

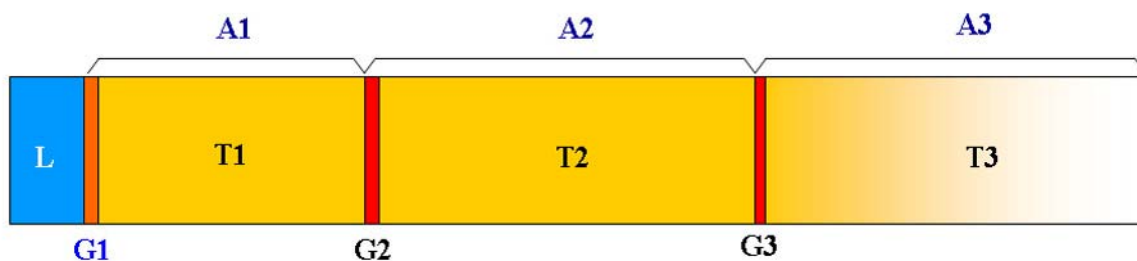
This guide is meant to introduce the community members to an effective comprehension of EAC interaction with the audio CD layout as well as the best options on extraction methods and reconstruction of a perfect, 1:1 image of the original disc. Firstly the present analysis will deal with the interface between an audio CD and the inner workings of our extracting tool, then how disc images are rebuilt by means of cuesheets; then again, we will thoroughly deal on the peculiar problems posed by the odd presence of a first track pregap, both silent or musical. I must ask for your comprehension for what will surely read by many as long-winded intro - but in these months I noticed a certain amount of misconceptions about these topics, so I think some analytical arguments could be worthwhile here for clarity's sake.

The CD layout

The Red Book standard for audio CDs has the album layout written in its Leadin, the inner zone where standalone players - or computer audio players - can read the necessary information about the disc structure: we usually refer to this as TOC or Table of Contents. When trying to extract and successively reconstruct a 1:1 CD image, we are forced to consider not only its actual **contents** (musical tracks and gaps included, the more so when we know from experience that pauses can contain music or other sonics as well) but its **layout** too. The whole disc image is usually split between a starting **Leadin**, musical segments [**Tracks**] and intermissions or pauses, which may be silent or not [**Gaps**]. The first thing which has to be conceptually grasped when dealing with CD layouts is the different meaning of the “Track” term when referring to audio CDs confronted with EAC extraction methods. Indeed, an **Audio Track** is made up by joining a pregap with its following musical content, that is on more analytical terms

Audio CD track = Gap + Musical track
An = Gn + Tn

We all know from experience that very often Gn is absent, that is each tracks flows directly in the following one. In this case, the Audio track will simply coincide with its correspondent musical segment, so **An = Tn**. The audio CD layout can be roughly described by the following image:



Graphical representation of an Audio CD layout

Where
 L = **Leadin** (always 02:00 length)
 Gn = **Gap** / intro to Tn
 Tn = **Track** = Musical segment of an audio track
 An = **Audio CD track**

The CD layout is marked on its temporal course by a succession of **Indexes**: after the starting 02:00 leadin, the starting point of each Gn gap is defined **Index 00**; its ending point which forms simultaneously the starting point of each Tn track is defined **Index 01**. So, every complete An audio track unwinds between the n Index 00 and its next one. This assuming the presence of gaps between each track: if there is no pause between Tn-1 and Tn so Gn = 0, there will be no Index 00 and the n audio track will be delimited from its Index 01 and the next marked Index. Sometimes we find other track subindexes which are nevertheless not pertinent to this guide's purposes. Moreover, except for classical audio CDs, the presence of G1 is uncommon.

What must be stressed is that though from a **conceptual** point of view gaps do not really "belong" to tracks, since the Table of Contents merely depicts a succession of musical sections alternating with pauses [and that's everything it has to do, since it does not bother with audio extractions and / or reconstruction of images], the **actual** organisation of the audio CD layout has indeed gaps as (mostly silent) **intros** to the following musical contents, hence the term **pregap** which comes usually applied to pauses. This can be easily verified considering the display of your cd player at the end of a track followed by a silent pause: **the tracknumber changes at once** [Index 0 appears], then a countdown of the length of the pregap unfolds: when the music starts [Index 1 appears and stays there until the end of the track], the countdown reaches zero, changes its course and assumes positive values. So the CD audio track starts indeed not with the music, instead with its previous silent intro: though it may sound a bit illogical having an audio track actually starting with silence, this is the way a CD layout is organised. We do not usually experience this on everyday listening since the cd player skips Index 00 and start reproducing the musical content of the audio track from Index 01, so the actual fact we're actually past the very start of the track is conceptually missed (all of this always assuming the presence of a pregap: if not, we already know there's no silent intro and no Index 00) A further prove of this – and we anticipate here some of the following arguments, though most of you is already familiar with them – is given by simply reading an 'Image' cuesheet of the audio cd, that is a textfile description of the disc layout considered as a unity, where the pattern you get is always consistent with an audio track starting with its Index 00 through Index 01 and ending to the next audio track's intro:

PERFORMER "Peter Erskine"	
TITLE "You Never Know"	
FILE "Range.wav" WAVE	
TRACK 01 AUDIO	
TITLE "New old age"	
PERFORMER "Peter Erskine"	
INDEX 00 00:00:00	
INDEX 01 00:00:33	A1
TRACK 02 AUDIO	
TITLE "Clapperclowe"	
PERFORMER "Peter Erskine"	
INDEX 00 09:26:23	
INDEX 01 09:30:55	A2
TRACK 03 AUDIO	
TITLE "On the lake"	
PERFORMER "Peter Erskine"	
INDEX 00 14:22:30	
INDEX 01 14:25:65	A3
TRACK 04 AUDIO	
TITLE "Amber waves"	
PERFORMER "Peter Erskine"	
INDEX 00 19:29:45	
INDEX 01 19:33:35	

This example is taken from a CD which presents significant gaps between each track: as you can clearly see, Indexes 00 are the first portion of each track so they reveal for what they actually are: **pregaps of the musical content**.

