

# **Printhead Maintenance Guide**

# Printhead Care and Maintenance

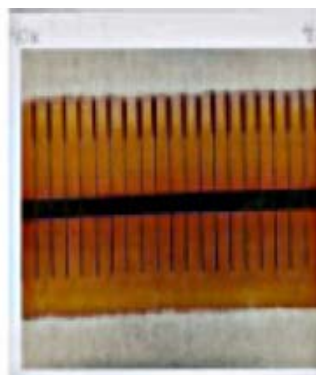
## Introduction

The printhead is the most critical component in your printer, and possibly the most delicate. It is a consumable item just like the brakes on your car, which will eventually wear over time; however, with ongoing careful attention and maintenance, you can extend the life of the printhead.

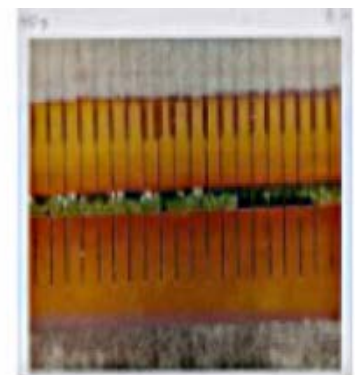
Below are photographs of three printheads. The first printhead is new. The second has printed over 1 million linear inches of thermal transfer printing and has been properly maintained. The third printhead has printed far fewer labels, but without proper care and maintenance - signs of abrasion and contamination build-up are evident.



New



Over 1 Million Inches  
(Properly Maintained)



Less Than 1 Million Inches  
(Without Proper Care)

By properly maintaining your printhead, using quality media and applying proper printer set-up such as adequate printhead pressure and optimum darkness settings, you will not only extend the life of your printhead, but ensure optimal performance and operational efficiency.

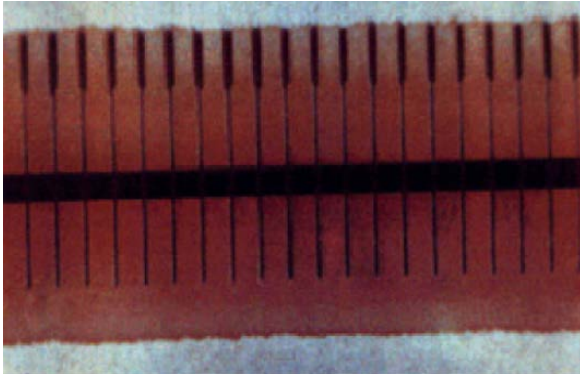
An accumulation of dirt, dust, or other contaminants on a printhead can result in poor quality, unreadable barcodes. If this goes undetected, a user may continue to print non-compliant barcodes resulting in hundreds or thousands of unreadable barcodes entering the supply chain. The consequences of poor label quality can have a significant impact on inventory operations, logistics and the bottom line. Cleaning your printhead regularly will protect against failures and quality degradation over time.

Printheads have a finite life and require replacement on a regular scheduled cadence. The timeline for replacing your printhead will vary based on usage, media type, environmental conditions such as temperature and humidity, printer settings, maintenance habits, etc.

To ensure optimal safety and reliability, always use genuine Zebra printheads with your printer. Zebra has designed, tested and certified the printer with Zebra printheads; use of non-Zebra printheads are not certified for safe use and will void your warranty.

## General Printhead Information

The photo below shows a normal printhead, which has been magnified 40 times.



The elements have no damage and are clean. The leads to the elements also show no signs of damage. There is no residue build-up on or around the elements, and the entire area has been well cleaned.

## Increasing the Life of Your Printhead

To ensure maximum printhead life, Zebra recommends the following general precautions:

- Use high quality supplies to prevent printhead wear. Poor quality supplies offer little or no protection to the printhead.
- Use only genuine Zebra printheads. The Zebra printer is designed and certified with the Zebra printhead; no other printheads are certified for safe usage in the printer.
- If possible, reduce the printhead pressure.
- Running the printer at lower darkness settings will increase the life of the printhead.
- Clean the printhead frequently based on the [Guidelines for Printhead Cleaning](#).

