

# Digital Audio File Preparation

This paper is written to help anybody involved in the preparation of Digitised Audio Files to be used for Radio Broadcasting and other Professional Audio Applications to achieve best possible quality sound.

Our company specialises in Professional Radio Broadcast Equipment, and have a commitment to help the Broadcast Industry develop and maintain the highest possible Transmitted Audio Quality.

Computer based Digital Audio Delivery Systems are essential elements in modern Radio Broadcasting.

Carefully prepared Digitized or Digital Audio Files are also essential for presenting Music or "Spots" To-Air from such systems whether this is used as an Announcer Assist or Automation System.

High Quality Audio Files are also important when required to produce professional sounding audio when used in equipment such as the Elan Audio REP-01 Compact Flash MP3 Emergency Player, or the Elan Audio RAD-01 Dual Compact Flash MP3 Player, specially designed for Tourist Radio and High Quality Background Music Applications.

## **First a few practical notes which we hope makes sense**

Common Digital Sampling Rates are 32 KHz, 44.1 KHz and 48 KHz.

96 KHz or 192 KHz Sampling Rates are not common, but used in some demanding Studio Applications

44.1 KHz Sampling Rate is the CD Standard, but not an official AES/EBU Standard.

Conversion from one Sampling Rate to another will cause some degree of Audio Degradation.

Conversion from 48 KHz to 44.1 KHz is "Not a Happy One"

Original Studio Recordings are now often done at 96 KHz or 192 KHz for better conversion to 44.1 KHz

Minimum Professional Standard is 16 Bit with 20 or 24 Bits now commonly used by Recording Studios.

The CD Standard is 44.1 KHz 16 Bit Linear with some additional management Data Bits.

Basic Linear or Wave Bit Rate for CD's is about 1.4 M Bits per Second with additional Bits for Error Correction and other purposes making it a total of about 2.2 M Bits per Second.

## **A few notes about Digital or Digitised Audio Files and Audio Compression**

With very few exceptions, all Digital Audio Files intended for Automated Playback are compressed in order to reduce the amount of Hard Disk or other type of memory space required, and also in order to reduce Local Area Network Traffic that can cause problems in large systems.

A notable exception is the BWF Broadcast Wave Format now becoming the European Broadcast Standard using uncompressed audio files for audio storage, presumably because of audio quality problems noticeable on Digital Audio Broadcasting and mainly caused by Compressed Audio Files.

There are many different Audio Compression Formats created for various purposes, some are or were not very good and completely unsuitable for broadcast applications, some have disappeared without trace with new ones being created or invented on a regular basis.

Some Audio Compression Formats, such as those used in Digital Note Takers, Mobile Phones and Internet Streaming are very economical in Data use, but in reality suitable for low quality speech only.

They may be suitable for broadcasting very short Sports Reports or short news Interviews, but should never be considered for storage of Music or "Spot" announcements.

Audio Compression formats commonly used in Broadcast Applications are MPEG-1, the professional MPEG-2 and the newer AAC mooted by some to be the perfect Audio Compression Format as well as a number of other formats not discussed here.

MPEG-1 Layer 3 is a very popular Audio Compression format, commonly known as MP3 and used in Portable Music Players, Internet Downloads of Music Audio Files and for Computer based Audio Storage and Playback Systems by many small Radio Stations.

MPEG-2 Layer 2 is the Audio Compression Format used by many Professional Radio Broadcasters although there are indications of a move to abandon Audio Compression and use the uncompressed linear BWF Format as compressed audio files pose a serious problem in Digital Radio Broadcasting.

AAC, Advanced Audio Coding, also known as MPEG-2 Layer 7 dates back to specifications written in 1997 and hailed to be superior to MP3 at low bit rates, and for this reason likely to be used as the standard Audio Compression Format for Digital Radio Broadcasting in this country.

## **Common to all Audio Compression Formats**

All audible Sounds are Analogue with nobody we are aware of who can actually hear "Digital Sound".

All Sound Recordings start with a Microphone converting Analogue Air Pressure Changes into Analogue Electrical Signals that can be captured as Analogue Information on Audio Tape, or converted to Digital Data and captured on Digital Tape, Computer Hard Disk or Solid State Memory.

For Analogue Audio Playback, the electrical signal carrying the information is amplified for feeding to Loudspeakers or Headphones and converted by these to Analogue Air Pressure Changes for listening.

For Digitised Audio the Data Information is converted to become Analogue Signals that are amplified for listening.

