



i n v e n t

HP DesignJets 500, 510 and 800 Series Large-Format Printers



Service Manual

For HP Use Only

Warranty

WARNING

WARNING

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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 Printer from the power source prior to performing any maintenance.
- Prevent water or any other liquids from running onto electrical components or circuits, or through openings in the enclosure.

Electrostatic Discharge

Refer to the beginning of Chapter 8 of this manual, for precautions you should take to prevent damage to the Printer circuits from electrostatic discharge.

Safety Symbols

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

The Warning symbol calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a Warning symbol until the indicated conditions are fully understood and met.

CAUTION

The Caution symbol 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. Do not proceed beyond a Caution symbol until the indicated conditions are fully understood and met.

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HP DesignJets 500, 510 and 800 Series Large-Format Printers



Service Manual

Using this Manual

Purpose

This Service Manual contains information necessary to test, calibrate and service:

- HP DesignJet 500 Printer - 24" Model (P/N C7769B)
- HP DesignJet 500 Printer - 42" Model (P/N C7770B)
- HP DesignJet 500PS Printer - 24" Model (P/N C7769C)
- HP DesignJet 500PS Printer - 42" Model (P/N C7770C)
- HP DesignJet 500Plus – 24" Model (P/N C7769F)
- HP DesignJet 500Plus – 42" Model (P/N C7770F)
- HP DesignJet 500Mono – 24" Model (P/N C7769E)
- HP DesignJet 500Mono – 42" Model (P/N C7770E)
- HP Designjet 510 – 24" Model (P/N CH336A)
- HP Designjet 510 – 42" Model (P/N CH337A)
- HP Designjet 510ps – 24" Model (P/N CJ996A)
- HP Designjet 510ps – 42" Model (P/N CJ997A)
- HP DesignJet 800 Printer - 24" Model (P/N C7779B)
- HP DesignJet 800 Printer - 42" Model (P/N C7780B)
- HP DesignJet 800PS Printer - 24" Model (P/N C7779C)
- HP DesignJet 800PS Printer - 42" Model (P/N C7780C)

For information about using these printers, refer to the corresponding User and Quick Reference Guides.

Readership

The procedures described in this Service Manual are to be performed by HP Certified Service Personnel only.

Part Numbers

Part Numbers for Printer options, accessories and service parts are

located in Chapter 7.

Conventions

A small arrow \Rightarrow is used to indicate other parts of the Service Manual where you can find information related to the topic you are consulting.

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Guide to Troubleshooting the Printer

Introduction

This chapter will guide you through the relevant steps to take when troubleshooting the printer.

Front Panel Difference for the HP DesignJet 500, 510 and 800 Series Printers

Front Panel for the HP DesignJet 500 and 800 Series

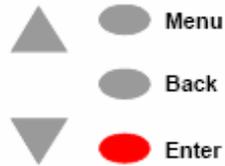


Front Panel for the HP DesignJet 510 Series



NOTE

The layout shown below will be used to refer to both types of front panels



Troubleshooting System Error Codes

Chapter 2 - *System Error Codes* contains a list of system error codes and their respective descriptions and recommended corrective actions. Only try one recommended action at a time and check if the error code has disappeared.

Performing a Service Test on a Failed Assembly

If possible, always perform a Service Test on the component/assembly that you are about to replace, just to make sure that is the component/assembly that has failed.

NOTE

If the test on that component/assembly passes, you should NOT replace it.

For information on the Service Tests and how to use them see Chapter 4 - *Service Tests and Utilities*.

Performing the Necessary Service Calibrations

Is the printer calibrated correctly after replacing a component?

NOTE

Remember that certain Calibrations are required even if an Assembly has been disassembled to gain access to another Assembly or Component.

For information on the Service Calibrations and how to use them see Chapter 5 - *Service Calibrations*.

Solving Print Quality Problems

The Printer contains an internal **Troubleshooting** procedure which helps you to diagnose and resolve the possible source of any Image Quality or Line Quality defects. If Print Quality is poor **before** the minimum life expectancy of the Printhead has been reached, the **Troubleshooting** procedure should be performed which will determine whether the Printhead needs replacing or not after performing various levels of recovery actions.