Nevertheless, it's a common misconceived opinion that gaps aren't anything but silent endings of tracks, so every Gn should actually be tied to its previous Tn-1; if from a conceptual point of view this can have the same degree of correctness as considering them as silent intros [actually they're neither endings nor intros: they're just **intervals**], as we stated above from the standpoint of **actual CD layout** structure this is plainly wrong. This diffuse misconception comes essentially from two reasons, the first one being the above mentioned working of cd players who seeks directly for musical content = Indexes 01, thus leading to the wrong conviction that anything coming before, including the track pregap, is part of the previous audio track; and the second one is based on EAC's widespread diffusion as 'the' reference audio extractor. EAC's default extraction method (that is, the one working before performing the gap detection / F4, with the last part of the 'Action' menu where the extraction methods are listed greyed out and not accessible) is the one **appending gaps to the previous tracks**: this makes people consider the gap as a sort of natural ending of the previous track, confusing a tool extraction method with the actual structure of the audio CD and forgetting that the primary target of audio extractors like EAC was not the reconstruction of a perfect disc image (the more so when dealing with multiple-tracks ripping), but instead the creation of playlists for computer listening, in a time when every PC audio player was unable to deal with cuesheets and seeking for a proper Index 01: from here the necessity of having the music start at the very beginning of the audio track (people wouldn't have accepted a musical file starting with silence), so the intros were forced to stick to the previous material indeed. All of this has become a sort of unofficial standard, the more so for people who listen to music primarily on their computer audio system who actually believe the term pregap meaning its conceptual opposite, that is pauses being end of the previous track. A third reason could well be that, since in most cases there is not a proper first track pregap (not to be confused with the leadin, which is of altogether different nature), the first pause on the disc is commonly the one between T1 and T2, and this too can induce to think that gaps belong to what comes before. – As a last note on this argument, and here too introducing a later topic, it has to be pointed out that in considering gaps as the last part of what precedes them, and setting extraction tools according this standpoint, we obtain as a practical by-product that G1 is left discarded since there is no previous material to append it to: thus denying any correct native reconstruction of the complete disc image.

The cuesheet parade

A cuesheet is a simple ASCII based textfile (of .cue extension) which contains all the necessary informations on the CD layout / image subdivision along with additional strings on title, album, performers, ISRC code etc.. Combined with its proper audio file(s), it's the key tool for a correct reconstruction of the disc image. As seen above, and concerning the CD layout, for a correct reading of a .cue file we must keep in mind that:

Index **00** = start of the gap

Index **01** = start of the track / musical content, end of the previous gap

So every track which is not preceded by a pause will not have an Index 00. A CD player (or a computer audio player who reads correctly cuesheets) skips altogether Indexes 00 and start directly playing from Index 01. Another thing we should remember about cuesheets is that they display the time in **MSF** structure [that is minutes : seconds : **frames**] and since there are 75 frames in one

second, when e.g. we have a track pregap of 44 h/s we will read it in our cuesheet in the following way:

Index 00: 00:00:00

Index 01: 00:00:33

We could well adjust EAC settings to adjust its time settings to MSF too, but it's an open choice to users. So, cuesheets are essential instruments for reproducing the extracted cd image, be it in audio players which supports them [Foobar, Winamp] as well as in burning applications [EAC, Burrn] which read from them the structure of the disc they're about to write. Since our analysis deals with the correct image reconstruction of the audio extracted with EAC, we will consider now the four kind of cuesheet our extracting tool can write. They are, as stated from the 'Action' menu:

1. Single-wav or '**Image**' cuesheet
2. Multiple .wav files with Gaps... (**Noncompliant**)
3. Multiple .wav files with **Leftout** Gaps
4. Multiple .wav files with **Corrected** Gaps

1. - Image cuesheet / Audiophiles extracting audio CD for archiving purposals are usually fine with a single complete image of the album associated with a single-wav cuesheet, so they simply tell EAC to perform a [Copy Image + create cuesheet] from the 'Action' menu before encoding the musical file to their preferred lossless format. Even though the association of an extracted single-wav image with its proper cuesheet **does always rebuild an exact, 1:1 image** of the audio CD, this method has a serious drawback up to now: though promised for future versions, even the latest EAC beta does not deliver Test & Copy workings on single images yet: so users cannot operate a CRC matching on the usual double-reading we're accustomed to with multiple-track ripping. Furthermore, this is one of the reasons behind the forbiddance to upload single-wav releases on this tracker (the other one being that, in the presence of a defective spot, users would be forced to re-download the whole release). So as far as this community is concerned, we will not consider this extraction method for the time being. Leaving aside cuesheet use, there are other options in EAC for extracting audio content as 'Copy range' [for specific portions of the CD image] and the useful 'Copy selected tracks index-based' which we'll consider later, but for the time being we will stick on **multiple-wavs extraction** methods. Now, as mentioned above, EAC ignores by default the presence of Indexes 00 and considers only Indexes 01 [when inserting a disc, you will see from the 'Action' menu that extraction methods are greyed and the 'append gap to previous track (default)' is checked. This practically means that pauses are extracted together with their previous musical content: that is, EAC will extract T1 + G2 as first .wav, T2 + G3 as second .wav and so on]. If we want to have control on how EAC extract our digital files, the first thing we must perform after inserting a disc is press **F4: Gap detection**. EAC computes pauses' lengths, makes Indexes 00 visible and opens up the last part of the 'Action' menu, where we can choose from these three different approaches to multi-track audio extraction, remembering to associate the correct kind of cuesheet by telling EAC which one to write before starting the audio extraction.

