Print Quality

6

Print Quality

Print Quality Troubleshooting Checklist

When faced with a Print Quality problem, use the following checklist as a guide in troubleshooting the problem:

1 Problem reproduction
   - Reproduce the problem that the customer is seeing using their original settings. You can use the Demo Print in order to do it.

2 Printer configuration:
   - Print Mode: Set to "Max. Quality" (in the Printer and in the driver).
   - Dry time: Set to "Automatic".
   - Select the correct media setting when loading the media.

3 Hardware check list

   Firmware Revision
   - Check if the latest version of the Firmware is installed. If not Install the latest Firmware revision ⇒ Page *9-11*.

4 Printheads

   Printhead Troubleshooting Process:
   - Check the Printhead status in the front-panel.
   - If **(xxxx)REPLACE** is displayed, the faulty Printhead may be replaced ⇒ Page *3-13*.
   - If the **(xxxx)RECOVER** is displayed recover the Printhead ⇒ Page *6-15*.
   - If you don't have any samples yet, reproduce the original problem with the correct Printer settings.
   - Print the Diagnostic Print (See Page *6-5*) using the exact settings and Media that the Customer used when faced with the Print Quality problem.

   Printhead Alignment and Check:
   - Perform the "Printhead Alignment" from the Printer Setup menu / Utilities/Calibrations/Printhead Alignment, using the same media with which you were experiencing problems.

5 Media
   - Make sure that you use HP media.
   - Store media according to its Environmental Specifications.
   - Select the correct media type through the Front Panel when loading it.

6 Driver print quality configuration:

To clarify if the reason of the problem is related with the print mode defined with the Non-HP Driver try the following:

- Print the same sample using the Non-HP driver and their normal media.
- Print one of the internal demos or Diagnostic Print using HP Media and configuring the Printer as indicated previously.
- If the output obtained using the HP Solution is good and the one obtained through the 3rd party solution is bad, HP support organization should communicate to the customer that the problem is not in the Printer and that they should address it through the 3rd party vendor support structure.

7 Service Accuracy Calibration

- Perform the "Service Accuracy calibration" using HP High-Gloss Photo Paper ⇒ Page *5-14*.

WARNING **Do NOT use any other type of media apart from HP High Gloss Photo Paper when performing the Service Accuracy Calibration.**

8 If the problem is in Production Mode, perform the Banding Calibration on the media and Printmode in which the problem appears ⇒ Page *5-44*.

9 If the customer is using HP media which is not present in the front panel menu, advise him to download the appropriate media profile.

10 There are two production limitations which affects both the 5000 and 5500 Series printers:

- Enrichment Issue ⇒ Page *6-24*.
- Ink Marks on Printouts ⇒ Page *6-27*.

These problems cannot be solved but they can be reduced.

How to Use the Diagnostic Print

What is the Diagnostic Print?

The Printer contains internal Diagnostic Prints to help you diagnose the possible source of some print quality defects. The Diagnostic Print is divided into five numbered parts:

1 Primary colors specifically designed to diagnose banding problems.

2 Color to color alignment.

3 Bidirectional alignment to check alignment when printing bidirectionally.

4 Vertical line straightness.

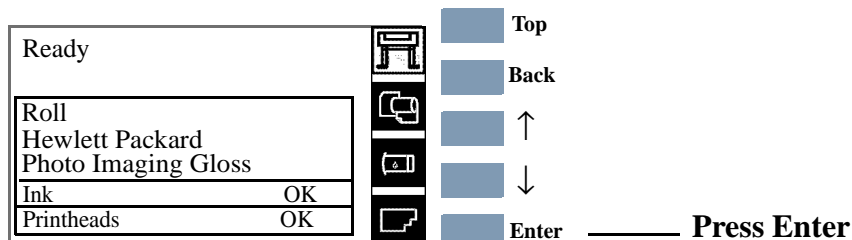**5** Nozzle print test to check each Printhead nozzle in a Printhead.

Considerations for Printing the Diagnostic Print.

1 The Diagnostic Print requires A2 or C size media so you must have media loaded (roll or sheet) that is this size or larger.

2 Use the same type of media that the customer was using when they experienced the print quality problem.

3 Use the same print mode the customer was using when they experienced the print quality problem.

4 If the customer is using non-HP media and after the Diagnostic Print you still have the same print quality problems, change to genuine HP media and repeat the Diagnostic Print.

5 Study each of the test patterns in the order that they are shown i.e. 1 through 5.

6 If you do not see any problems with the Diagnostic Print, then the problem may not be with the Printer itself. The problem may be with the RIP or the driver for example - Refer to Page *6-3* (Step 6).
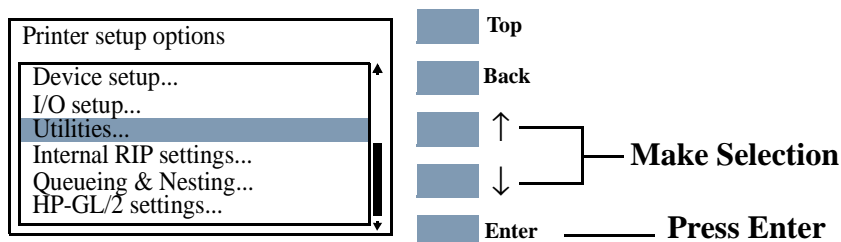
However if you do see problems with the Diagnostic Print then continue with the following procedures which will help you to diagnose the problem.

Printing the Diagnostic Print

1 Once the message "Ready" is displayed on the Front Panel, scroll to the "Printer Setup Options" icon and press the **Enter** key.
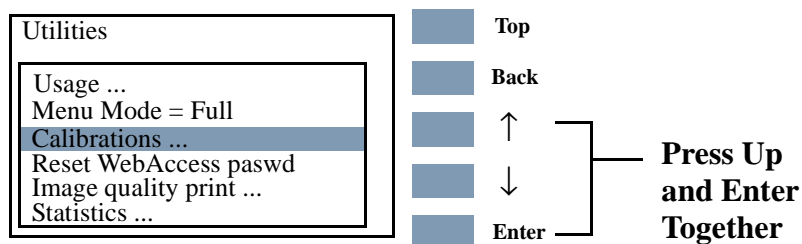
```
Ready

Roll
Hewlett Packard
Photo Imaging Gloss
Ink                   OK
Printheads            OK
```

Top
Back
↑
↓
Enter —————— **Press Enter**

2 Once inside the "Printer Setup Options" menu, use the **Arrow** keys to scroll to the "Utilities" menu and press the **Enter** key.

```
Printer setup options

Device setup...
I/O setup...
Utilities...
Internal RIP settings...
Queueing & Nesting...
HP-GL/2 settings...
```

Top
Back
↑
↓ ——— **Make Selection**
Enter —————— **Press Enter**

For On-Site Engineers accessing the complete list of Service Utilities

a Once inside the "Utilities" Menu, press the following key combination to access the complete list of Service Utilities.
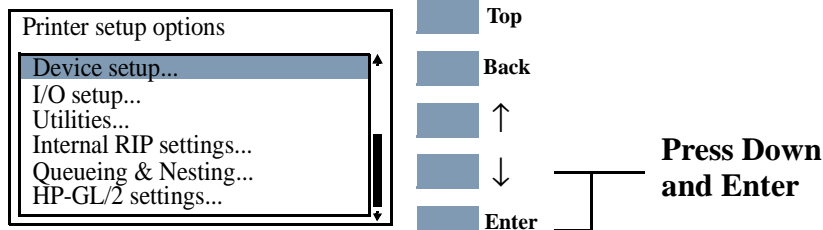
```
Utilities

Usage ...
Menu Mode = Full
Calibrations ...
Reset WebAccess paswd
Image quality print ...
Statistics ...
```