Many printheads fail due to lack of cleaning, using the wrong cleaning solutions, or not cleaning the head with sufficient force to remove contaminants and build-up. To prevent contaminants from entering the print mechanism, keep the printer's door closed and keep the printer away from areas where there is a possibility of falling debris.

## Causes of Shortened Printhead Life

### Overdriving the Printhead

Overdriving occurs when the printhead is not properly contacting the media. When this happens, the printhead heater element does not properly dissipate its energy (heat); shortening the life of the heater elements. Overdriving will cause wear to the printhead (missing pixels) resulting in white lines or voids to an image.

### Causes of Overdriving the Printhead

- The printhead has a build-up of residue/material at localized areas which prevents even contact with the media/platen.
- Heater elements do not properly dissipate the energy/heat and damage the elements.
- A print job should be completed, allowing the printhead heater element to fully dissipate its energy prior to opening the printhead mechanism.
- Printing without paper or disconnecting internal cables from the printer voltage.

### Excessive Abrasion

Excessive abrasion will cause the protective overcoat layer (top coat) of the printhead to wear prematurely. If the protective overcoat layer wears out, this subsequently exposes the heater element resulting in an open circuit or shorting of the element.

### Causes of Excessive Abrasion

- Poor quality media that has abrasive particles imbedded into its surface, which contact the printhead.
- Dirt or other contaminants that can come in contact with the printhead while driving the media over the printhead.

### Abusive Contact

Abusive contact is where the printhead heater element protective surface has been physically damaged.

### Causes

- This typically happens when either a sharp or hard object contacts the protective overcoat layer causing the surface to break; exposing the heat element resulting in opening or shorting of the element.

### Electrostatic Discharge (ESD)

The printhead is very sensitive to ESD. At the connector end of the printhead, as little as 250-300 volts of ESD can damage the printhead.

## Impurities

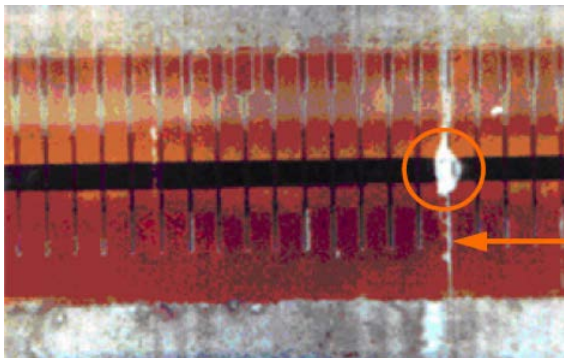
Impurities can cause corrosion to the printhead, which can result in open/short circuits.

### Causes

- Introduced to the printhead by cleaning with a substance that is not recommended or improper handling.
- Using non-Zebra media or poor quality media.
- Exposure to an environment with high humidity or wet environments (condensation).

## Scratched Printhead Elements

The photo below shows scratches through the elements of a printhead.



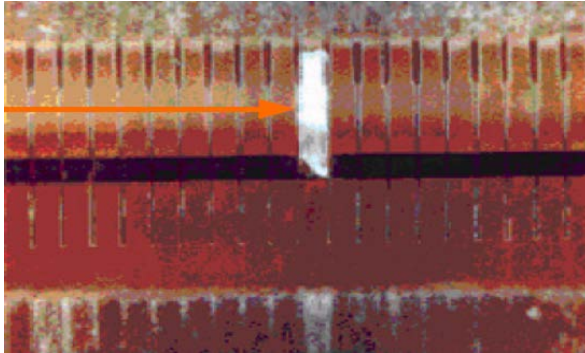
The scratch can be clearly seen as a thin line leading to the elements. The elements are higher than the leads, and have been torn away showing the underlying white substrate (circled above). Scratches will interrupt the electrical contact to the element as well as destroy the element itself.