2. - Noncompliant cuesheet / The term 'Noncompliant' refers here to the fact that the greater part of audio tools do not deal with this peculiar though widespread kind of cuesheet, which is associated with EAC's default extraction method: that is, as introduced above, the one which **appends gaps to the previous tracks**. In analytical terms, we have

$$A_{n-1} = T_{n-1} + G_n$$

$$A_n = T_n + G_{n+1}$$

... and so on, since every pause is tied to its previous musical content before being extracted on multiple .wavs: the content of these extracted files is forcibly different from their counterpart on the original CD. Thus the 'noncompliant' word assumes a wider meaning, since it comes associated with an **Index-shifting** extraction methodology with disrupts the correct image of audio CDs for what the extracted files are concerned (though when they are merged again in the burned copy through our Noncompliant .cuesheet things are in most cases fixed back). Now, since this deals directly with how things are working on this community – whose rules actually **prescribe** the use of EAC's default extraction methods combined with the Noncompliant cuesheet – and since this is the overall most common extraction method, it is worthwhile to deepen this topic a little further.

First of all, we must define what we actually mean when speaking of 1:1 copy of the original audio CD. The point which has to be made very clear is: the actual contents of a disc does not limit itself to the digital data written on its surface, but obviously covers how this material is **organized**; that is, the CD layout. So, a true 1:1 copy will not only have the same digital contents (on which a successful bit-for-bit comparison can be executed), but these contents will have to be systematized as they are on the original. Given this, having EAC by default appending gaps to previous tracks leads to a severe **modifying** of the layout: we have seen that the actual content of the extracted .wavs is different from the corresponding original audio tracks, since pauses have been shifted from the start of a track to the end of the previous one. So, if we're serious about keeping lossless digital copies of our original CDs for archival purposes, we should avoid this methodology.

But, starting from our index-shifted .wavs, is it still possible to rebuild a correct 1:1 image when we set to burn a cd-r copy? The answer is yes, provided that we actually use our Noncompliant cuesheet with those application able to read it: currently speaking, **EAC** and **Burrn** do rebuild a perfect image, since they correctly write back the original indexes while merging the multiple .wav files in a single image. But if we burn our copy with tools **unable of dealing with cuesheets** [e.g.: Nero], they will limit themselves to write our multiple .wavs sequentially with no concerning / possibility of bringing back Indexes 00 to their correct position: so we still have our contents back, but **the original CD layout is lost**. Our cd player display will show no Index 00 anymore, original pauses will be there but unmarked and merged on a displaced position. This of course won't mean a lot for the majority of users: after all, the music will still be there. But if our question remains if we will always get a true 1:1 copy back, the answer will be: not always, it depends on which tool we rely for burning our extracted image. Anyway, sticking with EAC warrants perfect results, as anyone can easily verify confronting an Image .cue of the original audio CD with another one of the burned cd-r copy through our Noncompliant friend. Well, this **in most cases**, since things changes again in the presence of a **first track pregap** in the original. This will be addressed a little later.

3. Leftout Gaps cuesheet / This rarely adopted cuesheet has to be associated with the most **unrecommended** extraction method, that is the '**Leave out Gaps**' one which replaces all pauses with digital silence

$$A_n = G_n^* + T_n$$

Where G_n^* is **not** the original pause (which can contain music, applause, intros etc..) since EAC erases it and replaces it with digital silence of the same length. So the audio contents are irreversibly altered and this extraction method will **not rebuild an exact, 1:1 copy**, except in the most uncommon case of an audio CD with no gaps at all (classical with a single opus performed, some live recordings etc..). We can confidently ignore this methodology altogether.

4. Corrected Gaps cuesheet / The naming of this cuesheet is indeed a misleading one, since it depicts the CD layout as actually written in the Table of Contents. Most presumably we must read

‘corrected’ gaps relating to EAC’s default way of dealing with them. Matter of fact, this last kind of cuesheet has to be associated with the ‘**append gaps to next track**’ extraction method, the one perfectly coherent with the CD layout since every extracted .wav file has its relative pause correctly written at the start as Index 00:

$$A_n = T_n + G_n$$

The association of this ripping methods with the Corrected gaps .cue **does always rebuild an exact, 1:1 image** of the original. The reason for this operating method being strangely underemployed (and by the way prohibited by this tracker’s rules) lies on the fact that most computer audio players still do not recognize cuesheets, so they start playing on each track’s Index 00 and users are forced to listen to the silent pause before the music actually start. Again, this is fully understandable if the main priority is computer listening of single files / songs. Anyway, this method will be very handy in the special case of a lengthy musical first track pregap, as we will see later.

Enter G1, and the beauty of Images

We will now deal with the issues created by the presence of a **first track pregap** (G1) on the original CD layout. Leaving aside for the time being the very infrequent case of a musical track hidden inside the pregap, the intro to track #1 is usually made of a very short portion of digital silence or ambience sonics, and it’s frequent on classical discs, less common on jazz releases and quite uncommon in other kind of musical CDs. Anyway, its occurrence poses no problem whatsoever when we extract the audio content as a single image, or when we set EAC to append gaps to the next musical tracks: but since the most diffuse – and the only one permitted here – extraction method is EAC’s default one [as seen above, the one which **appends gaps to their previous content**], it is intuitive enough what happens: since there is no previous track to append it, G1 is left discarded and only a partial extraction of the disc content is performed. So, once detected the presence of G1 on the original, we are faced with the problem of how to deal with our potential missing content: our analysis must firstly concentrate on the effects of the missing G1 on the successive rebuilding of the CD image, and secondly on the available devices to work them out. Starting from a **conceptual** point of view, things are plainly simple: if the original disc presents the first track pregap and the releaser omits to provide it, the strict concept of exact, 1:1 image is broken regardless any rebuilding option we can later adopt.

