

# The Techno Tape Primer

Since this issue of our newsletter has a number of tape oriented items in it, we thought it might be a good idea to offer some basic information on how tape recordings are made. Later, we'll look at some of the tape specific tools in DC7.

To get started with tape, it probably best to have a look at, well, the tape itself.

The base level of the tape is a flexible strip of plastic. On top of that is added glue. Sprinkled on the glue is a oxide coating - often tiny particles of ferric oxide. These are basically tiny metal particles that are magnetized by the recording heads.

Tape construction is quite robust, but it doesn't last forever. Many tapes made in the 1950s are suffering from a degradation of the glue layer which results in the loss of portions of the oxide layer. This oxide layer is where the magnetized particles are and therefore where the audio is. If it falls off, it'll clog your heads, make for a dirty tape path and take your audio with it!! We've written before about actually baking tapes to temporarily revitalize the glue layer - and this is why it works.

The next part of our tape primer is on heads. A tape head is required to record audio onto a tape and also to play audio from an already recorded tape. Many cassette and less expensive recorders have a single combined head for recording and playback.

I know you've all seen tape heads, but you may not realize that most of these are internally shaped like a doughnut with a tiny slit in the front of the head. If you look carefully, you can see this slit which is called a Head Gap. The purpose of the gap in our doughnut shaped head is to let the magnetic flux out! This is where the magnetic field spills out and magnetizes the oxide particles on the tape.

The head gap needs to be kept clean and a good cleaning using our cleaning kit will help keep your head in good order. In fact, any piece of metal, plastic or rubber that touches the tape will get some oxide residue on it and should be cleaned periodically.

By the way, there's a third type of head on most all tape decks - the erase head. This can be either a permanent magnet or an electromagnet which demagnetizes all the oxide particles, erasing the ebb and flow which is your audio.

So now we have tape and a tape head, it's time to make our tape move across the head. The key here is the speed and the highest speed normally used for pro applications is 30 inches per second. Other common tape speeds are:

- 15 ips - Some pro work, high end home reel to reel**
- 7 1/2 ips - Common home reel to reel speed for quality audio**
- 3 3/4 ips - Long play home reel to reel, and 8 tracks!**
- 1 7/8 ips - Normal cassettes**
- 15/16 ips - Normal microcassette**
- 15/32 ips - Double duration microcassette**

A couple things about tape speed - the faster the speed the lower the amount of hiss and the better the frequency response. This is why cassettes have audible hiss and why a giant noise reduction industry was born to make them quieter. Of course, nothing makes them as quiet as DC7, as we'll see later.

So, now we have tape, we have tape heads and we've got tape movement across those heads. We should be able to record good audio by just connecting our audio to the electromagnet that is our record head and let the magnetic field vary with our audio.

Except that won't work well. If you simply let your audio signal create the magnetic field you will get significant distortion to your audio - especially in the low frequencies.

The answer is in a little understood thing called Bias.

You see, tape heads are very non-linear at low frequencies. Non-linear means they distort. At high frequencies they are much more linear and therefore have much less distortion. So how to record only in the frequency range where our tape heads are linear? The answer is to mix our audio frequencies with a fixed signal of around 100kHz - a very high frequency indeed. The result is that we are writing this high frequency signal to our tapes that is modulated by our audio signals. We can't hear the high frequency component, so we only hear the pure sweet audio on playback. So, the purpose of Bias is simply to move up the frequencies we are presenting to our tape heads to an area where they are quite linear.

So now you know the basics of tape recording. There have been many books on this subject - it's at least as involved and complex as recording an LP and perhaps more so.