### Cause

- Scratches are caused by foreign particles (dirt, dust, grit, jewelry, etc.) hitting the element line.
- These particles can come from the ribbon, media, or environment.
- The particles that cause these scratches tend to be extremely hard and very small. The particle that caused the above damage was approximately 0.05mm in diameter.

## Delaminate Printhead Element

The photo below shows a printhead with a chip removed.



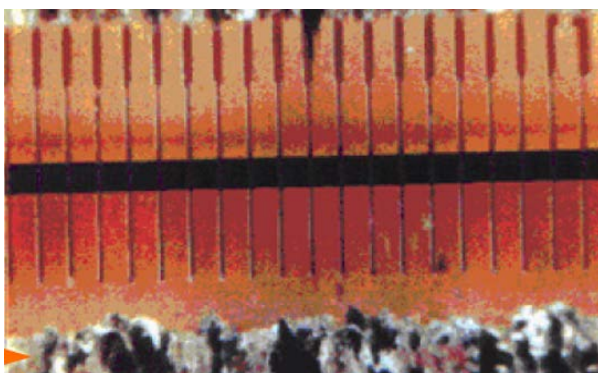
The delamination can be clearly seen as a thick line leading to the elements. The elements are higher than the leads, and have been torn away showing the white substrate underneath. The delamination will interrupt the electrical contact to the element as well as destroy the element itself.

### Cause

Delamination is caused by foreign particles (dirt, dust, grit, jewelry, etc.) hitting the element line. Often a scratch on a printhead will weaken the element to the point where it can be delaminated easily. These particles can come from the ribbon, media, or environment. The particles that cause the delamination tend to be extremely hard and very small. The particle that caused the damage above was approximately 0.1mm in diameter.

## Excessive Ribbon Residue Build-Up

The photo below shows a printhead contaminated with ribbon ink residue.



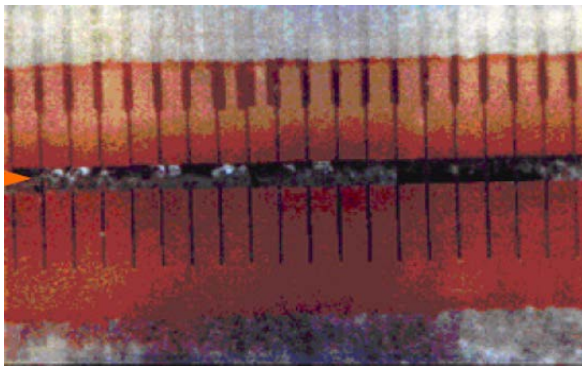
Normally, the ink is cleaned off with the recommended cleaning solution; however, some resins can be stubborn to remove. The ink residue builds up, covers the print elements, blocks the heat, and causes voids in the print.

## Cause

A build-up of ribbon ink residue is normally caused by a poor quality backcoating on the ribbon, pulling the ink off when the ribbon is wound. The ink is then deposited onto the head, and the ribbon contains voids where the ink has been removed.

## Excessive Backcoating Build-Up

The photo below shows an area of a printhead that has excessive ribbon backcoating build-up.



The build-up is highlighted by a silver/grey coating over the print elements. The coating blocks the heat from the print elements, and causes voids or missed areas of print.

## Cause

All ribbons will deposit backcoating on the printhead. The ribbon backcoatings allow the ribbon to travel across the printhead elements with minimum friction in high temperatures. As a result, backcoating is deposited on the printhead. Poor quality ribbons may have an inferior backcoating that is broken down at high temperatures.

## Prevention Guidelines

To prevent scratched printhead elements, delaminated printhead elements, excessive ribbon residue and excessive backcoating buildup, follow the below recommendations:

- Always use high quality supplies
- Do not place media or ribbon on the floor or other dirty surface

## Prevention Guidelines (continued)

- Clean printheads on a regular schedule as highlighted in “Guidelines for Printhead Cleaning” section or when print anomalies persist
- Remove jewelry before cleaning or handling the printhead
- Keep the printer door closed; this will minimize contaminants from entering the print mechanism.