Top
Back
↑
↓ ——— **Press Up and Enter Together**
Enter

The option selected in the menu does not matter

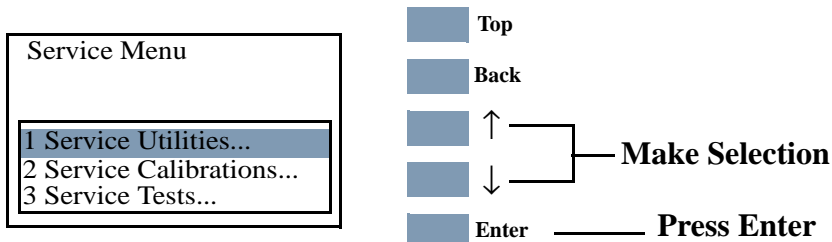**For Call Agents requesting the User to print the Service Diagnostic print**

PHONE SUPPORT

a Once inside the "Printer Setup Options" menu and the "Device setup" menu is highlighted, press the following key combination.
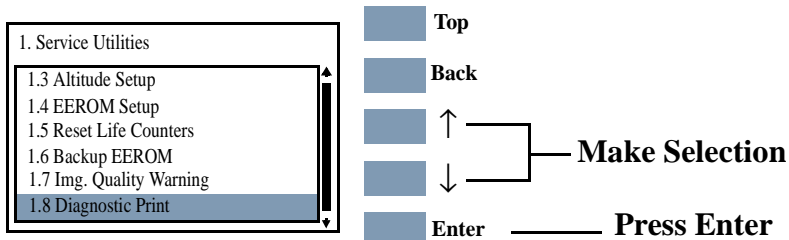
```
Printer setup options
  Device setup...
  I/O setup...
  Utilities...
  Internal RIP settings...
  Queueing & Nesting...
  HP-GL/2 settings...
```

Top
Back
↑
↓   **Press Down and Enter**
Enter

2 The message below is displayed. Select **Yes** to continue.

```
Warning!
This mode should NOT be
used without having the
guidance of a HP
representative person
Yes...
No
```

Top
Back
↑
↓
Enter   **Press Enter**
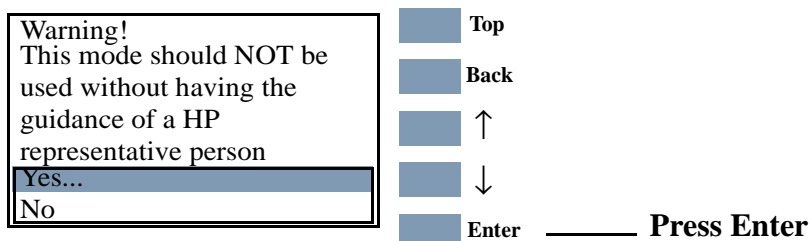
3 You are now in the **Service** Menu. Use the **Arrow** keys to scroll to the "Service Utilities" menu and press the **Enter** key.

```
Service Menu


1 Service Utilities...
2 Service Calibrations...
3 Service Tests...
```

Top
Back
↑
↓   **Make Selection**
Enter   **Press Enter**

4 Use the **Arrow** keys to select "1.8 Diagnostic Print" and press **Enter**.

```
1. Service Utilities
  1.3 Altitude Setup
  1.4 EEROM Setup
  1.5 Reset Life Counters
  1.6 Backup EEROM
  1.7 Img. Quality Warning
  1.8 Diagnostic Print
```

Top
Back
↑
↓   **Make Selection**
Enter   **Press Enter**

NOTE
5000 Series Only

For Firmware Versions earlier than A.02.xx, the Printer will start to print the Diagnostic Print immediately after selecting.

NOTE   **For Firmware Version A.02.xx in the 5000 Series and on the 5500 Series, the Printer DOES NOT print the complete Diagnostic Print. Instead you must select which part of the Diagnostic Print that you need.**

5 Use the **Arrow** keys to select the page that you need and press **Enter** to print it.
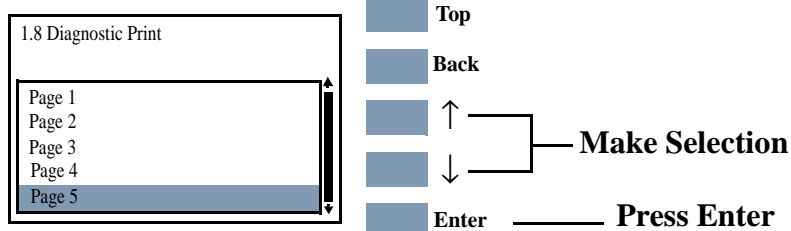
- **Page 1** - Checks for banding in the Primary Colors ⇒ Page *6-8*.
- **Page 2** - Checks the Color to Color Alignment ⇒ Page *6-11*.
- **Page 3** - Check the Bidirectional Alignment ⇒ Page *6-12*.
- **Page 4** - Check for Vertical Line Straightness ⇒ Page *6-13*.
- **Page 5** - Performs the Nozzle Test ⇒ Page *6-14*.

Overall Print Quality Test - Page 1

This test pattern checks for banding in the print mode and media that is being used.

1
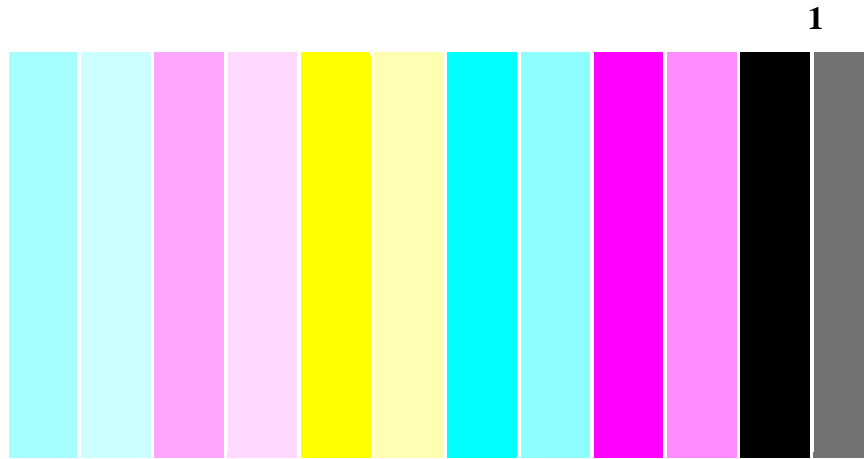
What is Banding?

Banding is when you see repetitive horizontal bands within the printed image (these may appear as light or dark bands).

This array of colored stripes is designed to check for certain defects with the Printer. It should not be used to check for color consistency or accuracy. The test pattern is printed with the six Printhead colors; Light Cyan, Light Magenta, Yellow, Cyan, Magenta and Black. Each pair of colors is printed by only one Printhead; one is the full color and the other is a lighter shade to help you detect any banding.

Solving the Banding Problem

The main causes of banding are:
- Printhead problems.
- Use of Non-HP media.
- Incorrect media type selected in the front panel.
- Media advance problems.

Banding Caused by Printhead Problems

Banding caused by problems with the Printhead(s) will be highlighted in the Diagnostic Print because the banding is not in all of the colors, the colored strip that has banding was caused by the same colored Printhead.

In the following example, there is a problem in the Magenta Printhead. There will be clear repetitive bands (perhaps white) in the magenta column.

1
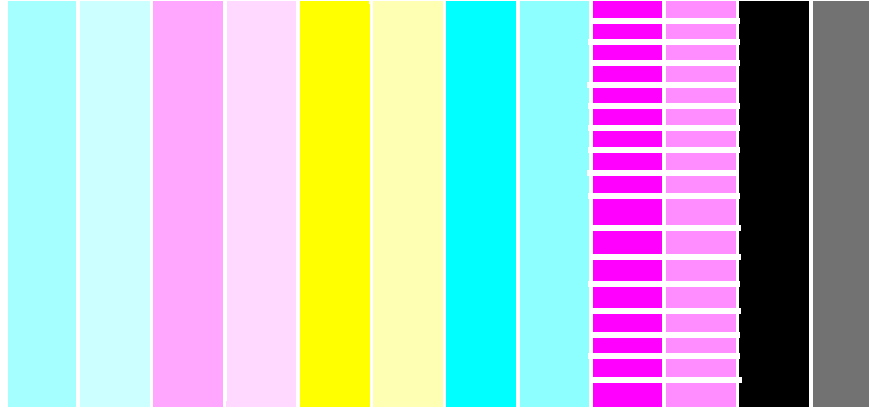
NOTE   **The Printer has automatic procedures to hide many Printhead defects. This type of problem affects print quality mostly in Productivity and Max. Speed modes. If you use Max. Quality print mode, banding caused by a malfunctioning Printhead may be "hidden" and image quality may not be affected.**

1 Perform Printhead Recovery ⇒ Page *6-15*.

2 If there is no improvement after Printhead Recovery, replace the failing Printhead.

Banding Caused by Media Advance Problems

Another type of banding is caused by an inaccurate media advance. In this case there will be banding (horizontal repetitive bands along the test pattern) in **all** the color columns.