In every case, Sound starts and finishes as analogue with the fidelity or quality of reproduction depending on the quality of the Microphones, Recording and Playback Equipment, and the reproducing Amplifiers, Loudspeakers or Headphones used.

All Digital Audio Compression Systems or Formats works on the "Loss" principle by throwing away subtle information contained in the original material assumed not to be missed or noticed on playback when converted back to analogue.

The lower the Bit Rate, the more information is "Thrown Away" resulting in reduced in Audio Quality with the information thrown away, "Gone" forever.

Cascaded Audio Compression means Compressed Audio converted from one format to another, or Compressed Audio Re-Compressed to the same format as is often done during Audio Editing.

Converted and Re-Compressed Audio often sounds strange, sometimes terrible and is unfortunately the case whether the conversion is done by a Digital or Analogue process.

What really happens is the unpleasant and inescapable fact that something must be "Thrown Away" during the Audio Compression Process.

Subtle details that may not be missed or noticed too much were thrown away during the first process, and generally not so subtle details must be thrown away in the second process.

Consider 1.4 M Bit Sec Data from a CD compressed to 128 K Bit Sec MP3 contain about 9% of the original data, then repeat the process another couple of times leaving maybe 4 to 5% of the original resulting in the creation of some strange non harmonic sounds known as aliasing products as well as poor quality sound lacking in depth and details.

Typical examples where Cascaded Audio Compression takes place are Audio Files Compressed to one format received from the Internet, Satellite Feeds, ISDN or Tie Line units, then converted to Wave Files for editing and then converted to another Compressed Audio Format for playback To-Air through the station's Audio Delivery System which is particularly noticeable if operating at low Bit Rates.

Worst scenario is possibly Digital Radio Broadcasting where 3 or more format conversions may take place through the broadcast chain, and possibly the reason for complaints voiced on the Internet by British DAB Listeners, and possibly why European Broadcasters are going away from Audio Compression.

Unfortunately, Audio Compression is necessary using ordinary Computers, so let us make the best of it.

### **More about the different common Audio Compression Formats**

#### **MPEG-1 Layer 3, commonly known as MP3**

Original MPEG Audio Compression Format, no longer classified as Professional, used for Announcer Assist and Automated Audio Delivery by some small Commercial and many Community Radio Stations.

Also used in Portable Music Players, Internet Downloads of Music Audio Files and MP3 CD's.

Will run on ordinary performance Personal Computers and ordinary Sound Cards.

Capable of very good audio quality from **carefully prepared** audio files at high bit rates.

Not suitable for quality Audio Editing, newer MPEG-2 is designed to be suitable for editing.

MP3 128 K Bit Sec, very ordinary quality, not really good enough for Broadcast.

MP3 160 K Bit Sec, near FM Quality, suitable for broadcast with carefully prepared audio files.

**MP3 256 K Bit Sec**, our recommendation for Audio Delivery, care still needed in file preparation.

For economy reasons, MP3 is probably the best choice for small Radio Stations.

#### **MPEG-2 Layer 2, Audio Compression Format used by many Professional Radio Broadcasters**

Require High Performance Computers or Special Professional (Expensive) Sound Cards.

Minimum acceptable bit rate 192 K Bit Sec with 256 K Bit Sec Better.

Better performance for Audio Editing than MP3.

Indications are MPEG-2 being replaced by BWF for serious European Broadcasting.

### **AAC, Advanced Audio Coding**

Also known as MPEG-2 Layer 7.

Hailed to be superior to MP3 at low bit rates.

Likely to be adopted as the standard Audio Compression Format for Digital Radio Broadcasting.

### **Now, at last something about creating of Audio Files**

#### **CD's to MP3 Audio Files for Announcer Assist or Automated Playback**

Use a reputable MP3 Ripper such as ALTO MP3 Maker or Adobe Audition and CD's in good condition.

Rip required tracks from CD to Hard Disk Drive.

Perform "Top and Tail Edits" in the Linear or Wave domain if tracks have sloppy starts and finishes, use a reputable editing package such as Adobe Audition (Formerly Cool Edit) or Audacity.

Convert to MP3, as Hard Drive Space is not expensive, set ALTO MP3 Maker or Adobe Audition to use 44.1 KHz Sampling Rate, 256 K Bit Sec Bit Rate in Stereo for best MP3 Audio Quality.

Enter track names and other details as required with particular attention to correct File Extensions.

