ZINE #1

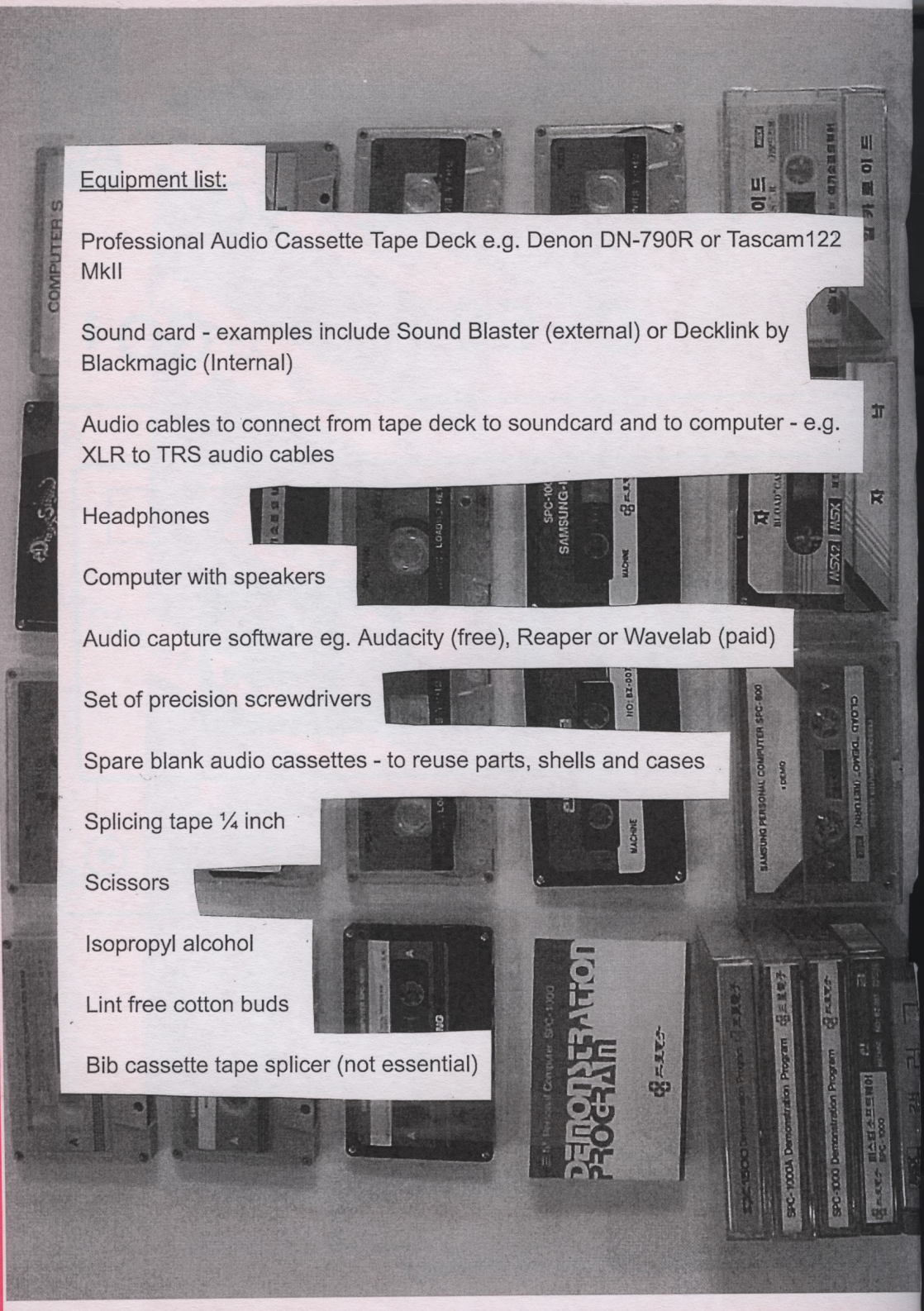
C-30, C-90 C-60, GO!