The bands can appear as dark bands, due to a shorter advance of the roller which causes an overlap, or lighter bands due to a longer advance causing spaces.
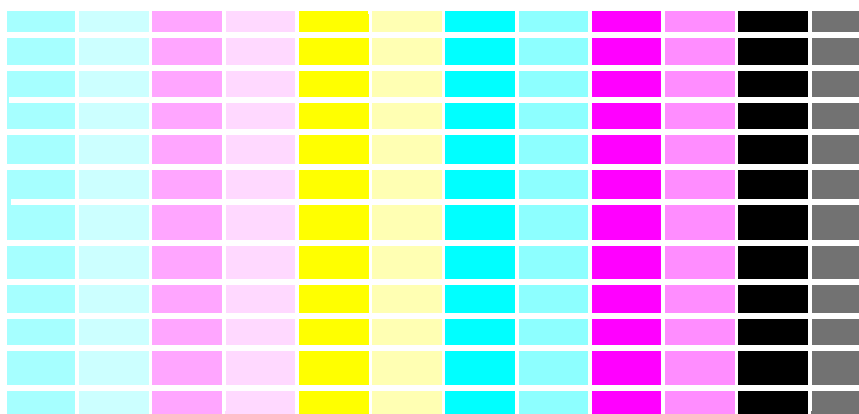
Banding in all of the colors

NOTE	In high quality modes media advance problems may not appear as lines of banding, they may appear grainy instead. The banding or graininess will appear in all the colors.

1 If the image is grainy, this could also be a symptom of problems with the bidirectional alignment (See Solving Bidirectional Alignment Problems 6-12). If the Bidirectional Alignment pattern has no problems go to step two.

2 Make sure that the media selection made in the front panel is the same as the media that you have loaded.

3 It is possible that the banding was caused because the customer was using non-HP media. If the customer still wants to use non-HP media, recalibrate the paper accuracy by performing the User's Accuracy calibration and **NOT** the Service Accuracy Calibration (Refer to the User's Guide). Performing this will overwrite the default setting for **only** the paper that you have selected.

4 Perform the Printheads alignment procedure (Refer to the User's Guide).

NOTE **5500 Series Only**	For high production modes, use the Banding Calibration ⇒ Page *5-44*.

Color Alignment Print Test - Page 2

This part of the Diagnostic Print Test is designed to check the color alignment.

It produces five crosses: one for each color compared to magenta. All lines are printed in one direction. If there is misalignment between Magenta and another color, the lines in the cross will not be aligned.

There are two types of misalignment:
- Horizontal - when the misalignment is in the horizontal axis.
- Vertical - when the misalignment is in the vertical axis.

Below are shown an example of alignment and misalignment:

2

correct   Incorrect

Solving the Color Alignment Problem

1 Make sure you have A1/D-size (24inches) media loaded (not clear film, vellum or tracing paper).

2 Go to the Printer submenu and press **Enter.**

| Ready		Printer submenu
Roll Hewlett Packard Photo Imaging Gloss		
Ink OK		
Printheads OK		
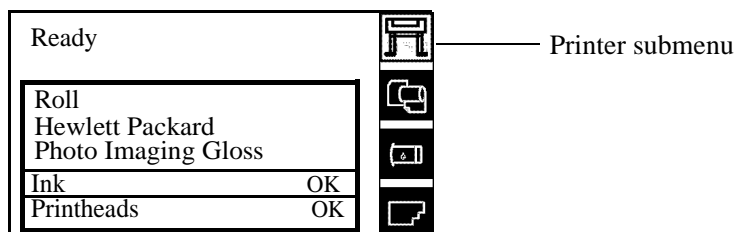
3 Go to Utilities/Calibrations/Printhead Alignment. Please wait as the process of aligning the Printheads takes a few minutes.

4 Reprint the image you were attempting to print before (in the same mode) to see if the problem still exists.

Bidirectional Alignment - Page 3

If a Printer has Bidirectional alignment problems, lines are not straight. The pattern shown below is designed to highlight this kind of problem.

A pair of vertical lines is printed with each Printhead color except yellow. Each section of the vertical line is printed by a different group of Printhead nozzles (one quarter), in one pass. Check the lines on this test pattern, if they have any defects like the ones described above, perform the corrective action.

3

Arrows indicate direction of printing for each section of the line
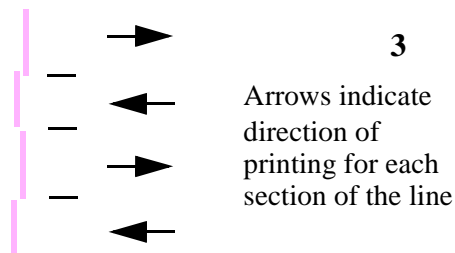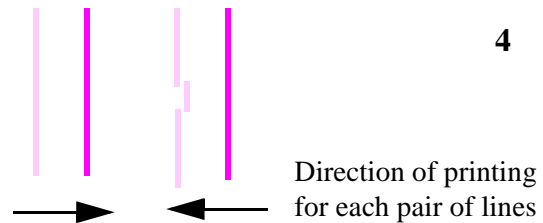
Solving Bidirectional Alignment Problems

1 Using the same media with which you were experiencing problems, perform Printhead Alignment from the Printer Setup menu by selecting Utilities/Calibration/Printhead Alignment. Please wait as the process of aligning the Printheads takes a few minutes.

Vertical Line Straightness - Page 4

If a Printer has Vertical Line Straightness problems, lines are not straight. The pattern seen below is designed to highlight this kind of problem.

A pair of vertical lines is printed in each direction, comparing line straightness for each Printhead color compared to Magenta.

Check the lines on this test pattern, if they have any defects like the ones described above perform the corrective action.

4

Direction of printing for each pair of lines

Solving Vertical Line Straightness

1 Using the same media with which you were experiencing problems, perform Printhead Alignment from the Printer Setup menu by selecting Utilities/Calibration/Printhead Alignment. Please wait as the process of aligning the Printheads takes a few minutes.

Nozzle Print Test - Page 5

NOTE

If your Printer has nozzle defects, it does not mean that you will not get perfect print quality results. The Printer has automatic procedures to hide many nozzle defects. This type of problem affects print quality mostly in Productivity and Max. Speed modes.

The nozzle print test is number 5 in the Diagnostic Print. In this test the 512 nozzles that each Printhead uses to print with are tested.

Nozzle Test for Cyan Printhead   Missing Squares
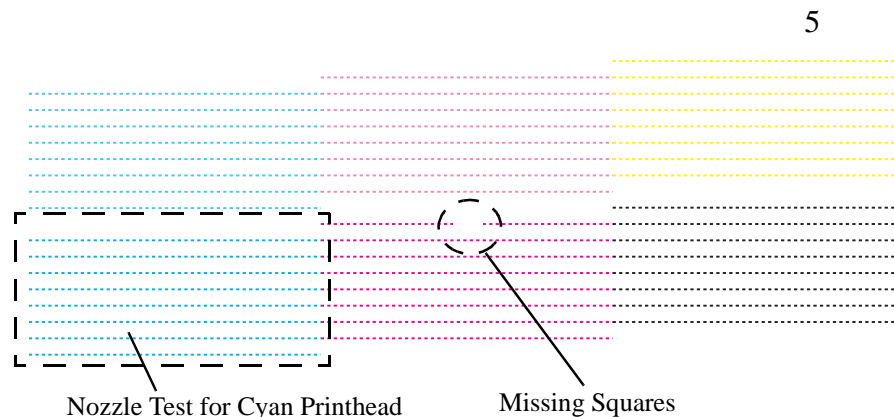
Each nozzle on each Printhead prints a series of very close lines that can be seen as small squares in the Diagnostic Print. You can see whether a nozzle is not working if squares are missing or if a nozzle is malfunctioning, the color fill is less dense.

