

*The **Busy LED** lights up and the plotter plots a calibration plot. The plotter ejects the sheet, and the **Load Media LED** lights up.*



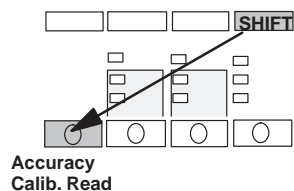
- 8 Unload the sheet.
- 9 Reload the sheet **facedown** into the plotter, in the direction indicated by the arrows on the calibration plot.

*If the plotter is D/A1 size, the sheet does not fit in the entry slot in the orientation indicated by the arrows. In this case, cut the blank end off the media so that it fits. (Cut along the long line on the plot; the cut must be very **straight** so that the sheet can be loaded.)*



- 10 When the **Ready** LED lights up, hold down the **SHIFT** key and press **Accuracy Calib. Read**,

*The **Busy** LED lights up. The plotter takes about 3 minutes to read the calibration sheet, to calculate the calibration data, and to save the data in the EEROM. (During this time, the plotter appears almost motionless for short intervals.) The plotter then ejects the sheet.*



- 11 Unload the sheet.

---

## Bail Calibration

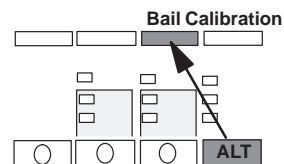
In this procedure, the 'up' position of the bail assembly is calibrated. A value is stored in the EEROM when the procedure is completed.

Perform the bail calibration whenever the:

- EEROM is cleared
- Main PCA is replaced
- Bail falls during media loading
- Bail switch is replaced
- Bail-lift mechanism is removed or replaced

To calibrate the bail, perform the following procedure:

- 1 Enter service mode ▶ page 7-2.
- 2 Hold down the **ALT** key and press **Bail Calibration**.



*The **Busy** LED lights up and the bail begins cycles of being raised and lowered. During a number of the cycles, the bail is let fall instead of being gently lowered. The calibration ends after about a minute and a half.*

---

## Media-Sensor Calibration

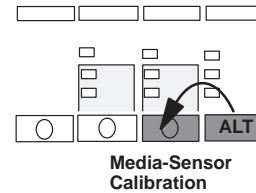
The media-sensor calibration measures the position of the media-sensor levers with respect to the drive roller. A value is stored in the EEROM when the procedure is completed.

Perform the media-sensor calibration whenever:

- The EEROM is cleared
- The main PCA is replaced
- The media sensor is removed or replaced
- The leading and trailing margins of a plot are greater than 17 mm (0.67 in).

To calibrate the media sensor, perform the following procedure:

- 1 Enter service mode ▶ page 7-2.
- 2 Hold down the **ALT** key and press **Media Calibration**.  
Any loaded media is ejected by the plotter.



- 3 When the **Load Media** LED begins to flash, load a sheet of media in landscape orientation.

*The loading process takes longer than usual because the sheet margins are measured several times. Once the sheet is loaded, it is ejected again.*

- 4 When the **Load Media** LED begins to flash again, load the **same** sheet in portrait orientation.

*Again, the loading process takes longer than usual because the sheet margins are measured several times. Once the sheet is loaded, it is ejected again, and the **Ready** LED lights up.*

---

## Setup-Sheet Calibration

This calibration calibrates the power of the LED situated on the cartridge carriage, for better scanning of the setup sheet.

Perform the setup-sheet calibration whenever:

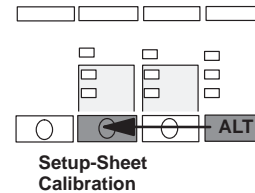
- The EEROM is cleared
- The cartridge carriage is replaced
- The optical sensor on the cartridge carriage is replaced
- Problems frequently occur with setup-sheet scanning

To calibrate the LED, perform the following procedure:

- 1 Enter service mode [page 7-2](#).
- 2 Load a blank sheet of paper.

*Do not use vellum, transparent or polyester media, or recycled paper.*

- 3 Hold down the **ALT** key and press **Setup-Sheet Calibration**.



*The plotter positions the cartridge carriage over the media. The carriage remains there for about 1 minute with the red LED lit, while the plotter performs the calibration. The plotter then ejects the sheet.*

To verify that the calibration has been performed correctly, plot a service configuration plot, [page 8-23](#), and look at the field entitled “Setup Sheet LED Calibration formula.” A formula appears in this field. If the calibration has not been performed correctly, a message, saying that the LED has not been calibrated for setup sheet, appears.

---

## Troubleshooting

---

## Power On

The plotters automatically perform a series of internal self tests and mechanical initialization sequences whenever the user switches the plotter on. These are completed after about 30 seconds. If a failure occurs, an error is indicated on the front-panel LEDs. You can perform a failure analysis by interpreting the LED error code. (Details ♦ later in this chapter.)

### Power-On Self Test

The power-on self test does the following:

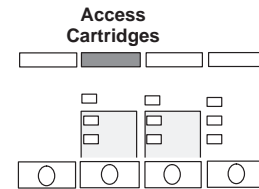
- 1 Initializes the servo processor.
- 2 Initializes the main processor .
- 3 Tests communication between the main processor and the servo processor.
- 4 Tests the ROM checksum.
- 5 Causes the main processor to initialize certain firmware modules and communicate with the carriage processor.
- 6 Tests the EEROM checksum.
- 7 Tests the servo-processor transfer buffer and interrupt-tracking abilities.
- 8 Tests the communication between the processors again.
- 9 Tests the carriage ASIC.
- 10 Begins mechanical initialization of the plotter.

## Extended Power-On Self Test

Perform the extended power-on test whenever the plotter passes the normal power-on test, but does not function properly.

To begin the extended power-on test, perform the following procedure:

- 1 Switch the plotter off.
- 2 While holding the **Access Cartridges** key down, switch the plotter on.
- 3 Once the **Busy** LED lights up, release the **Access Cartridges** key.



As well as carrying out the normal power-on tests, the extended power-on test does the following:

- 1 Tests the processor-support-ASIC motion control circuitry. (These circuits control the media and carriage motors.)
- 2 Tests the swath RAM.
- 3 Tests the communication link between the cartridge-interface ASIC and the carriage ASIC.
- 4 Tests the available DRAM not being used by the system. (The length of this test is dependent on how much DRAM is installed.)
- 5 Begins mechanical initialization of the plotter.

## Mechanical Initialization

The automatic mechanical initialization of the plotter begins at the end of the power-on test. The initialization procedure does the following:

- 1 Checks the window sensor.
- 2 Locates the initial position of the stepper motor.
- 3 Initializes the carriage axis (Y-axis).
- 4 Ejects any loaded sheet of media.
- 5 Checks the pinch-arm sensor.
- 6 Checks the media sensor.
- 7 Sets the plotter to accept media.
- 8 Tests the remainder of the DRAM.

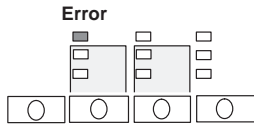
## What You Should See and Hear

When you turn on the plotter, the following happens:

- 1 All six LEDs light up for a brief moment; then the **Busy** LED remains on.  
*If you have activated the extended power-on self tests, all six LEDs remain off for a few seconds before the **Busy** LED lights up.*
- 2 The stepper motor makes a buzzing noise.
- 3 The cartridge carriage knocks against the left-hand side.
- 4 The carriage moves across the plotter and knocks three times against the right-hand side.
- 5 The carriage returns to the left-hand side.
- 6 Any loaded sheet of media is ejected.
- 7 If either cartridge is not correctly positioned, the carriage moves to a position where you can access it; the **Cartridges** LED lights up indicating that you have to load, reseal or replace the cartridges. (Instructions ▶ User's Guide.)
- 8 The cartridges are cleaned in the service station on the left-hand side of the plotter. During the cleaning process, the carriage moves slightly a number of times for the wiper to wipe the nozzles.
- 9 The carriage then parks in the service station on the left-hand side of the plotter.
- 10 If you have loaded or reseated the cartridges, the **Cartridges** and **Load Media** LEDs flash, indicating that the first sheet of media that you load will be used to run the cartridge-alignment procedure (Details ▶ chapter 7.)
- 11 If the cartridges are already aligned, the **Load Media** LED lights up to indicate that the plotter is ready for you to load media.



## Errors Indicated by LEDs



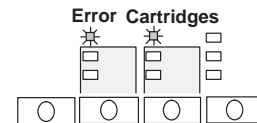
The **Error** LED on the front panel works in combination with the other LEDs to specify the type of error that has occurred. The three possible states of any LED are represented like this:



### User Errors

User errors are associated with user settings or user actions and may be solved by the user without calling a Customer Engineer. They are indicated by the **Error** LED flashing. (Further Information ▶ User's Guide, chapter 4, *Troubleshooting*.)

### Error and Cartridges flashing



#### Possible Causes

An error was detected during the cartridge-alignment routine.

An error was detected while scanning a setup sheet.

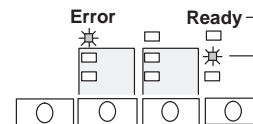
#### Corrective Action

1. Remove the cartridges.
2. Ensure that the protective tape has been removed and that the contacts are clean.
3. Replace the cartridges.
4. If the LEDs do not stop flashing when you lower the window, replace both cartridges with new ones.

See also ▶ later in chapter, § *Frequent Cartridge Failure*.

1. Check the quality of the media and print of the setup sheet.
2. If the quality appears acceptable, try loading the sheet again face down. If not, use a newly printed setup sheet.
3. If the error persists, perform the setup-sheet calibration.

### Error and Ready flashing



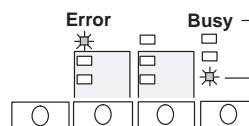
#### Possible Causes

The current plot is too large for the plotter's memory

#### Corrective Action

To be able to perform this plot, you have to install more memory. (If the plot is a raster plot, it might work if you send it with a **no negative motion** RTL command.)

## Error and Busy flashing



### Possible Causes

The serial-interface settings are different on the plotter and on the software.

The serial-interface cable is not correctly connected.

The computer is ignoring the plotter's handshake signals.

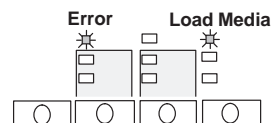
### Corrective Action

1. Print a setup sheet and check the plotter's current settings for **Baud Rate** and **Parity**.
2. Compare these with the current settings of the same two items for your application software. They must be the same.
3. If necessary, change the plotter's settings.

Connect the cable correctly.

If the computer is using hardware handshake, ensure that the serial-interface cable has a handshake wire.

## Error and Load Media flashing



### Possible Causes

The media does not advance around the roller when loaded.

You loaded the media too far from the right side.

The leading edge of the media is not parallel to the roller.

The media is too small for the plotter.

### Corrective Action

Remove the media and reload it.

Remove the media and reload it, aligning the right edge between the two dashed lines on the loading area.


Reload the media, aligning it correctly.

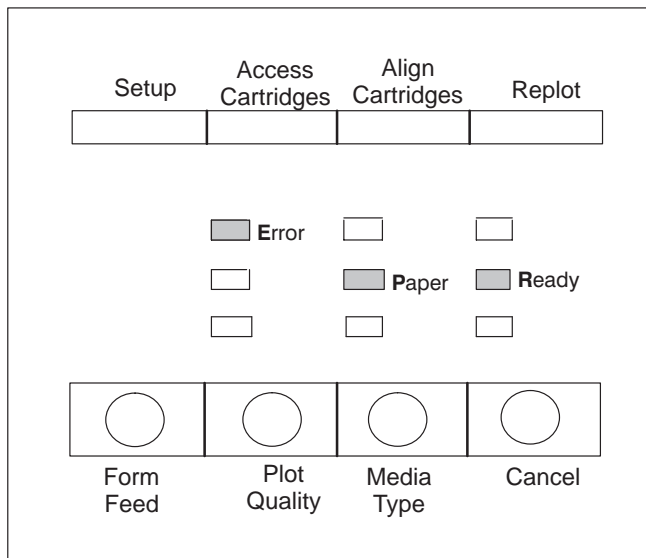
Use an A-size or A4-size sheet or larger. Load in portrait orientation for setup and align-cartridge routines.

See also [▶](#) later in this chapter, § *Problems in Loading Media*.

## System Errors




System errors are associated with plotter hardware failure that needs to be repaired by a Service or Customer Engineer. System errors are indicated by the **Error** LED lit and steady.

In the tables on the following pages, the symbol  represents the front-panel LEDs, where, in this case, the **Error**, **Paper** and **Ready** LEDs are lit and steady, and the other LEDs are off.



**Error and Busy** LEDs lit and steady: Input/output errors.



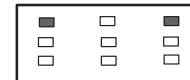
LEDs lit and steady	Error Number and Description	Corrective Options
	336. RS-232-C data overflow. Data byte was not read before another was entered into the UART.	At the time of printing of this manual, this error should be solved by replacing the main PCA. If the problem remains, consult recent service notes for a possible solution. If no service note deals with this error, report the problem to the HP Response Center.
	276. Failure of RS-232-C loopback test.	Ensure the loopback connector is the appropriate one. / Replace main PCA.
	340. Failure of centronics READ.	Replace main PCA.

Error and Ready LEDs lit and steady: Memory errors.



LEDs lit and steady	Error Number and Description	Corrective Options
	81. Failure of ROM test	Replace EPROMs. If problem remains, replace main PCA.
	21. Failure of DRAM quick test	Replace main PCA.
	85. Failure of DRAM full test	Replace main PCA
	49. Failure of Swath RAM test	Replace main PCA
	113. Failure of EEROM test	Replace main PCA.
	53. DRAM SIMM failure	Replace DRAM SIMM. If problem remains, replace main PCA.
	117. Sensor structure – firmware failure	At the time of printing of this manual, this error should not occur. If it does occur, consult recent service notes for a possible solution. If no service note deals with this error, report the problem to the HP Response Center.
	145. Out of memory	Install a larger DRAM SIMM.

**Error and Load Media LEDs lit and steady:**  
Media-path/servo errors.



LEDs lit and steady	Error Number and Description	Corrective Options
	82. Shutdown of media axis (X-axis)	See <a href="#">▶</a> later in this chapter, § <i>Servo-Control System Failures</i> .
	22. Shutdown of carriage axis (Y-axis)	See <a href="#">▶</a> later in this chapter, § <i>Servo-Control System Failures</i> .
	86. Carriage-axis failure	Check encoder strip, carriage assembly, trailing cable, main PCA.
	50. Cartridge-cap failure	See <a href="#">▶</a> later in this chapter, § <i>Frequent Cartridge Failure</i> . / Check the service station, encoder strip and media motor.
	114. Error detected in media-axis servo feedback loop.	Check media motor, media-motor encoder cable, main PCA.
	54. Error detected in carriage-axis servo feedback loop.	Check encoder strip, carriage assembly, trailing cable, main PCA.
	118. Bail sensor indicates the bail is up when it should be down or vice versa, or the bail drops suddenly (missing the notch on the auto cam).	See <a href="#">▶</a> later in this chapter, § <i>Bail-Lift-Mechanism Failure</i> . / Use the bail-sensor test to help troubleshoot. / Check for mechanical problems. / Perform the bail calibration.
	146. Accuracy-calibration error	Did you load the media in the correct orientation? / Ensure that the marks are visible on the plot. If not, check cartridges. / Ensure that the sheet is cut correctly. / Perform a cartridge alignment: if alignment is correct, the problem may be in the main PCA, media motor or media motor gear; if alignment is incorrect, the problem may be in the carriage.
	210. Media-sensor-calibration error. One of the flags on the media sensor may be positioned too far forward or too far back.	Replace the media sensor. If the error persists, there may be a problem with the LED on the cartridge carriage: Perform a cartridge alignment / Replace LED.

**Error and Cartridge LEDs lit and steady: Miscellaneous errors.**



LEDs lit and steady	Error Number and Description	Corrective Options
	88. Processor fault	At the time of printing of this manual, this error should not occur. If it does occur, consult recent service notes for a possible solution. If no service note deals with this error, report the problem to the HP Response Center.
	28. Communication failure between the main and servo processors. Communication occurs through the processor-support ASIC.	Replace main PCA.
	92. Servo interrupts not occurring or not reaching the main processor support ASIC.	Replace main PCA.
	56. Error in servo-drive calculations.	Replace main PCA.
	120. Servo-processor communication error.	Replace main PCA.
	60. Failed communications between the carriage and main processors.	Check trailing cable connections and continuity. If needed, replace trailing cable, main PCA or carriage assembly.
	124. The optical sensor on the carriage has failed to locate lines drawn during the cartridge calibration routine.	Reduce ambient light. / If media is not clean and reflective, change media. / If lines are faint, replace cartridges. / Clean lens. / Replace LED.
	152. Failure of cartridge-interface – ASIC test.	Replace main PCA.
	216. Firmware failure.	At the time of printing of this manual, this error should not occur. If it does occur, consult recent service notes for a possible solution. If no service note deals with this error, report the problem to the HP Response Center. Note conditions before error occurred. Include setup sheet and service configuration plot in report.

---

## Firmware-Code Revision Level

To check the firmware-code revision level that the plotter is using, print a setup sheet or a service configuration plot.

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## Troubleshooting Tips

### **Repair + Calibrate**

After you have made a repair, consider if any calibrations have been affected.

### **Print Quality**

You can use the user demonstration plot to look at overall print quality including smoothness and straightness of lines, arcs, circles, and characters. The procedure for plotting the demonstration plot is given in the User's Guide.

### **Diagnosing Problems**

You can use the service configuration plot to help diagnose problems. The procedure for plotting the configuration plot is given on page 8-23.

### **Other Tips**

On the following pages are tips about solving the following problems:

- Servo control-system failures
- Frequent cartridge failure
- Bail-lift-mechanism failure
- Cartridge carriage rubbing against encoder strip
- Premature wearing of drive belts
- Sensor does not find media edge
- Last swath is clipped when replotting
- Ink smearing
- Plots joined or not plotted
- Incorrect line widths
- Plotter won't read setup sheet; Plots solid black area fill
- Problems in loading media

---

## Servo Control-System Failures

### Media-Axis (X-Axis) Shutdown



In the case of a media-axis shutdown, try one or more of the following corrective actions:

- Clear any binding in the media-axis mechanics due to a media jam. (Do not pull the media along the carriage axis. Doing so could break the media-sensor flags.)
- Remove the two screws that attach the drive-roller gear to the drive roller. This should enable you to manually spin the drive roller. If it does not, the roller is probably jammed.
- Perform the servo/encoder service test to check for problems with the media-axis motor encoder and main PCA.