BRITISH LIBRARY

Audio Cassette Digitisation Guide

HERITAGE FUND

Unlocking Our Sound Heritage



Equipment list:

Professional Audio Cassette Tape Deck e.g. Denon DN-790R or Tascam122 MkII

Sound card - examples include Sound Blaster (external) or Decklink by Blackmagic (Internal)

Audio cables to connect from tape deck to soundcard and to computer - e.g. XLR to TRS audio cables

Headphones

Computer with speakers

Audio capture software eg. Audacity (free), Reaper or Wavelab (paid)

Set of precision screwdrivers

Spare blank audio cassettes - to reuse parts, shells and cases

Splicing tape ¼ inch

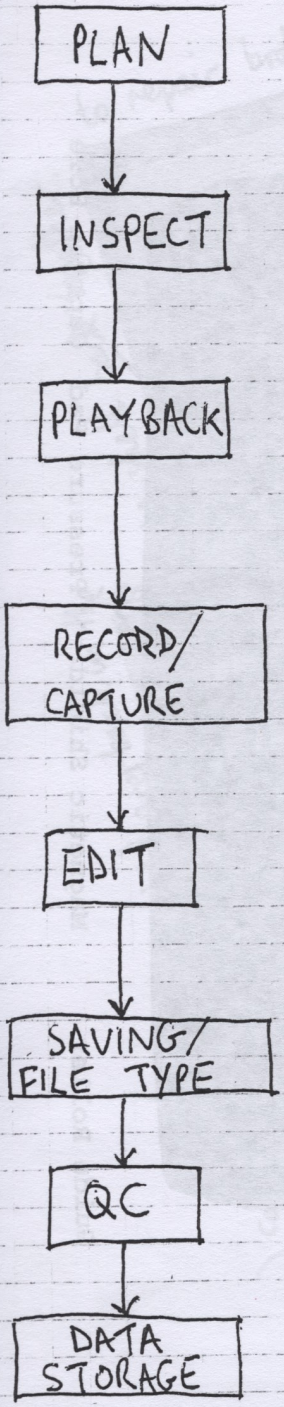
Scissors

Isopropyl alcohol

Lint free cotton buds

Bib cassette tape splicer (not essential)