Of course, this is a very radical statement and isn’t telling the whole story, so a natural step further could be considering it from a **practical** standpoint by exploring its different corners. The next logical move is to find out the **nature** of the pregap, that is if G1 is completely made of digital silence or not. This is easily done by EAC’s **F3** function ‘**Test Gaps on Silence**’, to perform after the gap detection.

Testing gaps on silence			
Gap before track	Length	Silence	Peak Level
Track 1	0:00:00.44	0.0 %	0.04 %
Track 2	0:00:04.42	0.0 %	0.01 %
Track 3	0:00:03.46	0.0 %	0.00 %
Track 4	0:00:03.86	0.0 %	0.02 %
Track 5	0:00:02.93	0.0 %	0.00 %
Track 6	0:00:02.44	0.0 %	0.00 %
Track 7	0:00:03.26	0.0 %	0.02 %
Track 8	0:00:02.90	0.0 %	0.00 %
Track 9	0:00:03.02	0.0 %	0.00 %

If G1 is showing a peak value different from 0,00% as in this example, this leads to the conclusion that some ambience has sneaked inside G1 and we cannot speak anymore of silent pregap, even if normally its content is beyond the audibility threshold: once again, the original material is needed if we mean seriously when we speak of exact 1:1 image.

If G1 shows a peak value of 0,00% we can confidently assume that the pregap is matter-of-fact utterly **silent**, and this means that we can temporarily drop the sheer notion of exact, 1:1 image taken from its conceptual essence, and consider the possibility of getting a practical, '**performing**' exact copy by replacing the original silent pregap with another identical tract of digital silence. Briefly, if we know the length of the original G1, all we need is rebuild a similar portion of audio material, have it silenced / peaked at 0,00% it and placed it before T1's Index 01. Conceptually, we're on different grounds: but anyone will agree that silence is silence, and not only the listening experience will be the same of the original disc [we are here dealing with extremes, since no one actually listens to digital pregaps anyway], but a bit-for-bit comparison as well will reveal no difference at all: hence an exact, performing 1:1 copy is (re)constructed.

Now, our analysis must proceed on further specifying according to the kind of digital copy we intend to keep, since there are substantial differences when forced to deal with the presence of G1 in the original disc. We approach here the most practical aspects on the whole argument, since there is a line to draw between users who want to keep a data image of the original for **archival purposes** (on their hard disk, or on dvd-r) and users who burn a physical, **cd-r copy** discarding the digital files altogether. Moreover, a further distinction must be made on what application is currently adopted by users when they set to burn their cd-r copy, since most of them do not deal with cuesheets at all, let alone Noncompliant ones.

As stated earlier, a great number of users currently deals with single-wav images of their original CDS, meaning that their operating tool has to be the 'Image' cuesheet which is based on a subsequent series of Indexes applied on single range.wav file (see example above). The *conditio sine qua non* for a correct working of the Single-wav cuesheet is the **completeness** of its corresponding digital image: that is, the single image must be fully coherent with the cd layout it describes. When dealing with multiple-track extractions, our single image is attained by merging together the resulting N files: now and again, if these files have been ripped with the usual extraction method which set EAC to appends gaps to their previous musical content, the odd presence of G1 leaves users with an **incomplete image**, just because there is not previous musical track before T1 to append its pregap, which is not therefore extracted by EAC and gets lost. This

also causes the practical inability of the ‘Image’ cuesheet: since it comes written with a correctly detected G1 as a ‘Pregap’ string before T1’s normal Index 01 (older versions of EAC before 0.95 beta 2 had it as an Index 00), when applied on a merged image which is missing of the brief portion of the original disc layout this will cause a most distressful **misplacement** of all Index 01 markers, with could be particularly bad in case of live recordings, gapless tracks etc... so, as a general rule: single-wav cuesheets must be only adopted when there is a **certainty** of a **complete** underneath image. All of this leads to the conclusion that users dealing with a single-file image and its corresponding ‘Image’ cuesheet (which incidentally can now be obtained from its equivalent Noncompliant one through the **CueTools** program – more info on Hydrogenaudio’s original thread) **do actually need G1** when the EAC logfile shows its presence.

But not only audiophiles who prefer to keep single image of their originals need physically the first track pregap: as stated earlier, until now only two applications are known to deal with Noncompliant cuesheets for burning a cd-r copy of the original disc, e.g. EAC (which is to be preferred anyway since users can set their drivers’ **write offset**) and Burrn. Moreover, and focusing firmly on our current issue, these programs correctly read the ‘pregap’ string from the cuesheet, assumes it peaked at 0,00% and write a silent duplicate of G1 before starting with the remaining content:

Title	Filenr	Track	Index	Absolute Position	Relative Position	Length
-	-	1	0	00:00,00	-	00:00,33
New Old Age	1	1	1	00:00,33	00:00,00	09:25,65
		2	0	09:26,23	09:25,65	00:04,32
Clapperclowe	2	3	1	09:30,55	00:00,00	04:51,50
		4	0	14:22,30	04:51,50	00:03,35
On The Lake	3	5	1	14:25,65	00:00,00	05:03,55
		6	0	19:29,45	05:03,55	00:03,65

This screenshot is taken from EAC 0.95 prebeta 5: as you can see any recent version of EAC **reads** correctly first track pregaps from the Noncompliant .cue, not only latest betas: so if G1 was correctly detected by EAC but **not written** in the cuesheet [this is the behaviour of the program’s prebetas, which only write G1 as an ‘Index 00’ line in the Single-wav cuesheet, and nothing in the Noncompliant .cue], we can detect the exact length of the pregap by the logfile and proceed to manually edit our cuesheet, which once loaded in EAC will correctly write a performing 1:1 copy, pregap included. So: users who only write physical cd-r copy of the originals with EAC or Burrn and do not care about archival images **do not need** G1. Nevertheless, people who usually adopt other burning tools [e.g. Nero, Feurio! etc.. which do not deal with cuesheet and simply write the multiple tracks in a sequential line] will still definitely miss the G1 part of the disc layout, and will be forced to manually add it, or tell the apps to apply a pre-pause to T1 (if they are bothered at all, but this is another question).