For information on solving Print Quality problems see Chapter 6 - *Print Quality*.

The Printer does not Power ON

- 1 Check that the power cord is connected correctly to the Printer and to the Power Socket.
- 2 Check that the Front-Panel Cable is correctly connected to the Interconnect PCA. Also make sure that the Front-Panel cable is not damaged.
- 3 Check that the Interconnect Cable is properly connected at the both ends of the Printer.

Cover Sensors are not Working

- 1 Check if the faulty sensor is installed correctly.
- 2 Check if the cable for the faulty sensor is connected correctly.
- 3 Replace the faulty Sensor (or the assembly that contains the Sensor).

The Line Sensor has Problems Detecting Media

- 1 Check the type of media that is being used since the Line Sensor may have problems detecting transparent media or some types of Non-HP media. Try loading white HP media in to the Printer and check if the Line Sensor detects it.
- 2 Excessive ink deposits on the Print Platen surface can fool the sensor by reflecting the light. Clean the Print Platen.
- 3 The Line Sensor is damaged or faulty. Replace the Carriage Assembly ⇒ Page 8-78.

Troubleshooting Paper-Axis Shutdowns

A Paper-Axis shutdown can happen when the Printer detects that the Drive Roller is **not** moving but at the same time power is being supplied to the Paper-Axis Motor (which should be turning the Drive Roller).

The reasons for the Paper-Axis shutdown, and their solutions, are explained as follows:

- 1 The Paper-Axis Motor does not respond to the electrical simulation.
 - It is possible to determine whether the Paper-Axis is faulty by performing the Paper Advance Test (Refer to Page 4-11). The Printer will move the Motor backwards and forwards and measure directly from the Motor Encoder whether the Paper-Axis Motor responded to the force. If the Paper-Axis Motor did not respond, the solution would be to replace the Paper-Axis Motor ⇒ Page 8-84.
- 2 The Transmission Gears, which transmit the movement to the Drive Roller, are not turning. This problem could be caused either by blockage of the gears (caused by an obstacle) or by one of the gears being damaged. To solve the problem, try the following:
 - Remove the Back Platen ⇒ Page 8-67 and check if there are any obstacles blocking the Gears. Remove the obstacles if necessary.
 - Remove the Back Platen ⇒ Page 8-67 and check if the Transmission Gears are damaged. If the Gears are damaged, replace the Gear Assemblies ⇒ Page 8-92.
- 3 The Drive Roller cannot move because of an obstacle or because it is damaged. To solve the problem, try the following:
 - Remove the Back Platen ⇒ Page 8-67 and check if there are any obstacles blocking the Drive Roller. Remove the obstacles if necessary.
 - Remove the Back Platen ⇒ Page 8-67 and check if the Drive Roller is damaged. If the Drive Roller is damaged, replace the Drive Roller ⇒ Page 8-86.
- 4 The Drive Roller Encoder Sensor is faulty
 - It is possible to determine whether the Encoder Sensor is faulty by loading a sheet of paper from the front of the Printer. If the Drive Roller is working, the sheet will be loaded correctly, and the Printer will detect that media has been loaded (using the Media Sensor). Therefore the problem must be the Encoder Sensor and the solution would be to replace the Encoder Sensor ⇒ Page 8-38.

Problems with the Vacuum Fan

If you have problems loading either Roll or Sheet Media, then there could be a problem with the Vacuum Fan. To verify if there really is a problem with the Vacuum Fan, try the following:

- 1 With the Printer ON, open the Window of the Printer and place a sheet of HP High Gloss Photo Paper (must be D-Size), aligned with the blue lines on the Center Platen. If the Vacuum Fan holds the sheet in place, and then loads it correctly, then the Vacuum Fan functions correctly. If the Vacuum Fan does not hold the sheet in place (no suction), then try the following:
 - Check that the holes in the Center Platen are NOT blocked.
 - Check that the Vacuum Fan is installed correctly.
 - Replace the Vacuum Fan ⇒ Page 8-64.
- 2 If the Vacuum Fan held the sheet in place, but couldn't correctly load it, then there could be a problem with the Drive Roller. In this case, replace the Drive Roller ⇒ Page 8-86.

