



## **Recording Head Failures - Causes and Cures**

Audio heads fail at any point during their useful lifetime. The Point of failure marks the end of a particular performance period, which may or may not be the end of the head's useful lifetime. Failure is defined as the point at which the head or heads do not meet the specified tolerance levels for that machine.

### **What Causes Failure?**

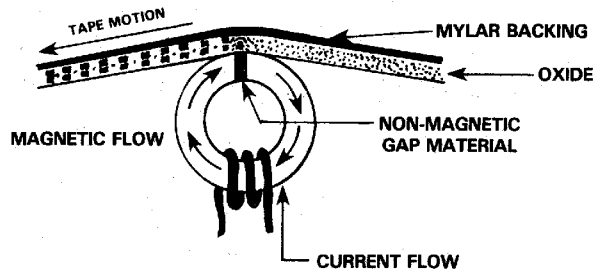
The most common reason for failure is lack of intimate head and media interface (poor tape contact). Other reasons are usually internal to the heads such as open channels (broken wires or burned out coils), output problems, etc.

The most common cause for failure is wear. As a head wears, its dynamic characteristics change. These factors can be compensated for on the machine throughout the head's useful lifetime. What cannot be compensated for is the change in head contour radius which, as the head wears, flattens out allowing the tape to "fly" or float away from the gap on a bearing surface of air.

The second most common cause of head failure is mishandling. Mishandling during installation or changeover is evidenced by broken connector, dinged or scratched tape contact, shifted gaps, or other damage which causes the head to fail at start-up or shortly thereafter.

To better understand the importance of tape to gap contact in the operation of any head it might help to understand how a head works. Very simply, a head records when an electrical current runs through the coil, creating a flow of magnetic flux which wants to go "round and round" inside the core, but due to the non-magnetic gap material in the face, the flux must "jump over" the gap to complete its path. The flux "jumping over" the gap magnetizes the ferric-oxide which is in contact with the gap area at that time. Saturation is a term used to define the depth into the tape or the amount of oxide which magnetized. Reproducing takes place when the magnetized tape passes across the gap. This creates a flow of magnetism within the core which induces an electrical current in the coil. Illustration A on the next page shows a basic toroid core and flow of electricity and magnetism.

Tape contact must be intimate in order to achieve proper saturation of the tape, and is even more critical during reproducing.

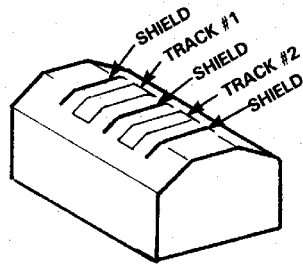


**Illustration A  
BASIC RECORDING**

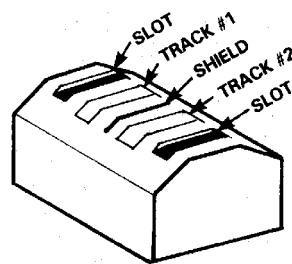
**Slotting**

Referred to as "Edge Slots", "Gutter Slots", or "Edge Reliefs". These are reliefs cut into the head, outside the edge tracks, i.e., tracks 1 & 4 on 4 track, 1 & 24 on 24 track heads. Illustration B shows a 2 track head not slotted.

As tape travels across the face of this head, wear, grooves or raised edges are created in the edge tracks. Eventually a "Lip" will be created on the edge tracks. This lip will make the tape curl and in some cases either scrape oxide or cut into the tape.



**ILLUSTRATION B**



**ILLUSTRATION C**

By slotting the head, illustration C, the edges of the tape overlap into the slot. Now the head wears even and "lips" are no longer a problem.

**Factors Causing Accelerated Head Wear**

Other factors directly influence wear rates, and thus the performance period of heads. On the next page are some of the major factors contributing to high wear rates and early head failures. Tape

tension, alignment, and bad tape, all of these factors which accelerate head wear are due to something either not being done or being done improperly. Heads are one of the most costly items on your machine. Follow the maintenance manuals carefully to achieve the longest possible performance periods from your heads. Remember that a machine running at 30 ips, runs almost one full mile of tape across the heads in 35 minutes.