We can summarize: people who just need a transitory image for burning a copy with EAC or Burrn starting from the Noncompliant cuesheet **do not** actually need the first track pregap, since these programs rewrite a portion of digital silence to make the layout identical to the source disc. They will get a performing, 1:1 copy of the original: let’s stress it again, all of this is valid argument only if we have the certainty of a fully silent, 0,00% peaked G1, since otherwise a bit-for-bit comparison would reveal differences (though from the listening experience standpoint, things would be the same in a practical way). **Everyone else** [that is 1) people who want to keep an archival 1:1 copy for lossy transcoding, future reference, lossless playing directly from PC connected with home stereo equipments etc.. and 2) users who prefer / are forced to go with other applications when burning their cd-rs] do need G1 to be attached to the extracted musical content.

At this given point, the dedicated uploaders (who have come to understand that users can have various needs, and different ways of dealing with the musical content of their releases) could do worse than decide for the automatic **inclusion** of the first track pregap if present, and let users decide later if it can be of some utility or not: of course this inclusion should be **mandatory** in the event of a not fully silent G1, but in any case it will surely save some hassle to users who are keen on extracting single-file images and storing them for archival purposes, who will not be forced to manually create a duplicate of the missing pregap. – There remains the further question if the ‘Image’ cuesheet should be included or not in the release; though the newly written **CueTools** makes anyone able to draw it from the included Noncompliant .cue and it’s a very handy tool for past releases, since the inclusion of G1 presupposes in most cases the successive rebuilding of a single big file, the ‘Image’ cuesheet has to be there, especially when dealing with a not-fully-silent first track pregap (which is not duplicable). So the dedicated releaser should include the ‘Image’ .cue anyway, again keeping in mind that different users have different needs.

A bit of Techné

How to detect G1: The concerned releaser is now aware of the issues posed by the occurrence of the first track pregap on the original CD layout, so first of all he must detect its eventual presence. There are two ways of identifying G1 before starting the extraction: after inserting the disc and performed F4 / Gap detection, let’s consider the first track string. G1 is there if

- the start of the track as showed by EAC is not 00:00:00, but something like 00:00:42 (Third column);
- the lenght of the first track pregap as showed by EAC is longer than 02:00 seconds (Fifth column);

G1 is of course detectable after the extraction as well, so users too can check its presence after the downloading. Let’s consider:

- The length of the first track pregap as written in the **logfile**, which is again longer than 02:00;
- The presence of a PREGAP index in the Noncompliant **cuesheet** [only from EAC 0.95 latest versions: older prebetas show G1 as ‘Index 00’ and only in the ‘Image’ cuesheet]

How to extract G1 Index-based: Once detected G1, the releaser will control if it’s utterly silent or not by performing F3 / Test Gaps on Silence: a **screenshot** of the results should be included, the more so when G1 is peaked at 0,00% and the releaser could therefore decide of halting here and not including it, on the (somehow restricted) assumption that most people will not need it. However, if he correctly decides to include G1, he will firstly perform the usual audio extraction; then he will set to another **Index-based** one, ripping this time only the first track in order to get G1. Adopting as exempla the Peter Erskine cd seen above, the next releaser’s steps will be:

1) Create the Single-wav or ‘Image’ cuesheet: with the gaps detected by pressing F4 or by having previously created the required Noncompliant cuesheet, is simply written by EAC with **Alt+S** and could be well manually re-named accordingly the album name (e.g. from range.wav to You Never Know.wav on its third line). This cuesheet will provide the necessary index for burning and / or playing the final single-wav image of the disc.

2) Select only the first track, then: [**Action - Copy Selected Tracks Index-Based**]. Important! Remember to save those files **in a different folder** and then cut'n'paste, otherwise your original logfile will be overwritten by EAC!

This way of extraction splits the first track in two parts:

01.00 - Trackname (covering from Index 00 to Index 01)

01.01 - Trackname (covering from Index 01 to the end of the track)

Obviously discard the 01.01 part (which has been already ripped anyway) and keep only the **01.00 - Trackname**. This tiny .flac file will be added to the release package: of course it has to be considered as an **extra**, being not "Pedro-compliant" (not tested before ripping, no CRC etc...) and it's not part of playlists, tracklist info etc... To avoid confusion with filenames I suggest to rename it following the scheme "Album name - First track pregap.flac", so for example

01.00 - 01. New old age.flac

should be renamed to

You Never Know - **First track pregap.flac**

Add this little file to your release and you're done. It makes no big difference if you add this file compressed or not. Being normally some half second of digital silence, its dimensions are really tiny compared to the normal musical files so the release size is left substantially untouched (e.g. 44/100 of second or 33 frames make for 76 Kb as a .wav file or 5 Kb as a .flac, in the event of a fully silent G1). Moreover, it is of no practical relevance if the file comes tagged or not, because its final use is to be merged with the whole content of the disc, and not to be played as musical file. Just keep up with your usual way: my personal preference is of course to let EAC compress and tag the files through the additional commandline, but anyone can follow his personal path here].

How to manually create a silent clone of G1. The short cut is here to create with an audio editor a pregap file of the length showed by the logfile or by the cuesheet, and append it at the start of the musical content. Since we're dealing with digital silence, there are no problems at all to copy and paste a portion of the necessary length from another source. You can make use of a previously downloaded pregap file, or else take a short silent musical section whatsoever and have it of the necessary length. Just open the tiny silent file in your chosen audio editor (e.g. Adobe Audition, Nero wave-editor etc..) and:

- if longer, cut it precisely at the length needed showed by the logfile or the cuesheet;
- if shorter, copy'n'paste the needed section: for example, if you have a 44/100 "First track pregap" file to work with and the EAC logfile shows a first track pre-gap length of 2:56, simply copy the last 12/100 from the original file and append it at the end.