Do not attempt to perform other Editing Functions such as Equalization or Level Changes as this will likely result in an audible quality loss.

Normalize the Audio Levels on Ripped Tracks using MP3 Gain.

Listen to the Ripped Tracks through a High Quality Monitor System using High Quality Speakers.

Transfer to required location in File Server.

Computer Speakers, Public Address Speakers or even expensive Headphones are not suitable to accurately judge Audio Quality.

**Please Note:** Unlike Quality Commercial CD Players, there is no really effective Error Correction System in place when Ripping CD's meaning that even slight surface damage can result in Clicks and Dropouts.

All MP3 Audio Files for playback from a PC, **Must** be done to the same Sampling and Bit Rate to allow seamless transition from one track to the next.

Audio Levels on poorly mastered CD's, can vary as much as 9 dB between individual track on the same CD, and as much as 12 dB between tracks on different CD's making it mandatory to use an effective Normaliser such as **MP3 Gain** when creating Audio Files suitable for Automated Playback.

**MP3 Gain** is a benign Normaliser or Audio Leveller working on the principle of analyzing the Loudness of each track and then produces a level correction figure in dB's that can be applied as required.

Certain other Audio Normalisers operate by sensing Audio Peaks and automatically sets the track gain from these peaks.

Results from this can be severely misleading or false if the peak sensed is caused by surface damage to the CD or clicks or accidental transients present from the recording or mastering process, a fairly common problem with cheap CD Compilations.

44.1 KHz Audio Files ripped to MP3 at 256 K Bit Sec from good CD's will produce excellent sound.

If a particular MP3 file sounds bad, the problem is most likely the CD itself being badly recorded, or badly mastered, or suffering from Data Errors caused by Surface damage.

More about CD Players and CD problems later in this.

### **LP Records to MP3 Audio Files for Announcer Assist or Automated Playback**

Selected rare and unusual tracks from LP Records in good condition are potentially of great interest to some listeners.

Sound from LP's, when carefully transcribed to Computerised Audio Files can be exceptionally good rivalling CD's for Audio Quality.

Equipment needed is a Commercial Turntable such as the Technics SL1200, a High Quality Pick Up Cartridge such as the Stanton 500 AL, and most important, a Professional Equalizer-Pre Amp such as the Elan Audio UPP-01 featuring passive HF Equalization.

Also needed is an Audio Editing Software Programme such as Adobe Audition:2 which comes with a De-Clicking or Vinyl Restoration routine which is very useful for removing Audio Transients or “Clicks” caused by dust or surface scratches.

Cheap Domestic Turntables available from Electronic Hobby Shops for around \$ 100.00c suffer from Wow and Flutter and inaccurate Equalization and simply not good enough for serious applications.

### **Transcription from LP to Digital Audio File using Adobe Audition:2**

Transfer all tracks on one side of LP to Hard Drive using 44.1 KHz 16 Bit Linear format.

Top and Tail tracks and save as separate files, discard unwanted tracks, carefully remove surface noise and clicks using the De-Clicking facility, take care not to remove wanted sounds.

Convert the stored 16 Bit Linear Audio Files to MP3 using 44.1 KHz Sampling Rate, 256 K Bit Sec Bit Rate in Stereo.

Enter track names and other details as required with particular attention to correct File Extensions.

Normalise Audio Levels on Ripped Tracks using MP3 Gain.

Transfer to required location in File Server.

Listen to the Ripped Tracks through a High Quality Monitor System and High Quality Speakers.

### **Recording of Voice, and Production of “Audio Spots” to MP3 Audio Files**

In addition to Voice, “Audio Spots” such as Station ID’s, Community Announcements, Commercials and Sponsorship Messages often feature a Music Bed and Sound Effects.

For these to be effective rather than irritating, “Audio Spots” must be produced to give the highest possible audio quality by using **44.1 KHz Wave Format** and then converted to MP3.

Voice Recording and Production can be done in a dedicated Production Studio, or in the “Standby Studio” provided these have good Acoustics.

Equipment needed is a High Quality Microphone, Audio Mixer, CD Player, Personal Computer with suitable Software such as Adobe Audition or Audacity, Alto MP3 Maker, MP3 Gain, Quality Sound Card and CD Burner, and most important Monitor Quality Headphones and a High Quality Loudspeaker Monitor System.

More about PC's, Monitor Quality Headphones and Loudspeaker Monitor Systems later in this.