If you have more than 30 defective nozzles, the Printer will automatically request you to recover the Printhead(s) (**(XX20)RECOVER**), or to replace the Printhead(s) (**(XX21)REPLACE**) if the defect cannot be recovered.

This test also allows you to check the condition of the Printhead if your Printer displays a **(XXXX)REPLACE** or **(XXXX)RECOVER** message for a Printhead that has recently been changed or recovered successfully. If there are not a large number of squares missing, and so the nozzles are firing correctly, you may have a drop detector problem.
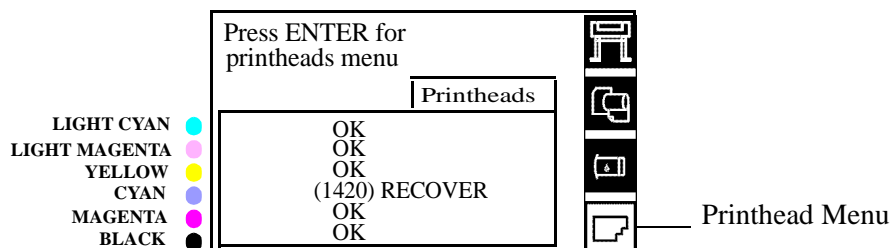
How to fix the Nozzle Defects

The Printer will automatically request you to recover Printheads with a number of defective nozzles that may affect print quality, or replace them if the Printhead defect cannot be recovered.

If your Printer has nozzle defects, it does not mean that you will not get perfect print quality results.

1 Go to the Printheads submenu and press **Enter.**

```
Press ENTER for
printheads menu
                            Printheads
LIGHT CYAN ○            OK
LIGHT MAGENTA ○         OK
YELLOW ○               OK
CYAN ○         (1420) RECOVER
MAGENTA ●              OK
BLACK ●                OK
```

Printhead Menu

2 Go to Recover Printheads.

3 Select the Printhead color that is responsible for the problem. The Printer will try to 'Recover' the defective Printhead. Please wait as the process of recovery takes a few minutes.

4 Reprint the Diagnostic Print to check that the defective nozzles have been corrected.

If the error is still present, replace the worst Printheads.

If your Printer displays a **(xxxx)REPLACE** or **(XXXX)RECOVER** message for a Printhead that has recently been changed or recovered successfully:

1 Perform Service Station Calibration to verify the correct functioning of the Drop Detector ⇒ Page *5-11*.

No Printing Defects Found in the Diagnostic Print

If all the test patterns from the Diagnostic Print are correct and you still experience print quality problems, here are some of the more likely causes to check:

■ The print mode used in the Printer is not right for the image that is being printed (this is defined by the Printer's Front Panel menu selections).

■ Non-HP driver.

■ The RIP.

■ The software applications you are using.

Use the following table to configure your system correctly.

What to Configure	Configuration Setting	Optimal Setting
Printer Front-Panel Menu	Media	Set to match the media type loaded in the Printer
	Dry time	Set to Automatic.
HP driver (Windows, AutoCAD or Mac)	Print mode setting	Set to Max. Quality
Non-HP drivers (Software RIPs)	The settings available depend on the driver. The most typical settings are: ■ Print Quality Settings ■ Half Tone ■ Media selection See the user's guide for your application for more information about its print quality settings.	In the software application: ■ Set Print Quality to Max. Quality. ■ Use no Half Tone (or Printer default). ■ Make sure that the media setting matches the media loaded in the Printer.

Print Quality Problems

For Color Accuracy and Consistency problems do the following:

■ Set the Color Calibration in Printer Setup/Internal RIP Settings/ Color Calibration to ON or turn it ON.

■ Perform a color calibration and print the plot again (any plots that have already been processed by the Printer will not benefit from the Calibration unless they are sent to the Printer again).

- If the problem persists check the lens and if it is dirty replace the Lens Cover Assembly (⇒ Page *9-5*) and repeat the calibrations.
- Perform the Printhead Alignment ⇒ Page *5-43*.
- Perform the Banding Calibration ⇒ Page *5-44*.

Solving Color Accuracy problems

These are two areas you should review when troubleshooting a color accuracy problem:

Configuration (PostScript option only)

Check that you are using the correct driver setting for the software. Check which ink emulation mode has been selected in the front panel.

Media

Make sure that the media loaded is genuine HP media and that the correct media type has been selected on the front panel.

Solving Color Consistency problems

- If color consistency is important for the customer, it is recommended that they do not use HP-GL/2 to print with.
- Some media may discolor or change with age. Check that the media is fresh and has been stored correctly.
- If the environmental conditions that the customer is printing in change rapidly, you may see changes in the color consistency. By reducing the time the print stays in extreme environmental conditions after being printed (especially very high humidity) you can reduce the color consistency problems.
- There will be color differences between HP DesignJet Printers because the other Printers use a different type of ink.

Color Accuracy Configuration

The configurations of the Printer, the driver, and the software RIPs define how ink is applied to each type of media. Use the information in the following table to configure the Printer and software for best color accuracy.

Location of Setting	Setting Description	Selection
Printer Front-Panel Menu	Media	Set to match the media type loaded in the Printer.
Internal RIP settings	Ink Emulation RGB CMYK (PS 5X00PS only)	Set the type of inks that your software generates.
	Color Calibration (both PS and RTL)	Set to ON.
Non-HP drivers (Software RIPS)	Media or equivalent setting	Set to match the media type loaded in the Printer. See the documentation that came with your software for information.
	Color correction option or equivalent	Do the color correction calibration if one is available.

Blurred Lines (Ink "Bleeds" from Lines)

Perhaps you have adjusted the drying time in the Front Panel menu to speed up the Printer output.

1 Set "Drying time" to "Automatic".
   - For details of drying time adjustments, see the User's Reference Guide.
   - The printer is laying too much ink for the media type. Check that HP media is being used.

The Prints are Too Short (DesignJet 5000 Series Only)

There are several situations where the print length can be too short:
   - Improper use of crop marks.
   - Use of Coated Media when trying to get precise output.

However, in the last case, the length difference is a maximum of 4 to 6mm per meter, whereas the first two cases can affect the print

length by several centimeters. Depending on the type of problem, the troubleshooting sequence is different.

1   Improper use of crop marks.

If the customer is using crop marks, this can be the cause of the length difference because the way the margins and the crop marks are implemented in the DJ5000 is very different from the way it is done in other Designjet products, e.g. DJ2000, 2500, 3000 & 3500.

2   Use of Coated Media when trying to get precise output.

If the customer is using any type of Coated Media, Bond, etc. advise them to use glossy or polyester based films when the print accuracy is important.

Colors are not as Expected

If the Application or Driver settings are not correct, this could result in colors which are different than the one that were expected.

■ To have full control of the colors that are printed, use the CMYK option and no emulation (in Driver). Sending a file in RGB even with no color emulation could end up in undesirable results. If a Postscript file is not sent from a DesignJet 5X00 PS driver, make sure you have the following settings in the Front Panel: Printer Setup Menu > Internal RIP settings > Ink Emulation > CMYK= Native.

■ As a special case, Adobe PhotoShop sends Pantone Colors as CMYK (no Pantone name). Therefore, Pantone Calibration does not make any difference. The file should be created as CMYK to prevent unexpected color changes.

Banding at the Top of the Page

Some prints may have banding in the first 2-3 centimeters or swaths. This kind of problem normally happens at the top of the page (the rest of the print is not affected), because the error-hiding algorithm cannot be applied at the beginning of the print in certain circumstances. This depends on the Take-Up Reel installation settings, the media used and the plot margins selected.

