

# Printhead Maintenance Guide

## 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 brand new. The second has printed over 1 million linear inches of thermal transfer cards and has been properly maintained. The third printhead has printed far fewer cards, but without proper care and maintenance - signs of abrasion and contamination build-up are evident.



New



Over 1 Million Inches  
(Properly Maintained)



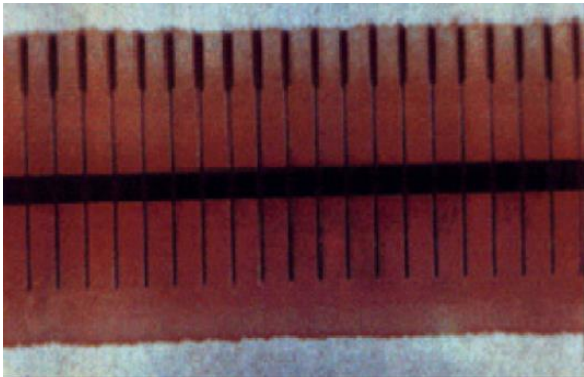
Less Than 1 Million Inches  
(Without Proper Care)

## NEW OVER 1 MILLION INCHES (PROPERLY MAINTAINED)

For optimum performance, clean the prints head every **5,000** cards for cards printers, 2 rolls of media or 1 roll of ribbon / 1 million inches / 2 rolls / full rolls of media (Barcode) or when print anomalies persist. Take care when handling or cleaning the printhead by removing any jewelry that may scratch the printhead, and use a grounding strap or anti-static mat to discharge static electricity that could damage the printhead.

## General Good Printhead Information

The photo below shows what a normal printhead should look like when 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**

Some general precautions can ensure the maximum life of a printhead:

- Always use good quality supplies. Poor quality supplies offer little or no protection to the printhead.
- If possible, reduce the printhead pressure.
- Running the printer at lower settings will increase the life of the printhead.
- Clean the printhead frequently, Exp: 5000 cards for card printers and 2 rolls, 1 roll of media and ribbon / 1 million inches / 2 rolls / full rolls of media (Barcode)
- 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.
- Keep the printer's door closed, and keep the printer away from areas where there is a possibility of falling debris; this will help prevent contaminants entering the print mechanism.

## Main Causes of Shortened Printhead Life

### OVERDRIVING THE PRINTHEAD

Occurs when the printhead is not properly contacting the media. This doesn't allow the printhead heater element to properly dissipate its energy (heat) and will shorten the heater elements life which will show up as missing pixels (white lines / voids where you would expect to see an image). This condition can be caused by several different ways.

#### Causes of Overdriving the Printhead

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

### EXCESSIVE ABRASION

This will cause the protective overcoat layer (top coat) of the printhead to wear prematurely which subsequently exposes the heater element and result in the open or shorting of the element.

#### Causes of Excessive Abrasion

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

### ABUSIVE CONTACT

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

**Causes:** Typically happens when either a sharp or hard object contacts the protective overcoat layer causing the surface to break and exposing the heat element which results in the opening or shorting of the element.

### ELECTRO-STATIC DISCHARGE (ESD)

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

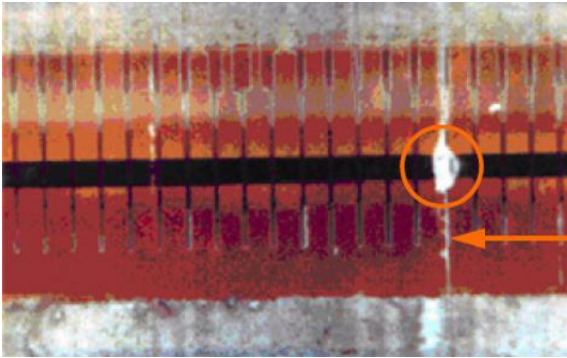
### IMPURITIES

These can cause corrosion to the printhead that can result in open / short circuits.

- Introduced to the printhead by cleaning with a substance that isn't recommended. Improper handling (sweat).
- Poor quality media
- Exposure to an environment with high humidity or wet environments (condensation)

## Scratched Printhead Elements Description

The below photo 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 white substrate (circled above) underneath. 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, 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.