WORKFLOW

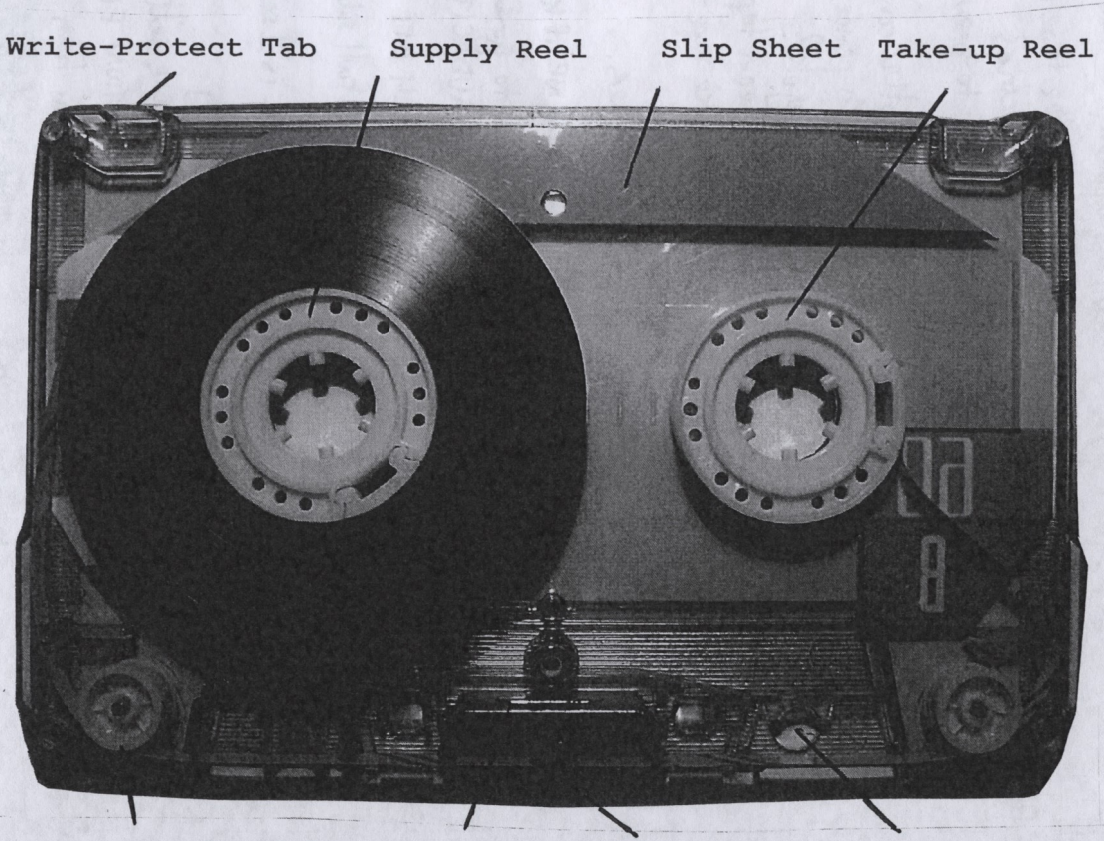


STEPS:

- Source & service equipment
- create a spreadsheet for your project log tape into
- configure & test equipment, set levels.
- check the condition - does the tape need repairing or the shell replacing?
- remove write protection tabs to prevent recording over
- check for any mould or other condition issues (can gently mind with pencil)
- load tape deck - does it play ok?

(any squeaking sound could mean tape has 'sticky shed' - option to bake tape to improv playback)

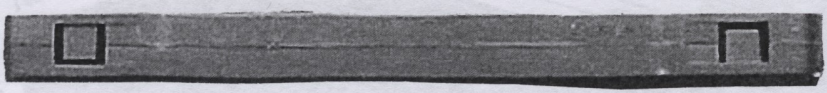
- clean tape deck heads + rollers.
- set the AZIMUTH & any Dolby NR if known.
- record in via a sound card to your audio capture sofware (eg. AUDACITY)
- Set to WAV, 96 kHz + 24 BIT. PCM.
- Playback + therefore capture full side of tape
- 'Top' + 'Tail' your file so there is 1 sec either side of yor recording
- Save this file under the same settings as an unaltered PRESERVATION FILE (you can create further vesions from this file like MP3s of separate tracks as ACCESS FILES) save NORMALIZED OR RESTORED FILE SEPARATELY
- QC file via playback or spotcheck Are any problems/issue inherrant from the tape or introduced during digitisation?
- BACKUP DATA in at least 2 places.


Write-Protect Tab
Supply Reel
Slip Sheet
Take-up Reel
Guide Roller
Magnetic Shield
Pressure Pad
Capstan Hole

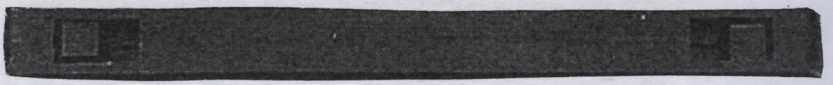
to repair broken tape open the cassette shell with a precision screwdriver. use a clear surface free of any drafts as the parts and tape can easily blow away. use repair tape and a splicer (if you have one) carefully make sure the pressure pad & magnetic shield are back in the correct position before putting the shell back together.