To prevent banding at the top of the page, the Printer should be configured as follows:

1   Take-Up reel installed and loaded (only for customers that have a Take-Up Reel, if not got to the following step).

2   Select the paper margins as normal (only for customers which use the extended margin PPD in the driver, if not go to the following step).

3 If Heavy Coated media is being used, use the Front Panel to select Heavy Coated Economy with Normal paper margins. Other alternatives are either to add a 2.5 cm margin at the beginning of the print or switch to any other type of media.

Vertical Banding

Some prints with uniform area fills (ink density between 30 and 70%) show vertical banding when printed on High-Gloss Photo Paper.

■ The problem can be minimized by printing with Composite Black when the problem appears in Black areas or by printing in RGB mode instead of CMYK when the effect appears in Color area fills.

Media

Always make sure that the customer is using the appropriate media for the required image and that it is consistent with the software application being used. To ensure color accuracy and print-quality performance of the Printer, only media types that have been certified for the Printer should be used. Use of non-HP media or HP media not certified for the Printer may significantly reduce the color and print quality of the required images. For details of HP media, refer to the **User's Guide** or the **Media Guide for the HP Designjet Printers**.

NOTE
To have accurate colors, the media settings must match the type of media loaded in the Printer.

If the customer is using non-HP media with HP drivers, the colors in the required print may not be accurate. Advise the customer to use HP media to improve the accuracy of the colors.

Printed surface smearing roll (DesignJet 5000 Series Only)

As the media is printed and the image is coming out from the Printer, the natural curl of the media causes it to rub against the roll of media installed in the Printer. This causes image smearing. In addition to this, if the exiting media sticks against the roll, because the ink is not dry or because of static (some Polyester films get electrostatically charged) it could cause the media to reenter into the Printer.

1 Make sure that the media deflectors are installed onto the Printer. The increased distance between the roll and the exiting media reduces the probability of having both surfaces being attracted (and smears).

Warped Lines on Media

The media itself may be warped. This can happen if it has been used or stored in an extreme environment.

1 Make sure the Environmental Conditions your Printer is operating in are within specifications (Refer to the User's Guide).

2 Store all Media according to Environmental Specifications (Refer to the User's Guide).

Marks and/or scratches on double-sided media

If you are using double-sided media and there are marks and scratches evident on the media, the platen may need cleaning (See ⇒ Page *9-9*).

There are Smears or Scratching on the Printed Media

This problem can appear on paper-based coated media if a lot of ink printed quickly. The media cannot absorb the ink quickly enough and becomes distorted. As the Printheads move over the media, the Printheads and the media come into contact with each other and the printed image is smeared.

1 Press the **Cancel** key on the front panel; if you continue to print, the paper may damage the Printheads.

2 Cancel the print job from your computer application.

In order to obtain better results perform the following:

- Use HP recommended media. If the image you are printing has intense color, use HP Heavy Weight Coated (Economy) Paper.
- Use extended margins, or try to increase the print margins by relocating the image on the page from the software application.
- Ensure the Deflectors are installed on your Printer.
- If the customer is using 'Media Saving Options' from the advanced section of the HP- GL/2 Driver, try disabling one or both of the options 'auto rotate' and 'inked area'.
- Use the Take Up Reel if you have one installed.

If the above fails to solve the problem of smears and scratching, change the media that the customer is using to a non-paper based media such as HP High Gloss Photo Paper.

Using the Color Print

Objective and Description

The objective of the Color Print is to determine whether the printer hardware has any color reproduction problems. Before starting, load a roll of HP High-Gloss Photo Paper or HP Heavyweight Coated Paper.

To start the Color Print, choose the **printer icon** on the printer's front panel, then Utilities > Test prints > Color print. The printer will then print a page consisting of three color scales as follows.

1 Yellow shading into blue.

2 Magenta shading into green.

3 Cyan shading into red.

Color lightness and density have been tuned to maximize the effectiveness of the print.
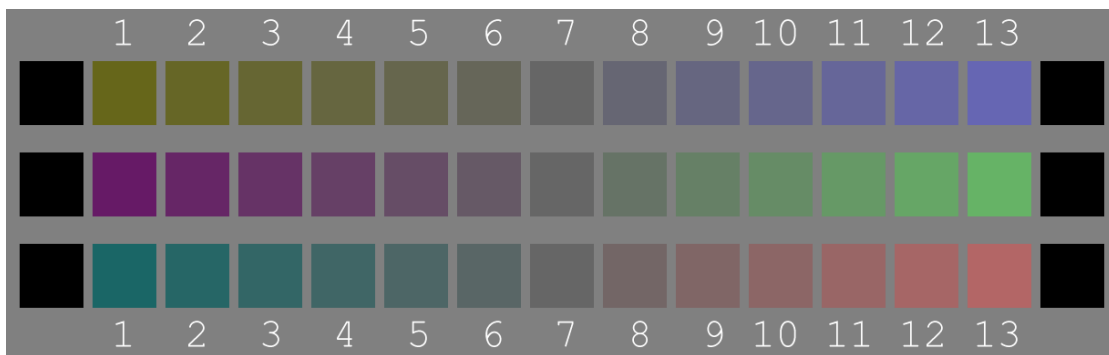
How to Evaluate the Print

Place the print under a source of white light. For each of the color scales in the print, select the square (or between two of them if in any doubt) where the color transition happens. The three following rules (a, b, c) show visually how to perform this evaluation.
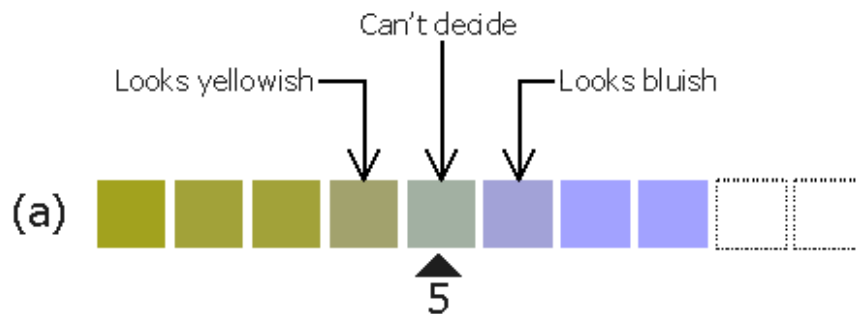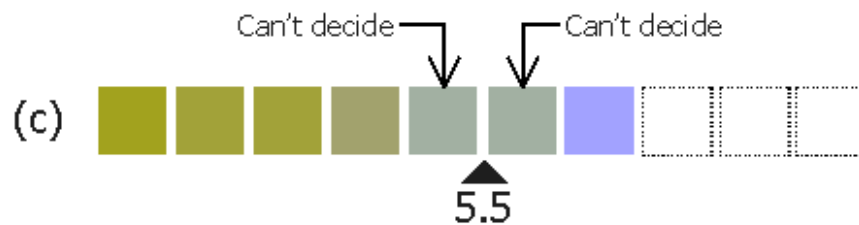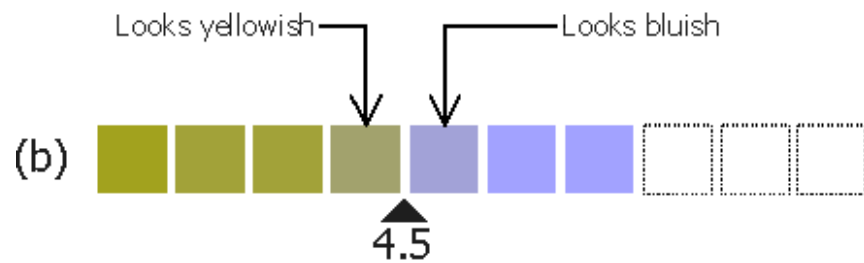
Bear in mind that the transition could happen anywhere along the line. Trust your perception!

How to Interpret the Result

If you get a number in the range 4.5 to 9.5, your printer is within the expected color reproduction accuracy.

