

## Chapter 9

# TAPE HEADS: PLAYING CREDIT CARDS

You will need:

- An expendable tape recorder/player, or a loose tape head.
- Some magnetic media: cassettes, reel-to-reel tape, transit cards, credit cards, hard disks, etc.
- A battery powered mini-amplifier with considerable gain.
- An additional sound source, such as a CD or tape player.
- Optional: a surplus credit card reader.

Even in the age of CDs there's a lot of data sitting around in magnetic particles: music and phone messages on cassette tapes, personal data on your credit card, files on hard drives, virtual money on transit cards. Whereas a cassette tape player is still a pretty common device and we're all familiar with the sounds of cassettes, it's not often we get to *hear* the information on other magnetic storage media. But all it takes is a tape head and an amplifier.

A tape recorder translates audio signals into a fluctuating electromagnetic field through a tape head, the small metal Brancusi-esque object you can see inside a cassette player or answering machine (see figure 9.1). The tape head's undulating magnetism in turn aligns little tiny magnetic domains in the iron-like powder covering one surface of the recording tape, as if they were tiny compass needles. When the tape is played back the whole process reverses: the varying magnetic orientation retained by the mini-magnets on the tape now induces current flow inside the tape head which, when amplified, resembles pretty closely what went into the tape recorder earlier—another instance of the *reversibility* of electromagnetism discussed in chapter 4. It's not so different from translating sound vibrations into grooves cut into a record's surface, later followed by a needle whose wiggling is re-translated back into sound waves—only with tape it's magnetic fluctuations instead of shimmying grooves. Digital tape recordings, such as floppy disks or credit card stripes, are like cassette tape only simpler: the magnetic domains just flop back and forth between two states, 0 and 1, instead of tracing the nuanced contour of an analog waveform.



Figure 9.1 Tape heads.

### Preparation

The easiest place to find a tape head is inside a broken or otherwise unwanted answering machine or cassette player. (If you have a functional boom box or other device that *records* as well as plays back tape, skip ahead to the “Recording” section below; if you have a working Walkman or other cassette playback-only device, skip to “Playback.”) Many Web-based electronic surplus stores sell individual tape heads or credit card data readers at reasonable prices. The advantage of Aztecking a tape head (ripping it out of a still warm electronic body) is that audio wiring is attached, usually in the form of some shielded cable; in this case just cut the cable so as to leave as long a section as possible attached to the tape head. The answering machine will yield a simple mono tape head, while the Walkman will probably be stereo, but for the purposes of this experiment stereo is not very important, and you can get away with wiring up just one channel if you’re feeling cheap or lazy.

The back-side of a stereo tape head will have four connections (as shown in the examples in figure 9.1); a mono head will have two. If the head has a cable attached, each pin will probably be attached to a separate wire in a multi-conductor shielded cable, and the shield will be affixed to the metal shell of the head. When wiring this cable from a *stereo* head to a *stereo* plug, solder “A” to the tip of your plug, “C” to the ring, and “B” and “D” and the shield to the sleeve; when wiring a *stereo* head to a *mono* plug, solder “A” and “C” to the tip of your plug and “B” and “D” and the shield to the sleeve; when wiring a *mono* head to a *mono* plug, connect “A” to the tip, “B” and shield to the sleeve (see figure 9.2).

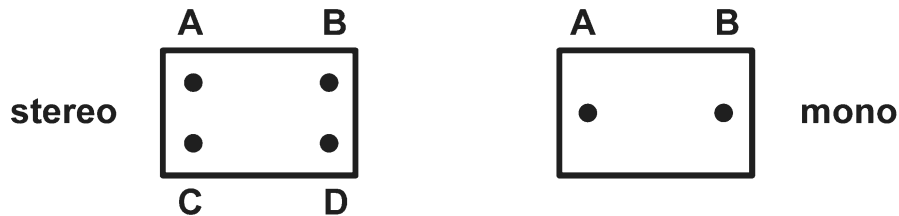


Figure 9.2 Wiring orientation for tape heads.

If the tape head arrives unwired, solder directly to connecting pins on the head, to the shield and to the tip of the jack, following the above routing instructions. Always use shielded cable to minimize hum, but bear in mind that tape heads are very hummy things by nature, and some noise is inevitable (in fact, you can substitute a tape head for a telephone tap coil to pick up electromagnetic fields, as described in chapter 3).

## Playback

If your tape head is inside a functional tape player, remove it from the player *without* disconnecting the cable if possible. You will probably need to extend its wiring with a few feet of shielded cable—enough that you have room to move the head freely. Either cut the existing wires in half and splice in some additional cable, or de-solder the head's wiring at the circuit board (make careful note of which wire goes where!) and solder the extension cable between the board and the pigtailed attached to the head.