Types of Audio Cassette

Different types of tape where introduced over the years in the following order:

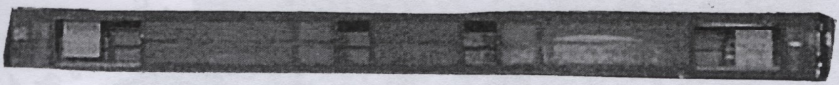


Type I: **Ferric Oxide** - had poor high frequency response and excessive tape hiss.This is standard ferric-oxide tape, also referred to as **"normal bias tape"**



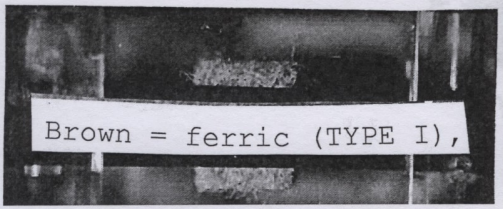
Type II: Chromium Dioxide - better frequency but not as good on low end and output levels. This is called **'chrome'** or CrO2 tape.

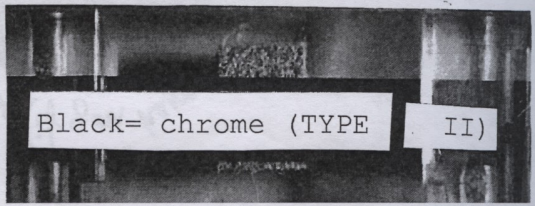
Type III: Called **'ferric chrome'** and now obsolete.



Type IV: Pure metal particles - increased dynamic range and frequency response but increased head wear. Referred to as a **'metal tape'**.

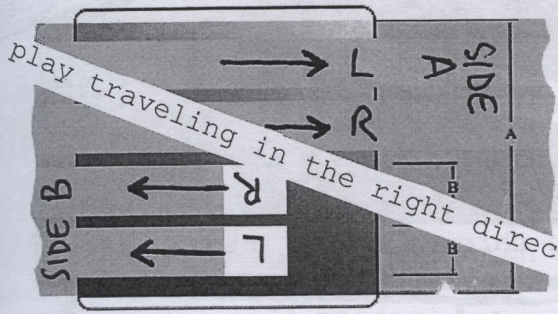
You can also tell the difference between TYPE I (ferric) and TYPE II (chrome) in the colour of the tape itself.





Tape Speed

The tape travels at the standard tape speed of 1 7/8 ips which is 4.76 cm/s. (DON'T ADJUST THE TAPE SPEED DIAL)



Side A stereo track has two parts then ...

Side B has two track when you turn the cassette over.

The above shows the typical four audio tracks.

A stereo Audio Cassette effectively has 4 bands that carry the signal on the outer side of the magnetic tape. There is a small gap where no information is recorded so to prevent 'crossover'.

Bias tape frequency

The correct bias signal should be automatically identified by the notches on the tape

(DON'T ADJUST THE BIAS FINE DIAL)

Dolby Noise reduction

For recordings made without Dolby NR, set to "OFF".
For recordings made with Dolby B NR, set to "B".
For recordings made with Dolby C NR, set to "C".
For recordings made with Dolby S NR, set to "S".

IF IN DOUBT LEAVE DOLBY OFF

101: Intro to Audio

EXPLAINING SOUND WAVES

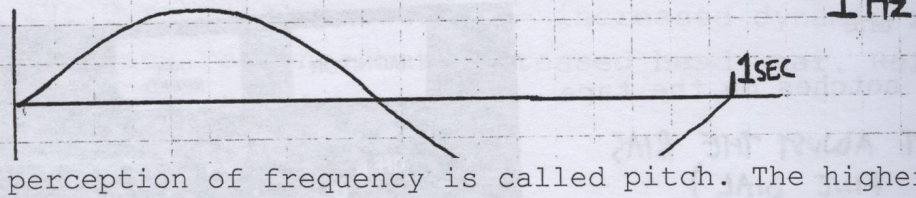
Sound waves are both longitudinal (travel in the same direction as the sound) and transversal (perpendicular).