### Carriage-Axis (Y-Axis) Shutdown



In the case of a carriage-axis shutdown, try one or more of the following corrective actions:

- Clear any binding in the carriage-axis mechanics due to a media jam.
- Turn the plotter off. This should enable you to manually move the carriage along the carriage-axis. Check for any areas where the carriage may be binding.
- Ensure that the double pulley, small drive belt, small belt tensioner, main belt, main idler, and carriage bushings are in correct working order.
- Perform the servo/encoder service test to check for problems with the servo-feedback and motor drive systems.

---

## Frequent Cartridge Failure

### Remove Tape and Align Cartridges

One frequent cause of cartridge problems is that the user has forgotten to remove the tape from new cartridges. Remove the tape and perform a cartridge alignment.

### Damaged Encoder Strip

Another cause of apparent frequent cartridge failure may be a damaged encoder strip. If the small slots on the strip are damaged, the plotter cannot position the carriage correctly during cartridge checking. Try replacing the encoder strip.

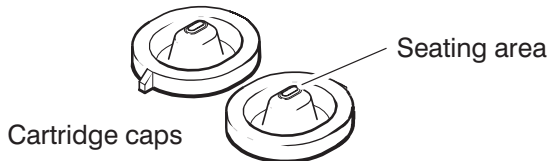
### Incompatibility between Carriage and Firmware

In combination, cartridge carriage C2847-60071 (carriage PCA C2847-60125) and plotter firmware A.01.00 destroy the cartridges. Update the plotter firmware and replace the cartridges. (Details ♦ chapter 9 § *Problems Corrected by Firmware Release A.01.01.*)



## Misaligned Cartridge Caps

If a customer is complaining about shortened cartridge life or frequent cartridge failure, you should check the cartridge-cap alignment (procedure below). This is especially true if the problem is always happening to the same cartridge. A sure sign of a misaligned cap is excess ink around the cap and inside the ink reservoir. You should clean the caps and reservoir using only water. You should also clean the wiper.



### Function of the Cartridge Caps

The cartridge caps (also called service-station caps) are located in the service station. Looking closely at a cartridge's print-head reveals two parallel rows of nozzles. The cap should form a seal that surrounds the rows. If the caps are mispositioned, the seal may be touching one or more of the nozzles. The result is premature cartridge failure and a messy service station.

### What can Cause Cap Misalignment?

The most common cause is that the cap is not seated properly on the service-station sled. Any of the service-station parts could cause misalignment if defective or installed incorrectly.

### Checking Cartridge-Cap Alignment

The following tools are recommended for this procedure:

- Soft lint-free wipes
- Non-permanent ink marker (dry erase type works best)
- 10X magnifier
- Print cartridges

To check the alignment of the caps with respect to the print-head nozzles

- 1 Remove the window, center cover and left endcover.
- 2 Manually move the carriage out of the service station.
- 3 Load very clean cartridges into the carriage.  
*Use lint-free wipes dampened with water to clean the cartridges.*
- 4 Apply ink to the seating area of the cartridge caps with the ink marker.
- 5 Manually move the carriage **slowly** into the service station, then out again.
- 6 Remove the cartridges and observe where the ink mark is positioned with respect to the nozzles. A 10X magnifier is very useful for this step. If one is not available, you should look at how centered the mark is within the gold pad area.
- 7 If the ink mark is touching any nozzle, you need to check and reseal the cartridge caps and repeat the test.

---

## Bail-Lift-Mechanism Failure

### Normal Bail-Lift Sequence

The following is what should happen during a normal bail-lift sequence:

- 1 The cartridge carriage positions over the engagement lever. This connects the auto-lift mechanism to the drive-roller gear. The media motor becomes the driving force for the auto-lift.
- 2 The media motor drives the drive roller, which in turn drives the bail auto-lift. The bail begins raising up until the “UP” position is reached.
- 3 The carriage moves away from the engagement lever so that the media may be driven by the drive roller without affecting the position of the bail. (The bail is kept in the up position by the left bail arm resting in the notch on the gear cam.)
- 4 After the media is moved forward, the carriage again positions over the engagement lever. The media motor then drives the bail auto-lift and the bail lowers to the down position.

When the bail is down, it presses on the bail sensor switch. This is how the plotter knows the position of the bail.

### Problems

- The cam gear and engaging gear detach from the drive-roller gear even though the carriage is still actuating the engaging lever. This can happen due to excessive part tolerances or wear.
- The engaging lever spring is installed on the lower rung of the Y-drive bracket, creating too much spring tension. Excessive spring tension accentuates any looseness in the bail lift parts. Install the spring on the upper rung.
- The carriage does not properly locate the engagement lever, preventing the gears from engaging. Any problems with the carriage-motor control system (for example, the encoder strip) or associated mechanics could cause this problem. Also, if the carriage cannot find the true left stop during initialization (caused by interference), the engaging lever cannot be located. Possible causes of interference are the service-station sled and the main tensioner bracket.
- The bail falls from the up position. This can result if the cam is over or under-rotated. The notch on the cam, used to catch the left bail bracket, is not properly located for the “bail up” condition, and the bail falls abruptly. A bail calibration may correct this problem.

### Teflon Washers versus Cam-Gear Support

Problems can arise if the lift mechanism is too loose or too tight. The solution in the DesignJet 200 involved the use of teflon washers. A new solution comes with the introduction of the DesignJet 220 and involves a new part called the cam-gear support. (Details ▶ chapter 9, § *New Bail-Lift-Mechanism Support*.)

---

## Cartridge Carriage Rubbing against Encoder Strip

When properly installed, the encoder strip should pass through the cartridge-carriage assembly without touching it. Sometimes excessive rubbing may be experienced, causing the encoder strip to buckle or vibrate, and thus causing errors in the carriage-axis servo feedback system and poor carriage-axis position tracking.

You can adjust the encoder-strip position by adjusting the position of the encoder spring bracket. To do this, perform the following procedure:

- 1 Remove the power cord from the plotter.
- 2 Remove the window, center cover and right endcover.
- 3 Manually position the carriage assembly in the center of the plotter.
- 4 Loosen the top and bottom screws of the adjustable encoder-spring bracket.
- 5 Manually move the bottom of the bracket about the bracket's top screw until the encoder strip is centered in the carriage; then tighten the screws.

---

## Premature Wearing of Drive Belts

The main belt or the small Y-drive belt may wear prematurely if the plotter is placed near a diazo copier that uses ammonia to produce blue-line copies. The material used in the belts is very reactive to ammonia vapor. The vapor is very corrosive and can damage other parts as well. It is recommended to move the plotters away from such copiers.

---

## Sensor does not Correctly Find Media Edge

Excessive ink deposits on the drive-roller surface can fool the sensor by reflecting the light. (Cleaning roller ▶ chapter 4.)

---

## Last Swath is Clipped when Replotting

This bug on DesignJet 200 plotters will be solved in firmware revision A.01.02. (Details ▶ chapter 9.)

---

## Ink Smearing

### Add Starwheel Mount

Ink may smear in DesignJet 200 plotters and early DesignJet 220 plotters due to cockle in the media caused by the geometry of the media path. The problem is more evident when loading A/A4-size media. (Solution ♦ chapter 9, § *Change in Bail and Overdrive Parts.*)

### Change Carriage Rear Bushing

Another reason for ink smearing in DesignJet 200 plotters is an insufficient distance between the cartridges and the media. This problem is solved in the DesignJet 220 plotters, using a new rear bushing on the carriage. You can order this bushing for a DesignJet 200. (Part number ♦ chapter 10.)

---

## Plots Joined or Not Plotted

### HP-GL Timeout

If the user is using an **HP 7586B** (HP-GL) driver, it may not end files properly with the result that several plots may be joined, or not plotted at all. In this case you need to choose an **HP-GL Timeout** period. (Instructions ♦ User's Guide.) The timeout tells the plotter how long to wait before assuming a plot is complete.

*Short timeout period:* A timeout setting that is too short results in incomplete plots.

*Long timeout period:* If the plotter has finished receiving the plot data (**Busy** LED stops flashing and remains on) and is waiting for the timeout period to finish before plotting, you can command it to plot immediately by pressing **Form Feed**.

### Incompatibility between Trailing Cable and Main PCA

The shielded trailing cable C3180-60033 (blue and white) is NOT compatible with old main PCAs (C3180-60101, C3180-68101, C3180-69101). Nothing is printed if you use them in combination. Update the main PCA.

---

## Incorrect Line Widths

DesignJet 200 plotters with firmware version A.01.00 may plot line widths that are inconsistent with the selected values if an **IN** command is absent in the plot files. Update the firmware. (Details ♦ chapter 9, § *Problems Corrected by Firmware Release A.01.01.*)

---

## Plotter won't Read Setup Sheet; Plots Solid Black Area Fill

This problem can occur on DesignJet 200 plotters with the old-style cartridge carriage. Install a new carriage. (Details ▶ chapter 9, § *Change in Carriage.*)

---

## Problems in Loading Media

### User's Guide

The Troubleshooting section of the User's Guide lists mistakes you may be making if the plotter continually rejects your media.

### Long Media doesn't Load

DesignJet 200 plotters with firmware version A.01.00 cannot load 1.6-m media. Update the firmware. (Details ▶ chapter 9, § *Problems Corrected by Firmware Release A.01.01.*)

### Translucent Media doesn't Load

Some DesignJet 200 carriage PCAs have problems sensing translucent media. The solution is to install a new cartridge carriage. (Further Information ▶ chapter 9, § *Change in Carriage.*)

### Binding, or Missing Sensor Flags

Media-load failures can also occur due to binding in the media-axis mechanics or missing media-sensor flags. Clear any binding in the media-axis mechanics due to a media jam. (Do not pull the media along the carriage axis. Doing so could break the media-sensor flags.)

### Media Skews Badly

Ensure that the media diverters (part number ▶ page 10-26) are correctly installed. If one is missing or broken, replace it. To access this part, you need to remove the drive roller !

---

## Service Tests

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Test	Description
Bail Cycle Test	This tests the following: <ul style="list-style-type: none"><li>• Bail</li><li>• Bail sensor switch</li><li>• Drive Mechanics</li><li>• Main PCA</li></ul>
Bail-Sensor Test	This tests the following: <ul style="list-style-type: none"><li>• Bail sensor switch</li><li>• Main PCA</li><li>• Mechanical interference</li></ul>
Electrical Test	The electrical test performs all of the following: <ul style="list-style-type: none"><li>• Carriage communications test</li><li>• Carriage ASIC test: Values stored in the carriage ASIC registers are temporarily stored. All registers are tested by writing, then reading, the numbers AA(hex) and 55(hex). When the test is complete, previously stored values are restored.</li><li>• Cartridge interface ASIC test: Verifies the functionality of the cartridge interface ASIC.</li><li>• Cartridge ASIC / carriage ASIC link test</li><li>• EEROM checksum</li><li>• On-board SIMM RAM test</li><li>• ROM CRC test: Performs a ROM checksum and compares it to a checksum value previously stored.</li><li>• Swath RAM test: Tests the RAM used by the cartridge interface ASIC to store the swath.</li></ul>
Input/Output Test	The input/output test performs the following: <ul style="list-style-type: none"><li>• Parallel input/output test: Reads the data and status registers of the Bi-Tronics PAL. (Tests only a small portion of the Bi-Tronics input/output functionality.)</li><li>• Serial input/output test: Verifies the ability of the RS-232 interface to send and receive data. This test uses a special loopback connector (part number 07440-60302) to connect the output to the input.</li></ul>

Test	Description
Media-Sensor Test	<p>This tests the following:</p> <ul style="list-style-type: none"> <li>• Media sensor on entry platen</li> <li>• Main PCA</li> <li>• Media opacity</li> </ul>
Pinch-Arm-Sensor Test	<p>This tests the following:</p> <ul style="list-style-type: none"> <li>• Pinch-arm sensor</li> <li>• Pinch-arm-sensor cable</li> <li>• Main PCA</li> </ul>
Service Configuration Plot	<p>The service configuration plot contains the following:</p> <ul style="list-style-type: none"> <li>• Hard-clip border around the plot enabling you to measure the margins.</li> <li>• Unique bar patterns enabling you to detect print-quality problems</li> <li>• Four X-shaped marks (crosshairs) for measuring the accuracy of the media-axis calibration. (The centers of the crosshairs should be 500 mm apart.)</li> <li>• Contents of EEROM, dumped in hexadecimal format.</li> <li>• Explanation of important EEROM parameters, including a mileage monitor and information on the last system error.</li> <li>• Designation of front-panel keys for service tests.</li> </ul>
Service Monitor (Data Display)	<p>Use the service monitor to compare the code sent by the computer with that received by the plotter. Instead of plotting the drawing that you send, the plotter prints part of the code that would otherwise have been used to plot the drawing. This code is useful when you suspect that there is a problem with the communication between the computer and the plotter.</p>
Servo/Encoder Test	<p>The servo/encoder test performs the following:</p> <ul style="list-style-type: none"> <li>• <b>Media-axis encoder test:</b> Verifies the operation of the servo loop (Media-axis feedback).</li> <li>• <b>Carriage-axis encoder test:</b> Verifies the operation of the servo loop (Carriage-axis feedback).</li> <li>• Records the maximum pulse-width modulations used. You can view this information on the service configuration plot.</li> </ul>

---

Test	Description
Stepper-Motor Test	<p>The stepper-motor test continuously cycles the stepper motor, thus raising and lowering the wiper and the lever mechanism.</p> <p>It tests the following:</p> <ul style="list-style-type: none"><li>• Stepper motor</li><li>• Main PCA</li><li>• Cartridge-adjust linkage</li><li>• Wiper linkage</li></ul>
Window-Sensor Test	<p>This tests the following:</p> <ul style="list-style-type: none"><li>• Window sensor</li><li>• Window-sensor cable</li><li>• Main PCA</li></ul>



## Which Service Test to Perform

The following table indicates the service tests that you can perform on particular assemblies:

Assembly	Tested by ...
Bail	Bail cycle test
Bail-sensor	Bail-sensor test, Bail cycle test
Carriage-axis encoder/motor	Servo/encoder test
Carriage-axis encoder cable	Servo/encoder test
Cartridge-adjust linkage	Stepper-motor test
Cartridge carriage	Electrical test
Communication between computer and plotter	Service monitor
Double pulley	Servo/encoder test
DRAM SIMM	Electrical test
Drive belt	Servo/encoder test
Drive mechanics	Bail cycle test
Drive roller	Servo/encoder test
EEROM	Electrical test
Main belt	Servo/encoder test
Main idler	Servo/encoder test
Main PCA	Electrical test, Input/output test, Stepper-motor test, Servo/encoder test, Bail-sensor test, Media-sensor test, Window-sensor test, Pinch-arm-sensor test, Bail cycle test
Mechanical interference	Bail-sensor test
Media-axis encoder/motor	Servo/encoder test
Media-axis encoder cable	Servo/encoder test
Media sensor	Media-sensor test
Overdrive	Servo/encoder test
Pinch-arm sensor	Pinch-arm-sensor test
Pinch-arm-sensor cable	Pinch-arm-sensor test
ROM	Electrical test
Slider rods	Servo/encoder test
Stepper motor	Stepper-motor test
Trailing cable	Electrical test
Window sensor	Window-sensor test
Window-sensor cable	Window-sensor test
Wiper linkage	Stepper-motor test

## Performing the Service Tests

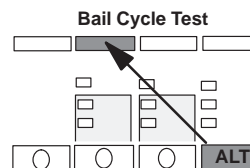
The following paragraphs describe how to perform the various service tests. You know that a test has failed if a system error is indicated by means of the front-panel LEDs.

### Bail Cycle Test

- 1 Enter service mode (see page 7-2).
- 2 Hold down the **ALT** key and press **Bail Cycle Test**.

*The **Busy LED** lights up and the bail begins cycles of being **gently** raised and lowered.*

- 3 Press the **ALT (Cancel)** key when you want to stop the test.



### Bail-Sensor Test

- 1 Enter service mode (see page 7-2).
- 2 Hold down the **ALT** key and press **Bail Sensor Test**.

*The **Busy LED** lights up.*

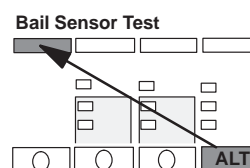
- 3 Open the window within 120 seconds.

*Otherwise the **Busy LED** goes off and the test ends.*

- 4 Manually raise the bail.

*The **Ready LED** flashes.*

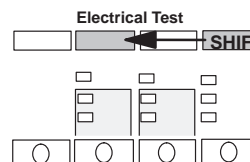
- 5 Press the **ALT (Cancel)** key when you want to stop the test, and lower the window.



### Electrical Test

- 1 Enter service mode (see page 7-2).
- 2 Hold down the **SHIFT** key and press **Electrical Test**.

*The **Busy LED** lights up and remains lit for about 30 seconds while the tests are being performed.*



### Input/Output Test

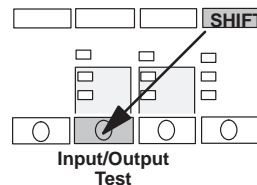
- 1 Connect a loopback connector (part number 07440-60302) to the serial port of the plotter.

*If a connector is not available, you can place a jumper between pins 2 and 3 of the serial port for the test.*

- 2 Enter service mode (see page 7-2).

- 3 Hold down the **SHIFT** key and press **Input/Output Test**.

*An error is displayed on the front panel if the test fails.*



### Media-Sensor Test

When the **Load Media** LED is lit, manually insert a sheet of media, so that it covers the media sensor.

*The **Load Media** LED should turn off, and the **Busy** LED should light up. (The plotter then loads the sheet.)*

### Pinch-Arm-Sensor Test

- 1 With the window closed and the **Load Media** LED lit, pull the media-jam lever (pinch-arm lever) forward.

*This raises the pinch arms. The **Ready** LED should flash.*

- 2 Push the media-jam lever back to its original vertical position.

*This lowers the pinch arms. The **Ready** LED should stop flashing, and the **Load Media** LED should light up again.*

### Service Configuration Plot

- 1 Enter service mode (see page 7-2).

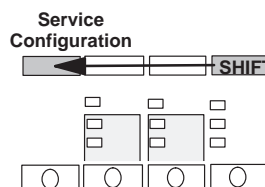
- 2 Set the **Plot Quality** to **Final** on the front panel.

- 3 Load a sheet of A1-size or D-size media in portrait orientation.

*If you use a smaller sheet (minimum A4 or A size), all information will be plotted, except the “X” marks, used for accuracy calibration in chapter 7.*

- 4 When the **Ready** LED lights up, hold down the **SHIFT** key and press **Service Configuration**.