Save the file as usual: "Albumname - First track pregap.flac". You can of course decompress and work with .wav files, if your audio editor does not have a flac plugin with which directly operate with .flacs.

How to recreate an 1:1 image by means of G1: The ‘dedicated’ user wishing to rebuild the 1:1 image of the disc must append G1 before the musical content of the release, then decompress a single .wav image file for burning with the included ‘Image’ cuesheet. Now, there are many programs able to merge musical files and anyone can go their own way: the important thing is to get the pregap file appended before the first track. I will restrain myself to only illustrate a simple way to get the desired output using **Foobar 2000**.

[Playlist - Add file] Create a new playlist and add the .flac files of the release in this order: first the pregap file, then the cd tracks (better, open the .flac playlist if included on the release, which will display all the musical files in the proper order). You will get for example:

1. You Never Know - First track pregap.flac
2. Peter Erskine - You Never Know - #1 - New old age
3. Peter Erskine - You Never Know - #2 - Clapperclowe
4. Peter Erskine - You Never Know - #3 - On the lake
- ...
- ...
12. Peter Erskine - You Never Know - #9 - Everything I love

Now select all - right-click, from the menu: [Convert - **Run conversion, single file output**]. You should name the single-wav file accordingly to the third line of the “Image cuesheet” e.g. You Never Know.wav, or Range.wav... so check the cuesheet. Be sure to have the Foobar’s diskwriter conversion settings to:

Output presets: WAV (PCM, fixed-point)
Output file name formatting: %_filename%

Point the output to a dedicated subfolder in which you will have copied the ‘Image’ cuesheet. Foobar will decompress your .flac files and merge them in a single big .wav Image of the disc. You have your exact 1:1 digital image of the original, along with the ‘Image’ cuesheet to load on EAC or Burrn for a perfect audio CD copy.

How to recreate an 1:1 image by means of an edited Noncompliant cuesheet: the user who does not want to bother with images can adopt this alternate method to rebuild the complete image through a simple editing of the Noncompliant .cue, which will save him the need of merging G1 with the other musical files and to work with the Image cuesheet, which could well be not included anyway. The user will simply link G1 to be written before T1 by means of this edited N-cue. Referring to the .wav Noncompliant cuesheet of the very same example (you will need to decode G1 if included in .flac format), edit your N-cue from:

```
...
PERFORMER "Peter Erskine"
TITLE "You Never Know"
FILE "01 - New Old Age.wav" WAVE
TRACK 01 AUDIO
  TITLE "New Old Age"
  PERFORMER "Peter Erskine"
  PREGAP 00:00:33
  INDEX 01 00:00:00
```

TRACK 02 AUDIO
TITLE "Clapperclowe"
PERFORMER "Peter Erskine"

...

To:

...

PERFORMER "Peter Erskine"
TITLE "You Never Know"
FILE "You Never Know - First track pregap.wav" WAVE
TRACK 01 AUDIO
INDEX 00 00:00:00
FILE "01 - New Old Age.wav" WAVE
TITLE "New Old Age"
PERFORMER "Peter Erskine"
INDEX 01 00:00:00
TRACK 02 AUDIO
TITLE "Clapperclowe"
PERFORMER "Peter Erskine"

...

Speaking of edited Noncompliant cuesheets, users can decide of **not considering** the included G1 at all and have EAC automatically replace it with a silent duplicate: but they must check if the first track pregap is **correctly shown** in their N-cue, since only the ones written by EAC's latest betas will write a 'Pregap' string before T1's Index 01 as shown above. If we're faced with an old Noncompliant cuesheet, but we know that G1 is there by detecting it from the logfile, we can edit the Noncompliant cuesheet by inserting a 'Pregap' string of the correct mm:ss:ff format (e.g. if the logfile shows a first track pregap of 00:02:44, we know there is a G1 of 44 hundredth of seconds which is the equivalent of 33 frames in cuesheet's time format) so that EAC will write it before T1. We will set our Noncompliant cuesheet from:

...

PERFORMER "Peter Erskine"
TITLE "You Never Know"
FILE "01 - New old age.wav" WAVE
TRACK 01 AUDIO
TITLE "New old age"
PERFORMER "Peter Erskine"
INDEX 01 00:00:00
TRACK 02 AUDIO
TITLE "Clapperclowe"
PERFORMER "Peter Erskine"

...

To

...

```
PERFORMER "Peter Erskine"  
TITLE "You Never Know"  
FILE "01 - New old age.wav" WAVE  
TRACK 01 AUDIO  
  TITLE "New old age"  
  PERFORMER "Peter Erskine"  
  PREGAP 00:00:33  
  INDEX 01 00:00:00  
TRACK 02 AUDIO  
  TITLE "Clapperclowe"  
  PERFORMER "Peter Erskine"  
...  

```

This method is very handy with old releases whose logfile shows the presence of a first track pregap. Again, since we cannot know if G1 was silent or not, we will never have the absolute certainty if our performing, 1:1 copy will be the exact bit-for-bit content, but since G1 commonly peaks at 0,00% we can confidently adopt this edited N-cue when adopting EAC or Burrn as our burning tools.

/// To summarize how we should deal with G1 when extracting audio by EAC's default way: basically, the **releaser** has two options when detecting the pregap on the original disc:

1) Include the original **G1** in the release and the '**Image**' cuesheet. **Recommended:** users will have all the necessary means to recreate the correct, 1:1 image of the original disc. This should be **mandatory** for not-fully-silent pregaps, that is G1 not peaked at 0,00%. The inclusion of a screenshot of F3 is recommended too.