If you get a number lower than 4.5 or higher than 9.5, try the following:

1 Make sure that the Color Calibration is ON.

2 Perform Color Calibration on that paper.

3 Replace the lens on the Line Sensor and repeat the color calibration.

4 Replace the Line Sensor ⇒ Page *8-53*.

Enrichment Issue

Issues Description

There can be some light color area fills that have two different (but related) image quality issues at the border:

1 The initial part of the area fill has a grading from white to the regular color of the area fill (~ 2-4mm high x 0-10mm long)

2 After this first grading, it may show a border darker than the rest of the area fill, creating another type of grading, which is shorter, but can appear along the entire border.

See the following image to better understand the explanation:

1. Initial Grading

2. Darker Border
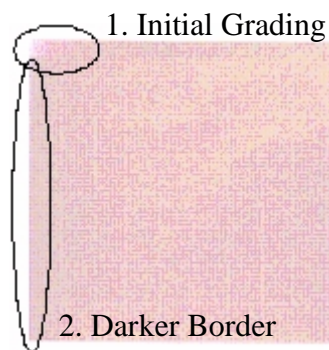
As it will be explained, both issues are related and have similarities:

- The appearance of the issue depends highly on the selected printmode (MaxQuality, Productivity or MaxSpeed) and the medium and ink type loaded into the printer.
- The darker border issue may show along the entire border, or appear in some determined locations and disappear in others.
- The direction of this grading is always in the printing direction.
- This problem shows up much more in composite light colors and unidirectional printmodes (when the printer lays ink only when the carriage moves in one direction).

See the following image:
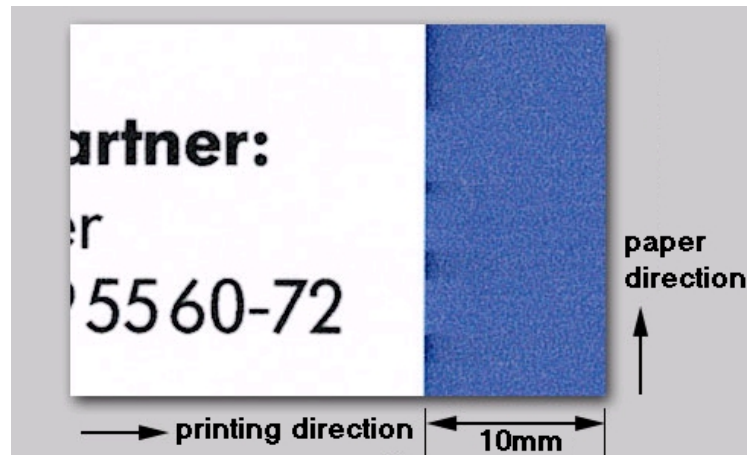
Cause:

Before going to the root cause, we have to understand two main concepts of the inkjet technology:

1 The dye ink is made by a liquid and pigments (which, in fact, delivers the color to the ink).

2 This ink is contained on the printhead nozzles.

**3** An internal heating process eject the drops of ink that are delivered though these nozzles.

Therefore, during the normal printing process, the printer is firing the drops of ink over the media by heating the ink that is contained on the nozzles.
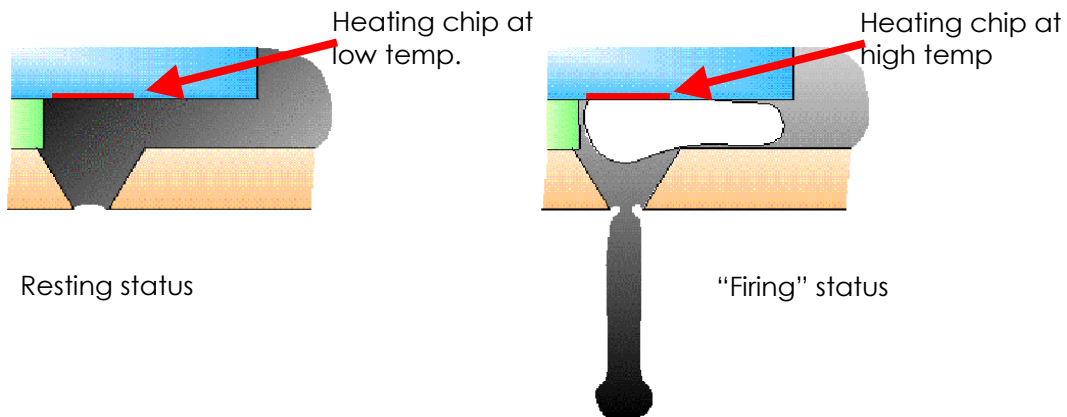

The cause of the issues is that, when the nozzles are on the resting state for some time, the liquid of the ink evaporates. We have two different cases:

1 If the resting state is not very long, the water of the ink only

evaporates partially, which leaves the ink on the nozzle with more pigments. Therefore, the initial drops ejected from those nozzles will be darker (they have more pigment) than the following ones. This leads to the second issue (darker border). If we take the previous example, we will observe that the parts of the border which are darker corresponds to the parts which have not printed for some time.
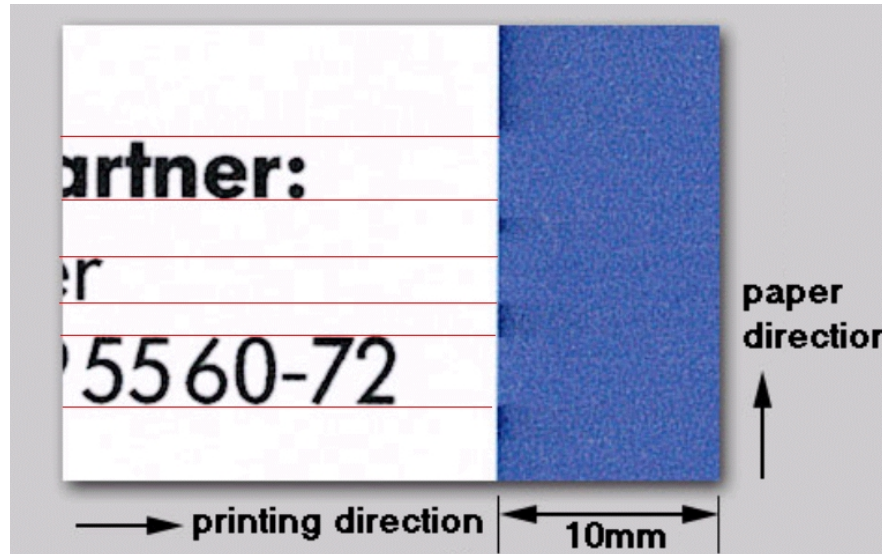
If we magnify the error you will see that the darker part (which is not printing) has darker drops, because of the initial excess of pigments.
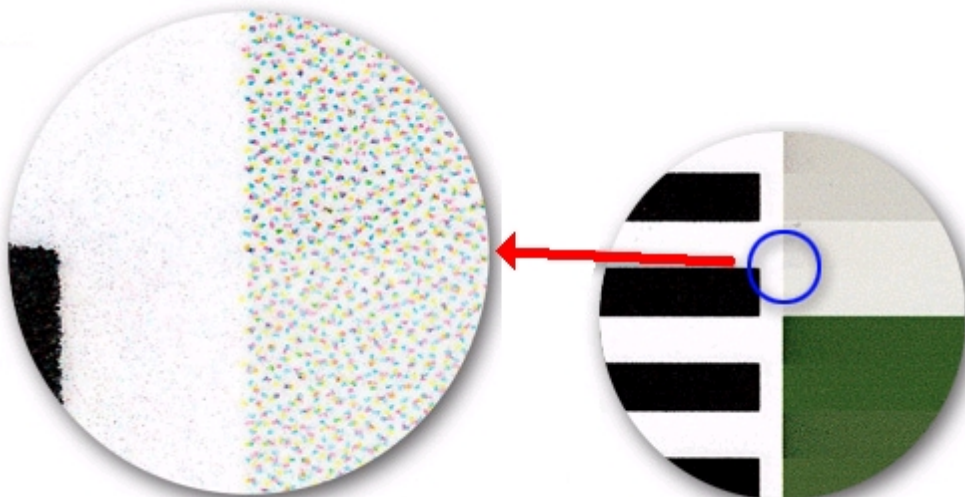
2 If the resting state is maintained longer, the water of the ink evaporates almost completely, which blocks the nozzle from a small amount of time while it is refilled with fresh ink.