*The **Busy** light first begins to flash and then remains on and steady. The plotter plots the service configuration plot and ejects the media.*

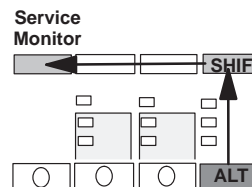


- 5 Unload the media.

- 6 See “Interpreting the Service Configuration Plot” on page 8-25 for how to analyze the bar pattern and how to read the EEROM text block.

### Service Monitor (Data Display)

- 1 Enter service mode (see page 7-2).
- 2 Hold down the **SHIFT** and **ALT** keys and press **Service Monitor**.
- 3 Send the file or files from the computer through the serial or parallel ports.
- 4 Press any front-panel key when the file(s) have been transferred to the plotter.
- 5 Load a sheet of media (A3 size or B size minimum) in portrait orientation.

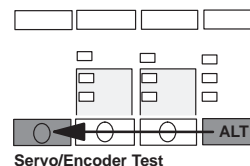


*Instead of plotting the drawings that you sent, the plotter plots the first and last Kbytes of the code for those drawings. The code is printed in hexadecimal and ASCII format. (If the total size of the file(s) sent is not bigger than one Kbyte, only the first buffer is printed.) The plotter exits the service monitor mode if the file(s) sent contain PjL universal exit language.*

- 6 Compare the code printed with the code sent from the computer to check if communication between the computer and the plotter is functioning correctly.

### Servo/Encoder Test

- 1 Enter service mode (see page 7-2).
- 2 Hold down the **ALT** key and press **Servo/Encoder Test**.

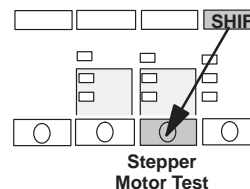


*The **Busy LED** lights up and the carriage moves to the center of the plotter. Both the carriage and the roller then move backwards and forwards in cycles of six short steps, changing direction between cycles.*

- 3 Press any front-panel key to stop the test.

### Stepper-Motor Test

- 1 Enter service mode (see page 7-2).
- 2 Hold down the **SHIFT** key and press **Stepper Motor Test**.



*The **Busy LED** lights up and the stepper motor switches on, continuously raising and lowering the wiper and the lever mechanism.*

- 3 Press the **ALT** key when you want to stop the test.

### Window-Sensor Test

- 1 With the **Load Media LED** lit, open the window.

*The **Ready LED** should flash.*

- 2 Close the window again.

*The **Ready LED** should stop flashing, and the **Load Media LED** should light up again.*

---

## Interpreting the Service Configuration Plot

### Analyzing the Bar Pattern

The configuration plot has special built-in diagnostic features. It includes seven bars printed along the top that enable you to detect print-quality problems.

#### First Four Bars

Use the first four bars (from left to right) to detect

- Problems with nozzle firing direction
- Missing nozzles

These bars are a series of straight horizontal lines, four pixels apart. Different nozzles are used to create each of the four bars.

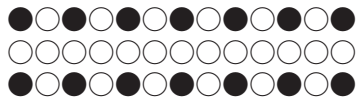
Use a 10X magnifier to look at the patterns. Perfect patterns should be parallel lines equally spaced. Some slight errors in direction (meaning the ink dots are not being fired straight) are due to nozzle imperfections and cannot be fixed. Others may be caused by nozzle contamination. You can sometimes correct these by cleaning the nozzles (◆ User's Guide).

#### Fifth and Sixth Bars

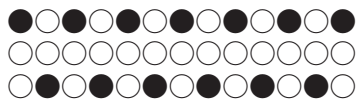
Use the fifth and sixth bars to detect

- Banding
- Problems with nozzle firing direction
- Misalignment between the cartridges

In the following two diagrams, ● denotes a dot and ○ denotes a white space. The fifth bar is a 25% area fill pattern that looks as follows,



The sixth bar is also a 25% area fill pattern that looks as follows:



These bars should look solid gray.

#### Seventh Bar

Use the seventh bar to detect misalignment between the cartridges.

This bar is a series of vertical lines, 8 pixels apart. The lines should be straight with a deviation of no more than 2 mils.

## Parameters Printed Below EEROM Text Block (*Decimal Values*)

Number of Power Cycles (*Number of times plotter has been switched on.*)

Number of Pages Printed

Number of Bail Lifts

Number of Bail Errors

Number of System Errors

Last System Error

*(See System Errors earlier in this chapter for correspondence of numbers to errors.)*

Last System Error Data

Bail Up Position Offset (*Calculated during bail calibration.*)

Bench Run (*Whether the bench run has been performed or not.*)

Bench Run Maximum Y-Axis PWM (*Y-axis = carriage axis.*)

Bench Run Maximum X-Axis PWM (*X-axis = media axis.*)

Encoder Tests Maximum Y-Axis PWM

Encoder Tests Maximum X-Axis PWM

Last X-Axis Calibration (*X-axis calibration = accuracy calibration*)

Factory Calibration Factor

*(This is the drive-roller correction factor, calculated during accuracy calibration.)*

Setup Sheet LED Calibration formula.

*(The values in the formula are calculated during the setup-sheet calibration.)*

## Reading the EEROM Text Block

The contents of the EEROM integrated circuit are printed in hexadecimal form in a text block on the service configuration plot.

To read the EEROM text block, perform the following procedure:

- 1 Examine the EEROM memory map in Table 8-1 to find the memory address of the data you want to read.
- 2 Use the memory location key in Table 8-2 to locate the position of the memory address on the service configuration plot.
- 3 Read the contents of the memory address from the service configuration plot.

**Example:** *Searching for the media-sensor correction factor*

- 1 *The EEROM memory map (Table 8-1) indicates that the memory address of the media-sensor correction factor is 1b.*
- 2 *The memory location key (Table 8-2) indicates that address 1b is located in the second row from the top, in the fifth column from the right.*
- 3 *On the sample EEROM text block (Table 8-3), address 1b contains the number 0.*

*Therefore, in this case, the media-sensor correction factor is hexadecimal 0 (= decimal 0).*

Table 8-1. EEROM Map

Address Location	Definition
00	Value=55 if EEROM has been initialized (Read by servo processor)
01	Value=AA if EEROM has been initialized (Read by servo processor)
02	Value=5A if EEROM has been initialized (Read by servo processor)
10	Byte 0 of the number of bench-run cycles completed
11	Byte 1 of the number of bench-run cycles completed
15	Number of stepper cycles per bench-run cycle
16	Byte 0 of the total number of bench-run cycles
17	Byte 1 of the total number of bench-run cycles
18	Number of waits per bench-run cycle
19	Number of bail cycles per print in bench run
1a	Number of swaths per bench-run cycle
1b	Media-sensor correction factor. (Calculated during media-sensor calibration)
33 (bit 6)	Bit 1 (MSB) of bail-calibration (00 = not calibrated; 11 = calibrated; status.. 01 and 10 = calibration in process)
33 (bit 7)	Bit 0 (LSB) of bail-calibration status.
36 (bit 7)	Need-cartridge-alignment flag. (1 = needs cartridge alignment)
37 (bit 0)	Valid-cartridge-alignment flag. (1 = alignment performed OK)
39	PWM for carriage LED (calculated during cartridge alignment)
3d	Byte 1 of media-axis alignment distance. (Positions engagement lever.)
3e	Byte 0 of media-axis alignment distance.  Constants at address locations 3F through 4D are loaded when the cartridge-alignment routine is performed.
3f	Value used to correct position of carriage LED relative to media axis.
40	Value used to correct position of carriage LED relative to carriage axis.
41	Cartridge offset. (Used to correct distance between the two cartridges.)
42	Bi-directional offset in columns. (Used to compensate for differences between ink-drop trajectory when carriage is moving from left to right and that when carriage is moving from right to left.)
4b	High-velocity factor, scaled by 64. (Used to adjust the bidirectional offset when the plot quality is set to draft mode.)
4d	Cartridges' first nozzles (Not all of the nozzles are used; there may be an overlap between the two cartridges to allow for alignment. Bits 0 and 1 indicate the first nozzle used on the right cartridge. Bits 2 and 3 indicate the first nozzle used on the left cartridge.)
4e	Drive-roller correction factor. (Calculated during accuracy calibration.)

Table 8-2 is a key to the EEROM memory text block on the service configuration plot. The first column is the same as on the plot; the remaining columns show the memory location number instead of the contents at each position on the text block.

Table 8-2. Memory Location Key

EEROM Text Block Memory Locations																	
0:	00	01	02	03	04	05	06	07	-	08	09	0a	0b	0c	0d	0e	0f
10:	10	11	12	13	14	15	16	17	-	18	19	1a	1b	1c	1d	1e	1f
20:	20	21	22	23	24	25	26	27	-	28	29	2a	2b	2c	2d	2e	2f
30:	30	31	32	33	34	35	36	37	-	38	39	3a	3b	3c	3d	3e	3f
40:	40	41	42	43	44	45	46	47	-	48	49	4a	4b	4c	4d	4e	4f
50:	50	51	52	53	54	55	56	57	-	58	59	5a	5b	5c	5d	5e	5f
60:	60	61	62	63	64	65	66	67	-	68	69	6a	6b	6c	6d	6e	6f
70:	70	71	72	73	74	75	76	77	-	78	79	7a	7b	7c	7d	7e	7f
80:	80	81	82	83	84	85	86	87	-	88	89	8a	8b	8c	8d	8e	8f
90:	90	91	92	93	94	95	96	97	-	98	99	9a	9b	9c	9d	9e	9f
a0:	a0	a1	a2	a3	a4	a5	a6	a7	-	a8	a9	aa	ab	ac	ad	ae	af
b0:	b0	b1	b2	b3	b4	b5	b6	b7	-	b8	b9	ba	bb	bc	bd	be	bf
c0:	c0	c1	c2	c3	c4	c5	c6	c7	-	c8	c9	ca	cb	cc	cd	ce	cf
d0:	d0	d1	d2	d3	d4	d5	d6	d7	-	d8	d9	da	db	dc	dd	de	df
e0:	e0	e1	e2	e3	e4	e5	e6	e7	-	e8	e9	ea	eb	ec	ed	ee	ef
f0:	f0	f1	f2	f3	f4	f5	f6	f7	-	f8	f9	fa	fb	fc	fd	fe	ff



The block of text on the service configuration plot that shows the contents of the EEROM, appears in the form shown in Table 8-3. This table is a text block from a sample plot. The contents of the EEROM that you are testing will differ from this sample.

Table 8-3. Sample EEROM Contents Text Block

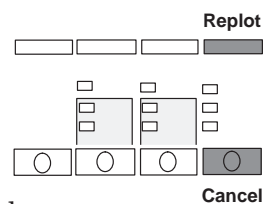
EEROM contents:																	
0:	55	aa	5a	0	20	0	0	0	-	2b	0	0	0	3a	0	0	0
10:	0	0	44	31	0	0	0	0	-	0	0	0	0	0	0	0	0
20:	3	20	3	a3	a3	a3	a3	a3	-	a3	a3	a3	a3	a3	a3	a3	a3
30:	a3	a3	0	21	0	0	0	81	-	88	35	0	0	0	e0	fe	1d
40:	f2	0	2	25	27	f2	f2	9	-	9	e0	e1	f0	0	5	0	0
50:	0	0	0	0	0	8d	0	1	-	de	ed	57	3e	d3	8e	db	3d
60:	e	ed	b	3a	16	0	0	0	-	2	0	0	ca	c	4	39	0
70:	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	c9
80:	ff	ff	ff	ff	ff	ff	ff	ff	-	ff	ff	ff	ff	ff	ff	ff	ff
90:	ff	ff	ff	ff	ff	ff	ff	ff	-	ff	ff	ff	ff	ff	ff	ff	ff
a0:	ff	ff	ff	ff	ff	ff	ff	ff	-	ff	ff	ff	ff	ff	ff	ff	ff
b0:	ff	ff	ff	ff	ff	ff	ff	ff	-	ff	ff	ff	ff	ff	ff	ff	ff
c0:	ff	ff	ff	ff	ff	ff	ff	ff	-	ff	ff	ff	ff	ff	ff	ff	ff
d0:	ff	ff	ff	ff	ff	ff	ff	ff	-	ff	ff	ff	ff	ff	ff	ff	ff
e0:	ff	ff	ff	ff	ff	ff	ff	ff	-	ff	ff	ff	ff	ff	ff	ff	ff
f0:	ff	ff	ff	ff	ff	ff	ff	ff	-	ff	ff	ff	ff	ff	ff	ff	ff

## Clearing the EEROM

**Careful:** If you clear the EEROM, you will then need to perform all of the plotter calibrations. (Details ▶ chapter 7.)

To clear the EEROM, perform the following procedure:

- 1 Switch the plotter off.
- 2 While holding both the **Cancel** and **Replot** keys down, switch the plotter on.
- 3 Once the **Busy** LED lights up, release the **Cancel** and **Replot** keys.



**Notes**

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Product History and  
Service Notes

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## Introduction

This chapter describes the differences between earlier versions of the plotters and the latest version documented in this manual.

---

## Serial-Number Format

The plotter serial number is composed of 10 letters and digits, for example ESA4800248.

- In the first two positions is the code for the country of manufacture of the plotter. In the example above, this is ES, which is the code for Spain.
- In the third position is the revision letter of the plotter. The letter A identifies the original version of the plotter. The next revision would have the letter B and so on. All DesignJet 200 plotters have revision letter A. The original version of the DesignJet 220 also has revision letter A.
- In the fourth position is the last digit of the year of manufacture. This is 4 for plotters made in 1994, as in the example above.
- In the fifth position is the month of the year. (October is represented by the letter A, November by B, and December by C.) In the example above, the digit is 8, that is, August.
- The remaining five digits distinguish the plotter from others manufactured in the same country in the same month. In the example above, these are 00248.

---

## Identifying a Printed Circuit Assembly

DesignJet 200 and DesignJet 220 PCAs have the following major identification features:

### **Part Number**

PCAs having the same part number are directly interchangeable. If a PCA is revised in any way that makes it non-interchangeable with previously issued PCAs of a particular part number, a new part number is assigned to the revised PCA.

### **Revision Letter**

This letter identifies the most recent revision to the etched circuit pattern. The original issue is identified with the letter A. If the master artwork for a printed circuit board is revised in order to alter performance or manufacture, the revision letter is changed to the next letter in the alphabetical sequence.

### **Firmware Revision Code**

The firmware revision code is printed on the EPROMs or masked ROMs on the main PCA, for example B.02.01. This code is also printed by the plotter on the setup sheet and on the service configuration plot.

---

### **CAUTION**

The DesignJet 200 old firmware revision A.01.00 is not forward compatible with the new carriage C2847-60071 (carriage PCA C2847-60125). In combination they destroy the cartridges.

The DesignJet 200 old main PCA C3180-60101 is not forward compatible with the new shielded trailing cable C3180-60033 (colored blue on one side).

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## Potential Ink Smearing Problem

**Date:** 29 July 1994

**Service Note:** C3180A-01  
C3181A-01

**Supersedes:** None

**Products:** HP C3180A DesignJet 200 Drafting Plotter (D/A1 Size)  
HP C3181A DesignJet 200 Drafting Plotter (E/A0 size)

**Serial Numbers:** ESA30000000/ESA3C99999

**Parts required:** None

### **Situation:**

The media-motor mount, C1633-20006, must be removed to troubleshoot several assemblies associated with the media path of the DesignJet 200.

This service note is intended to describe the print-quality problem resulting from incorrect reassembling of this part and to provide a cartridge-to-roller distance specification for the DesignJet 200.

### **Solution/Action:**

#### **1) Impact of Cartridge-to-Roller Distance on Print Quality**

This distance is a critical parameter that dramatically impacts the print quality of the DesignJet 200.

The acceptable height range is from 0.9 mm (0.035 in) to 1.3 mm (0.05 in).

Values below the lower limit are likely to cause ink-smearing, especially when using A or A4 media sizes.

Values above the upper limit result in ink spraying and overall poor print quality.

#### **2) How does the Media-Motor Mount Affect this Distance ?**

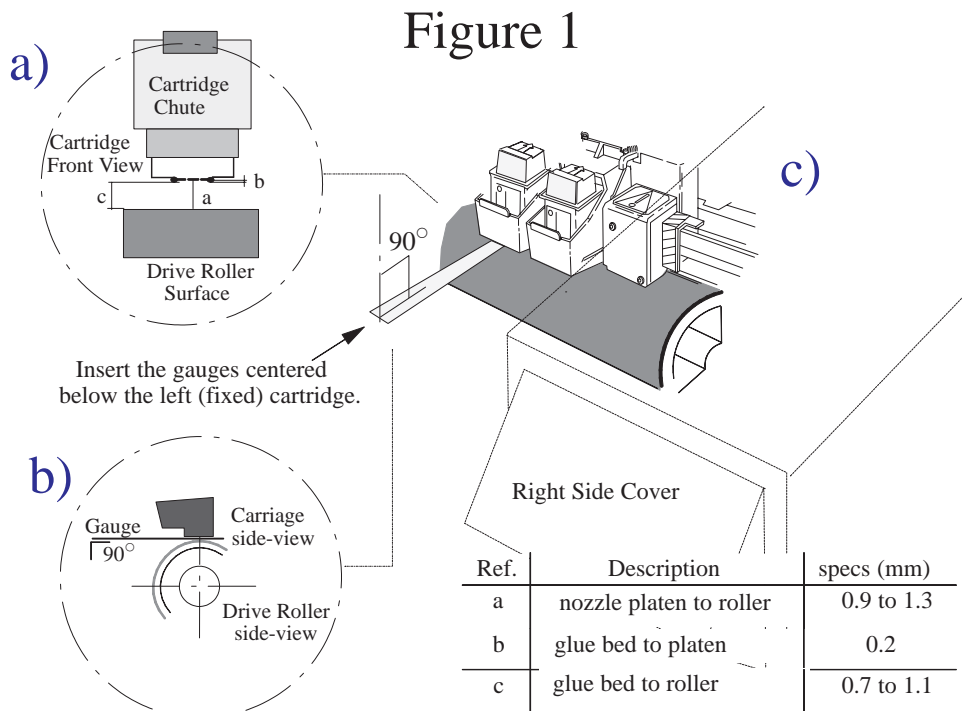
If this part is not mounted correctly, the drive roller may be assembled slightly higher than its correct position, thus decreasing the cartridge-to-roller distance on the right side of the unit.