2) If G1 is found completely silent when performing F3, the inclusion of the pregap can be avoided. Releasers should nevertheless include a **screenshot** of the test, in order to assure users that the pregap is actually made of pure digital silence: so its inclusion is not strictly necessary on practical terms, since EAC will write an identical pregap when burning the copy. Nevertheless, people who desire a 1:1 digital copy for archival purposes – that is, not burning a cd – will be forced to manually create a duplicate of G1 by means of an audio editor and append it at the start of the merged musical content.

To explain its proceedings, the releaser could do worse than drop a line or two in the tech part of the torrent description, on the sort of “added Single-wav cuesheet + extra first track pregap-file for a complete 1:1 image reconstruction” with a link on this guide for a detailed description :D

/// Likewise, the **user** will have the following options. First of all, he should always check their freshly downloaded releases: of course the vast majority of them do not feature an included G1 for the simple basic reason that the original disc doesn't have it: but to know it for sure the EAC **logfile** should be checked:

- * If the first track pregap is 2:00, the original disc has no first track pregap;
- * If the first track pregap is **longer than 2:00**, usually 2:44 or around, the original disc features G1 so we're faced with an **incomplete release** and we must deal with this fact. Of course the presence

of G1 is deducible from cuesheets as well [though for extractions made with EAC versions before 0.95 beta 2, only in the - rarely included - 'Image' cuesheet]. So, what should be the user's behaviour when faced with a detected G1? There are some options to consider:

1) If he needs an exact, 1:1 image for **archival** purposes, he will merge G1 – if included – with the other musical files and keep the resulting single file with the 'Image' cuesheet, if provided (otherwise he can obtain it from the Noncompliant .cue with **CueTools**). If G1 is found not included, but detected anyway by the logfile and / or the cuesheet(s), this user will be forced to manually create it by means of an audio editor, then he will proceed as before;

2) If he just wants to burn a **cd-r** from the downloaded files, all he needs to do is load the Noncompliant .cue in EAC or Burrn and get a performing 1:1 copy, which will be bit-for-bit equal to the original in the most frequent case of a silent G1: so the pregap can be ignored, if included, since our burning tools will replace it anyway. Or **better**, he can manually edit the Noncompliant cuesheet for taking into account G1, if included: musical experience will be the same, but he will have an exact, 1:1 copy. – Alternatively, the user adopting other burning tools should again manually re-create G1 (if not included) and add it at the start of T1, in order to get the complete content of the original (though, as we already saw above, the layout will differ since all Indexes 00 will be lost since there is no cuesheet to rebuild the original image).

The hunt for red G1

Finally we're getting to deal with the special case of a longer and **not silent** pregap of the first track, that is an **hidden bonus track** placed before T1, and not after the last track how it usually happens (thus accidentally producing a Red Book noncompliant disc). We must firstly obviously concentrate on **how** to detect the presence of this (admittedly rare) kind of bonus track. The habitual starting point – once inserted the disc and opened EAC – is **F4** for the gap detection. If the CD happens to have some musical content – as an intro to the first track or a full hidden bonus track – before T1, EAC will show you **two** peculiar displays:

- * The first track starting point is longer than 2 seconds: for example, it is 02:45:00 (3rd column).
- * The gap length (5th column) is necessarily L added to the hidden musical content, so EAC displays it not of the normal 00:02:00 length (or the odd 00:02:xx one, when dealing with the usual additional silent G1), but exactly 2 seconds longer than the displayed first track start: following the same example, gap length will be showed as 02:47:00. Moreover, from EAC 0.95 beta 2 version onwards, first tracks with hidden pre-content come highlighted in **red** so you can't miss them :D)

It is clear that we're faced with a larger pregap of track one to be extracted. By the way, we could do worse than modifying the relative filename, the more so when we already know the bonus track name - it comes often quoted in reviews, etc... like this: [Hidden track - First track] so our first extracted file will be

01 - Hidden Track - First track.wav

This will come handy later. Since we learned above that the 'append gap to previous track' extraction method will leave out pregaps to T1 altogether, we need to change extraction method: we'll apply the '**Append gaps to Next track**' method while telling EAC to write us the adequate **Corrected Gaps** cuesheet to reflect our change of approach. So EAC will now append gaps to the following musical content, so our larger and "musical" G1 will not be discarded but attached to T1,

which will be augmented to contain also the hidden material. The resulting cuesheet will reflect the new situation adding a proper Index 00 line (or a “Pregap” line in new EAC beta versions) before the usual Index 01. So, the steps we have to perform after F4 are:

1) [**Action - Append Gaps To Next Track**]: you will see EAC change the previous displays, since G1 is now appended to the following track, that is the hidden track is now attached to T1: take a look at the first line and you will see that the first track start is now showed at 00:00:00, the track length is now the hidden musical content + first track combined together (following the same example again, the first track length is augmented of 2.45:00) while the gap display is obviously unaltered. The gaps are now appended to the tracks that follow: the hidden track is attached to T1 and will be extracted by EAC;

2) [**Create Cue Sheet - Corrected gaps...**]: EAC will write what could be named a ‘Compliant’ cuesheet, that is one that will correctly show gaps connected to the following musical material, by adding Index 00 lines in the presence of normal gaps between tracks and - what’s important here – a ‘Pregap’ string (or an ‘Index 00’ in older prebetas) before Index 01 of first track, which will permit to separate the “normal” first track from its hidden companion.

That’s all when it comes about extraction, and the releaser will include in his package the multiple .flac files with the “Corrected Gaps” cuesheet, which will be loaded into EAC or Burrn by the user to get a perfect copy of the original, bonus hidden material included.

IMPORTANT!! Since the ripping and subsequent upload of this kind of hidden musical content requires an alternative, “Pedro-noncompliant’ extraction method and the contestual creation of a different kind of cuesheet, **the releaser must explain the situation to and ask for permission from moderators!** This is mandatory.