Workarounds

This image quality problem is a product limitation. So, it has NO solution. Anyway, due to the limited cases where the problem could appear, large amounts of complaints are not expected.

If any customer complains about this problem, provide the following workarounds:

■ Rotate the image. Remember that this problem only appears on the scan-axis direction when there are light colors are fills in the borders. By rotating the image, you may avoid this type of colors in the scan-axis direction.

■ If using a RIP, print in bi-directional print-mode.

■ Circle the print with a black frame that will stabilize the printheads before doing the print.

Ink Marks on Printouts

Problem statement:

Customers usually describe the issue as "Ink marks on printouts" or "Ink smearing".

These marks are not located everywhere, but at very distinct places on the printout. Depending on their location, we have identified **two different problems** that can create these marks.

As a summary:

Position of Marks	Root Cause Problem
Marks on the back side of the media	Aerosol Problem
Marks on the lateral sides of the media	
Marks on the leading edge of the media	
"Shadows in the print"	Static Problem
Non repetitive marks in the print area of the media while printing or inserting printheads	

It is very important to identify the problem very clear, because their work-arounds are different.

It is important that you thoroughly follow the qualification steps explained in this document in order to solve correctly the customer's problem.

You will see that **replacing any printer's hardware part can not solve these problems**. Let's go problem by problem…

Problem description:

As we have already explained before, ink marks on printouts is caused by two different issues each with a different resolution: Cause 1: Aerosol and Cause 2: Static. Let's describe both problems:
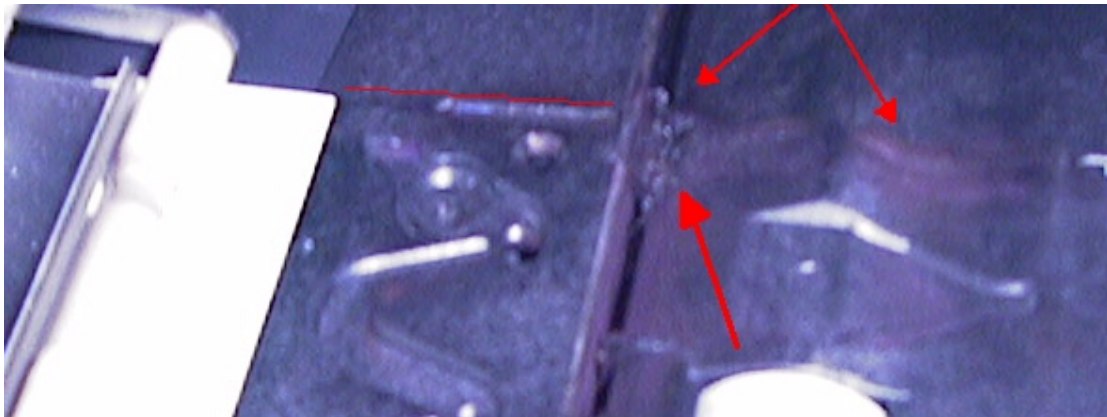
Cause 1: Aerosol

Aerosol: Background

Through its normal operation the DesignJet 5000 printer fires drops of liquid ink from a printhead on to a media surface. As the ink is fired from the printhead, minute droplets of the ink often break away from the main drop. Because of their small size and weight, these droplets can form a fine mist inside the printer. The mist settles on the printer components and, after a while, visible ink deposits form inside the printer. The term we use to describe the mist is "aerosol".
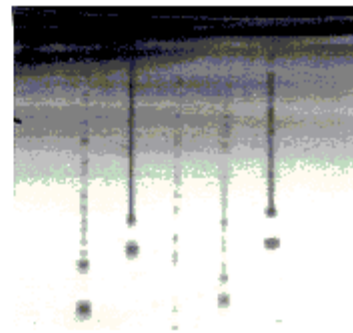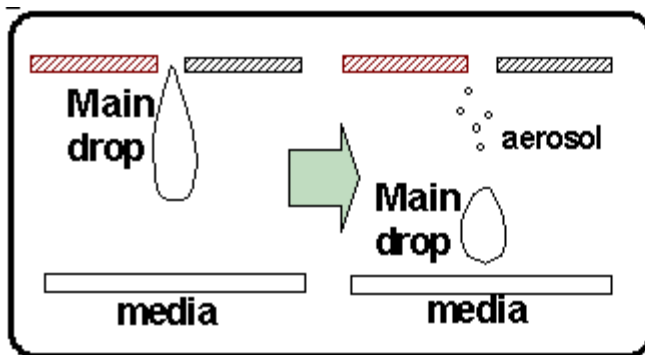
We have seen in the DesignJet 5X00 printers that the majority of the aerosol is attracted to where the airflow is strongest; this is at the lateral sides of the media at any given width and inside the linear blade. We have also seen aerosol build-up on the pinch-wheels and cutter.

Given that the DesignJet 5X00 series printer is a production speed printer and customer usage was expected to be at high volume; aerosol affects were an expected occurrence that customers would see. Because of this occurrence HP included cleaning and maintenance instructions with the printer. HP provided a clear message that the DesignJet 5X00 series printer is a production printer that would have to be cleaned from time to time.

Aerosol ink accumulation will grow with time and usage. This accumulation is not a big problem if the usage of the customer allows the ink to dry. The issue is more severe under HEAVY USAGE (more than 30 high-density prints a day). This usage profile does not allow the ink on the platen (or other places) to dry and thus causes marks on the printouts.

Aerosol ink accumulation is a result of the printhead architecture and the way the printer manages it (the writing systems). **DO NOT REPLACE** any internal hardware component because of this issue.

Aerosol: What customers see.

1 Presence of marks on the backside of the media. This is the first manifestation of aerosol.

Remember that the media "drags" along the platen while printing. If there is aerosol ink accumulation on the platen, the backside of the media will collect some of that ink. The following figure shows the typical marks you can get:
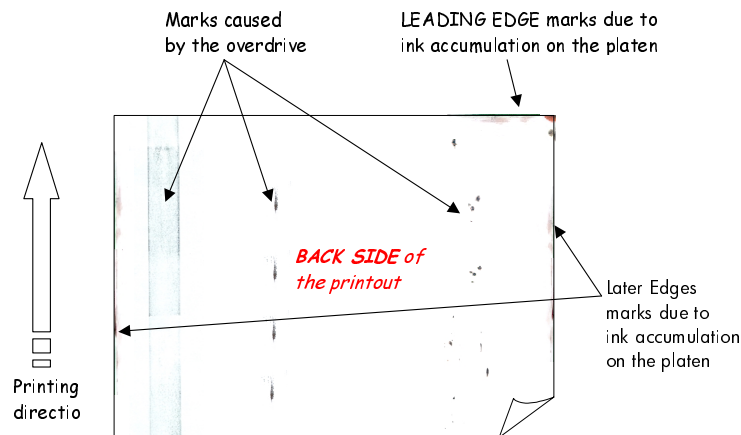
2 Presence of marks on the front side of the media.