## Guidelines for Printhead Cleaning

Printheads for Industrial printers should be cleaned after every roll (1,500 feet) of thermal transfer ribbon or after every roll (500 feet) of direct thermal media. For Desktop, Card and Mobile printers, please refer to the table below for recommended guidelines to clean your printhead. The printhead should be cleaned more frequently if inconsistent print quality appears such as voids in the barcode or graphics.

Zebra recommends using Zebra’s Preventive Maintenance Kit for cleaning your printhead. Alternatively, you may use a clean swab dipped in 99.7% isopropyl alcohol.

**Note:** 600 DPI printheads should be cleaned with printhead cleaning film (lapping paper) and 99.7% isopropyl alcohol after every roll of labels to ensure optimal printhead care.

When handling or cleaning the printhead, remove any jewelry that may scratch the printhead and use a grounding strap or antistatic mat to discharge static electricity that could damage the printhead.

**Table 1: Printhead Cleaning Guidelines for Zebra Printers**

| Industrial Printers   | Desktop Printers  | Card Printers                          | Mobile Printers                                   |
|---|---|--|---|
| Clean printhead after every roll (1,500 feet) of thermal transfer ribbon or after every roll (500 feet) of direct Thermal labels<br>Clean 600 DPI printheads after every roll of media using cleaning film. | Clean printhead after every roll of thermal transfer ribbon or after every roll of direct Thermal media | Clean the printhead every 5,000 cards. | Clean the printhead after every 5 rolls of media. |



Table 2 provides a list of Zebra cleaning kits for your printer.

**Table 2: Zebra Cleaning Kits**

| Part Number                  | Description                                    |
|------------------------------|--|
| <b>Save-A-Printhead Film</b> |  |
| P /N 46902                   | 3" – 4"<br>(76 mm to 102 mm)                   |
| P /N 44902                   | 4" – 5"<br>(102 mm to 127 mm)                  |
| P /N 48902                   | 5" – 6"<br>(127 mm to 152 mm)                  |
| P /N 38902                   | 6" – 7"<br>(152 mm to 178 mm)                  |
| P /N 22902                   | 8" – 9"<br>(178 mm to 229 mm)                  |
| P/N105950-035                | Mobile Printer,<br>package of 10 cleaning pens |

## General Printhead Maintenance Guidelines

Inconsistent print quality such as voids in barcodes or graphics may indicate a dirty printhead. Zebra recommends following the procedure highlighted below when cleaning the printhead.

### Important

It is not necessary to turn the printer off prior to cleaning. Remove all jewelry (rings, watches, ID badges, etc.) that could touch the printhead or get caught in the printer.

If the printer is turned off, all images, and parameter settings stored in printers formatting RAM memory will be lost. Permanent parameter settings stored in EEPROM or Flash are retained.

If the printer is turned on, it may be necessary to reload some items into memory.

#### Use the following procedure to clean the printhead:

1. Open the printer, and remove the media and ribbon.
2. When cleaning the printhead, Zebra recommends using the Preventive Maintenance Kit. Alternatively, you may use a clean swab dipped in 99.7% isopropyl alcohol. Allow a few seconds for the solvent to evaporate. Please see Printer User Guide(s) for specifics on cleaning the Printhead.
3. Rotate the platen roller and clean thoroughly with a solvent and an applicator.
4. Brush or vacuum any accumulated lint and dust away from the rollers, the media, and the ribbon sensors.
5. Reload the media and ribbon; close the printer, and perform a test print job to check print quality.