First record the Voice Track, take care that Audio Levels are correct, listen carefully on playback for "Popping" and Distortion and mistakes through the Loudspeaker Monitor System, Re-Do the "Take" if necessary.

Perform "Top and Tail" edits, do any necessary minor level adjustments and equalization, carefully listen to recorded material again.

Transfer or Record Music Bed and Sound Effects to separate tracks on PC Audio Editor.

Mix Voice, Music Bed and Sound Effects as required and carefully listen to the final material.

If result is not satisfactory, Re-Do the mix, when satisfied name and archive the mix as a 44.1 KHz Wave File.

Rip or convert the 44.1 KHz Wave File to 44.1 KHz 256 K Bit Sec MP3, Normalize using MP3 Gain enter all necessary details as required with particular attention to correct File Extensions.

Transfer to required location in File Server.

### **Recording and Editing of Field Interviews for MP3 Playback**

Portable Compact Cassette, Mini Disk and Solid State Flash Recorders are used for recording interviews away from the station.

High Quality portable Monophonic Compact Cassette Recorders are still being manufactured in Japan by Marantz, and capable of very good results when used with High Quality Compact Cassette Tape.

Portable Mini Disk Recorders are "On Their Way Out".

They were never particularly good for anything anyway, being rather fragile and using a unique Audio Compression Format that did not translate to MP3 particularly well.

OK for speech, but in reality unsatisfactory for music.

Portable Solid State Flash Recorders such as the EDIROL R-1 and several Models made by Marantz such as the PMD 660, PMD 670 and PMD 671 are becoming the standard for serious Field Recording.

All of the above mentioned types use professional Compact Flash Memory Cards, now available in sizes up to 8 Gigabytes, and capable of recording CD Quality Wave Files as well as direct to 44.1 KHz MP3 at various bit rates, including 256 K Bit Sec and offer fast transfer to PC via USB.

### **Transfer of Audio from Compact Cassette to Computer System**

Do Analogue Transfer to PC using 44.1 KHz Wave file, take particular care to get audio levels correct.

Perform "Top and Tail" edits as necessary, do any necessary minor level adjustments and equalization, carefully listen to recorded material.

Rip or convert the 44.1 KHz Wave File to 44.1 KHz 256 K Bit Sec MP3 File, Normalize it using MP3 Gain enter all necessary details as required with particular attention to correct File Extensions.

Transfer to required location in File Server.

### **Transfer of Audio from Mini Disk to Computer System**

Exact same procedure as for Compact Cassette.

### **Transfer of Audio from Solid State Flash Recorder to Computer System**

Recording may be done as 44.1 KHz Wave File, or as a compressed MP3 File at 44.1 KHz 256 K Bit Sec.

Transfer to PC using USB Port, "Top and Tail" and perform minor adjustments as necessary, listen carefully to material.

If 44.1 KHz Wave File, "Rip" to 44.1 KHz 256 K Bit Sec MP3 File, Normalize it using MP3 Gain enter all necessary details as required with particular attention to correct File Extensions.

If 44.1 KHz 256 K Bit Sec MP3 File, simply Normalize it using MP3 Gain enter all necessary details as required with particular attention to correct File Extensions.

Transfer to required location in File Server.

### **Transfer of Audio Files from PC to CF or other types of Flash Memory Cards for use in Elan Audio REP-01, RAD-01 or other types of MP3 Players**

The REP-01 is a Single Compact Flash Card Player, designed primarily for use on Radio Broadcast Transmitter Sites as a truly reliable Emergency Programme Delivery System.

The RAD-01 is a Dual Compact Flash Card Player offering Sequential playback of "Spots" from one player and Pseudo Random, or Sequential Playback from the second player.

Both have many other potential applications where reliable unattended operation is required, such as basic Night Time Automation, Tourist Radio, Background Music, Information Kiosks, Museum Displays and other applications we may not have thought about.

Transfer of Audio Files is very simple and done via USB using a Flash Card Reader.

For Random Playback, Audio Files to be transferred are simply selected and Pasted to the CF Card.

For Sequential Playback, Audio Files **Must be Selected and Pasted** in the playback order required.

A Software Package, **PLAYLIST COPY V 0.9.0.1** using Winamp compatible playlists is available free from the internet and will save considerable time when creating sequential playlists.

Web Address is **[www.familie-kaluza.de/playlistcopy](http://www.familie-kaluza.de/playlistcopy)**

The same basic principles and techniques apply for transfer of Audio Files for use for playback on other MP3 players and to other types of Flash Memory Cards.