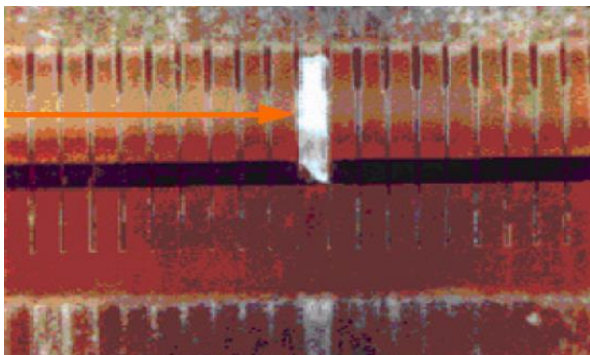
### PREVENTION

Scratches can be eliminated by taking some general precautions detailed below:

- Always use good quality supplies.
- Never place media or ribbon on the floor or other dirty surface. Always unwrap cards and rolls of ribbon, and put them straight in the printer.
- Clean the printheads every 5,000 cards, and 2 rolls, 1 roll of media and ribbon / 1 million inches / 2 rolls / full rolls of media (Barcode) or when print anomalies persist.
- Keep the printer's door closed; this will help prevent contaminants from entering the print mechanism

## “Chucked” Printhead Element

The photo below shows a printhead that has a chunk or chip taken out of it.



The chunk 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. Chunks will interrupt the electrical contact to the element as well as destroy the element itself.

### CAUSE

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

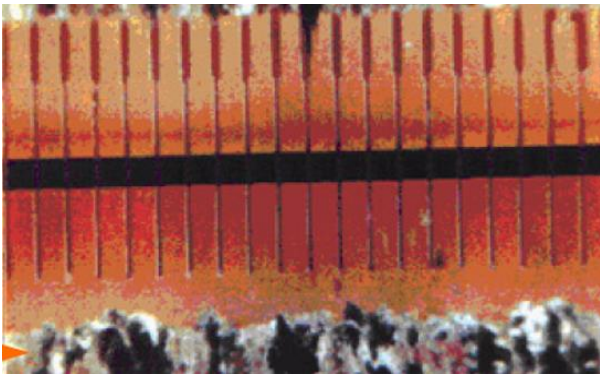
### PREVENTION

Chunks can be eliminated by taking some general precautions detailed below:

- Always use good quality supplies
- Never place media or ribbon on the floor or other dirty surface. Always unwrap cards and rolls of ribbon, and put them straight in the printer.
- Clean the printheads every 5,000 cards, and 2 rolls, 1 roll of media and ribbon / 1 million inches / 2 rolls / full rolls of media (Barcode) or when print anomalies persist
- Keep the printer's door closed, and keep the printer away from areas where there is a possibility of falling debris; this will help prevent contaminants entering the print mechanism

## Excessive Ribbon Residue Build-up Description

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 are fairly stubborn to remove. The ink residue builds up, then covers the print elements, blocking the heat and causing voids in the print.

### CAUSE

A build-up of ribbon ink residue is normally caused by a poor quality back coating 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.

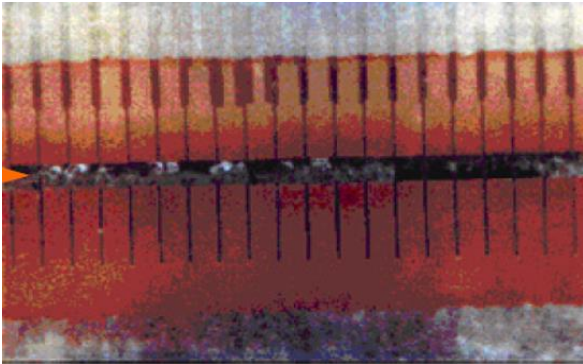
### PREVENTION

Excessive ribbon residue build-up can be eliminated by taking some general precautions detailed below:

- Always use good quality supplies
- Never place media or ribbon on the floor or other dirty surface. Always unwrap cards and rolls of ribbon, and put them straight in the printer.
- Clean the printheads every 5,000 cards, and 2 rolls, 1 roll of media and ribbon / 1 million inches / 2 rolls / full rolls of media (Barcode) or when print anomalies persist
- Keep the printer's door closed, and keep the printer away from areas where there is a possibility of falling debris; this will help prevent contaminants entering the print mechanism