## Printhead Warranty

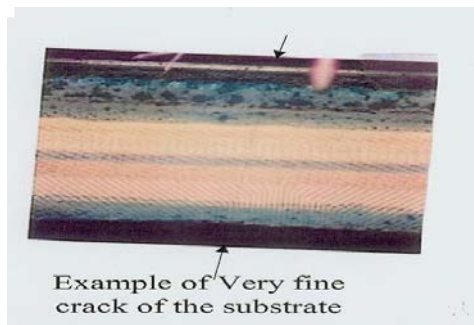
### Zebra Warranty Limited Policy

Zebra Technologies Corporation has a Limited Warranty for genuine Zebra printheads. Please browse the Zebra Website for warranty details:

<https://www.zebra.com/us/en/support-downloads/warranty/product-warranty.html>

The following pictures show examples of defective printheads, typical warranty rejection due to misuse:

**Abusive Handling or Impact Damage:** Poor handling or impact damage can crack the substrate; this crack can cause pixel damage. When the edge is damaged by impact, a crack can be formed on the substrate starting at the impact point.



### Examples of Printhead Failures

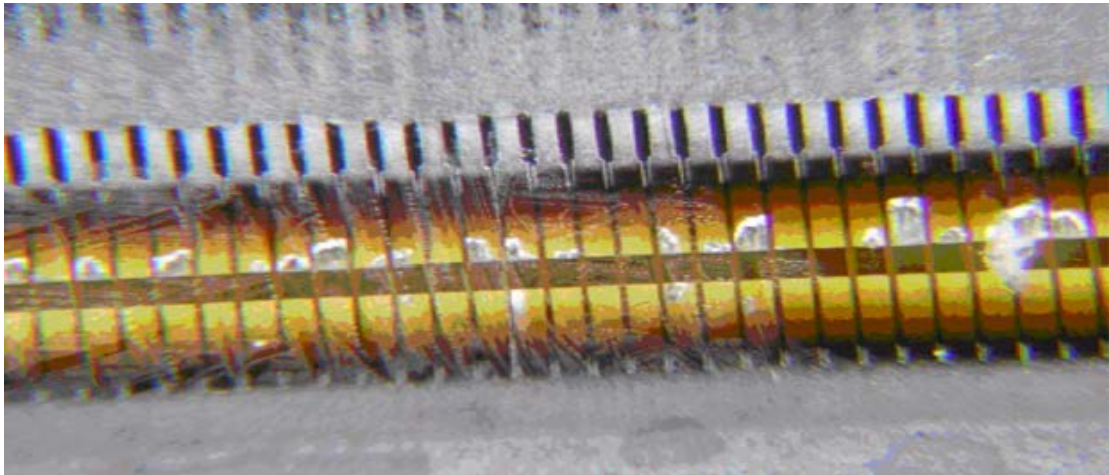
The information that follows provides examples of printhead failures which require printhead replacement to ensure optimal performance. Examples of printhead failures include:

- Excessive wear or abrasion
- Physical damage, scratches, and chipping
- Backcoating contamination and excessive ribbon residue
- Galvanic corrosion
- Overpower damage
- Static damage

## Excessive Wear or Abrasion

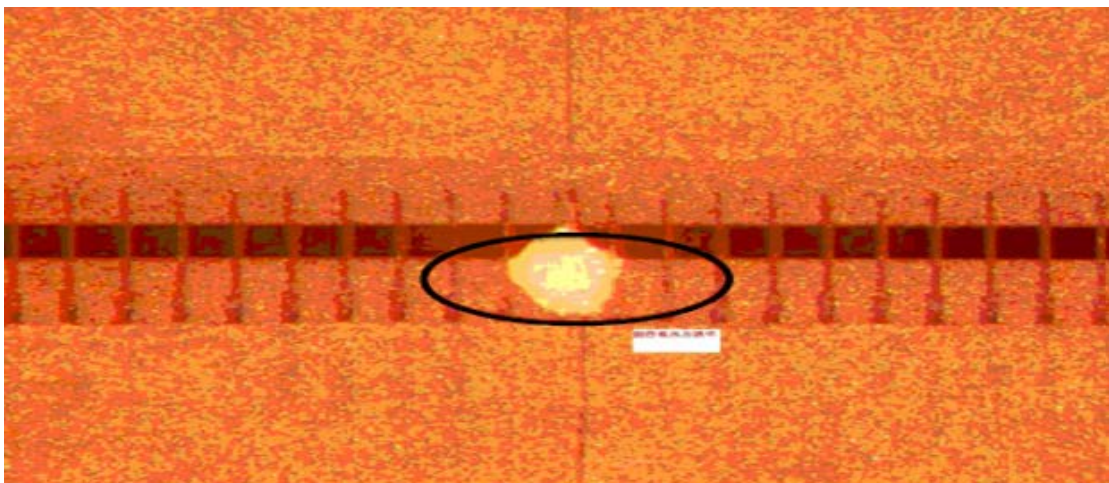
Probable causes, which reduced the printhead life include:

- The printhead has been used past its rated life
- Poor maintenance
- Poor quality/abrasive media

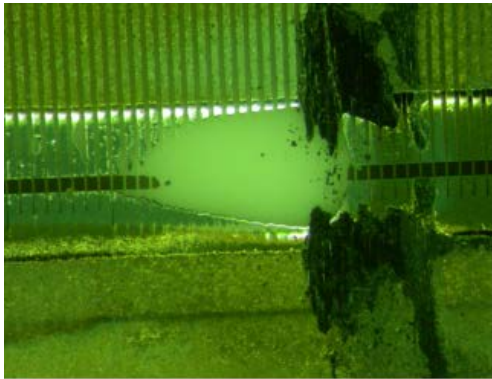


## Physical Damage, Scratches, and Chipping

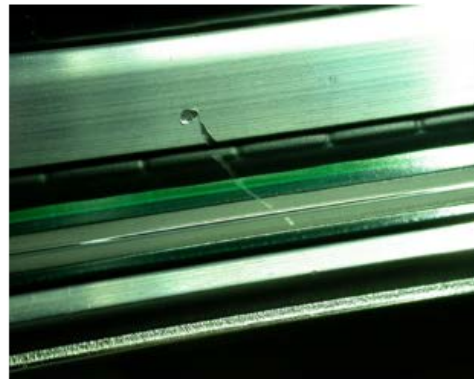
These types of physical damage are easily identifiable when the substrate is exposed on the printhead surface. Scratches, chipping, and physical damage are caused by foreign particles (dirt, dust, grit, etc.) hitting the element line; these particles can come from the ribbon, media, or environment.



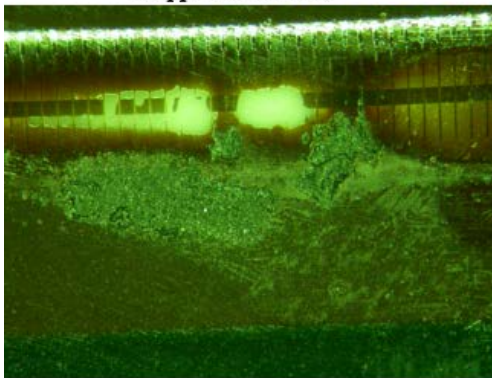
*Print head damaged by foreign particle*