### 3) How/Where to Measure the Distance

- a) Power off the unit.
- b) Ensure that the pinch-arm lever is in the UP position.
- c) Open the window and remove the bail.
- d) Slide the carriage (with both cartridges loaded) to the right until the right black and yellow strip of the carriage is above the right sideplate (see figure 1.c).
- e) Carefully try to insert, one at a time, the following gauges below the left cartridge, (figure 1.b):

- \* 0.6 mm (0.025 in) – gauge should enter without any effort
- \* 0.7 mm (0.027 in) – gauge rubs slightly
- \* 0.8 mm (0.031 in) – gauge may enter but the carriage is lifted when you insert the gauge.

If the results are as described above, the distance is within specifications



#### 4) What to Do with Units Exhibiting Ink-Smearing Problems

If the unit is exhibiting an ink-smearing problem using HP-recommended media and under proper environmental conditions, do the following:

i) Ensure the glue bed of each cartridge is as specified in item (b) of the table in figure 1.

ii) If both cartridges are okay, do the following:

a) Verify the carriage-to-roller height as in (3) above:

\* If within specs refer to note below.

\* If out of specs continue the procedure.

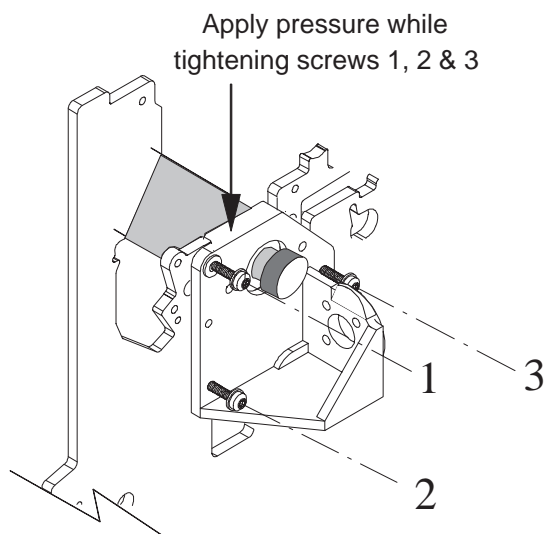
b) Remove the right end-cover

c) Remove the carriage and media motors from their support.

d) Loosen (one turn) the three screws holding the media-motor mount in place.

e) Retighten them while applying a downward pressure as shown in the figure 2.

Figure 2



f) Check the carriage height as in (3) above.

g) If the value is within specs, reassemble the unit. If still out of specs redo steps (b) to (f).

h) Verify proper operation of the unit by plotting a demo plot on A/A4-size media.

Note: This procedure is intended to troubleshoot only those ink-smearing problems caused by incorrect cartridge-to-roller distance. Make sure that proper humidity conditions are met and also check for media-related factors that may influence this distance (for example wet-cockle effect).

#### Administrative Information

**Classification:** Information Only

**Author/Entity:** PP/F900



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## Problems Corrected by Firmware Release A.01.01

**Date:** 29 July 1994

**Service Note:** C3180A-02  
C3181A-02

**Supersedes:** None

**Products:** HP C3180A DesignJet 200 Drafting Plotter (D/A1 size)  
HP C3181A DesignJet 200 Drafting Plotter (E/A0 size)

**Serial Numbers:** ESA30000000/ESA3C99999

**To be performed by:** HP-Qualified Personnel

**Parts required:** C3180-18006 A.01.01 EPROM (U28)  
C3180-18007 A.01.01 EPROM (U29)  
C3180-18008 A.01.01 EPROM (U9)  
C3180-18009 A.01.01 EPROM (U4)

### **Situation:**

Firmware version A.01.00 of the DesignJet 200 exhibits the following problems:

- 1) The unit is not able to load 1.6 m cut-sheet media.
- 2) In the absence on an IN command in the plot files, the resulting line widths are not consistent with the selected values.
- 3) Carriage start-up pulses may damage the print cartridges causing early cartridge failures.

### **Solution/Action:**

Whenever a unit exhibits a problem as described above, replace firmware version A.01.00 by firmware version A.01.01.

Production units may have the A.01.00 code implemented in two different sets of devices:

- 1) EPROM/OTP devices:

P/Ns: 1818-5724 A.01.00 (U28)  
1818-5725 A.01.00 (U29)  
1818-5726 A.01.00 (U9)  
1818-5727 A.01.00 (U4)

- 2) Mask ROM devices:

P/Ns: 1818-5484 A.01.00 (U28) Mask  
1818-5485 A.01.00 (U29) Mask

All the part numbers associated with both A.01.00 implementations are obsoleted and replaced by A.01.01 part numbers.

Usage of a DIP-40 IC-extracting tool or similar is highly recommended to prevent damage to the Main PCA traces.

Note that firmware version A.01.01 is available only on EPROMs. Make sure that proper ESD safety procedures are followed and that the devices are correctly plugged into their sockets, leaving the rightmost pair of holes free.

### **Administrative Information**

**Classification:** Modification recommended  
**Standards:** Labor hours 0.5, Travel authorized  
**Action Category:** On specified failure  
**Location Category:** On-site  
**Service Inventory:** Scrap  
**Used Parts:** Scrap  
**HP Responsible Until:** 15-June-96  
**Author/Entity:** PP/F900

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## **Problems that will be Corrected by Firmware Release A.01.02**

**Date:** 29 July 1994

### **Bug Fixing**

RTL: Fix bitmap on negative Y-coordinates. (Jail effect)

STARSHIP: PjL enter language = HPGL/2 was going back to HPGL; now goes to HPGL/2.

RELOT: Replot clips last swath. When doing replot (same size as the original plot), sometimes the last swath of the plot is clipped. This is because the media-load sheet length measurement is not exact, so the plotter recognizes the sheet as shorter than it actually is. Fixed by increasing the tolerance on sheet length before clipping by 0.15 in. when replotting. The previous tolerance was only 1/1200 in.

CANCEL: In firmware versions A.01.01 (DesignJet 200) and B.02.00 (DesignJet 220) the user could not cancel while plotting non-flow-mode plots (plots that don't exceed maximum memory available in plotter). Fixed.

*This firmware is not yet available at the time of printing of this manual.*

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## EPROMs and Masked ROMs

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### CAUTION

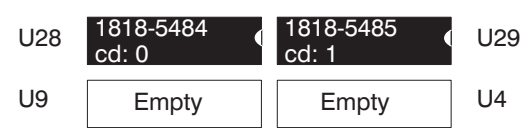
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The DesignJet 200 old firmware revision A.01.00 is not forward compatible with the new carriage C2847-60071 (carriage PCA C2847-60125). In combination they destroy the cartridges.

#### DesignJet 200 EPROMs (Firmware code A.01.00, obsolete)



#### DesignJet 200 Masked ROMs (Firmware code A.01.00, obsolete)



#### DesignJet 200 EPROMs (Firmware code A.01.01)



#### DesignJet 220 EPROMs (Firmware code B.02.00, obsolete)



#### DesignJet 220 Masked ROMs (Firmware code B.02.00, obsolete)



#### DesignJet 220 Masked ROMs (Firmware code B.02.01)



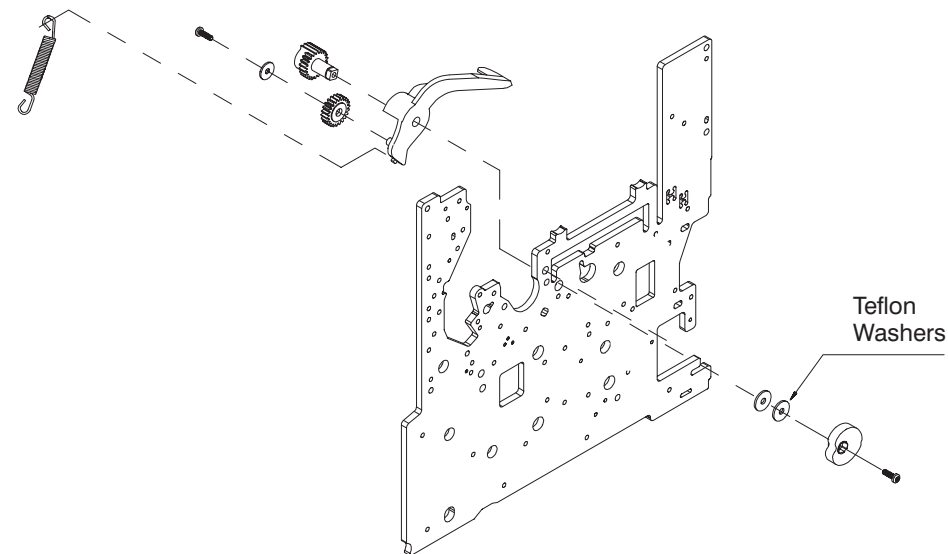
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## Re-installing Teflon Washers

Normally, you should not have to re-install teflon washers on a DesignJet 200. Instead, you should install a cam-gear support and the associated parts as described later in this chapter. The following note is given in case you need to reassemble the plotter while you wait for these parts to arrive.

Problems can occur if the bail-lift mechanism is too loose or too tight. Typically the number of teflon washers to install is two. However, the ideal reassembly procedure is as follows:

- 1 Re-install the lift mechanism using **two** washers.
- 2 With the engaging-lever spring installed, press down on the lever and slowly let it rise.
- 3 If the lever does not completely lift up using the spring tension alone, remove one washer.



---

## New Bail-Lift-Mechanism Support

**Date:** 01 August 1994  
**Service Note:** **Draft**  
**Supersedes:** None  
**Products:** HP DesignJet 200 C3180A & C3181A  
**Serial Numbers:** C3180A ESA0000000/ESA4507951  
C3181A ESA0000000/ESA4508541

**To Be Performed By:** HP-Qualified Personnel

**Parts Required:** C2858-60209 Bail Mechanism Assembly

### **Situation:**

The bail features an automatic lift mechanism driven by the media motor using a series of gears and actuated by the carriage. The lift mechanism is composed of the engagement lever, cam gear, engagement gear, auto-cam and teflon washers.

When it is necessary to lift the bail, the carriage positions itself over the engaging lever, pressing it down (the lever is spring loaded). As the lever is pressed down, the gear cam and the engaging gear are connected to the left drive roller gear. Once connected, the driver roller rotates (via the Media-drive motor), causing the cam to rotate. As the cam rotates, it pushes against the left bail pivot, raising the bail.

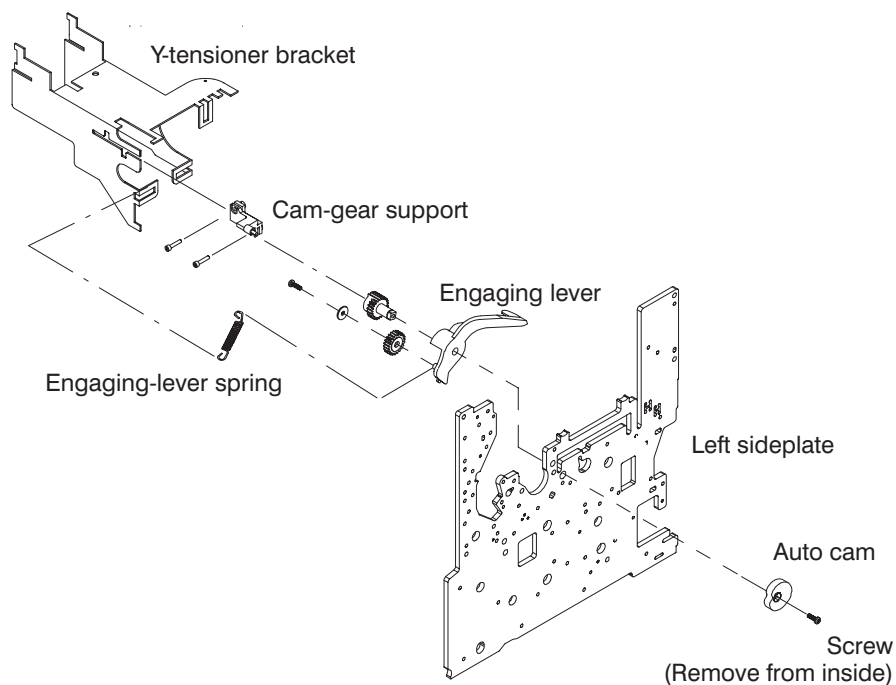
The teflon washers are installed between the auto-cam and the side-plate to act as shims which reduce looseness between the different parts of the assembly. Typically the number of Teflon Washers to install on a DesignJet 200 is two. However problems can occur if the bail lift is too loose or too tight. In some cases, it may be necessary to install between 1 and 3, thus complicating the repair procedure.

### **Solution**

A new solution has been introduced in order to improve the serviceability of the bail-lift mechanism and which avoids the use of teflon washers. The looseness of the mechanism is reduced by a new part, the cam-gear support. This part attaches to the Y-tensioner bracket and fits into the center of the cam gear preventing the movement of this gear during the engaging process.

A new lift-mechanism kit has been created that includes all the necessary parts to implement this new solution. The part number of the kit is C2858-60209. It is expected to be available at the beginning of September 1994.

## Installing the New Bail-Lift Mechanism



**IMPORTANT:** You need a scissors as well as the tools listed in chapter 6.

1. Remove the window assembly and the left end-cover.
2. Remove the the bail assembly, the encoder strip and the service station.
3. Remove the primer assembly.
4. Remove the Y-tensioner bracket and related assemblies.
5. Using scissors or a cutter, cut the teflon washers.
6. Using needle-nose pliers, remove the teflon washers.

**IMPORTANT:** Ensure that you have removed all the teflon washers and that you are not leaving any fragment between the side-plate and the auto-cam.

If you are not able to remove them, perform the following additional steps:

- a. Disassemble the plotter to access the automatic bail-lift mechanism following the procedure described in chapter 6.
  - b. Re-install the bail-lift mechanism **WITHOUT** the teflon washers.
7. Place the cam-gear support into the slot on the **NEW** Y-tensioner bracket included in the bail-mechanism assembly.
  8. Install the Y-tensioner bracket on the left sideplate. Tighten the two left screws and leave the right one loose.

9. While softly pushing the cam-gear support all the way into the center of the gear, tighten the two screws that attach the cam-gear support to the Y-tensioner bracket.

**IMPORTANT:** Ensure that the bail-lift mechanism easily performs the engaging and disengaging movement, by pushing the cam gear with your fingers.

10. Tighten the right screw of the Y-tensioner bracket.

11.-Re-assemble the plotter and perform the calibrations in the following order:

- a. Cap alignment (chapter 9)
- b. Bail calibration (chapter 8)
- c. Accuracy calibration (chapter 8)

### **Administrative Information** DRAFT SERVICE NOTE

**Classification:** Modification available

**Reason:** Serviceability & Reliability Enhancement

**Action Category:**

**Location Category:** On-Site

**Availability:** Product Support Life

**Author/Entity:** EV/F900

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## Change in Trailing Cable

Early DesignJet 200 plotters were manufactured with the following trailing cable and associated parts:

- Unshielded Trailing Cable, C3180-60007 (colored white on both sides)
- Trailing-Cable Rear Tray, C3180-00006
- Four Ferrites, 9170-1535  
(two inside electronics enclosure, two on trailing-cable rear tray)
- Four Ferrite Clamps, 9170-1533

Later DesignJet 200 plotters, and DesignJet 220 plotters, have a new trailing cable and associated parts, improving electromagnetic compatibility and rendering unnecessary the ferrites on the trailing-cable rear tray:

- Shielded Trailing Cable, C3180-60033 (colored white on one side, blue on the other side)
- Trailing-Cable Rear Tray, C3180-00040
- Two Ferrites, 9170-1535, inside the electronics enclosure
- Two Ferrite Clamps, 9170-1533

The shielded trailing cable is NOT compatible with old main PCAs (C3180-60101, C3180-68101, C3180-69101).

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## Change in Carriage

Early DesignJet 200 plotters were manufactured with the following cartridge carriage:

- Cartridge Carriage, C1633-60120 (including Carriage PCA, C2847-60103), now obsolete.

Later DesignJet 200 plotters, and DesignJet 220 plotters, have a new cartridge carriage:

- Cartridge Carriage, C2847-60071 (including Carriage PCA, C2847-60125).

The new carriage is not compatible with the DesignJet 200 firmware revision A.01.00. In combination, they destroy the cartridges. If you install a new carriage, ensure that the firmware revision of the EPROMs or masked ROMs on the main PCA is later than A.01.00. Later firmware revisions can be installed with either carriage.

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## Change in Bail and Overdrive Parts

DesignJet 200 plotters, and early DesignJet 220 plotters, were manufactured with 9 starwheel mounts on D/A1-size models, and 13 starwheel mounts on E/A0-size models.

To reduce the risk of the media-path geometry sometimes causing media to cockle and ink to smear, later DesignJet 220 plotters include an extra starwheel mount towards the right-hand side of the bail. (The problem was greatest when loading A/A4-size media.)

If you are ordering a new bail, overdrive roller or overdrive enclosure, ensure that you order the appropriate part corresponding with the number of starwheel mounts on the plotter. A service rework kit is available if you need to replace **all** 9- or 13-starwheel-mount parts with 10- or 14-starwheel-mount parts respectively. (Part numbers ♦ page 10-24b.)



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Parts and Diagrams

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## Exchange Assemblies

Exchange assemblies are factory-repaired and tested assemblies that you can order; they are listed in the following table. Exchange assemblies are available only on a trade-in basis; therefore, you must return the defective assemblies for credit.

Exchange Assemblies			
HP Part Number	CD	Qty	Description
C3180-69102	1	1	Main PCA (Rebuilt)

---

## Replacement Parts

Parts shown in the drawings in this chapter are listed in the corresponding part lists. Match the appropriate number on the drawing with the same number in the parts list for information on that part. The total quantity for each part on the drawing is given as well as the part number and check digit.

To obtain replacement parts, address an inquiry to the nearest HP Support Office. You must include the part number, check digit and part description in the order you send. Also include the plotter model and serial number.