## Excessive Back Coating Build-up Description

The photo below shows an area of a printhead that has excessive ribbon back coating 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 missed areas of print

### CAUSE

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

### PREVENTION

To ensure the back coating does not build up excessively causing poor print quality:

- Always use good quality supplies
- Clean the printheads every 5,000 cards, and 2 rolls, 1 roll of media and ribbon / 1 million inches / 2 rolls / full rolls of media (Barcode) or when print anomalies persist
- If possible reduce the printhead pressure and head temperature

## Printhead Maintenance

### CLEANING

Inconsistent print quality such as voids in barcodes or graphics may indicate a dirty printhead. For optimum performance, the printhead should be cleaned regularly. Zebra recommends performing the cleaning procedure every:

- 5,000 cards / 25 rolls of ribbon for (Card) printers
- 1 million inches / 2 rolls / full rolls of media (Barcode) printers or when print anomalies persist.

#### 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 card formats, images, and parameter settings stored in printers formatting RAM memory will be lost. Permanent parameter settings stored in EEPROM or Flash is 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

- Open the printer, and remove the media and ribbon.
- Moisten a clean swab with solvent and wipe the print elements from end to end. Allow a few seconds for the solvent to evaporate.
- Rotate the platen roller and clean thoroughly with a solvent and an applicator.
- Brush or vacuum any accumulated lint and dust away from the rollers, the media, and the ribbon sensors.
- Reload the media and ribbon; close the printer, and print a test card to check print quality.



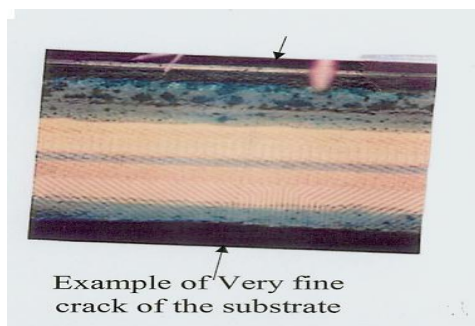
## Printhead Warranty

### 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 showed some defective printhead, typical warranty rejection due to misuse:

Abusive Handling or Impact Damage: Poor handling or impact damage can crack the Substrate and 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.



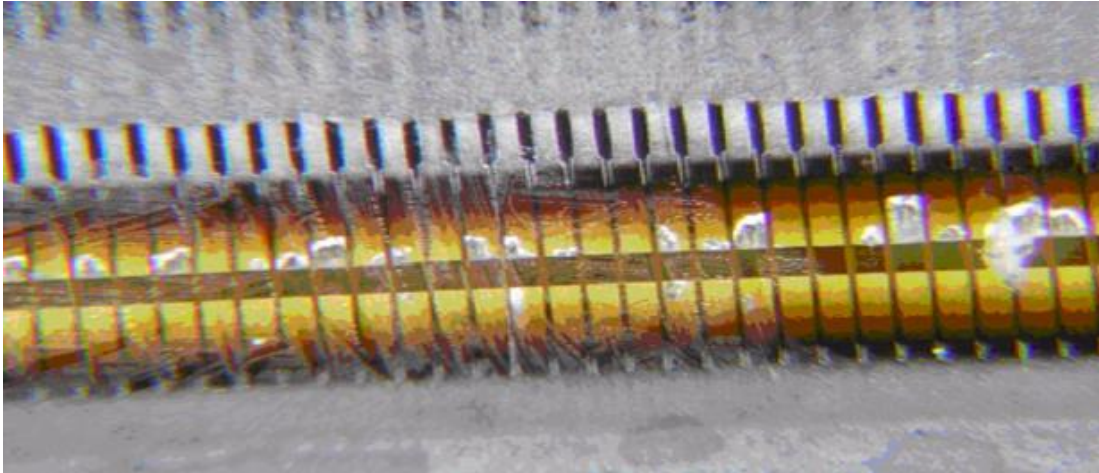
## Zebra Supplied Cleaning Kits

Part Number	Description
<b>Save-A-Printhead Film</b>	
P /N 46902	3" – 4" (76 mm to 102 mm)
P /N 44902	4" – 5" (102 mm to 127 mm)
P /N 48902	5" – 6" (127 mm to 152 mm)
P /N 38902	6" – 7" (152 mm to 178 mm)
P /N 22902	8" – 9" (178 mm to 229 mm)
<b>Printhead Cleaning Pen</b>	
P /N 105950-035	Contains 12 pens