## **Bad Tape**

Unfortunately, tape is a variable you cannot always control. Old tape can cause problems when the epoxy binder breaks down, shedding oxide which again accelerates wear. Every tape is different, some more abrasive than others.

## **Improper Alignment**

Head tilt (perpendicularity to mounting surface), if not correct, can cause uneven wear at one edge of the head. This also can be caused by improperly aligned tape guides.

## **Improper Tape Wrap**

(Part of the alignment procedure) Tape wrap problems may not show up immediately, but if the wrap is excessive, wear will be caused excessively on one side of the head and contribute to early failure.

## **Improper Tape Tension**

Too little tension can result in early tape flying, even though the head may have little or no visible wear. Too much tension will not show up until later because the greater tension will maintain tape to gap contact longer, but will wear like a belt sander, actually shortening the performance period.

## **Improper Climatic Controls**

Given otherwise uniform conditions, high temperature, high humidity, dirty air, or any combinations of these factors will greatly increase the rate of wear, possibly up to 50%.

## **Improper Cleaning**

Infrequent cleaning, or worse yet, cleaning with damaging materials or chemicals can cause accelerated wear or instant failure. Head and tape path cleaning should always be done with inert solvents such as Isopropyl Alcohol, Freon, or an approved commercially available head cleaning solution. Never use Acetone, MEK, or any chemical known to attack epoxies or metals.

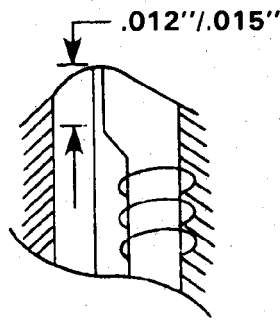
## What Happens When A head Fails? - Is Its Life Over?

Earlier we've used the terms Performance Period **and** Useful Lifetime. Performance period is best defined as the between installation and failure on a machine. Useful lifetime is best defined as the actual useful, useable life remaining in the head, whether or not the head has experienced failure. In other words, a head can have two, three or more performance periods during its useful lifetime.

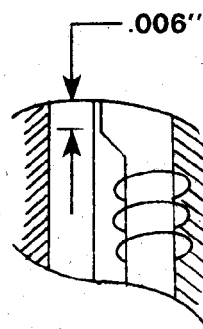
## What Is Head Recontouring?

Recontouring entails the reestablishment of the original contour configuration of the head and ascertaining the amount of remaining life in the head. Refer to the illustrations below for graphic presentation of head life and recontour procedures.

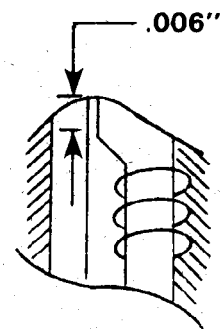
### RECONTOUR



**ILLUSTRATION D**  
**NEW HEAD**



**ILLUSTRATION E**  
**WORN HEAD**



**ILLUSTRATION F**  
**RECONTOURED**

Illustration D shows the head as new having a full gap depth (which equates to life) of .012" to .015", with original contour radius which allows perfect tape to head contact. Illustration E shows the head at the end of its first performance period, still having more than ½ of its total life remaining even though it has failed. Illustration F shows the head after recontour, ready to begin its second performance period. The head still has ½ or more of its original "life".

## SUMMARY

Heads, one of the most costly items in a machine, fail primarily due to wear. This wear cannot be prevented. Its rate, however, can be slowed by careful alignment, tape tension, wrap, cleaning and environmental controls. After the head fails, it can be recovered through recontouring and returned to the machine in new condition at less than 10% of the cost of a new head. Heads can have two, three and even four performance periods during their lifetime.