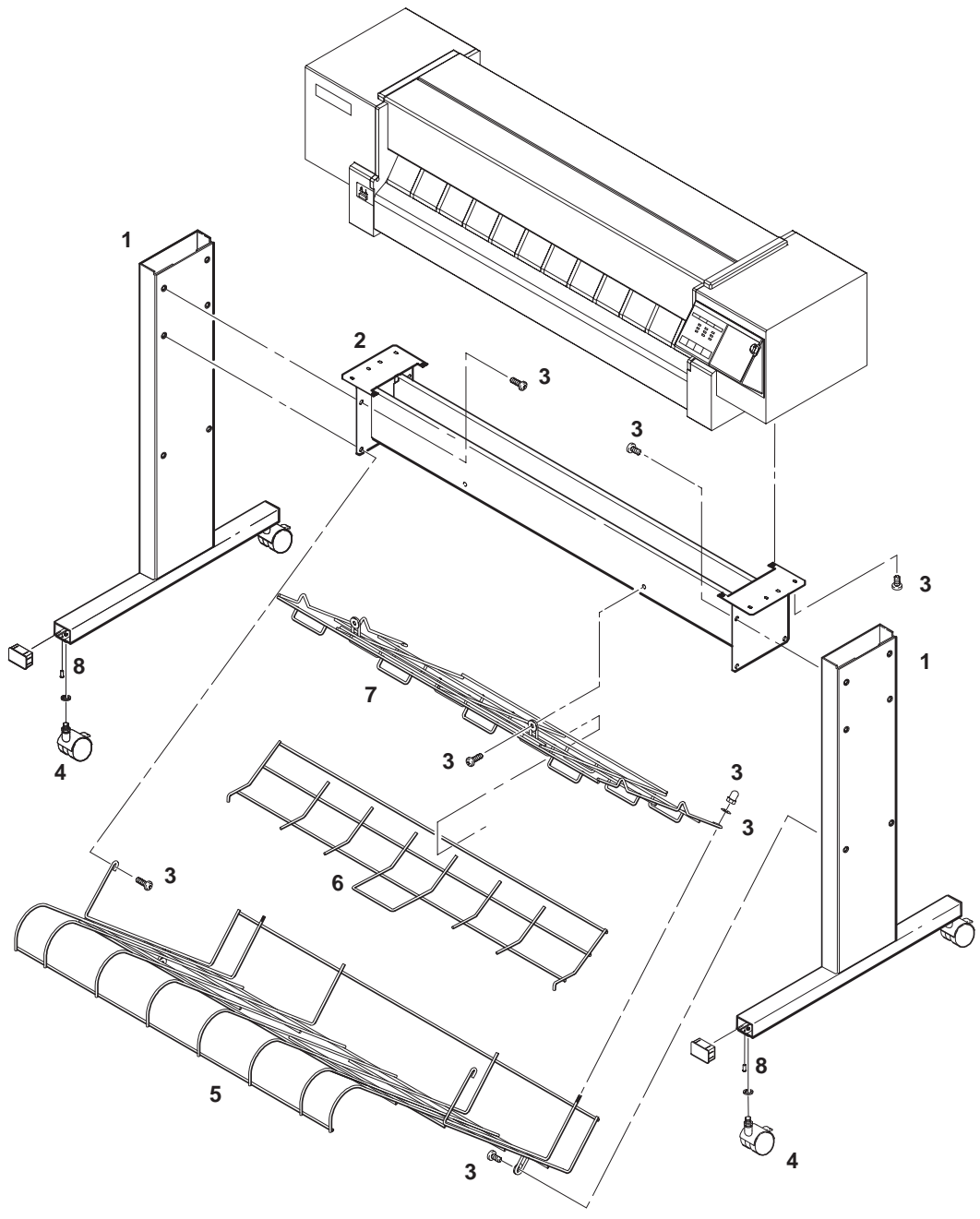
### Parts List: Legs and Media Bin

Reference on Drawing	HP Part Number	Check Digit	Quantity	Description	
1	C2847-60002	6	2	Leg Assembly	(D/A1 Size)
	C2848-60002	7	2		(E/A0 Size)
2	C3185-00034	9	1	Stand Brace	(D/A1 Size)
	C3186-00034	0	1		(E/A0 Size)
3	C2847-60061	7	1	Hardware Kit	
4	1492-0145	8	4	Caster Assembly	
5	C2847-00006	4	1	Media Bin Front	(D/A1 Size)
	C1633-00020	2	1		(E/A0 Size)
6	C2847-00012	2	1	Media Bin Adjust	(D/A1 Size)
	C1633-00044	0	1		(E/A0 Size)
7	C2847-00005	3	1	Media Bin Back	(D/A1 Size)
	C1633-00019	9	1		(E/A0 Size)
8	no part number		4	M3 Thread-Forming Screw	

### **Complete Legs and Media Bin**

Part Number C3185A = Complete legs and media bin for D/A1-size plotters.

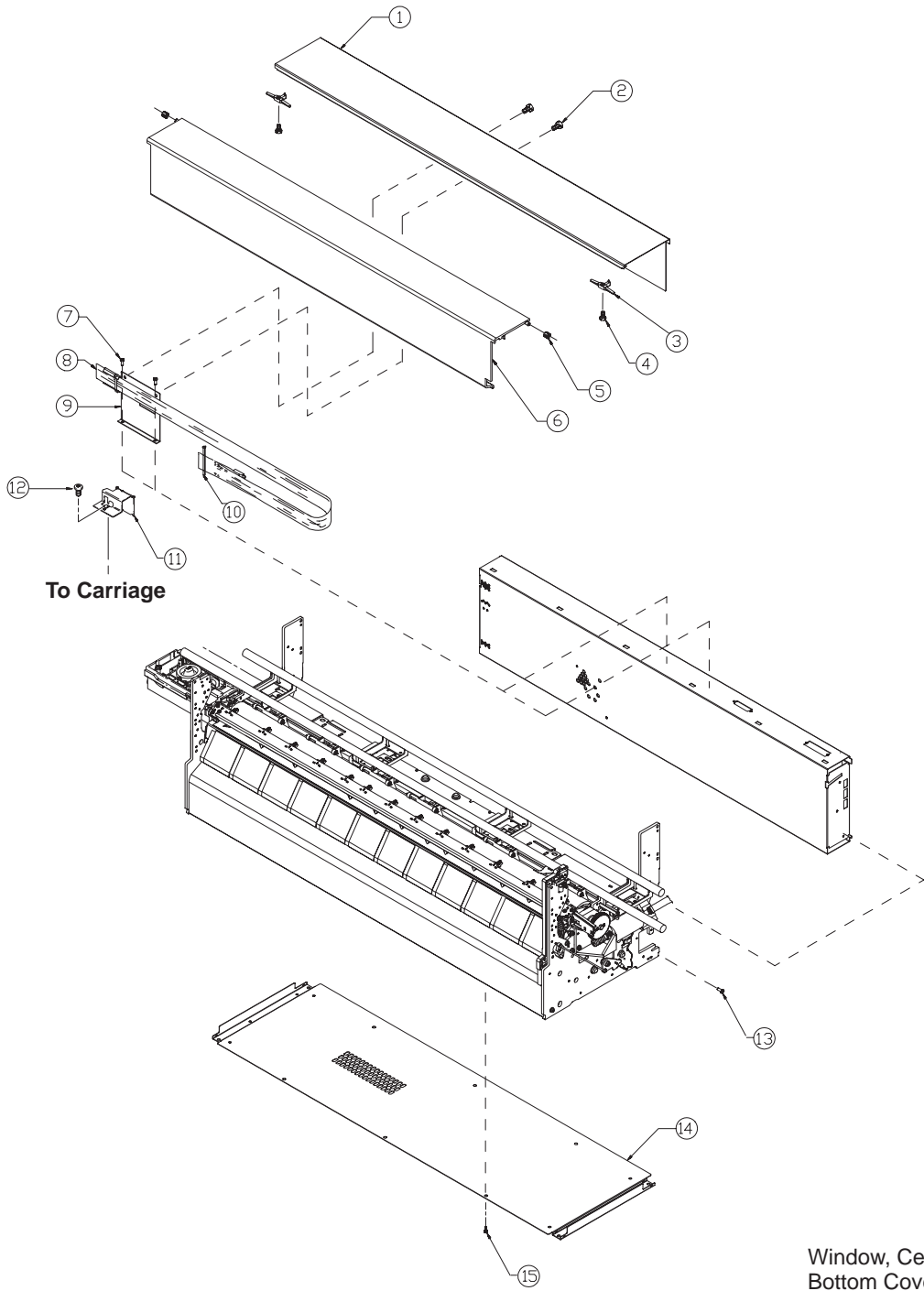
Part Number C3186A = Complete legs and media bin for E/A0-size plotters.



Legs and Media Bin

Parts List: Window, Center and Bottom Covers

Reference on Drawing	HP Part Number	Check Digit	Quantity	Description
1	C3180-00005	9	1	Center Cover (D/A1 Size)
	C3181-00005	0	1	(E/A0 Size)
2	0515-0380	2	2	Screw (D/A1 Size)
			4	(E/A0 Size)
3 and 4	C3180-40019	9	2	Center-Cover Latch Assembly
5	C3180-80001	3	2	Window-Pivot Spring
6	C3180-60039	5	1	Window (D/A1 Size)
	C3181-60039	6	1	(E/A0 Size)
7	0515-2278	1	2	Screw (D/A1 Size)
			4	(E/A0 Size)
8	C3180-60033	9	1	Shielded Trailing Cable
	C3180-60064	6		Shielded Trailing-Cable Assembly. (Includes shielded trailing cable, three plastic ties, and trailing-cable bracket.)
9	C3180-00040	2	1	Trailing-Cable Rear Tray. (DesignJet 200 chapter 9.)
10	1400-0577	7	2	Trailing-Cable Tie
11	C1633-00015	5	1	Trailing-Cable Bracket
12	0624-0647	5	1	Torx-10 Screw
13	0515-2248	5	6	Torx-20 Screw
14	C3180-60008	8	1	Bottom Cover (D/A1 Size)
	C3181-60008	9	1	(E/A0 Size)
15	0624-0771	6	8	Plastite Screw (D/A1 Size)
			10	(E/A0 Size)

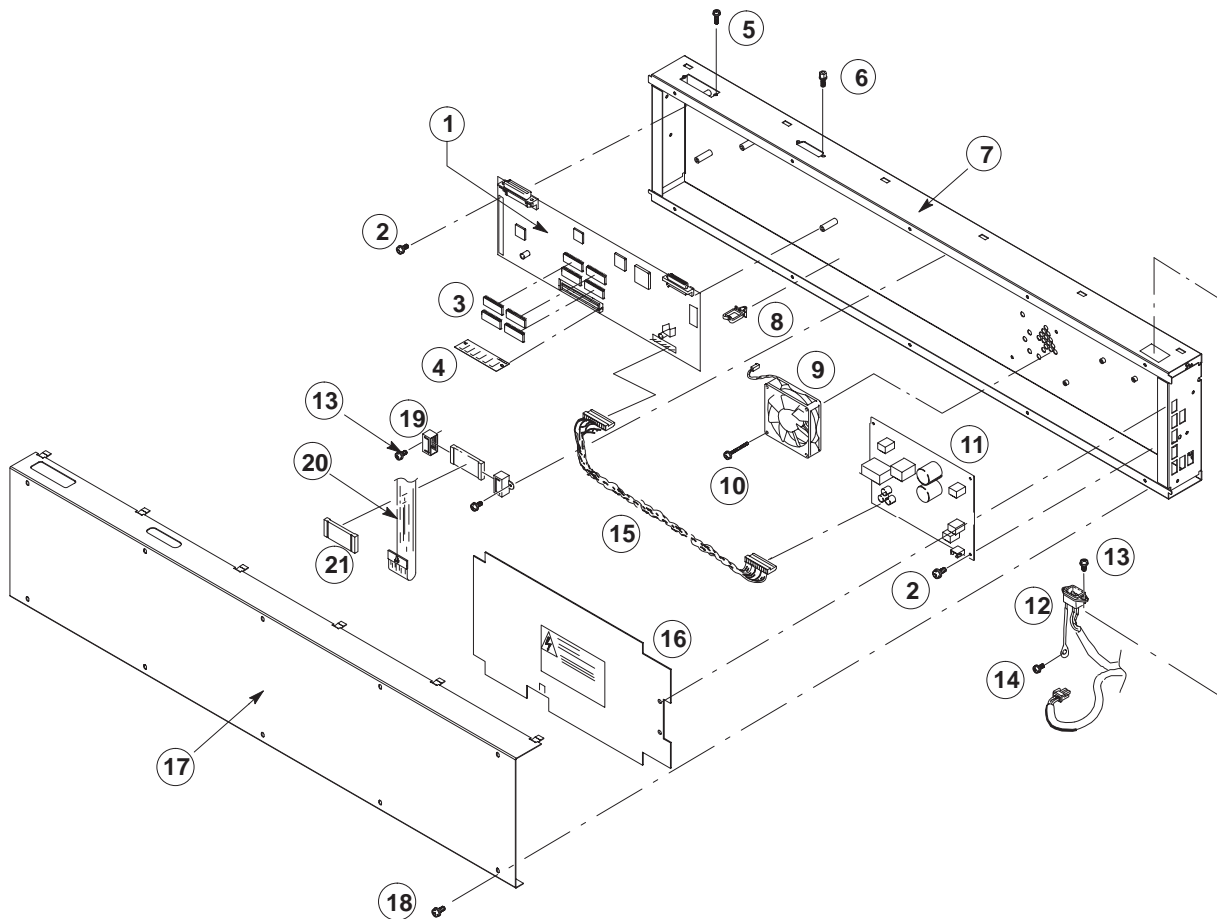


Window, Center and Bottom Covers.

## Parts List: Electronics Enclosure

Reference on Drawing	HP Part Number	Check Digit	Quantity	Description
1	C3180-68102	9	1	Main PCA (New)
1	C3180-69102	1		Main PCA (Rebuilt, Exchange Assembly)
2	0515-2253	2	11	Machine Screw
3	See illustration		4 / 2	4 EPROMs or 2 Masked ROMs
4	C2064A	3		DRAM SIMM (Optional) (2 Mbytes)
	C2065A	4		(4 Mbytes)
	C2066A	5		(8 Mbytes)
5	2200-0145	2	2	Machine Screw, 4-40
6	0570-1316	2	2	Female Screwlock (RS-232)
7	C3180-00003	7	1	Electronics Enclosure (D/A1 Size)
	C3181-00003	8	1	(E/A0 Size)
				(Associated part: 8160-0770 RFI strip, attaches to the enclosure to improve electromagnetic compatibility of the plotter.)
8	1400-1648	5	1	Cable Clip
9	3160-0814	7	1	Tubeaxial Fan
10	0515-2405	6	2	Tapite Fan Screw
11	0950-2417	2	1	Power Supply
12	C3180-60006	6	1	AC Power Receptacle Assembly
13	0515-2149	5	4	Screw, M3.0X0.5X8
14	0515-2278	1	1	Torx-20 Screw
15	C2847-60005	9	1	Cable Assembly: Power supply to main PCA
16	C3180-60013	5	1	Power Supply Insulator (with label and tie)
17	C3180-00004	8	1	Electronics-enclosure Cover (D/A1 Size)
	C3181-00004	9	1	(E/A0 Size)
18	0515-2429	4	4	Torx-15 Screw (D/A1 Size)
			5	(E/A0 Size)
19	9170-1533	6	2	Ferrite Clamp
20	See page 10-6.		1	Trailing Cable
21	9170-1535	8	2	Split Ferrite





③ DesignJet 200 EPROMs  
(Firmware code A.01.01)



Empty pair of holes

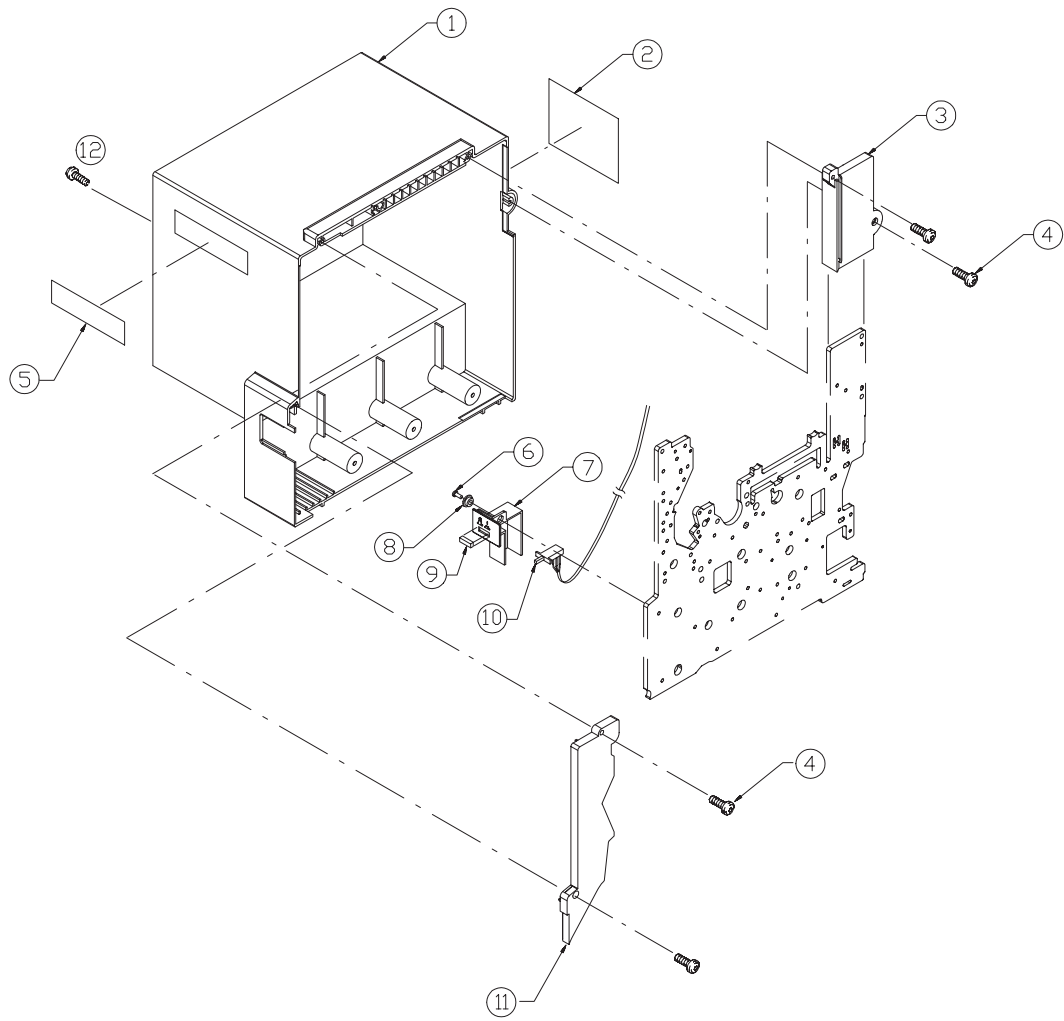
③ DesignJet 220 Masked ROMs  
(Firmware code B.02.01)