Think of ripples when you throw a stone into a pond:

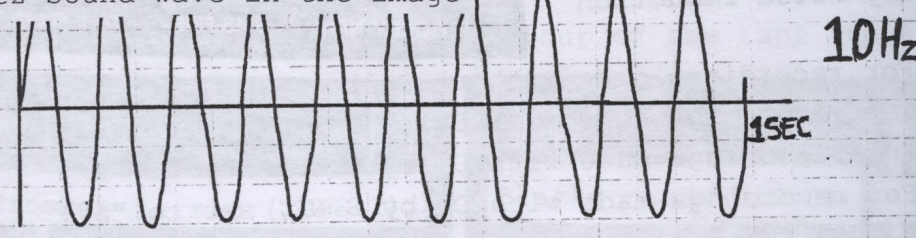
The air particles do not travel, instead they vibrate around a point in space and pass this movement on. The rate of this oscillation is called frequency.

The amount of compression/rarefaction in the air is the amplitude of the sound wave. The distance between these peaks is the wavelength of the sound wave.

One sound wave is one peak and one trough together making i oscillation. Note: 1 oscillation per second is 1 Hertz (Hz)



Our perception of frequency is called pitch. The higher pitch something is the more the oscillations over time such as the Hertz sound wave in the image.



Frequency and Pitch

The limits of human hearing are approx. 35 to 16/17,000 Hz

This changes with age where the upper level changes to
15,000 Hz (aged 40)
12,000 Hz (aged 50)
10,000 Hz or lower beyond 50

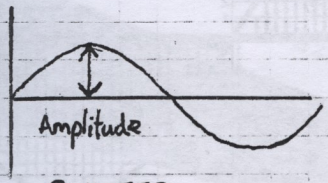
We perceive frequency as pitch

LOW BASS (1st & 2nd octaves 20-80 Hz)

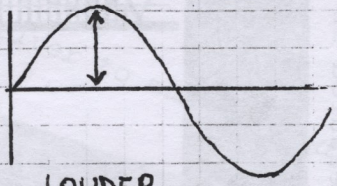
UPPER BASS (3rd & 4th octaves 80-320 Hz)

MIDRANGE (5th, 6th, 7th octaves 320-2,560 Hz)

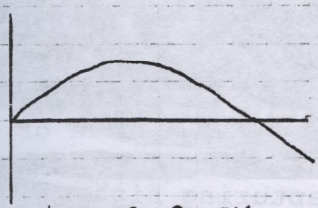
UPPER MIDRANGE (8th octave 2,560 - 5,120 Hz)