### **Transfer or "Burning" Audio Files from PC to Compact Disk blanks**

A common procedure familiar to just about everyone, can be done as Standard CD Format Wave Files or as MP3 Files.

### **Some Notes about CD Players, CD's and "Burnt" CD's**

#### **Always use High Quality Blanks, Copy preferably at 4 x Speed, or 8 x Speed as maximum**

Commercial CD Players suitable for broadcast applications all have Advanced Error Correction Circuitry, High Quality Digital to Analogue Converters and produce High Quality Sound.

Commercial CD Players also have a number of very practical operational features such as Fast Cue to Start of Music, Play Single Track then stop, Track Lockout, "Spin Dial" for easy Track Selection and Remote Start making them nice and easy for use in Broadcast Applications.

Unfortunately, the Error Correction, vital for high audio quality, also makes them sensitive or intolerant of "Bad or Damaged" CD's.

Generally, cheap CD Players, DVD Players and Computer CD Drives have only very basic or no Error Correction at all and for that reason highly tolerant of "Bad" CD's.

Most of these sound OK on good CD's, but can sound quite rough on "Bad or Damaged" CD's.

Rough sounding Audio Files "Ripped" from CD's may in fact be caused by Data Errors not detected or rejected by the Computer System.

A Computer Program, CD/DVD Diagnostics will evaluate the condition of a CD and report in this which can be very useful in settling the common dispute, "Why won't the Studio CD Player play this recording, it plays OK on my DVD Player at home".

The CD/DVD Program is available from Infina Dyne for \$ 49.99c US from the Internet.

Web address is [www.infinadyne.com](http://www.infinadyne.com)

CD's in good condition, manufactured by reputable Recording Companies to the CD Redbook Specifications, generally produce good sound quality, have correct audio or recording levels, always manufactured as proper "Pressings" and usually does not present problems.

Cheap CD Compilations from relatively unknown companies often produce sound quality too low to use for broadcast, audio levels all over the place, undetected "Phase Flips" causing cancellation of centre channel Mono Information and are, we suspect in some cases "Burnt" copies rather than pressings.

Private or local CD's, such as recordings of local "Bands" bought at the door of Venues are almost without exception "Burnt" CD's.

Sound quality from these might be excellent, or in might be absolutely terrible requiring very careful auditioning to determine whether it is suitable for broadcasting.

### **Some general observations**

CD's "Burnt" at high speed, particularly on to cheap low quality blanks usually suffer from Data Errors.

CD "Burn" or writing speeds higher than 8 Times should be avoided.

Cheap CD Blanks generally produce excessive Data Errors, particularly at high writing speeds.

Cheap CD Blanks generally deteriorate and does not retain Data for prolonged periods.

Cheap CD Blanks are “Bright Shiny Objects” suitable only to hang on Fruit Trees to scare Birds away.

Some Commercial and Domestic CD, and nearly all DVD Players will play MP3 Audio Files.

### **Some notes about Monitoring**

Listening carefully to check the prepared Audio Files for Distortion, Sonic Balance, General Audio Level, Clicks, Dropouts and the Start and Finish on individual Audio Tracks through a professional quality Monitor System is extremely important.

A Professional Quality Monitor System consists of a Professional Quality Monitor Amplifier, and a pair of Monitor Quality Loudspeakers.

Some Hi-Fi Amplifiers may be suitable for Monitoring while others have specific characteristics causing changes and colorization to the sound.

Public Address Amplifiers are generally completely unsuitable for serious monitoring.

The Elan Audio RMA-01 is a completely benign and neutral Professional 30 Watt per Channel Stereo Amplifier with Low Noise and Distortion and Flat Frequency Response, designed specifically for use in Broadcast and Recording applications and highly recommended.

Monitor Quality Loudspeakers like the Monitor Amplifier must be completely benign, accurate and neutral with Low Distortion and a Flat Frequency Response and able to tell you what you have got.

Many Hi-Fi Loudspeakers are very “Honest” featuring a Sharp Transient Response and Flat Frequency Response and eminently suitable for use as Monitor Speakers.

Others are designed to be “Flattering” having a rather relaxed and lazy Transient Response which tends to hide minor imperfections and often a peak in the LF response making them sound “Boomy” and for those reasons not suitable for use as Monitor Speakers.

Small Lightweight Loudspeakers, most Computer Speakers and virtually all Public Address Speakers are completely useless for use as Monitor Speakers.