Vacuum suction much lower at high altitudes

Sometimes, at high altitudes, the vacuum force holding down the media will be lower, therefore the media will not be held in place properly causing:

- Ink Smearing on the Media.
- Printhead crashes against the Media.
- Cut Sheet loading problems (high probability).
- Roll Media loading problems (low probability).

The solution to this would be to change the Vacuum force by changing the Altitude setting. This can be done via the front panel ⇒ Set-up Menu / Altitude.

HP-GL/2 color differences in different HP DesignJet Printers

Color differences between one image printed on the HP DesignJet 500/510/800 Series and the rest of the DesignJet platforms are due to the different chemistry of the 500/510/800 series inks compared with the rest of the inks for other printers. This color variability among different HP DesignJet Series Printers has always been present. To solve the problem, try the following:

- Perform the color calibration from the driver at the time of printing. However, that calibration is not very accurate but it may help in the most severe cases.
- Some applications have color controls for the user to modify the image in order to obtain the desired colors.
- Printing with PostScript reduces the problem significantly.
- Avoid very long exposures to extreme environmental conditions after printing with glossy media (more than 12 hours at 80% humidity may result in severe changes in color).

Banding at variable extreme environmental conditions

Since the Accuracy Calibration has been done at normal environmental conditions, printing in extreme environmental conditions will cause banding because the advance of the Drive Roller does not correspond to the same conditions that the calibration was done in. To solve the problem, try the following:

- Perform the Accuracy Calibration in the new environmental conditions (Refer to the User's Guide).

The Priming Procedure Fails

When the customer first receives the Printer, it is supplied with a set of **four** Start-up Printheads pre-installed in the Printhead Carriage. These Start-up Printheads are used for the priming of the tubes in the Ink Delivery System.

When the Printer is powered ON for the first time, the Printer will automatically perform the priming process. Without the priming process, the customer will **NOT** be able to use the Printer.

The initial startup assumes that the Start-up Printheads are installed, but the Printer cannot detect them because the Printer can only detect normal Printheads. If normal Printheads are installed during the initial startup, the Printer will request the User to remove them and check if they really have been removed. It will then request the User to install the Start-up Printheads.

Also the Printer will request the User to install the Ink Cartridges if they have not been installed already. If the Ink Cartridges contain less than 20cc of ink (the Ink Cartridges are encoded with the quantity of ink remaining) they will be rejected. Normally with a new Printer this should not be a problem since the Printer comes with Ink Cartridges that are full, but there maybe cases when the Ink Supply Tubes need to be replaced, in which case half empty Ink Cartridges may be used.

Once the Printer assumes that the Start-up Printheads and Ink Cartridges with enough ink are installed, the priming process will begin.

If the priming process is completed successfully, the Printer will directly proceed to the Printhead replacement procedure in order to replace the used Start-up Printheads with normal Printheads.

Once the priming process has started, it can fail due to 2 different problems:

- The Ink Supply Tubes were not completely empty - This is the most common cause especially if the Printer has been powered ON and OFF several times with the Ink Cartridges installed since the initialization process performs at least one pumping cycle.
- The Printer detects that one or more of the tubes cannot be detected as filled with ink - The most likely cause for this problem is Ink Cartridges with a faulty valve.

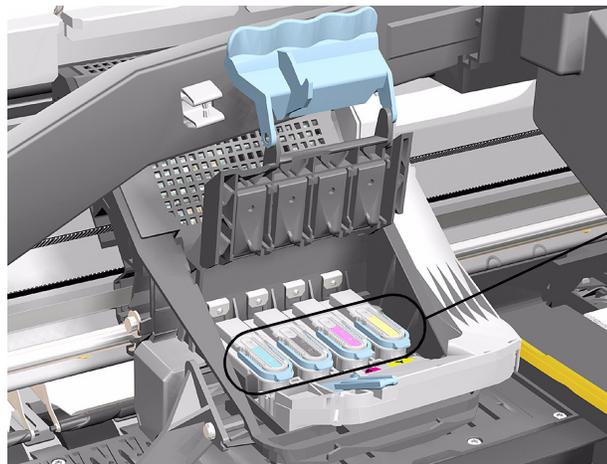
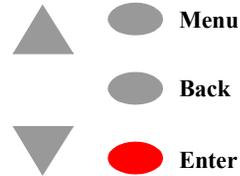
Even if the priming process fails, the Printer will try to verify whether the priming process has been completed by moving the Carriage to the access position and you will see the following

message on the Front Panel:

Unable to prepare
ink system.
Open window to check
SETUP printheads

Open the Window and you will see the following message on the Front Panel:

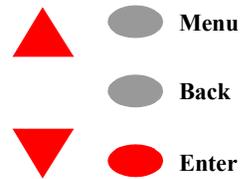
1. Lift printhead cover
2. Check if there is ink
inside printhead windows
3. Press ENTER to continue



Open the Carriage Cover and check if there is ink inside the Start-up Printheads. On the Front Panel you will see the following question and you will need to select the answer depending on whether the Start-up Printheads were filled with ink or not:

Are all printhead windows
filled with ink?

ALL with some ink
NOT all with ink



If there is ink in **all** of the Start-up printheads, the Printer considers that the priming procedure has been completed successfully and will proceed to the Printhead replacement process.

If you select **NOT all with ink** the Printer will react differently depending on the source of the problem:

NOTE

If you need to reseal the Start-up Printheads, make sure you reinsert them in the same color slot in the Carriage.

- The Printer will request you to reseal the Start-up Printheads (or in the case of missing Start-up Printheads you should install them or order new ones) and then retry the priming process (if the priming process fails 3 times because of the same problem, it will display a System Error). In this situation, the problem could be the following:
 - 1 The Start-up Printheads were **not** installed correctly or they are missing (one or all of them).
 - 2 The Start-up Printheads do not work properly and do not allow air to flow (one or all of them).
 - 3 The Ink Supply Station fails to pressurize the Ink Cartridges. To check this, perform the Ink Supply Station test ⇒ Page 4-6.
 - 4 The Ink Supply Tubes are blocked, preventing the ink from flowing correctly.
- If a System Error is displayed, try the following:
 - 1 The Ink Cartridge valve is broken so the Ink Cartridge should be replaced.
 - 2 The Start-up Printhead is not working properly and allows ink to flow outside.
 - 3 The Ink Supply Tube is leaking.

NOTE

The last 2 cases will be more obvious because there will be a lot of ink in the Printer (around 20 cc of ink). Remove the Ink Cartridges and release the Tubes Bracket from the Ink Supply Station and check if there is ink in this area.

For more information on this problem, refer to System Error **93:10** on Page 2-19.

Using the Power Switch LED to Troubleshoot

In certain circumstances the LED located in the power switch (located on the left hand side of the Printer) can help to troubleshoot the Printer. The LED can be OFF, ON or flashing and using different combinations can indicate different problems.

NOTE

You should only use the LED to troubleshoot when the Printer does not Power up completely. The LED may flash in other circumstances which are completely normal and this does not mean that there is a problem with the Printer.



LED is OFF - This indicates that the Power Supply Unit is completely dead. Try the following:

- 1 Check that power cord is connected correctly to the Printer and to the Power Socket. Also make sure that you firmly press the Power Switch to the ON position.
- 2 Replace the Power Supply Unit ⇒ Page 8-27.

LED is ON (all the time) - This indicates that the Main PCA is completely dead. Replace the Electronics Module ⇒ Page 8-24.

LED is Flashing continuously - A problem has been detected with the previous firmware upgrade. Try resending the firmware upgrade file.

LED Flashes twice every few seconds - The Printer cannot detect

the Interconnect Cable. Try the following:

- 1 Check that the Interconnect Cable is connected correctly to the Electronics Module and to the Interconnect PCA.
- 2 If the Interconnect cable is connected correctly and the LED continues to flash twice then replace the Interconnect Cable ⇒ Page 8-59.