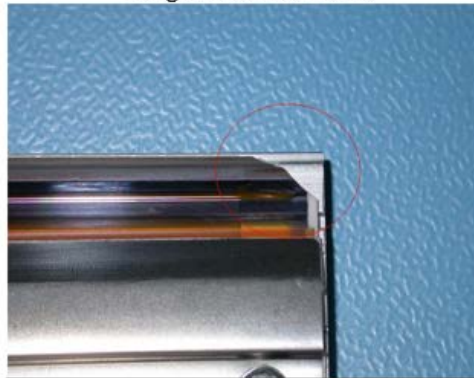
*Chipped indication*



*Diagonal Scratch mark*



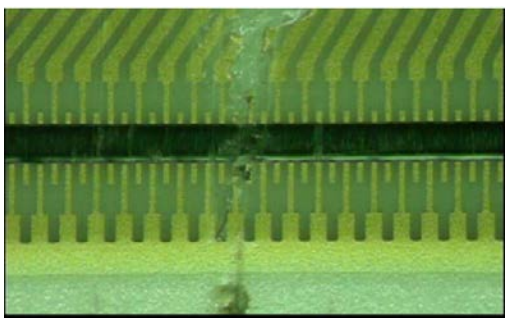
*Chipped indication*



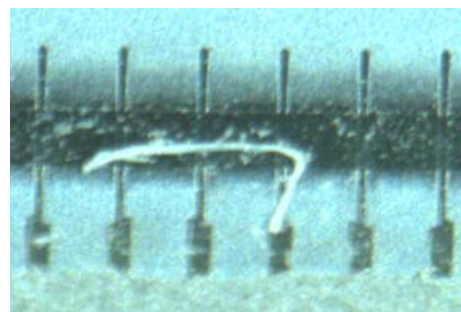
*Chipped indication at right print head*



*Physically damaged area*



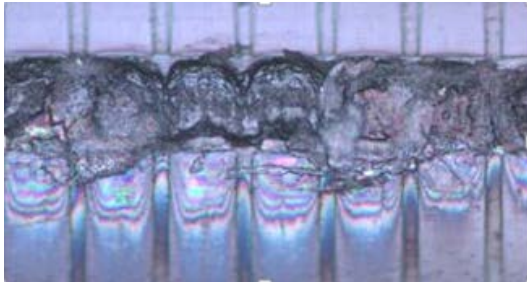
*Scratch Indication*



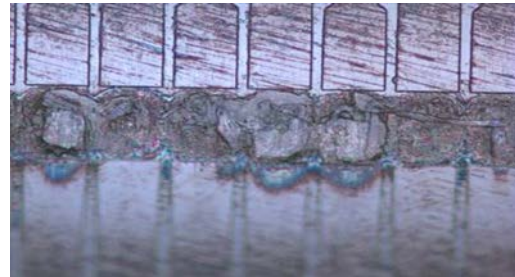
*Scratch Indication*

## Backcoating Contamination/Excessive Ribbon Residue

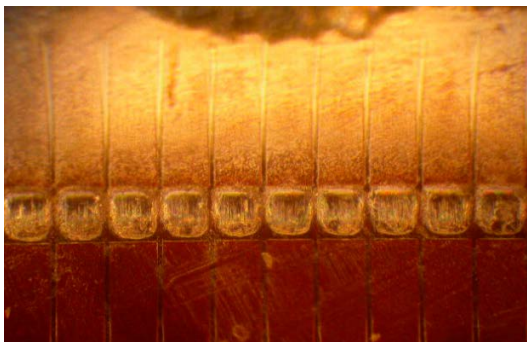
The residue build-up appears as a silver/grey coating over the print elements. The coating blocks the heat from the print elements and causes missed areas of print.