## Examples of Printhead Failures

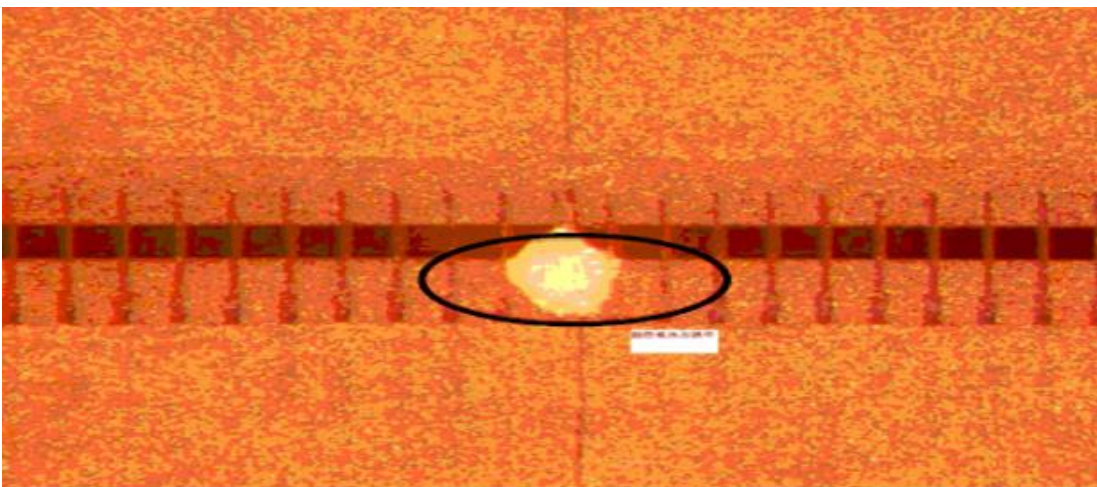
### EXCESSIVE WEAR OR ABRASION

Probable cause is that the printhead has been used past its rated life or there was poor maintenance or poor quality media used that was abrasive and reduced the printhead life.

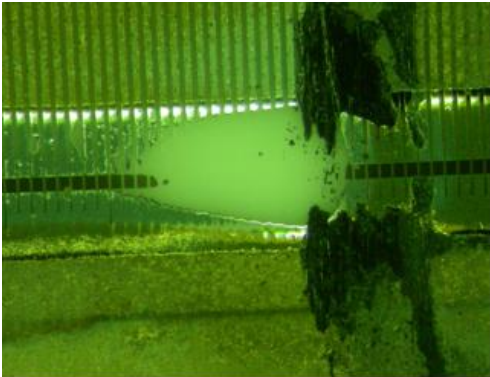


### PHYSICAL DAMAGE, SCRATCHES CHIPPING (CHUCK)

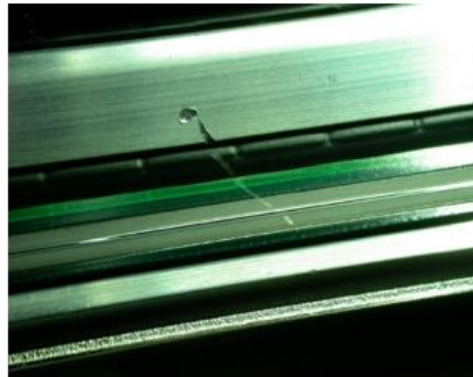
Are easily identifiable via the substrate being exposed from damage sustained on the printhead surface. Scratches, chipping & physical damage are caused by foreign particles (dirt, dust, grit, etc.) hitting the element line these particles can come from the ribbon, media, or environment.