Headphones, even expensive ones are not really suitable for serious quality monitoring.

## **A small selection of affordable Loudspeakers suitable for Monitoring**

Types available from Elan Audio

Landmark	Australia		LM-TB	Near-Field Monitors
Landmark	Australia		LM-1B	Air Studio Monitors
Energy	Canada/China	Connoisseur	RC-10B	Hi-Fi Bookshelf Speakers
Energy	Canada/China	Athena	WS-15/AS-P4000	Satellite-Sub Woofer
Altec Lansing	USA/China	Computer Spkr	MX 5021	Powered Satellite-Sub

## **Web Addresses for Audio Software**

ALTO MP3 Maker	<a href="http://www.yuansoft.com">www.yuansoft.com</a>
Adobe Audition	<a href="http://www.adobe.com/products/audition/">www.adobe.com/products/audition/</a>
Audacity	<a href="http://audacity.sourceforge.net">http://audacity.sourceforge.net</a>
MP3 Gain	<a href="http://mp3gain.sourceforge.net">http://mp3gain.sourceforge.net</a>
Infinadyne CD/DVD Program	<a href="http://WWW.infinadyne.com">WWW.infinadyne.com</a>
Playlist Copy V0.9.0.1	<a href="http://WWW.familie-kaluza.de/playlistcopy">WWW.familie-kaluza.de/playlistcopy</a>

## **Digital Audio Delivery Software**

A very large number of Announcer Assist and Broadcast Automation Programs are available from many different suppliers.

Some of these are very comprehensive and expensive and suit large Commercial and Government Radio Stations.

Others are fairly basic and may suit the smaller Community Radio Stations.

Some are even available free from the Internet.

Choice of which to select is entirely up to the Broadcaster and not discussed here.

## **Format Conversion**

Generally, it is not a good idea to convert Compressed Audio Files from one format to another.

If Conversion is inevitable, use a reputable Software Package such as Adobe Audition that uses the genuine Fraunhofer MPEG Audio Compression Algorithms.

In our experience Adobe Audition cause minimum Audio Quality Loss by converting MP3 Files to Linear Wave Files that are then converted to the new format.

Experiments conducted at Elan Audio using some "Universal" Conversion Programs obtained from the Internet, based on Mathematical Conversion techniques were found to be "Unbelievably Bad".

A fairly simple conversion from 44.1 KHz Wave to 48 KHz Wave produced noticeable artefacts.

Conversion from 44.1 KHz 256 K Bit to 44.1 KHz 128 K Bit was reasonable but not brilliant.

Conversion from 44.1 KHz 256 K Bit to 44.1 KHz 160 K Bit was absolutely shocking.

Conversion from 44.1 KHz 128 K Bit to 32 KHz 128 K Bit was very, very bad.

If absolutely necessary to convert to a lower Bit Rate to save storage space on Compact Flash Media, for use on the Elan Audio REP-01 or RAD-01, we suggest using Adobe Audition rather than the Universal "Number Crunching" Software.

Digital Audio Files obtained from the Internet, judging from listening tests on high quality monitoring equipment varied from quite acceptable to very bad and should be used only as an absolutely last resort.

## **Our final recommendations**

Following the recommendations shown below, will guarantee superb sound from your Radio Station.

Following them also gives you a "Sporting Chance" that the Digital Audio Files will be good enough to use for Digital Radio Broadcasting, if and when this becomes a reality.

**Hard Drive Capacity is not expensive, so why not aim for the best possible audio quality**

### **Do's**

Carefully prepare your own Digital Audio Files from known good CD's and other quality audio sources.

Rip to Hard Drive, Top and Tail files to get tight Starts and Finishes but do not attempt to do any other form of editing.

Convert to MP3 using Ato MP3 Maker or Adobe Audition at 44.1 KHz, Sampling Rate 256 K Bits per Second.

Enter track names and other details as required with particular attention to correct File Extensions.

Normalize audio levels using MP3 Gain.

Listen carefully to each Track through a High Quality Monitor System with High Quality Speakers.

Transfer Audio File to required location in File Server.

## **Don'ts**

Avoid taking Audio Files from the Internet unless absolutely necessary.

Avoid making Sample Rate, Bit Rate and Compression Format changes if at all possible.

Never use Arithmetical or "Number Crunching" Data Format Changing Software.

Other than in performing an emergency "Top and Tail", never edit Compressed Audio Files.

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