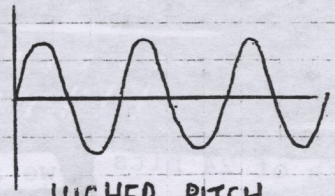
QUIETER



LOUDER



LOWER PITCH



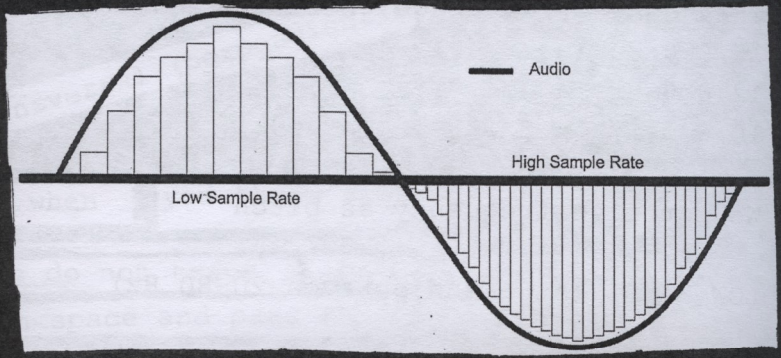
HIGHER PITCH

AUDIO QUALITY

The audio quality of digitisation is the accuracy of the original recording

depends on: **Sample rate** and **bit depth.**

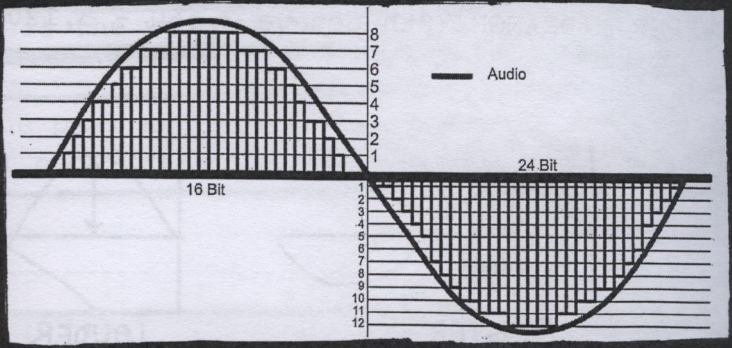
Sample rate (measured in Hertz or Kilohertz)



An audio CD is 44.1 kHz

(that's 48,000 Hz or 48,000 samples per sec.

Bit depth (measured in bits)



An Audio CD is 16 bit (65,000 values)

Current archive standards

For archive digitisation we use a sample rate of 96 kHz. a bit depth of 24 bits we are capturing higher frequencies this leaves plenty of headroom for any restoration work and future proofing standards of preservation files.

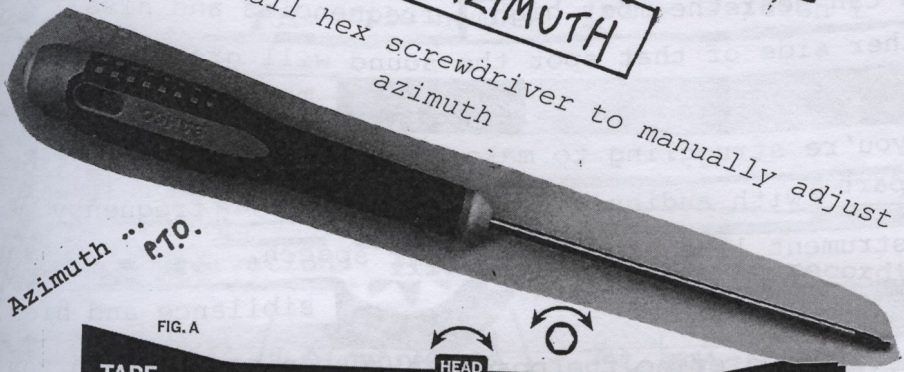
TO GET THE BEST SIGNAL

#1 CLEAN + MAINTAIN EQUIPMENT

At the start of each day do a thorough clean of all the heads and rollers starting left to right to clean the dirt and oxide deposit that have built up. To do this use a lint-free cotton bud soaked 95+% isopropyl alcohol.

#2 SET THE AZIMUTH

using a small hex screwdriver to manually adjust the azimuth



Azimuth ... P.T.O.

FIG. A

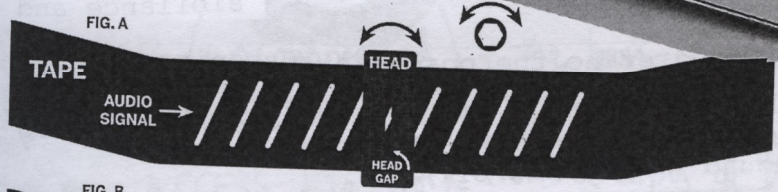
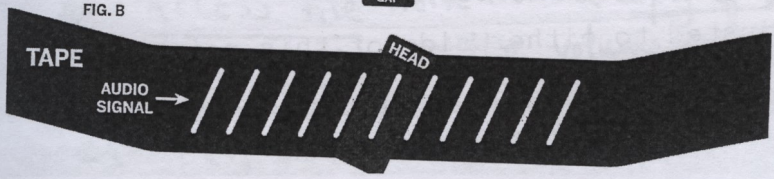


FIG. B



Azimuth

The azimuth is the angle that tape head recorded the original audio signal onto the original audio carrier.