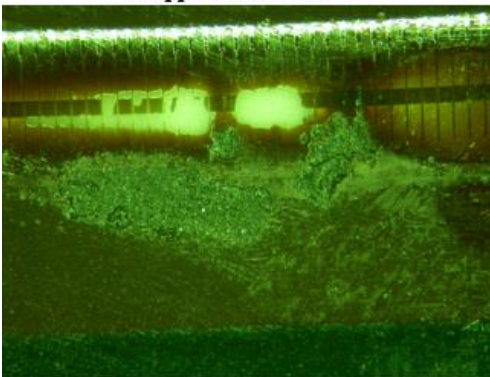
*Print head damaged by foreign particle*



*Chipped indication*



*Diagonal Scratch mark*



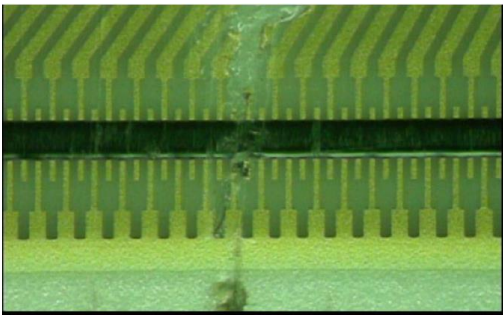
*Chipped indication*



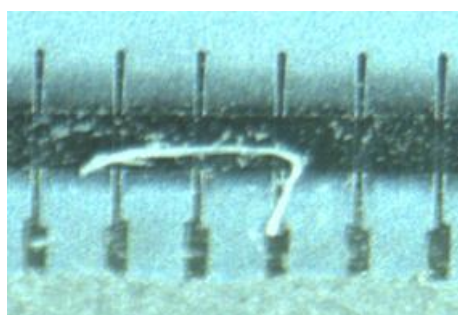
*Chipped indication at right print head*



**Physically damaged area**



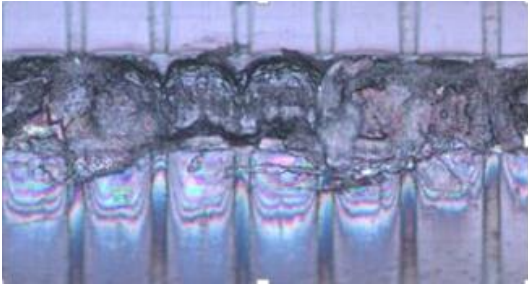
**Scratch Indication**



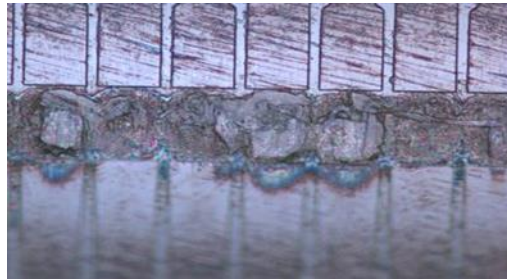
**Scratch Indication**

## BACKCOATING CONTAMINATION / EXCESSIVE RIBBON RESIDUE

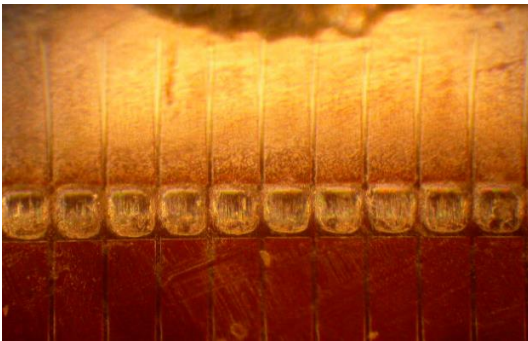
The build-up is highlighted by a silver /grey coating over the print elements. The coating blocks the heat from the print elements and causes missed areas of print