If you are working with a loose tape head, plug it into a high gain amplifier, such as the Radio Shack mini test amplifier, a guitar amp, or the microphone input of a mixer. Press play on the cassette player or turn on the amplifier/mixer. Now rub the head over some recorded media: transit cards and credit cards, eviscerated cassette tapes, computer disks. If you're using cassette tape, it helps to stretch the audiotape across a sheet of cardboard, a tabletop, or some other flat surface and fasten it down with the sticky kind of tape at either end, or double-stick tape or spray adhesive on the back side. You will notice that one side (emulsion) will be MUCH louder than the other (backing). Digital data (credit cards, transit cards) tends to make a much louder sound than audiotape, and one that often sounds curiously like turntable scratching (see "Card Readers," below).

If you find it awkward to handle the tiny tape head you can lash it to the end of a pop-sicle stick or pencil with some electrical or gaffing tape, or solder it to a metal fingerpick (see figure 9.3).



**Figure 9.3** Tape heads mounted on fingerpicks, Nicolas Collins.

### Tape

Although invented for straightforward recording and playback in the service of the Third Reich, and largely known today in its more benign role as a trustworthy musical amanuensis, magnetic tape has proven to be a wonderfully flexible performance medium in itself. Composers such as Alvin Lucier (“I am sitting in a room,” 1970), Steve Reich (“Come Out,” 1966), Pauline Oliveros (“1 of 4,” 1966) and Terry Riley (“Rainbow in Curved Air,” 1969) have all made pieces derived from the properties of tape loops and tape delays. When the tape is taken off the reels it becomes surprisingly instrumental. In 1963 Nam June Paik, on the threshold of his transformation from composer to video artist, attached dozens of strips of prerecorded tape to the wall of a gallery in Wuppertal, Germany, and invited the visitors to play it back via handheld tape heads. According to legend, John Cage once did a similar thing in reverse. He fully covered a tabletop with blank tape, invited the public to scribble across it with tape heads attached to pencils through which electronic sound was playing; at the end of the evening the tape was wound onto a reel and played back for all to hear.

Laurie Anderson’s “Tape Bow Violin” (built in 1977 in collaboration with Bob Bielecki—see “The Luthiers,” chapter 29) substitutes a tape head for the bridge, and a strip of tape for the hair of the bow; the tape contains a recording that Anderson plays backwards and forwards as she draws the bow across the head (see figure below). “I began to work with audio palindromes, words that produced different words when reversed. Audio palindromes are not predictable like written palindromes (‘god’ is always ‘dog’ spelled backwards). With a lot of experimentation I produced songs for ‘The Tape Bow Violin’ that could be played forwards and backwards.”

Years later, César Eugenio Dávila-Irizarry glued recordings of percussion instruments onto the body of the gourd typically used to make a *güiro* (a percussion instrument consisting of a gourd scribed with notches that are scraped rhythmically with a comb-like *raspa*); his new instrument is played with a hand-held



“Tape Bow Violin,” Laurie Anderson.



“Tape Güiro,” César Eugenio Dávila-Irizarry.

tape head (see figure above). In the installation version of Mark Trayle’s “*capital magnetiC*” (1999) visitors insert their credit cards into what appears to be an ordinary ATM; Trayle has programmed an internal computer to generate short musical compositions based on the data on each card, heard through speakers embedded in the ATM.

## Recording

You can try *recording* with a hand-held tape head as well. Stretch cassette or reel-to-reel tape over a tabletop as above. If you are working with a loose tape head, plug a CD or cassette player into the input of a mini-amplifier; plug the tape head into its external speaker output. While playing the CD/cassette, move the tape head over the tape surface—keep the head in close contact with the tape. After a while stop recording and try playing back the tape—either by amplifying the head while moving it by hand across the surface, or reload the tape into a cassette or onto a reel and play it back on a tape recorder. Sometimes this works and sometimes it doesn’t, so don’t be too disappointed if you are unsuccessful.

You can get much better results if you start with a functional boom box or cassette recorder that you’re willing to sacrifice on the altar of the weird. Disassemble the recorder to the point that you can carefully remove the record head from its mount in the cassette well. You will probably need to extend its wiring, as we described earlier in the “Playback” section. Mount some scrap cassette or reel-to-reel tape to a flat surface as we did above. Connect a signal to the boom box inputs, or tune in its radio. Insert a blank cassette in the well, or press that little prong with your pinkie, in order to enable the record function, and press the “record” and “play” keys to start recording. Move the head smoothly across



**Figure 9.4** The “Scratchmaster” card reader (by Nicolas Collins, from the collection of Ted Collins).

the scrap tape. Press “stop,” then “play,” turn up the boom box volume, then retrace your movements over the tape—you should hear the original signal, altered by the inconsistencies in speed and smoothness between your two passes. You can speed up, slow down, and reverse your original sounds by changing the speed and direction of your playback motion. Or you can reload the tape into a cassette shell or onto a reel.

### Card Readers

Surplus outlets often sell “card readers” from ATM machines, public telephones, etc. The reader consists of a tape head inside a housing that guides the card smoothly past it, along with circuitry needed to decode the digital data (see figure 9.4). Stealing credit card data is *advanced* hacking but for our immediate purposes you can discard the digital circuitry, wire the head up as shown in figure 9.2, plug into an amp, and end up with a very nice instrument for “scratching” cards.