To digitise the full range of frequencies from the original recording we need to manually match up the azimuth angle each time

Press play on the tape. enter a small hex screwdriver
Sometime the azimuth can change throughout the recording
so we must digitise versions at more than one setting.

Using headphones on both ears, make an assessment whilst gently turning the screw driver
Be careful not to turn too much as it will lose it's thread and could damage the tape deck.

This process is a bit like the audio equivalent of focusing a camera lens. There will be a sweet spot where you can hear the most high frequencies and hiss.
Either side of that spot the sound will grow more muddy and flat.

If you're struggling to make a judgement select a part with audience applause or a high frequency instrument like a violin. clear speech, sibilance and hiss.

Adjust and refine the position, listening for when you can hear ~~the~~ most of the recording CLEARLY.

The sound will 'roll off' when adjusted to either side of this point and you will hear a muddier sound where the high frequencies are lost.

Editing & Saving Preservation Files

Editing - trim files to at least 1 second either side of recording.

For creating preservation files the only intervention required is for 'topping' and 'tailing 'each file.

Metadata - data about data

Record descriptive + physical metadata in digitisation logs/spreadsheets eg. info from the inlay card and if the recording is MONO or stereo. You can use software such as BWF MetaEdit to embed metadata within the file itself eg. equipment used, name of engineer.

Saving

The raw recording is already a 96kHz 24 bit WAV file.

'FILE' > 'SAVE AS' and pick or create an appropriate folder

ARCHIVES+ An example of file naming protocol e.g.

AP_RMAN-1092_s1_f01_v1.wav

AP = Archives+ (Originator) **RMAN-1092**= Example of shelfmark

_s1 = side 1 **_f01**= file number **_v1** = version 1 **.wav**

(Objective Changes = _f02…)

(Subjective Changes = _v2…)

THIS IS a preservation file of the digitised recording.

it is lossless (uncompressed) + the best representation, of the unaltered original recording.

NB: To make an ACCESS file work from a copy of the preservation file. NORMALIZE the volume to EBU R128 LEVELS using your audio editor software. Output to MP3 which is an easily shared compressed file.

QC Playback: QUALITY CONTROL FOR YOUR FINAL FILE

Spot check points in the recording, especially where you can see there have been changes, for instance a different song or performance. at points in the recording

~~Looking at the Phasescope check whether the azimuth drifts~~

Spectrogram view too much

Zoom in and check through the file looking for any abrupt straight lines that signify a digital glitch.

The band will appear as a straight vertical line through all frequencies.

You may hear a click or a jump in the recording like a small portion of sound is missing.

confirm if this was during digitisation or

10 s 59 ms introduced 7 s 59 ms 396 µs inherent in the source

In the **Waveform** view, zoom in and look for any right angles

A pure analogue sound wave will have a natural curve and any blocking/stepping is an error that has been digitally introduced

if it does you have digital clipping and will likely require retransferring

List of resources

North West Sound Heritage blog:
https://northwestsoundheritage.org/

International Association of Sound and Audiovisual Archives (IASA) Guidelines on the Production and Preservation of Digital Audio Objects (IASA TC-04, 2nd Edition)
http://www.iasa-web.org/tc04/audio-preservation

Free open source audio capture and editing software:
https://www.audacityteam.org/

Free open source metadata editing software:
https://mediaarea.net/BWFMetaEdit

Supplies and equipment:
https://tapeline.info/v2/about-us.html
http://www.tapecity.co.uk/

Further reading:
Free Course from Open University : Revolutions in sound recording
http://www.open.edu/openlearn/science-maths-technology/engineering-and-technology/technology/revolutions-sound-recording/content-section-0?intro=1