LED Flashes 3 times every few seconds - The Printer cannot detect the Front Panel. Try the following:

- 1 Check that the Front Panel is connected correctly to the Interconnect PCA.
- 2 Check that the Interconnect Cable is properly connected at the both ends of the Printer.
- 3 If the Front Panel is connected correctly and the LED continues to flash 3 times then replace the Front Panel ⇒ Page 8-9.
- 4 Replace the Interconnect Cable ⇒ Page 8-59.
- 5 Replace the Electronics Module ⇒ Page 8-24.

LED Flashes 4 times every few seconds - This indicates that the Main PCA has failed. Replace the Electronics Module ⇒ Page 8-24.

LED Flashes 5 times every few seconds - This indicates that the Main PCA has failed. Replace the Electronics Module ⇒ Page 8-24.

Using the Boot-Up Sequence to Troubleshoot

When you Power On the Printer, the Printer performs the Boot-Up sequence which initializes the major components of the Printer. If for some reason the Boot-Up sequence fails because a component has failed to initialize, the following explanations will help you to locate the failing component:



 During the first phase of the Boot-up sequence (all the squares turn grey) the Printer is initializing the Operating System. If for some reason this sequence fails, try the following:

- 1 Switch the Printer Off and wait a few minutes. Switch the Printer On again and check if the initialization sequence is successful.
- 2 If the initialization sequence fails again, replace the Electronics Module ⇒ Page 8-24.

 During the second phase of the Boot-up sequence (all the squares turn black) the Printer is initializing various components (too numerous to mention). In normal circumstances, if a component fails during this sequence a System Error will appear and you should refer to Chapter 2 - *System Error Codes*. The following information explains what is being initialized as each square turns black:

 Initializing various components of the Main PCA.

 Initializing various components of the Main PCA.

 Initializing a portion of the Firmware.

 Initializing various components of the Main PCA.



Initializing various components of the Main PCA.



Initializing a portion of the Firmware.



Initializing the I/O.



Initializing the User Interface (Front Panel menus).



Initializing a portion of the Firmware.



Initializing the Formatter.



Initializing the communication between Main PCA and Formatter.



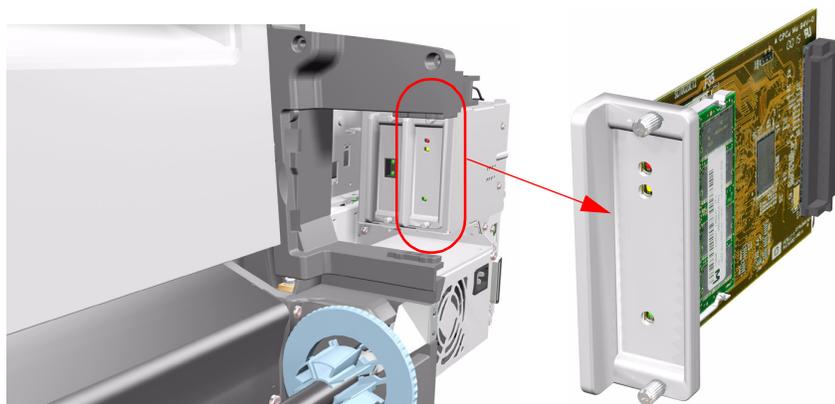
End of initialization sequence.