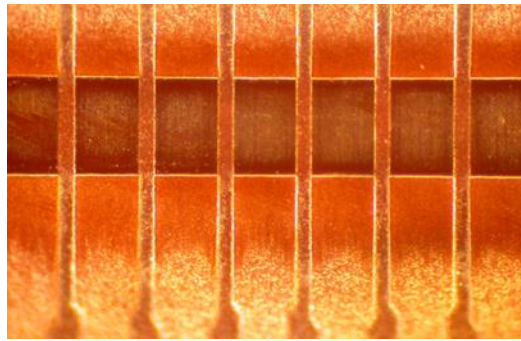
**Excessive residue contamination**



**Excessive residue contamination**



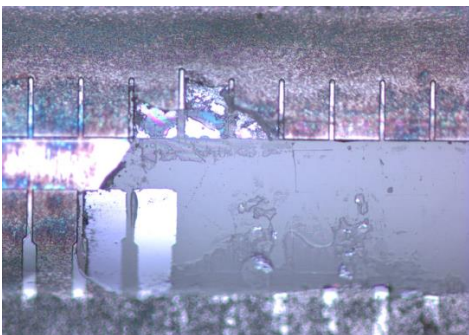
**Backcoating Contamination**



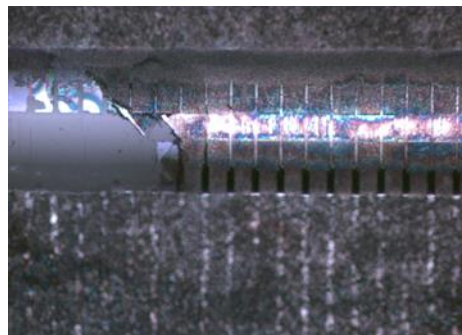
**Backcoating Contamination**

## GALVANIC CORROSION

This can occur in humid environments with printers running direct thermal media and most importantly, in use cases that lead to long standby periods where the printer is left on with the printhead engaged over the media. The Galvanic Corrosion occurs when the moist (humidity) direct thermal media reacts to high printhead voltage that exists over long periods of time with no media movement (standby). The galvanic corrosion causes the media to stick to the printhead. The ceramic coated print line is then ripped from the printhead when the printer is brought out of standby to printing status.



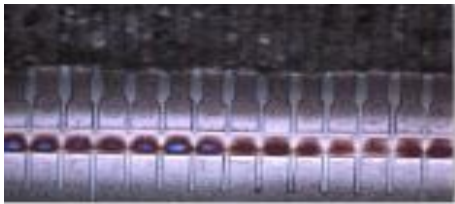
**Galvanic Corrosion Damage**



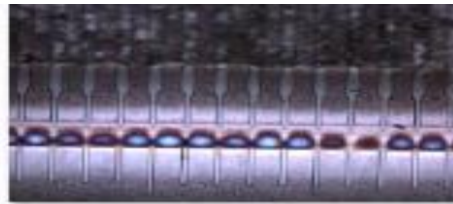
**Galvanic Corrosion Damage**

## OVERPOWER DAMAGE

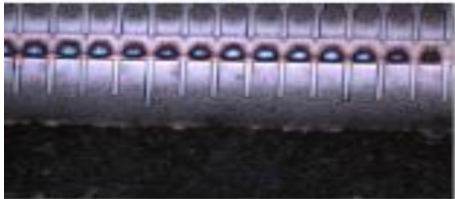
Occurs when excess darkness /burn temperatures are used. Often, increases in darkness or burn temperatures are needed to get acceptable print quality only because too little printhead pressure is setup or if the printhead is not correctly aligned over the platen. Increases in darkness or burn temperatures 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) where acceptable print quality can be accomplished.



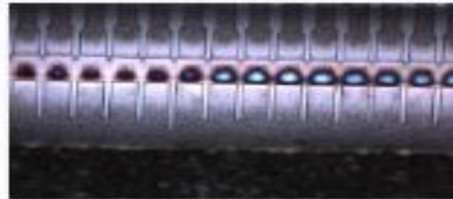
25a.jpg



25b.jpg



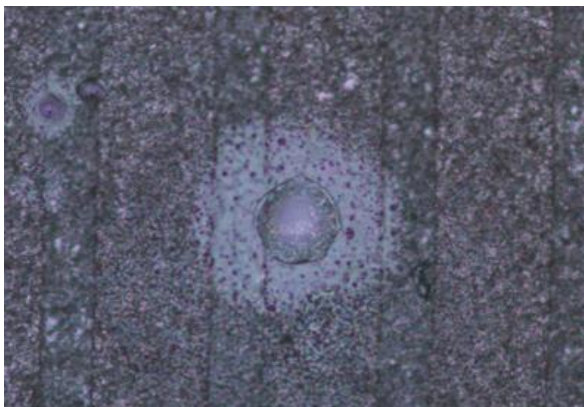
Overpower Damage



Overpower Damage

## STATIC DAMAGE

In the image below you can see that the central element is damaged, in the upper centre of the element there is a small area of static damage. This can be seen on the printhead element as dark areas, these areas are where the protective ceramic coating has become separated from the element below and damaged the element by allowing 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.

**OPTIONAL PAGE**

## Revision History

<b>REV</b>	<b>DESCRIPTION</b>	<b>DATE</b>	<b>AUTHOR</b>
1.0	Initial Release		