Electronics Enclosure

Parts List: Left Endcover and Trim

Reference on Drawing	HP Part Number	Check Digit	Quantity	Description
1	C3180-40003	1	1	Left Endcover
2	C3187-00015	8	1	Serial-Number Label
3	C3180-40005	3	1	Rear Left Trim
4	0624-0771	6	4	Torx-15 Screw
5	C3180-00010	6	1	Nameplate
6	0515-2282	7	1	Tapite Screw
7	C3180-40012	2	1	Switch Mount
9	5041-1203	0	1	Power Key Cap
10	C3180-60006	6	1	AC Power Receptacle Assembly
11	C3180-40008	6	1	Front Left Trim
12	0515-2337	3	3	Endcover Lower Screw

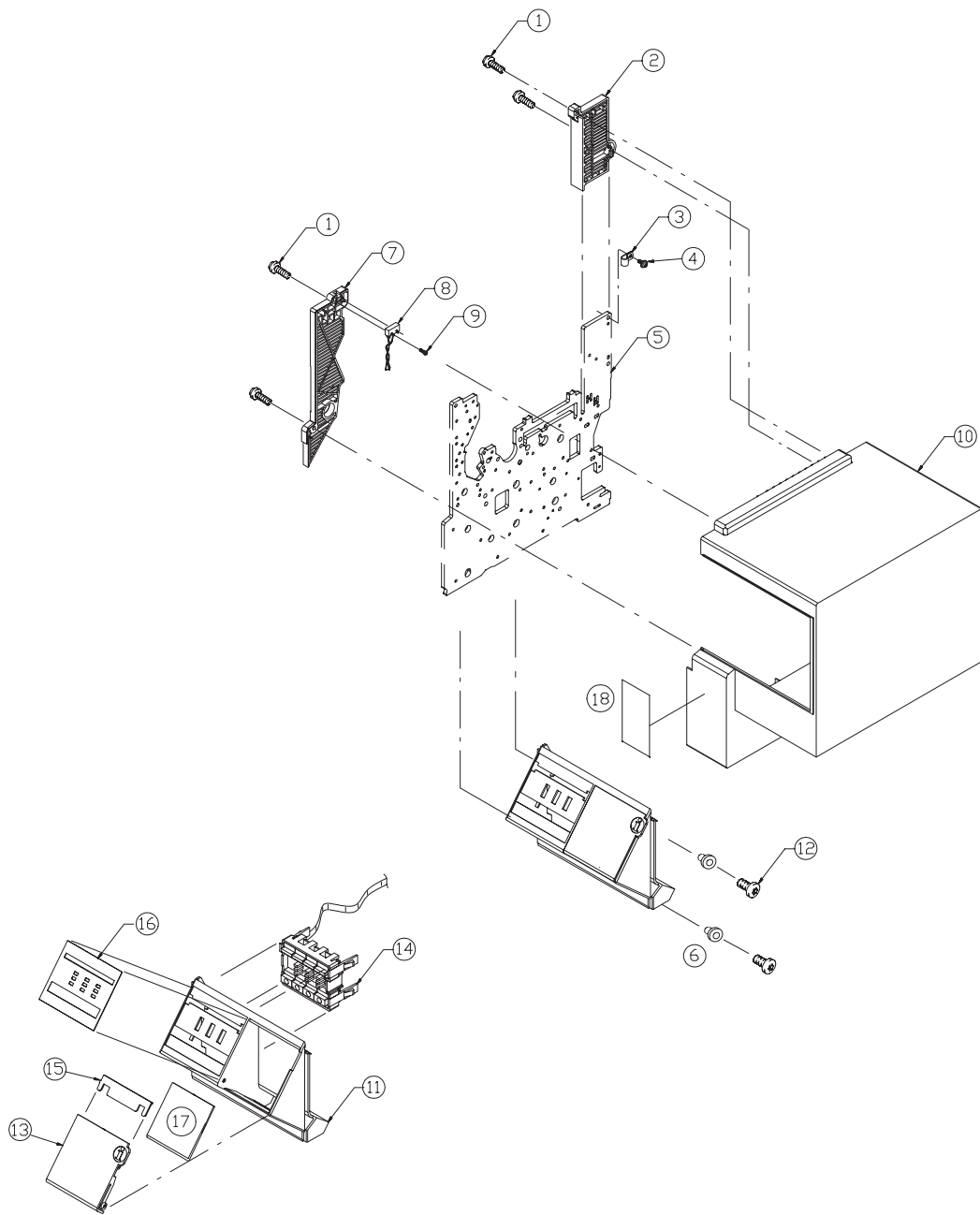


Left Endcover and Trim

### Parts List: Right Endcover and Trim

Reference on Drawing	HP Part Number	Check Digit	Quantity	Description
1	0624-0771	6	4	Torx-15 Screw
2	C3180-40006	4	1	Rear Right Trim
3	1400-0293	4	1	Cable Guide (Fastener)
4	0515-2278	1	1	Torx-20 Screw
5	–	–	1	Right Sideplate (Not Orderable)
6	07090-20020	4	2	Shoulder Washer
7	C3180-40007	5	1	Front Right Trim
8	C3180-60009	9		Window-Sensor Assembly
9	0624-0745	4	1	Torx-8 Screw
10	C3180-40004	2	1	Right Endcover
11	C3180-40014	4	1	Front-Panel Bezel
12	0515-2282	7	2	Tapite Screw
13	C3180-40015	5	1	Front-panel Door
14	C3180-60010	2	1	Keyboard Assembly
15	C3180-40016	6	1	Help-Cards Lock
16 and 17	see below		1	Overlay and Help Cards
18	C3180-00033	3	1	Media-Load Label

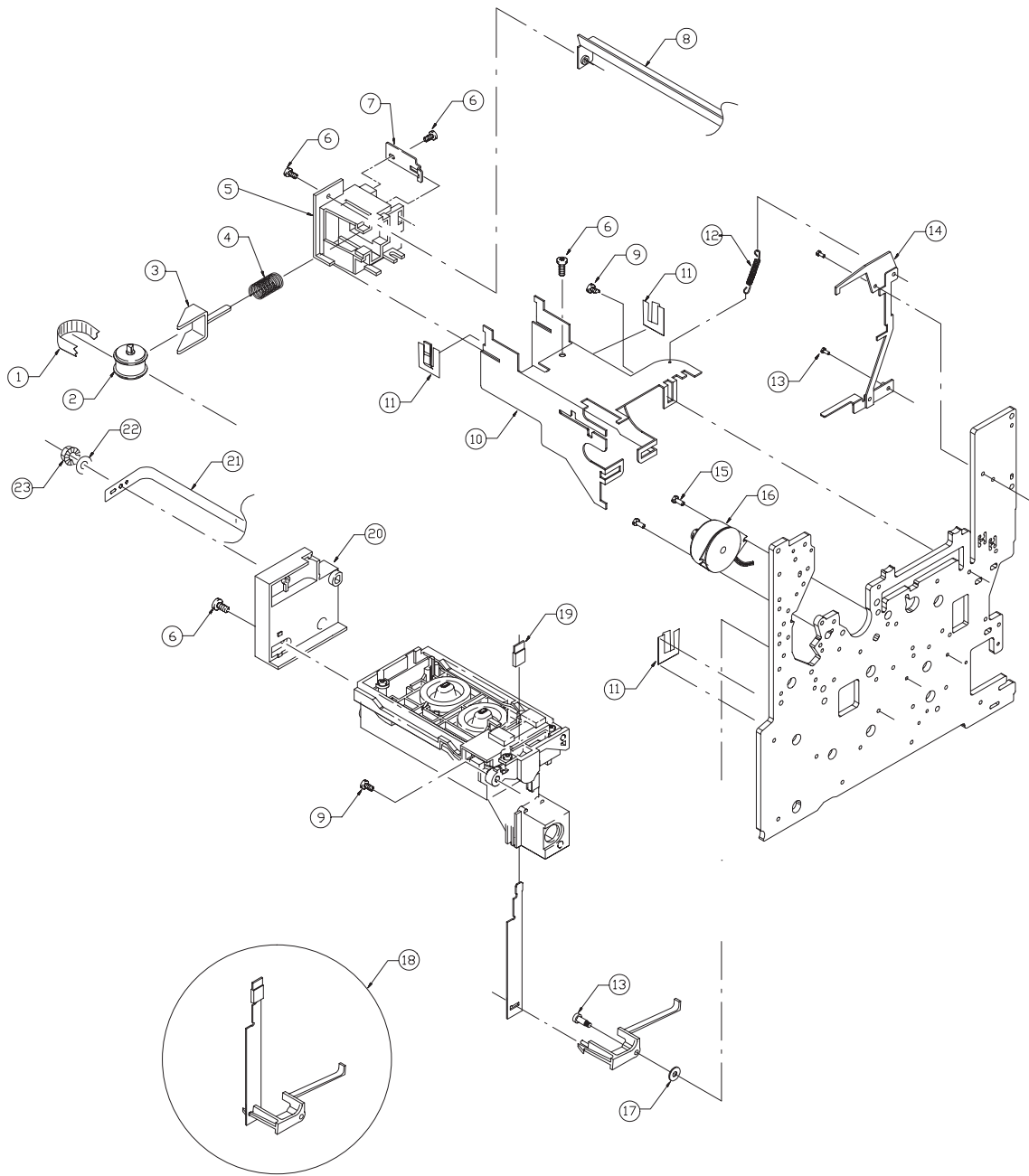
Front-Panel Overlay and Help Cards	DesignJet 200	Check	DesignJet 220	Check
Chinese	C3180-60030	6	C3187-60010	9
English	C3180-60021	5	C3187-60001	8
French	C3180-60025	9	C3187-60005	2
German	C3180-60024	8	C3187-60004	1
Italian	C3180-60027	1	C3187-60007	4
Japanese	C3180-60028	2	C3187-60008	5
Korean	C3180-60022	6	C3187-60002	9
Portuguese	C3180-60029	3	C3187-60009	6
Spanish	C3180-60026	0	C3187-60006	3
Taiwanese	C3180-60023	7	C3187-60003	0



Right Endcover and Trim

Parts List: Carriage-Axis Drive (Left End)

Reference on Drawing	HP Part Number	Check Digit	Quantity	Description	
1	C2847-00029	1	1	Main Drive Belt	(D/A1 Size)
	1500-0856	7	1		(E/A0 Size)
2	07570-60105	1	1	Main Idler Assembly	
3	07570-40105	9	1	Main Tensioner	
4	1460-2139	7	1	Tensioner Spring	
5	C1633-40065	9	1	Main-Tensioner Housing	
6	0515-0380	2	4	Torx-15 Screw	
7	C1633-00068	8	1	Tensioner-Housing Door	
8	C2847-00014	4	1	Trailing-Cable Front Tray (Guide)	(D/A1 Size)
	C1633-00056	4	1		(E/A0 Size)
9	0515-2248	5	3	Torx-20 Screw	
10	C2847-00051	9	1	Y-Tensioner Bracket	
11	1400-1021	8	3	Cable Clip	
12	C1633-80016	4	1	Linkage Spring	
13	C1633-20021	5	1	Shoulder Screw	
14	C1633-60033	3	1	Automatic Cartridge-Adjust Linkage	
15	0624-0647	5	2	Torx-10 Screw	
16	C3180-60005	5	1	Stepper Motor Assembly	
17	3050-1415	3	1	Washer	
18	C3180-60014	6	1	Wiper Assembly (Wiper, Wiper Rod, and Rocker)	
19	C1633-40006	8	1	Wiper Only	
20	C1633-40093	3	1	Encoder-Strip Bracket	
21	C2858-60208	7	1	Encoder Strip	(D/A1 Size)
	C2859-60208	8	1		(E/A0 Size)
22	3050-0026	0	3	Washer 3.2mm	
23	0535-0031	2	2	Nut, Hex, W/LKWR M3	

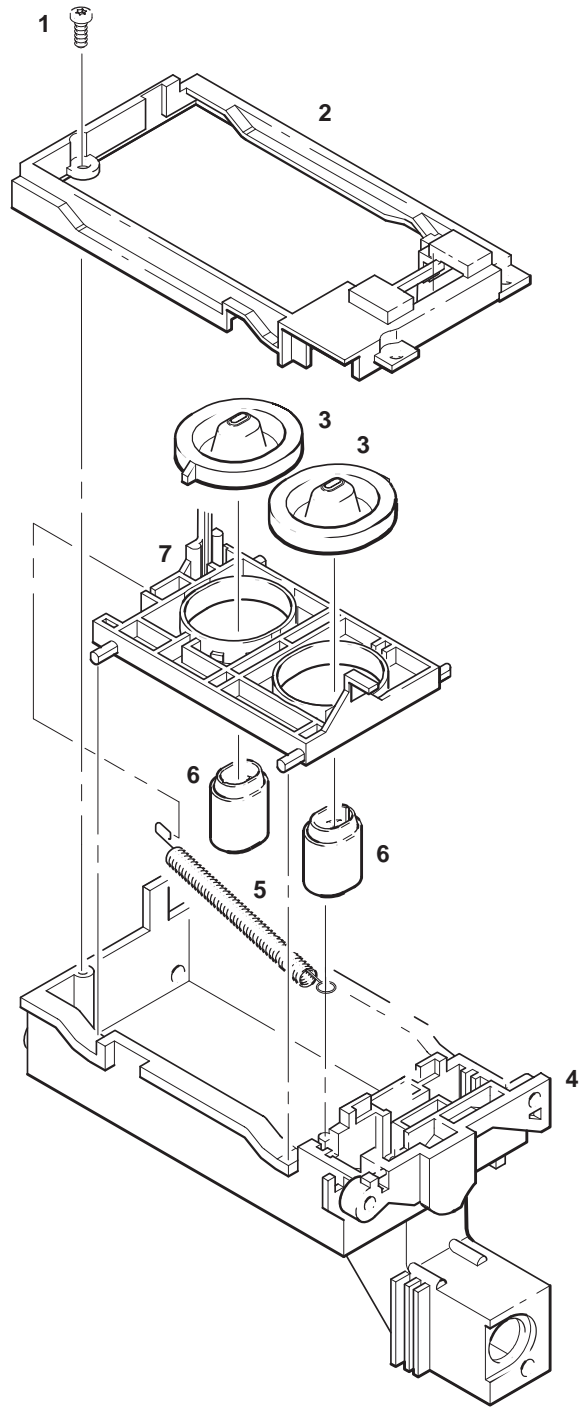


Carriage-Axis Drive  
(Left End)

Parts List: Service Station

Reference on Drawing	HP Part Number	Check Digit	Quantity	Description
1	0624-0704	5	12	Plastite Screw #6-19x.375
2	C1633-40003	5	1	Service-Station Cover
3	C1633-40005	7	2	Service-Station Cap
4	C1633-40001	3	1	Service-Station Housing
5	C1633-80002	8	1	Sled Spring
6	C1633-40004	6	2	Cap Fitting
7	C2847-40011	5	1	Service-Station Sled

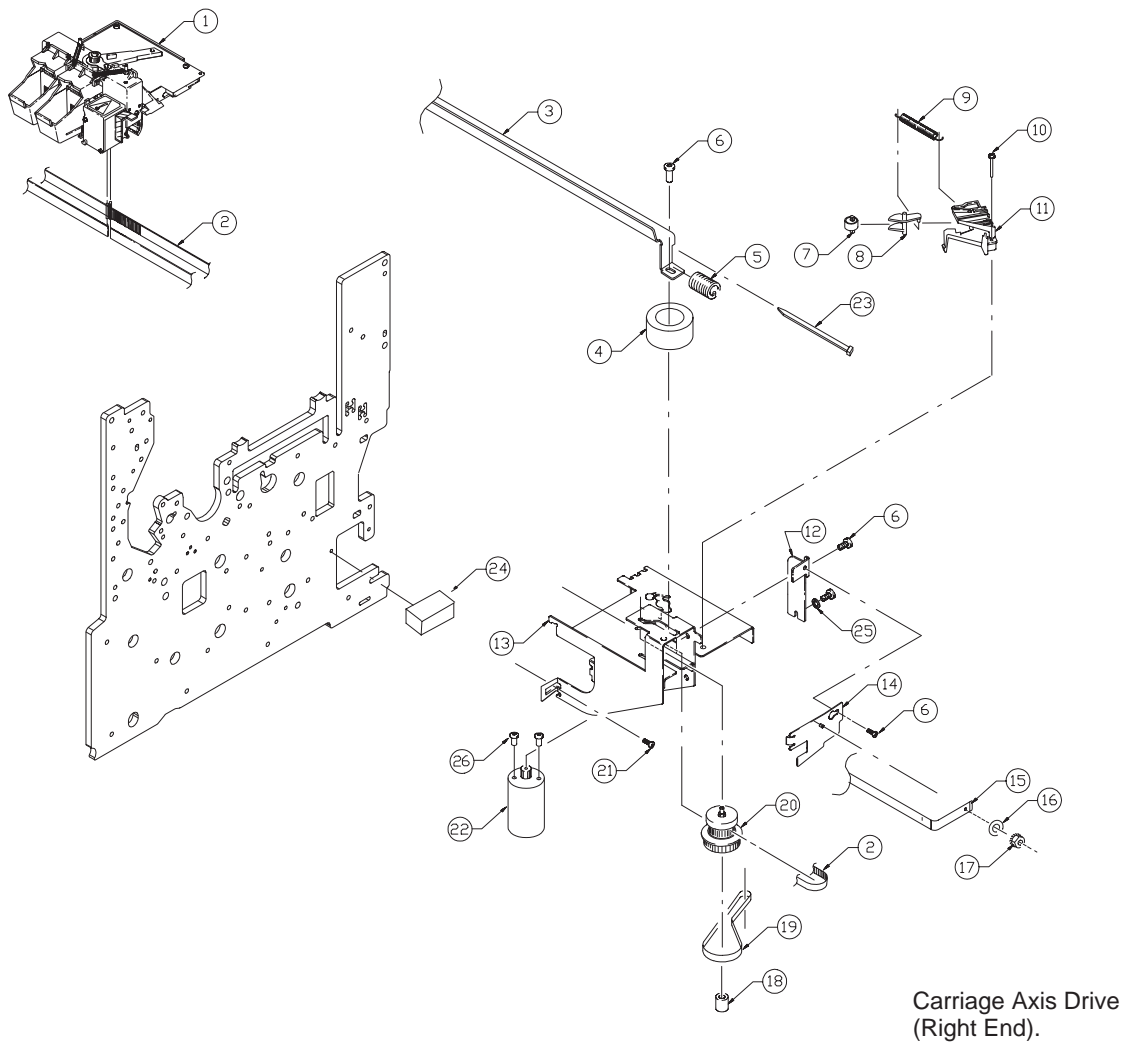




Service Station

Parts List: Carriage-Axis Drive (Right End)