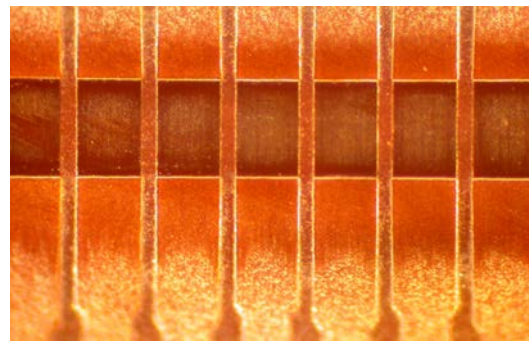
***Excessive residue contamination***



***Excessive residue contamination***



***Backcoating contamination***

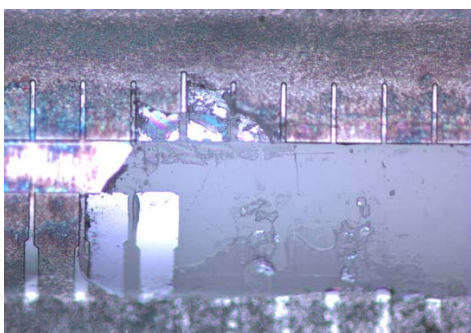


***Backcoating contamination***

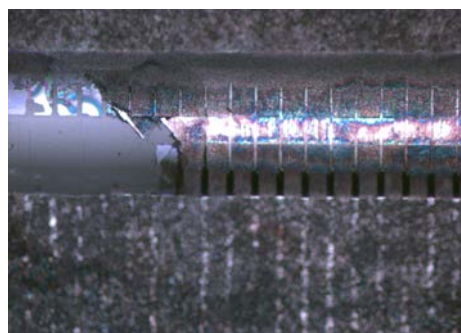
## Galvanic Corrosion

Galvanic corrosion occurs in humid environments when direct thermal media remains in contact with high printhead voltage for extended periods of time, such as when a printer is placed in standby (with no media movement).

The galvanic corrosion causes the media to stick to the printhead. When the printer is brought out of standby to begin printing, the ceramic-coated print line is ripped from the printhead.



***Galvanic Corrosion Damage***



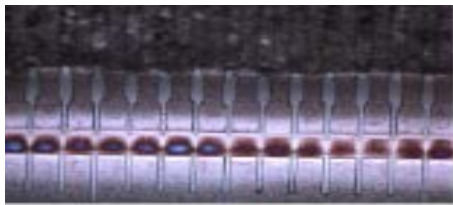
***Galvanic Corrosion Damage***

## Overpower Damage

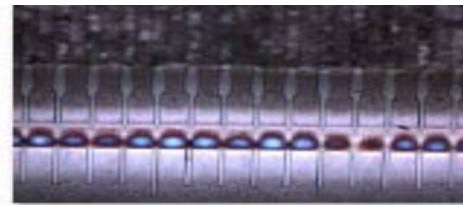
Overpower damage occurs when excessive darkness/burn temperatures are used.

When the printhead toggle pressure is set too low or if the printhead is not correctly aligned over the platen, oftentimes, increases in darkness (or burn temperatures) are required to reach acceptable print quality. Therefore, increases in darkness (or burn temperatures) will help to increase print quality, but at the expense of printhead life.

Printhead life is optimized when the lowest darkness/burn temperatures are used along with the lowest printhead toggle pressure (if applicable) to obtain acceptable print quality.



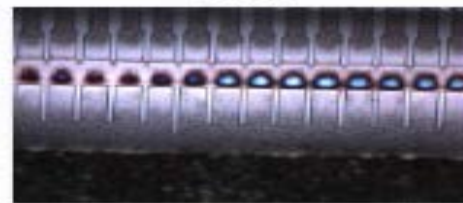
25a.jpg



25b.jpg



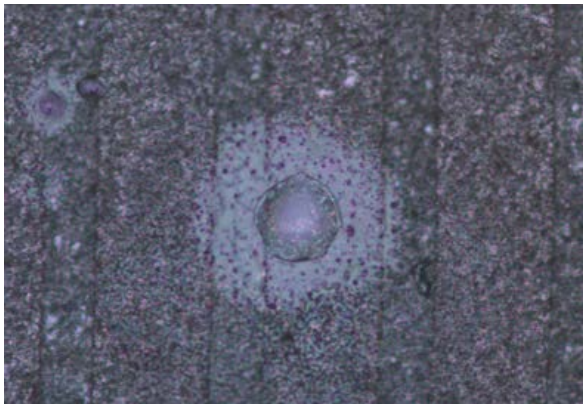
*Overpower Damage*



*Overpower Damage*

## Static Damage

In the image below, the central element is damaged, in the upper center of the element there is a small area of static damage. This may be observed on the printhead element as dark areas. These areas are where the protective ceramic coating has become separated from the element below it. The damage to the element is a result of ion contamination.



*ESD Static Damage*

The separation of the ceramic covering and the element has been caused by the static electricity that has been generated. The static 'pinhole' can be seen in the upper central area of the element.

## Document Control

| Version | Date           | Description     |
|---------|----------------|-----------------|
| 1       | November, 2017 | Initial Release |

## Disclaimer

All links and information provided within this document are correct at time of writing.