The following figure shows the typical marks on the front side of the printout due to aerosol:
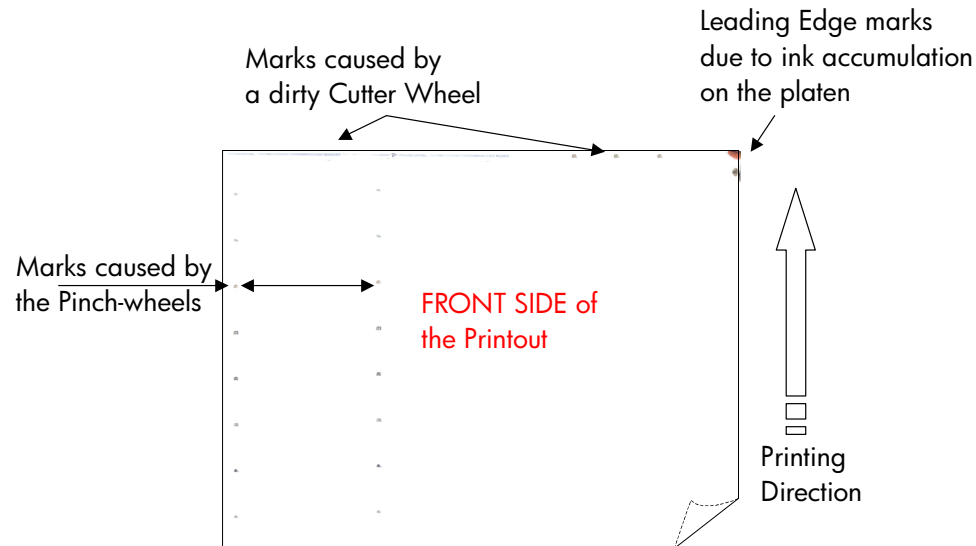
So, as you have seen, we can have marks caused by the ink accumulation on:

■ The center platen (and overdrive).

■ The pinch-wheels.

■ The cutter wheel.

Our recommendation is to clean the printer once per roll.

Cause 2: Static

Static: Background

Over the past few years, HP has been improving image quality by using smaller and smaller drops of inks. Without this it would have been impossible to achieve a level of photo quality unmatched by any other printer in its class. For example, the DesignJet 5X00 fires 12 pl drops when using dye-based ink and 18 pl drops with the UV inks, compared to the 24 or 40 pl used in previous DesignJet printers.

However, reducing the size of the drops has made them more susceptible to:

■ Airflow and/or

■ Static charges.

Any of these two effects may force the ink drops to deviate from its trajectory causing them to position at the wrong place of the media.

The HP DesignJet 5X00 series is already optimized to minimize the static build up within the printer, i.e. the spindle is connected to ground, the print zone is made out of carbon filled plastic to make it conductive, there is an antistatic brush in front of the printer, etc.

Another of the measures we took to reduce the static charges was to place an anti-static back coating to the HP plastic media type. Without this backcoating, the media charges itself.

So, despite the *printer* antistatic features, we have discovered that the anti-static backcoating of the *media* is a MUST for the 5X00 Series in order to avoid the image quality and ink accumulation issues we will describe later on.

Which printers are affected by this?

- Customers who print on a 3rd party polyester-based film without anti-static back coating are more susceptible to static related issues. If they do not see any of the below mentioned symptoms, the media probably has an anti-static back coating, thus they are not affected.
- Printers are not affected if they print using:
  – HP media approved for HP DesignJet 5000 Series or
  – Any paper-based media.
- Customers use only photo-based media are probably not affected. Most photo-based media work fine. However, there are some photo-based media with a plastic back coating that is conducive to static-build up. These media could be affected too.

What can you see?
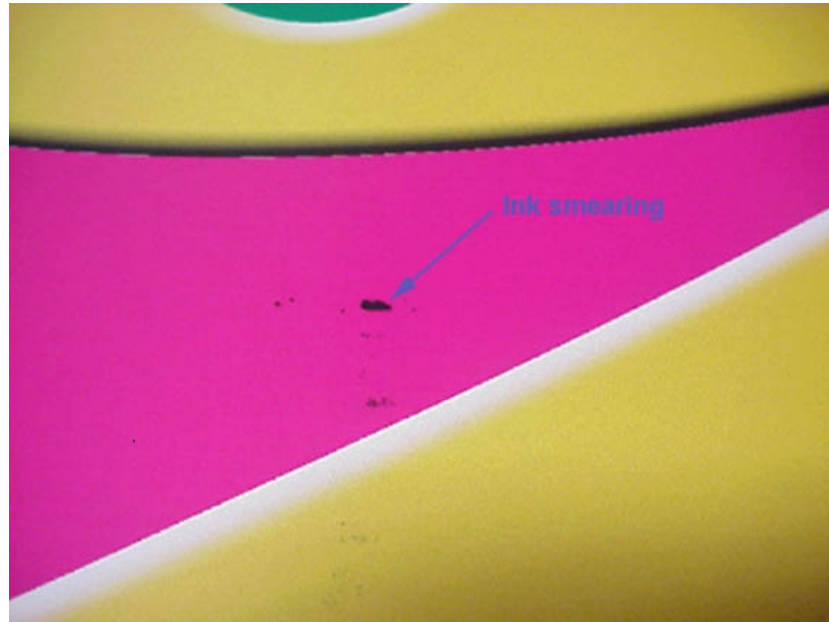
1 Presence of "shadows" on the printout.

See the following image to see an example. These "shadows" are particularly visible next to black areas or at the border of the print.

This is because the media is statically charged and misdirects the smallest drop.

2 Presence of ink smears or even drops on the printout.
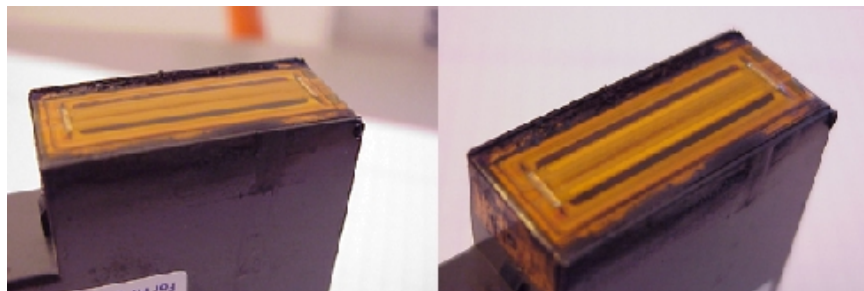
See the following image to see an example.

These marks are caused due by the fact that the static charge of the media forces the aerosol to accumulate at the edges of the printheads and at the bottom of the carriage.

When there is too much ink accumulated, it may:
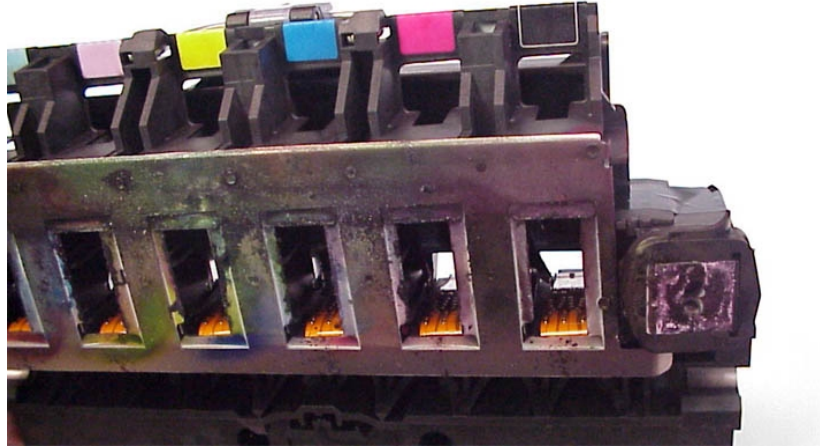
- Fall onto the media
- Smear the media

Causing the problem.

See the following images:

Ink accumulation at the bottom edges of the Printheads.

Ink accumulation at the bottom of the Carriage Assembly.

3 Ink stains on the media after changing/reseating the printheads

NOTE | **This is a secondary effect of the ink accumulation.**

See the following image to for an example.

Static: Solutions and Workarounds

The following options resolve the issue:
- Use HP DesignJet 5X00 Series approved media
- Use 3rd party media types with ANTI-STATIC BACK COATING

If these options are not possible, and they still want to continue printing with the current non-supported media, you can use the following workarounds:
- Clean the sides of the printheads, the bottom of the carriage and the electrical contacts regularly.
- Increase the relative humidity to 30% or more for films with anti-static coating or 60 – 70% for films without anti-static coating, but there might be some films where this is still not sufficient.
- Change to UV inks, which are not as susceptible to static.

DO NOT REPLACE ANY PRINTER HARDWARE PART OR PRINTHEADS. THEY PROVIDE NO RESOLUTION FOR THIS ISSUE.