Entering Service Menu at Power Up - Only for Onsite Repair

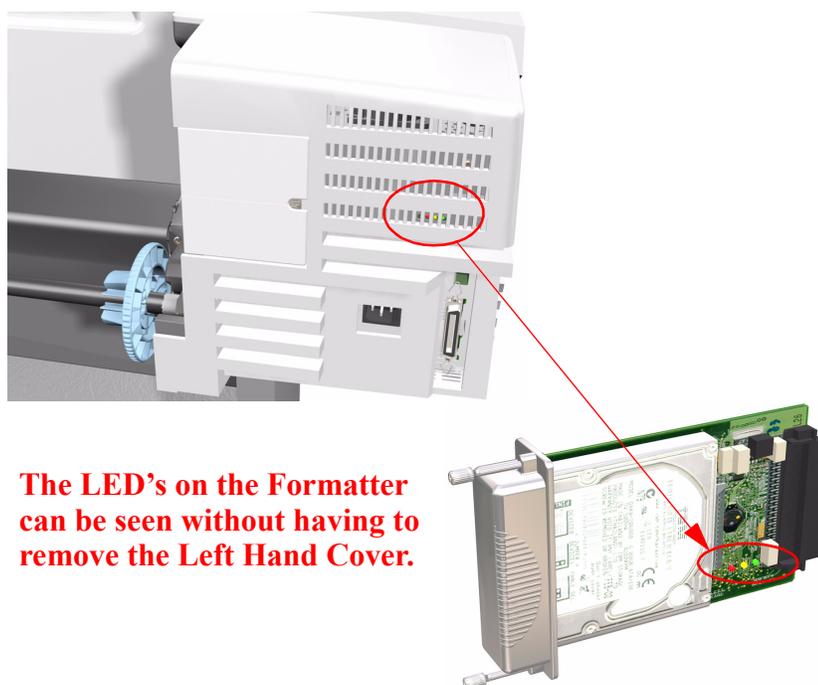
If the Printer fails to initialize completely because of a System Error and you need to use the Service Menu (Service Tests and Utilities), the Printer can be powered up in Service Mode by pressing the **Up** and **Enter** keys while switching the Printer ON. This will give you access to some of the Service Tests and Utilities without having to complete the System Initialization (if you perform some of the tests, they will need to initialize the relevant part of the System).

Using the Formatter/Accessory Card LEDs to Troubleshoot

In certain circumstances the LEDs located in the Formatter or HP-GL/2 Accessory Card can help to highlight certain failures. There are 3 LEDs, Red, Yellow and Green and using different combinations can indicate different problems.



LED's on the HP-GL/2 Accessory Card



The LED's on the Formatter can be seen without having to remove the Left Hand Cover.

LED's on the Formatter

- The yellow LED (normally flashing) indicates that the Formatter/Accessory Card is alive. If it stops flashing, it means that the Formatter/Accessory Card has failed and should be replaced.
- The green LED indicates that there is power being supplied to the

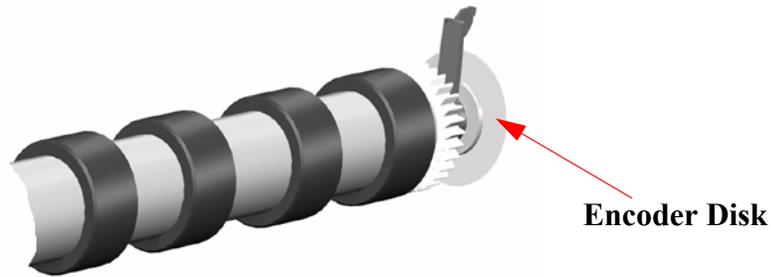
Formatter/Accessory Card. If the green LED is NOT lit and the LED in the Power Switch is ON, then it could mean that the Formatter/Accessory Card is badly connected or that the Printer is switched OFF. If after reseating the Formatter/Accessory Card, the problem persists, try the following:

- 1** Switch the Printer OFF and remove the Formatter/Accessory Card BUT leaving the LAN Card installed (if available). Switch the Printer ON. If the Printer powers up correctly and the LAN Card works properly, then try **step 2**. If the LAN Card doesn't work, then try **step 3**.
- 2** Switch the Printer OFF and remove the LAN Card from the current slot and install the Formatter/Accessory Card in the same slot (that was previously used by the LAN Card). Switch the Printer ON and check if the green LED in the Formatter/Accessory Card is lit. If the green LED is NOT lit, it means that the Formatter/Accessory Card is faulty and should be replaced.

If the green LED is lit, then switch the Printer OFF and install the LAN Card in the vacant slot. Switch ON the Printer and check if the LAN Card works properly. If the LAN Card does NOT work, then there is a problem with the Electronics Module and should be replaced ⇒ Page 8-24.