Reference Drawing	HP Part Number	Check Digit	Quantity	Description
1	see page 10-21		1	Cartridge Carriage
2	C2847-00029	1	1	Main Drive Belt (D/A1 Size)
	1500-0856	7	1	(E/A0 Size)
3	see page 10-14		1	Trailing-Cable Front Tray
4	9170-1536	9	1	Ferrite Ring
5	C1633-80003	9	1	Blade Spring
6	0515-0380	2	4	Torx-15 Screw
7	07570-60112	0	1	Drive-Pulley Idler
8	07550-40104	4	1	Drive-Tensioner Cam
9	1460-2061	4	3	Drive-Tensioner Spring
10	0515-1349	5	1	M3 Machine Screw
11	07575-40125	8	1	Drive-Tensioner Bracket
12	C1633-00132	7	1	Encoder-Spring Bracket
13	C1633-60029	7	1	Y-Drive-Assembly Bracket
14	C1633-00002	0	1	Encoder Spring
15	C2858-60208	7	1	Encoder Strip (D/A1 Size)
	C2859-60208	8	1	(E/A0 Size)
16	3050-0026	0	3	Washer 3.2mm
17	0535-0031	2	2	Nut, Hex, W/LKWR M3
18	C1633-20034	0	1	Double-Pulley Bushing
19	1500-0855	6	1	Carriage-Axis Small Drive Belt
20	C3170-60009	7	1	Double Pulley
21	0515-2248	5	4	Y-Arm Screw
22	C2858-60206	5	1	Carriage Motor (includes item 26)
23	1400-0577	7	1	Cable Tie
24	See table opposite			Ferrite Assemblies
25	3050-1415	3	1	Washer
26	0515-0433	6	2	Screw, M4.0 X 0.7 X 8 mm

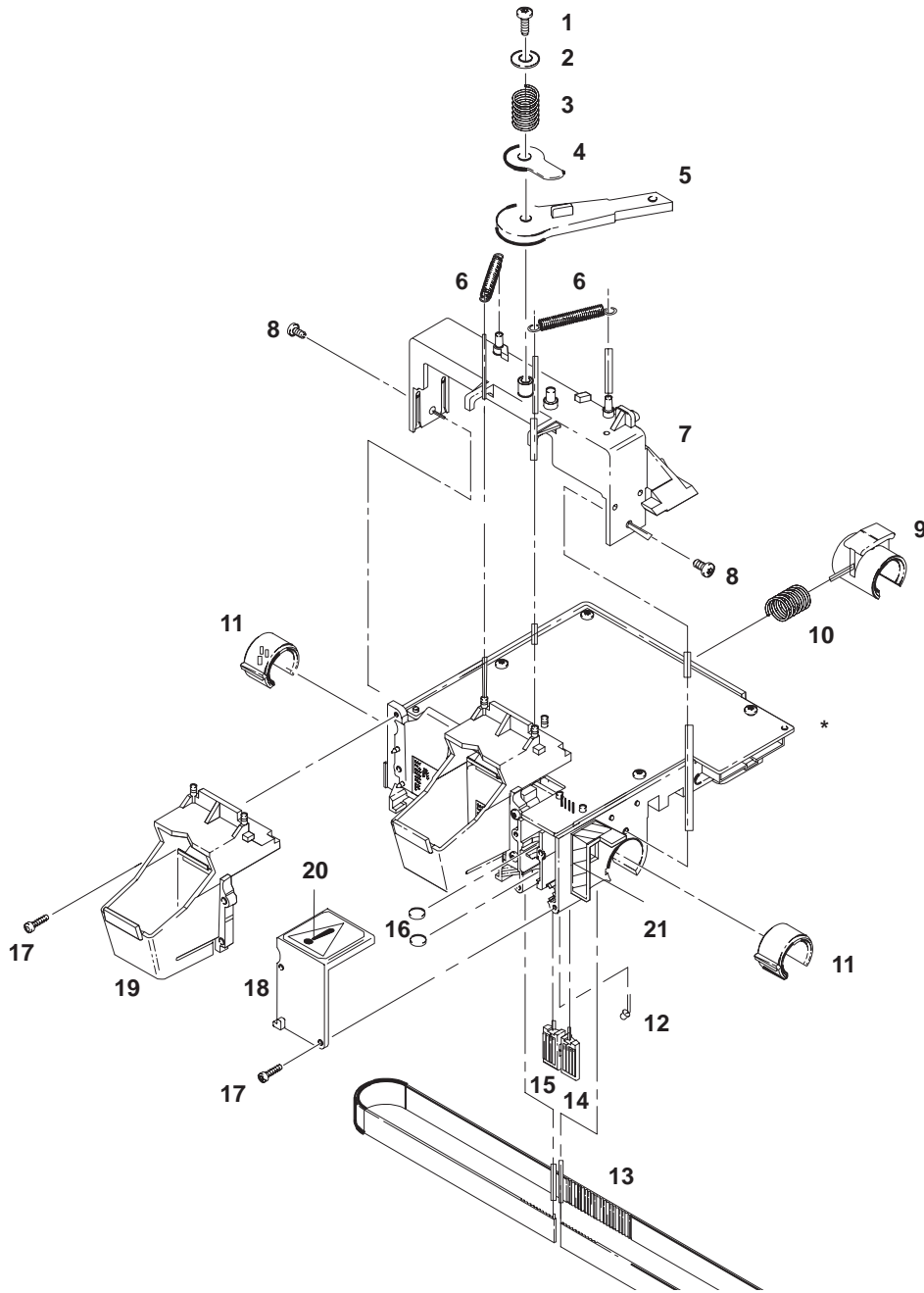


Reference 24: Ferrite Assemblies

HP Part Number	Check Digit	Quantity	Description
9170-1400	6	1	Flat Ferrite
9170-1594	9	2	Large Ferrite
9170-1593	8	4	Small Ferrite
9170-1596	1	1	Large-Ferrite Holder
9170-1595	0	2	Small-Ferrite Holder
0515-2299	6	3	Holder Screw

## Parts List: Carriage Assembly

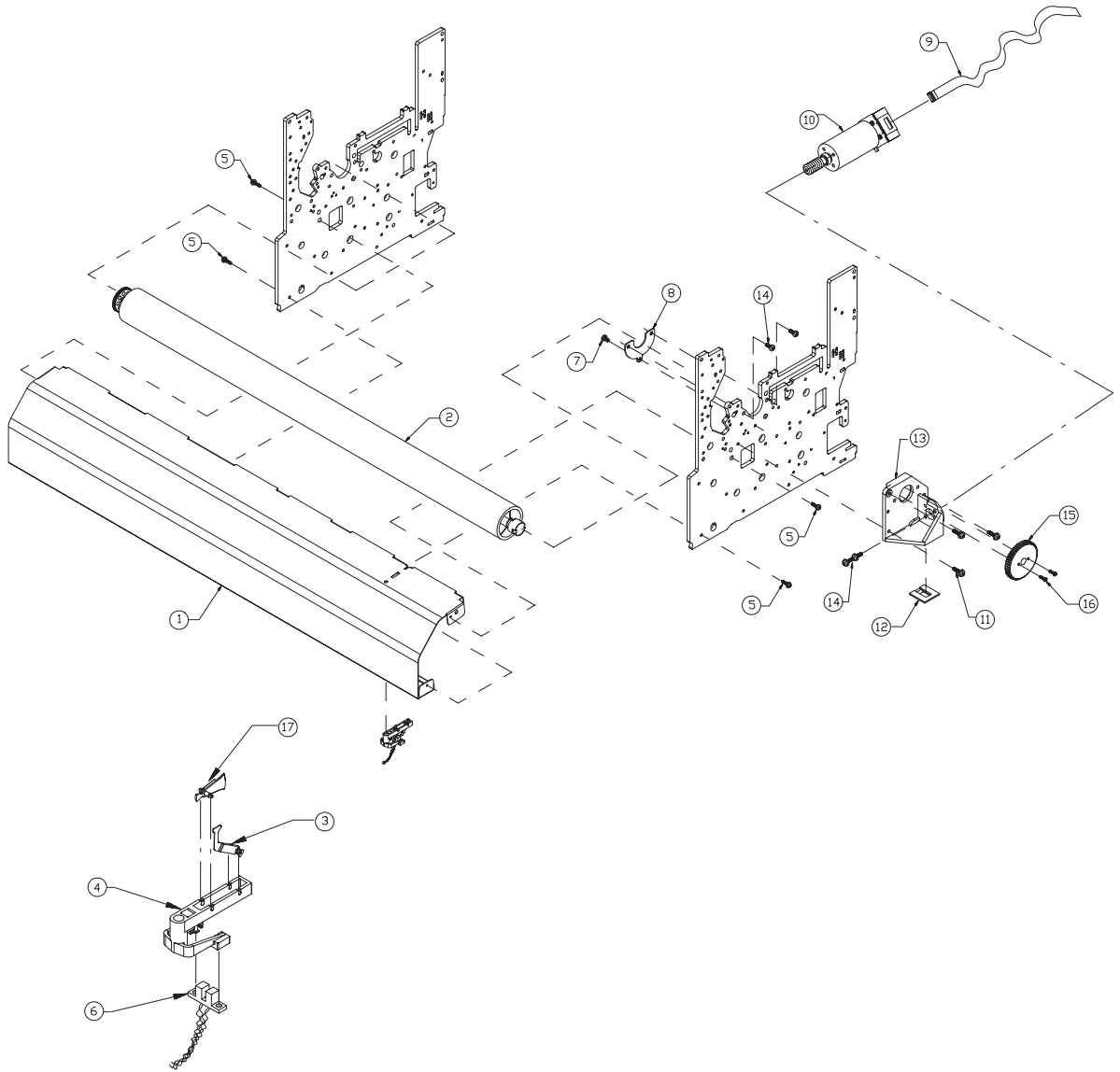
Reference on Drawing	HP Part Number	Check Digit	Quantity	Description
	C2847-60071	9	1	Cartridge Carriage (Not compatible with plotter firmware version A.01.00.) Includes all items below except items 9, 10, and 13.
1	0624-0704	5	1	Plastite Screw #6-19x.375
2	2190-0760	4	1	Washer 5.1mm
3	C1633-80013	1	1	Cam Preload Spring
4	C1633-00079	1	1	Act Cam Washer
5	C1633-40009	1	1	Cartridge-Adjust Cam
6	1460-2061	4	2	Cartridge-Adjust Tensioner Spring
7	C1633-40055	7	1	Cam Base
8	0624-0647	5	5	Tapping Screw 4-20
9	C3180-40025	7	1	Rear Bushing
10	C1633-80014	2	1	Carriage Spring
11	C1633-40066	0	2	Front Bushing
12	1990-1615	5	1	Hi-Intensity Red Led
13	C2847-00029	1	1	Main Drive Belt (D/A1 Size)
	1500-0856	7	1	(E/A0 Size)
14	07575-40014	4	1	Right Belt Clamp
15	07575-40013	3	1	Left Belt Clamp
16	1000-0909	1	2	Lens
17	0624-0745	4	10	Plastite Screw 2-28x0.375
18	C1633-40070	6	1	Line-Detect Cover
19	C2847-60204	0	2	Cartridge Chute (also called carriage snap)
20	C1633-00104	3	1	Carriage Warning Label
21	C1633-00107	6	3	Carriage Striped Label



Carriage Assembly

Parts List: Media Drive Assemblies

Reference on Drawing	HP Part Number	Check Digit	Quantity	Description
1	C3180-00002	6	1	Entry Platen (D/A1 Size)
	C3181-00002	7		(E/A0 Size)
2	C2858-60054	1	1	Drive-Roller Assembly (D/A1 Size)
	C2859-60004	2		(E/A0 Size)
3	C3180-40010	0	1	Secondary Lever
4	C3180-40011	1	1	Media-Sensor Holder
5	0515-2337	3	4	Torx-15 Screw
6	C3180-60001	1	1	Media-Sensor Assembly
7	0515-2278	1	1	Torx-20 Screw
8	C1633-00009	7	1	Axial Bias Plate
9	C2847-60019	5	1	Media-Axis Encoder Cable Assembly
10	C2848-60003	8	1	Media Motor Assembly (includes item 15)
11	0515-2248	5	4	Torx-20 Screw
12	1400-1021	8	1	Cable Clip
13	C1633-20006	6	1	Media-Motor Mount
14	0515-0382	4	4	Torx-15 Screw
15	C2847-20013	5	1	Helical Gear (Drive-Roller Gear)
16	0515-1349	5	2	Torx-10 Screw
17	C3180-40009	7	1	Edge-Measuring Lever



Media Drive Assemblies

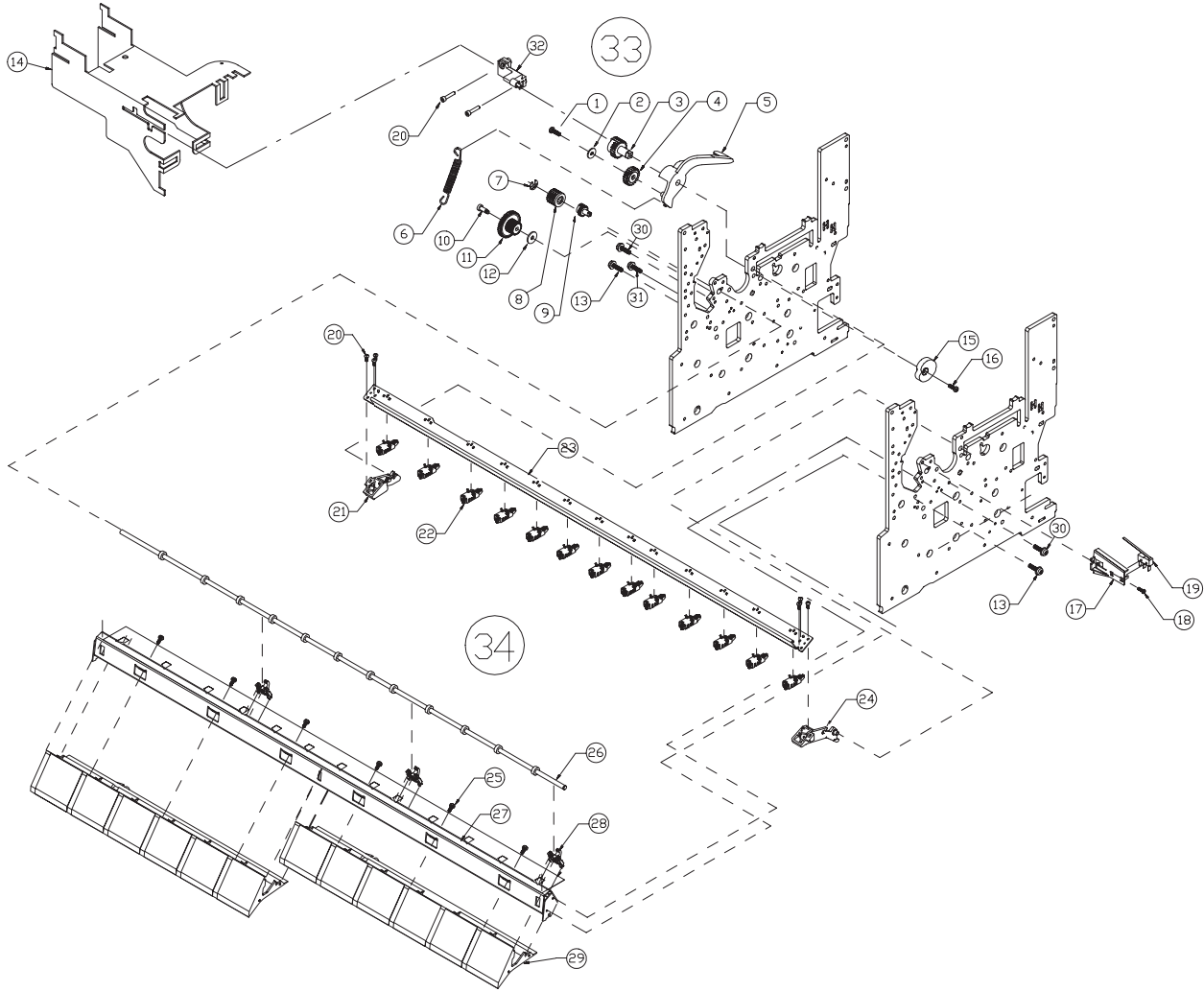
(Parts List: Bail and Overdrive Assemblies ▶ pages 10-24a and 10-24b)



Parts List: Bail and Overdrive Assemblies

Reference on Drawing	HP Part Number	Check Digit	Quantity	Description
1	0624-0647	5	1	Torx-10 Screw
2	3050-0026	0	3	Washer 3.2 mm
3	C1633-40028	4	1	Cam Gear
4	C1633-40027	3	1	Engaging-Lever Gear
5	C2847-40013	7	0	Engaging Lever
6	C1633-80006	2	1	Engaging-Lever Spring
7	0510-0083	2	1	Ring Retainer, 0.25 Diameter
8	C1633-60030	0	1	Overdrive Gear Assembly (Includes item 7)
9	C3180-40024	6	1	Sideplate Bushing
10	C1633-20021	5	5	Shoulder Screw
11	C1633-40019	3	1	Overdrive Gear Cluster
12	3050-1415	3	1	Washer
13	0515-2337	3	2	Torx-15 Screw
14	C2847-00051	9	1	Y-Tensioner Bracket
15	C1633-40052	4	1	Auto Cam
16	0624-0520	3	5	Screw 6-19 0.50
17	C3180-40013	3	1	Bail-Switch Holder
18	0515-2278	1	1	Torx-20 Screw
19	C3180-60002	2	1	Bail-Switch Assembly
20	0624-0704	5	14	Plastite Screw #6-19x.375
21	C1633-40038	6	1	Left Bail Bracket
22	C1633-60034	4	9 or 10 13 or 14	Starwheel Mount Assembly (D/A1 Size) (E/A0 Size)