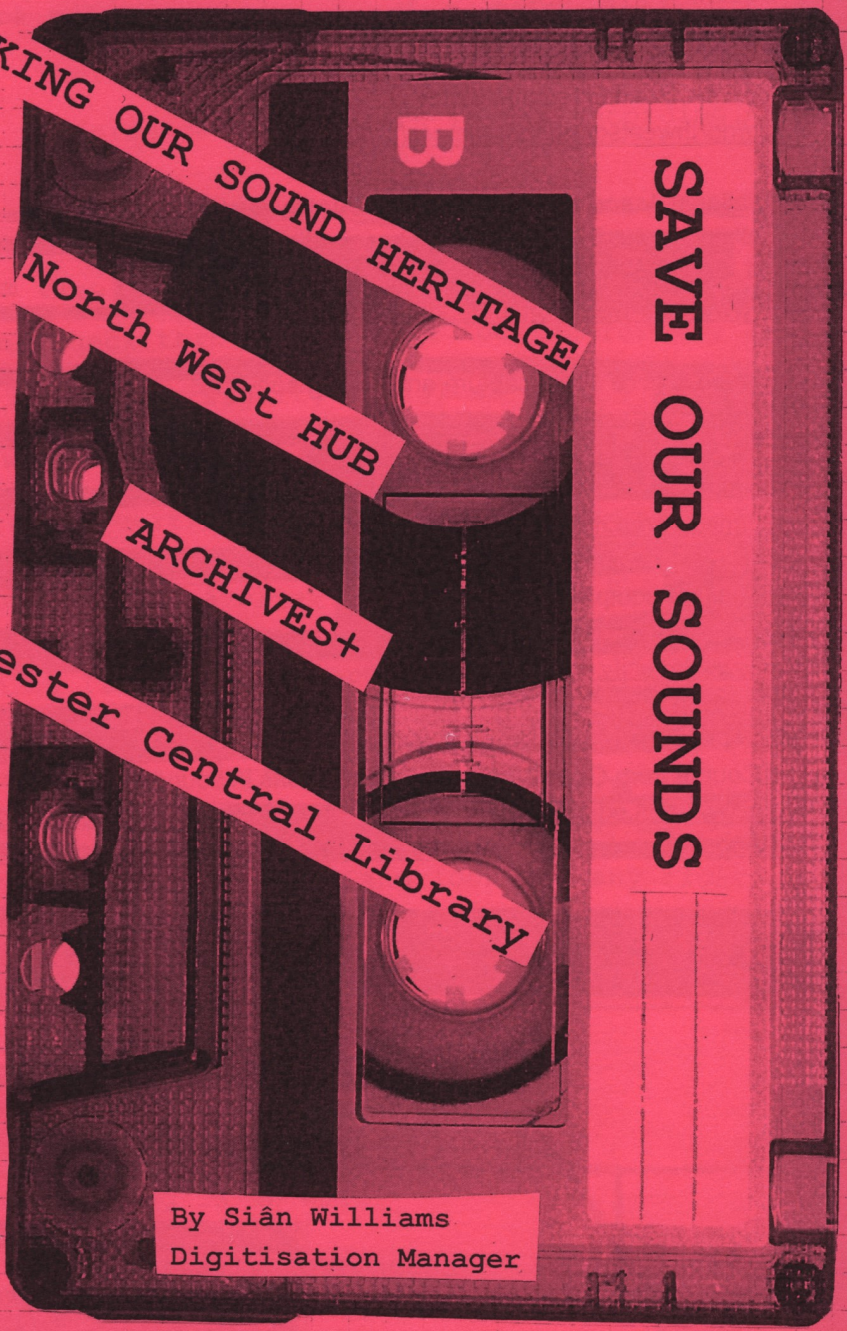
Wire article with Will Prentice from The British Library: 'Collateral Damage'
https://www.thewire.co.uk/in-writing/essays/collateral-damage_archivist-will-prentice

UNLOCKING OUR SOUND HERITAGE

North West HUB

ARCHIVES+

Manchester Central Library



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https://northwestsoundheritage.org/