- 3** Switch the Printer OFF and remove the LAN Card. Switch ON the Printer and check if it initializes completely. If it initializes correctly without any problems, then the problem could be with the Electronics Module and should be replaced ⇒ Page 8-24.
- 4** If the Printer does not even start to power up (i.e. nothing seen on the Front Panel and the LED in the Power Switch is NOT flashing) **without** the LAN Card nor the Formatter/Accessory Card, but the power switch LED is ON (all the time) the problem could be with the Electronics Module or the Power Supply Unit.
 - The red LED will flash a few times when the Printer is started up but if it stays lit (all the time) or flashes continuously, then this indicates that the Formatter/Accessory Card is faulty and should be replaced.
 - HP Designjet 510 Series printers will only include “HPGL/2 Accessory Card (Processor Card)” installed in the Left Slot of the Electronics Module.

How to Detect Problems Related to the Encoder Disk



The following information will help you detect any problems related to the Encoder Disk:

- Horizontal and periodic white lines, all of them with the same width depending on the failure mode. This is a clear indication that the Encoder Disk is damaged.
- System Error 56:10 - This means that you have to replace the Drive Roller Encoder Sensor ⇒ Page 8-38. But, if the problem persists, replace the Encoder Disk Assembly.
- System Error 81:01 - This means a Paper-Axis shutdown. If this error code appeared but was NOT caused by a paper jam, then perform the Paper Advance Test ⇒ Page 4-11. If the Paper Advance Test fails during the third test, the Front Panel will display the following message:

Paper Advance test
System error 56:10
Roller encoder sensor failed

In this case, you should replace the Drive Roller Encoder Sensor ⇒ Page 8-38. But, if the problem persists, replace the Encoder Disk Assembly.

NOTE

In order to remove the Encoder Disk, you must first remove the Drive Roller ⇒ Page 8-86.

Be very careful when assembling the Axle Spring because you could damage the Encoder Disk.

Check that no air bubbles are trapped between the Encoder Disk and the hub once it is installed.

System Error Codes

2

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Introduction

System error codes are hexa-decimal based numbers generally caused by internal system errors. The following pages contain a list of system error codes and their respective descriptions and recommended corrective actions. Only try one recommended action at a time and check if the error code has disappeared.

Continuable and Non-Continuable Error Codes

Some of the Error Codes are continuable, which means you can press **Enter** on the front-panel and continue working with the Printer. Non-Continuable Error Codes do not allow you to continue working with the Printer, in this case power the Printer OFF and ON again and see if the System Error disappears. If the Error Code reappears, then the Printer requires an on-site visit in order to resolve the problem.

NOTE

Even though the customer can continue working with a Continuable Error Code, an on-site visit should still be planned to troubleshoot the problem.

System Error Codes - Explanation

System Error Codes consist of 4 digits which explain which component/system is failing and what action should be taken to resolve the problem.

The following table explains the **first** 2 digits of the System Error Code:

Code	Component/System
01	Main PCA/Electronics Module
02	Carriage/Carriage PCA
03	Power Supply Unit
04	Network Card
05	Formatter
06	Hard Disk Drive
07	Interconnect PCA
08	Front Panel
11	Trailing Cable
12	Carriage Flex Circuit

Code	Component/System
17	Interconnect Cable
21	Service Station
22	Ink Supply Station
23	Pressure System (APS)
24	Ink Delivery System
25	Spittoon
31	Cutter
32	Take-up Reel
33	Sheet Feeder
34	Dryer/Blower
41	Paper-Axis Motor
42	Scan-Axis Motor
43	Vacuum Fan
51	Window Sensor
52	Drop Detector
53	Media Sensor
54	Pinch-Arm Sensor
55	Line Sensor
56	Drive Roller Encoder Sensor
57	Ink Leak Detector
58	Color Sensor
59	Media Type Sensor
61	Language Interpreting
62	Input/Output through Parallel Port
63	Input/Output through Network Card
64	Input/Output through USB Port
65	Input/Output
71	Memory Management
72	Generic Firmware
73	Servo
79	Assertion
81	Media Advance
82	Media Cut
83	Single-Sheet Feeding
84	Roll Feeding