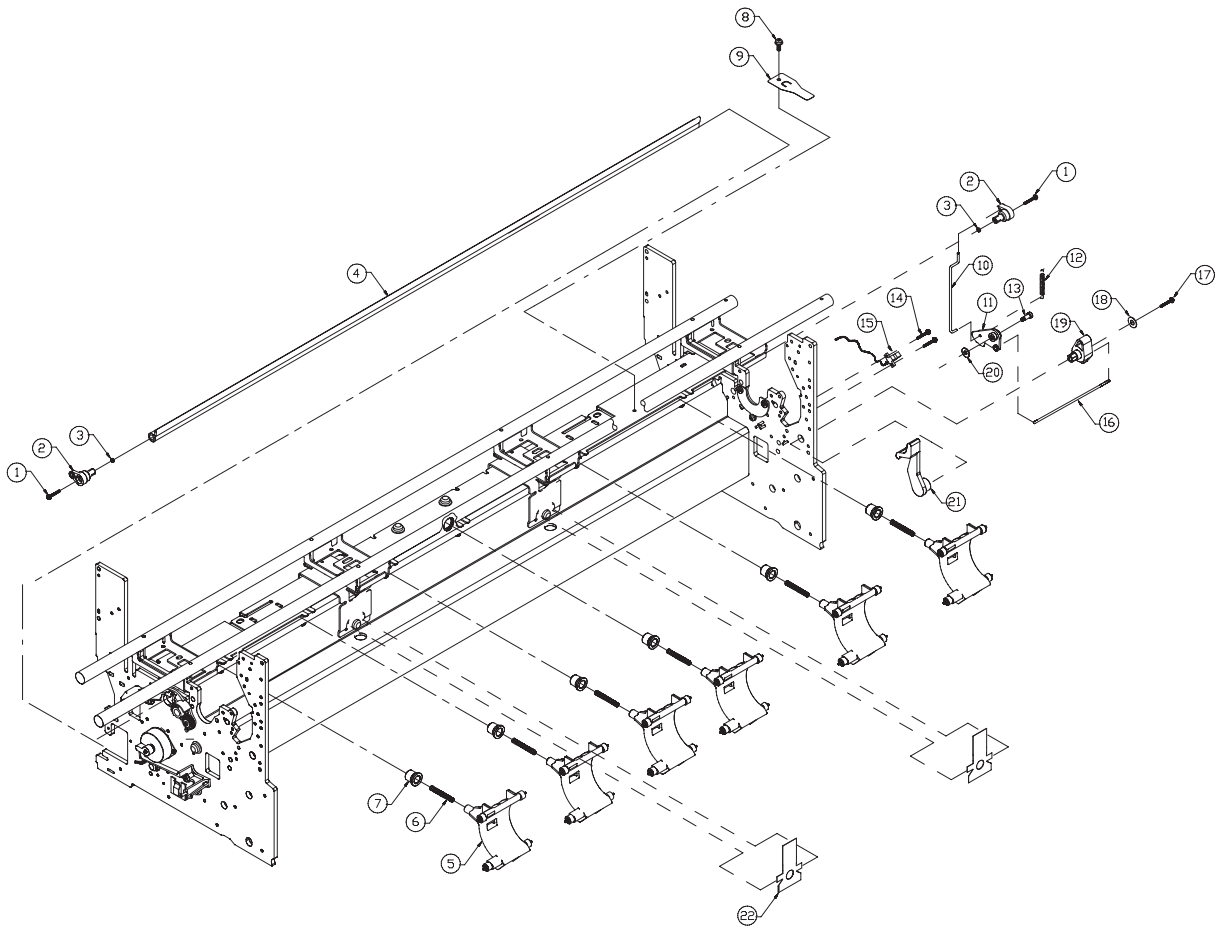
Reference on Drawing	HP Part Number	Check Digit	Quantity	Description
23			1	Bail (Includes items 20, 21, 22, 23, 24)
	C3180-60017	9		with 9 starwheel mounts (D/A1 Size)
	C3180-60065	7		with 10 starwheel mounts (D/A1 Size)
	C3181-60017	6		with 13 starwheel mounts (E/A0 Size)
	C3181-60065	8		with 14 starwheel mounts (E/A0 Size)
24	C1633-40037	5	1	Right Bail Bracket
25	0624-0400	8	4	Screw, Pozidriv 2 (D/A1 Size)
			6	(E/A0 Size)
26			1	Overdrive Roller
	C3180-60004	4		for 9 starwheel mounts (D/A1 Size)
	C3180-60035	1		for 10 starwheel mounts (D/A1 Size)
	C3181-60004	5		for 13 starwheel mounts (E/A0 Size)
	C3181-60035	2		for 14 starwheel mounts (E/A0 Size)
27				Overdrive Enclosure (includes items 25, 27, 29)
	C3180-60015	7	1	for 9 starwheel mounts (D/A1 Size)
	C3180-60061	3	1	for 10 starwheel mounts (D/A1 Size)
	C3181-60015	8	1	for 13 starwheel mounts (E/A0 Size)
	C3181-60061	4	1	for 14 starwheel mounts (E/A0 Size)
28	C3180-40002	0	2	Overdrive Bushing (D/A1 Size)
			3	(E/A0 Size)
29	C3180-40018	8	2	Media Guide (D/A1 Size)
	C3181-40018	9	2	(E/A0 Size)
30	0515-2248	5	1	Torx-20 Screw
31	C3180-20001	7	2	Alignment Screw
32	C2847-40015	9	1	Cam-Gear Support
33	C2858-60209	8	1	Bail-lift-mechanism rework assembly ♦ chapter 9. (includes items 1, 2, 3, 4, 5, 6, 14, 15, 16, 20, 32)
34			1	Overdrive and bail rework kit ♦ chapter 9. (includes items 20, 21, 22, 23, 24, 25, 26, 27, 29)
	C3180-60062	4		for 10 starwheel mounts (D/A1 Size)
	C3181-60062	5		for 14 starwheel mounts (E/A0 Size)



Bail and Overdrive  
Assemblies

Parts List: Pinch-Arm Assembly

Reference on Drawing	HP Part Number	Check Digit	Quantity	Description
1	0515-1992	4	2	Torx-9 Screw
2	C3190-40053	3	2	Cam Journal
3	0535-0026	5	2	Hex Nut, DBL-CHAM
4	C2847-20005	5	1	Pinch-Arm Bar Cam (D/A1 Size)
	C1633-20012	4	1	(E/A0 Size)
5	C1633-60039	9	4	Pinch-Arm Assembly (D/A1 Size)
			6	(E/A0 Size)
6	C1633-80005	1	4	Pinch-Arm Spring (D/A1 Size)
			6	(E/A0 Size)
7	C1633-40082	0	4	Pinch-Arm Bushing (D/A1 Size)
			6	(E/A0 Size)
8	0515-0380	2	21	Torx-15 Screw
9	C1633-00100	9	1	Media Director
10	C1633-00076	8	1	Rear Wire Link
11	C1633-40079	5	1	Rocker Plate
12	C1633-80007	3	1	Rocker Spring
13	C1633-20021	5	1	Torx-15 Shoulder Screw
14	0624-0647	5	11	Torx-10 Screw
15	C3180-60034	0	1	Pinch-Arm Sensor
16	C1633-00075	7	1	Front Wire Link
17	0515-2414	7	1	Pinch-Arm-Lever Screw
18	2190-0760	4	1	Washer 5.1mm
19	C3180-40020	2	1	Pinch-Arm-Lever Cam
20	3050-1415	3	1	Shoulder Washer
21	C3180-40017	7	1	Pinch-Arm Lever (Media-Jam Lever)
22	C1633-00059	7	1	Media Diverter



Pinch-Arm Assembly

## Accessories

Description	HP Part Number	
Unpacking Instructions	Until 30 Sept 1994: C3180-90020 (◆ chapter 3) From 01 Oct 1994: C2847-90030 (new packaging)	
Repacking Instructions	From 01 Oct 1994: C2847-90032 (new packaging)	
Repackaging Kit	C3180-60016 (D/A1 size) C3181-60016 (E/A0 size)	
<b>User's Guide</b>	<b>DesignJet 200</b>	<b>DesignJet 220</b>
Chinese	C3180-90010	C3187-90010
English	C3180-90001	C3187-90001
French	C3180-90005	C3187-90005
German	C3180-90004	C3187-90004
Italian	C3180-90007	C3187-90007
Japanese	C3180-90008	C3187-90008
Korean	C3180-90002	C3187-90002
Portuguese	C3180-90009	C3187-90009
Spanish	C3180-90006	C3187-90006
Taiwanese	C3180-90003	C3187-90003
<b>AutoCAD Driver, 3.5-inch Disk + Documentation</b>		
Chinese		C3187-60060
English		C3187-60051
French		C3187-60055
German		C3187-60054
Italian		C3187-60057
Korean		C3187-60052
Spanish		C3187-60056
Taiwanese		C3187-60053

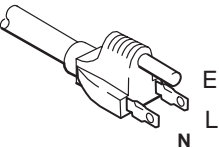
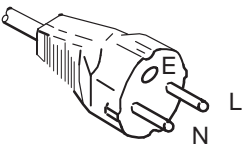
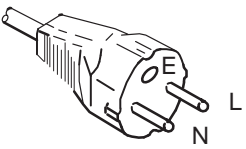
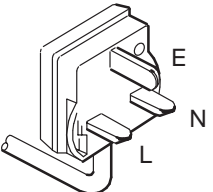
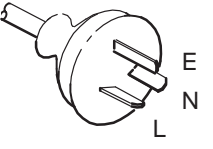
Description	HP Part Number
Windows Driver, 3.5-inch Disk + Documentation	
English	C3187-60031
French	C3187-60035
German	C3187-60034
Italian	C3187-60037
Japanese	C3187-60081
Spanish	C3187-60036
HP CAD Plotters Software/Hardware Guide	
Europe	5963-0997LE
Elsewhere	5963-0998E
Software Application Notes	C3187-90080
Print Cartridge	51626A
Supplies Source (booklet)	
USA	5091-7378EUS
Elsewhere	5091-7690E
Supplies Source Update	
USA	5091-9802EUS
Elsewhere	5091-9799E
Upgrade Kit (DesignJet 200 to DesignJet 220)	C3189A
includes User's Guide, Drivers, Help Cards, Overlay and:	
Upgrade Instructions	C3187-90028
Nameplate	C3187-00011
Upgrade Label	C3189-00001
ROM Memory Kit	C3189-60001
Plug-In Memory (DRAM SIMM)	
2-Mbyte SIMM	C2064A
4-Mbyte SIMM	C2065A
8-Mbyte SIMM	C2066A
HP JetDirect EX, External Network Interface	
Ethernet	J2382B
Token Ring	J2383B

## Line Cord Set

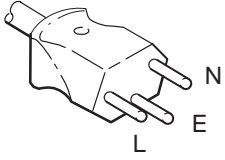
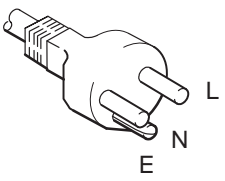
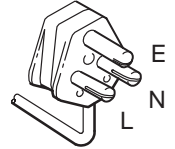
The power cord supplied with the plotter should meet the plug requirements for the area. However, different power cords (international options) are available (see following table).

Note the following abbreviations used in the power-cord options table below:

- L** – Line or Active Conductor (also called “live” or “hot”)
- N** – Neutral or Identified Conductor
- E** – Earth or Ground

Plug Type	Country	HP Part Number
 <p>NEMA 5-15P</p>	Latin America North America Korea Philippines Taiwan	8120-1378
 <p>MITI 41-9692</p>	Japan	8120-4753
 <p>CEE 7-VII</p>	Continental Europe Egypt India Saudi Arabia	8120-1689
 <p>BS 1363A</p>	Hong Kong Ireland United Kingdom	8120-1351
 <p>ASC112</p>	Argentina Australia China (mainland) New Zealand	8120-1369



Plug Type	Country	HP Part Number
SEV 1011	Switzerland	8120-2104
 <p>A diagram of a SEV 1011 plug, which is a three-pronged Swiss plug. The prongs are labeled L (Left), E (Earth), and N (Neutral).</p>		
DHCR-107	Denmark	8120-2956
 <p>A diagram of a DHCR-107 plug, which is a two-pronged Danish plug. The prongs are labeled L (Left) and E (Earth). The N (Neutral) label is positioned near the plug body.</p>		
SABS	Republic of South Africa	8120-4211
 <p>A diagram of a SABS plug, which is a three-pronged South African plug. The prongs are labeled E (Earth), N (Neutral), and L (Left).</p>		

## Interface Cables

### Parallel (Bi-Tronics/Centronics) Interface Cables

Computer	HP Part Number	Cable length	Connector type at computer end of cable
HP Vectra with HP 24540A/B serial/parallel interface card using the parallel connector. HP 9000 workstations, series 300, 400, 700. IBM AT, IBM PS/2, IBM PC/XT and compatible computers.	92284A	2.1 m (6.9 ft)	25-pin male

### Serial (RS-232-C) Interface Cables

Computer	HP Part Number	Cable length	Connector type at computer end of cable
HP Vectra or HP 24541A/B serial interface card (9-pin connector). HP 9000 workstations using 9-pin connectors. IBM AT and compatible computers using 9-pin serial connectors.	24542G	3.0 m (9.8 ft)	9-pin female
HP Vectra PC with HP 24541A/B dual serial interface card using the 25-pin connector. HP Apollo workstation using an SPE (Serial/Parallel Expansion) option and supplied adapter cable. DEC VAX. Sun workstation.	17255M	1.2 m (3.9 ft)	25-pin male
IBM PC, PC/XT, IBM PS/2 and compatible computers	17255D	1.2 m (3.9 ft)	25-pin female
DEC VAX using DEC BC22D, BC03M, or equivalent	17355M	3.0 m (9.8 ft)	
Apple Macintosh Plus, SE, II	17302A	1.5 m (4.9 ft)	8-pin male mini-DIN
Apple Macintosh 128K and 512K	92219M	1.5 m (4.9 ft)	9-pin male
Extension cable	31391A	5 m (16.4 ft)	25-pin female

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## Glossary

**ac** Alternating current

**accuracy calibration** X-axis calibration

**A/D** Analog to Digital converter

**addressable dpi** A resolution higher than the nominal value of the cartridges, giving a finer grid on which the plotter can selectively position dots and improve print quality.

**ANSI** American National Standards Institute

**ASCII** American Standard Code for Information Interchange. An 8-bit code that uses 7 bits to represent character data such as letters, punctuation, symbols, and control characters. Bit 8 can be used for parity.

**ASIC** Application-Specific Integrated Circuit

**baud rate** For the RS-232-C interface, the data transmission rate between the computer and the plotter (bits per second).

**Bi-Tronics** A parallel interface standard.

**CAD** Computer-Aided Design

**CAM** Computer-Aided Manufacturing

**carriage LED** Line sensor

**cartridge** Print cartridge (pen)

**CD** Check Digit

**Centronics** A parallel interface standard.

**cockle** Wrinkling of media due to ink saturation.

**CRC** Cyclic Redundancy Check

**D/A1-size plotters** Models C3180A and C3187A

**dc** Direct current

**display data** Monitor mode

**DIP** Dual In-line Package

**dpi** Dots per inch, the plotter's resolution of raster images on the media.

**DRAM** Dynamic Random-Access Memory

**driver** Configuration data used by software to control input and output between the computer and the plotter.

**drive roller** Platen roller

**DTR** Data-Terminal Read

**E/A0-size plotters** Models C3181A and C3188A

**EPROM** Erasable Programmable Read-Only Memory

**EEROM** Electrically Erasable Read-Only Memory

**EPROM** Erasable Programmable Read-Only Memory

**ESD** Electrostatic discharge

**FET** Field-Effect Transistor

**HP-GL/2** Hewlett-Packard's standard graphics language for its plotters.

**HP-RTL** Hewlett-Packard Raster Transfer Language

**IC** Integrated Circuit

**IEEE** Institute of Electrical and Electronics Engineers

**ISO** International Standards Organization

**Kanji** A Japanese character set.

**LED** Light-Emitting Diode

**legs and bin** Plotter stand and media bin

**line sensor** Carriage LED

**LSB** Least Significant Bit

**media axis** X-axis (paper axis)

**media-length calibration** Media-sensor calibration

**media-sensor calibration** Media-length calibration

**MSB** Most Significant Bit

**NVRAM** Nonvolatile Random-Access Memory

**PAL** Programmable Array Logic

**palette** A set of pens for which width and % shading are defined using the setup sheet or the graphics software.

**paper axis** Media axis (X-axis)

**parity** An error-checking method for information transfer between a computer and a peripheral device. Parity is used to check the accuracy of binary data.

**PC** Personal Computer

**PCA** Printed Circuit Assembly

**pen** 1. Even though the inkjet plotter has no physical pens, the lines it draws match the attributes for pens numbered 1 through 8 in the application software. (See also “palette.”)  
2. Sometimes used instead of “print cartridge”

**pinch-arm sensor** pinch-wheel sensor

**PJL** Printer Job Language, developed by Hewlett-Packard to give software applications more job-level device control and to provide device status information to the application.

**platen roller** Drive roller

**P/N** Part Number

**PNP** Positive Negative Positive

**PWM** Pulse-Width Modulation

**RAM** Random-Access Memory

**raster** 1. A matrix of dots, or pixels, where each pixel is defined by a bit. A bit that is “on” will print a dot on the paper. A bit that is “off” will leave the area blank. 2. A method for defining a plot directly in terms of the pixels rather than as vectors.

**resolution** A measure of image sharpness expressed as a number of lines per unit length. When referring to plotters, addressable resolution means the smallest move the plotter can make programmatically.

**rms** Root mean square

**ROM** Read-Only Memory

**RS-232-C interface** A serial interface standardized by the Electronic Industries Association Standard RS-232-C.

**RTL** see “HP-RTL”

**RTS** Request To Send

**SIMM** Single In-line Memory Module

**SMT** Surface-Mount Technology

**stand** Plotter legs and media bin

**TCP/IP** Transmission Control Protocol / Internet Protocol

**Transl.** Translucent media

**UART** Universal Asynchronous Receiver Transmitter

**X-axis** Media axis

**X-axis calibration** Accuracy calibration

**Y-axis** Carriage axis

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**Notes**

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### **About This Edition**

This is the second edition of this service manual. It updates information in respect to the HP DesignJet 200 and introduces the HP DesignJet 220.

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2nd edition, titled  
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September 1994



### **What's in This Book**

This manual contains information necessary to test, calibrate and service

- HP DesignJet 200 plotters  
(models C3180A and C3181A)
- HP DesignJet 220 plotters  
(models C3187A and C3188A)

For information about using these plotters, refer to the corresponding user guides.

The procedures described in this manual are to be performed by HP-qualified service personnel only.

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