We’re not really finished though, at least a true “dedicated” releaser shouldn’t be: because after extracting and burning our cd copy we set about to listening to it, and soon we discover that since we have an exact 1:1 copy, we’re faced with the same problem occurring when playing a disc with a pre-T1 hidden musical content on a normal cd player (or a computer audio player who emulates it when reading a physical disc, and not the extracted files): that is, the player seeks for Index 01, so the hidden tracks has been correctly burned on the CD **but stays hidden**, and we have to pause the player and <<< rewind it back toward Index 00 to have it playing also our bonus track. This is perfectly coherent with the chosen approach to let EAC have us to create a perfect 1:1 copy, but it’s not very handy since being able to play the hidden material is still an annoying issue.

So, we should undertake some other, possible steps in order to make life easier for our users and let them the possibility of “flushing” the hidden track and have it normally playable. What I’m about to describe now is of course quite optional, but it could be of some real interest after all. Basically, we have **four** options when dealing with some bonus pre-T1 material, the **first** one being of letting the 1:1 CD image completely untouched – that is, both physical- and layout-features untouched. But we already know that following this simple path the bonus material stays hidden. There are three alternatives:

2 - The **second** method (**‘Index-modified cuesheet’**) does not bother with the musical content of the disc: we simply **edit** our ‘Corrected gaps’ .cue file by bringing its first track Index 01 back to the very beginning of the musical content, making it coincide with Index 00 so our player will start the reproduction including the hidden track too. The serious drawback of this methodology is that, since hidden and first track **stay joined** and the layout provided by the modified cuesheet does not differentiate them, your player cannot directly access T1. Operate this way:

2A. For releasers using **EAC versions before 0.95 beta 2** (all prebetas included): open the ‘Corrected Gaps’ cuesheet and erase the first Index 00 line, then **bring the Index 01 value to 00:00:00**: that is, keeping the same above example, from

Index 00 00:00:00
Index 01 02:45:00

to:

Index 01 00:00:00

2B Releasers using **EAC versions from 0.95 beta 2** onwards: open the ‘Corrected Gaps’ cuesheet and just erase the Pregap line: that is, keeping the same above example, from

Pregap 02:45:00
Index 01 00:00:00

to:

Index 01 00:00:00

In both cases, your cd player will no more differentiate between indexes (there’s only Index 01 left) and will play straightly also the pregap – that is, the hidden track – then T1, as a single augmented first track. There is of course no noticeable index / track separation so your player won’t be able to start directly playing the normal first track and you’ll have to wait for the hidden track to finish, or to manually browse this new augmented track. This tiresome issue is overcome by the other two methods, who both creates a n+1 tracks layout on the same musical content.

3 - The **third** method (**‘Image-modified cuesheet’**) is the more radical, because assumes a physical separation through your favourite Audio editor of your ‘augmented’ track one: that is, you have to obtain from:

01 - Hidden track - First track.wav

the following two files:

00 - Hidden track.wav

01 - First track.wav

by split your original “hidden+first” track on the pregap-length point: in our previous example, separation line is at 02:45:00. Once done that, proceed to manually edit the ‘Corrected Gaps’ cuesheet this way: from

FILE "01 - Hidden track - First track.wav" WAVE
TRACK 01 AUDIO
TITLE "Hidden track - First track"
PERFORMER "Artist"
INDEX 00 00:00:00
INDEX 01 02:45:00
...

To:

```
FILE "00 - Hidden track.wav" WAVE
TRACK 01 AUDIO
TITLE "Hidden track"
PERFORMER "Artist"
INDEX 01 00:00:00
FILE "01 - First track.wav" WAVE
TRACK 02 AUDIO
TITLE "First track"
PERFORMER "Artist"
INDEX 01 00:00:00
```

... and so on, "Second track" becomes "Track 03 Audio", "Third track" becomes "Track 04 Audio" etc. etc. until you have every "Track 0x Audio" renamed. You get a 'personalized' copy with an added file to burn and a modified TOC, which creates a n+1 track layout suitable for direct access to all tracks. The only drawback is the **track-shifting**: you have e.g. to remember to tell your player to seek for track 7 when you want to play original track 6, and so on. An added feature of this method is the possibility of placing the bonus track *where you want*, and not necessarily at the start of the disc, by properly editing the cuesheet: e.g. if you want it played between track 4 and 5, link the "00 - Hidden track.wav" to the 'Track 05 Audio' position, "05 - Fifth Track.wav" to the 'Track 06 Audio' position, and onwards..

4 - The fourth method ('Layout-modified cuesheet') is based on the single CD image so you have to take the previous additional steps of creating the single-wav 'Image' cuesheet (Alt+S in EAC after F4) and obtain a merged, single "Album.wav" image of the disc. Given that, simply edit the 'Image' cuesheet this way: from

```
FILE "Album.wav" WAVE
TRACK 01 AUDIO
TITLE "Hidden track - First track"
PERFORMER "Artist"
INDEX 00 00:00:00
INDEX 01 02:45:00
TRACK 02 AUDIO
TITLE "Second track"
PERFORMER "Artist"
INDEX 01 06:01:45
...
```

To

```
FILE "Album.wav" WAVE
TRACK 01 AUDIO
TITLE "Hidden track"
PERFORMER "Artist"
INDEX 01 00:00:00
TRACK 02 AUDIO
TITLE "First track"
```

PERFORMER "Artist"
INDEX 01 02:45:00
TRACK 03 AUDIO
TITLE "Second track"
PERFORMER "Artist"
INDEX 01 06:01:45
...

.. and so on. The third track becomes "Track 04 Audio", the fourth track "Track 05 Audio" etc. etc. until you have every "Track 0x Audio" renamed. Here too you get a 'personalized' copy of your cd based on the single, merged image with a slightly modified TOC reflecting a n+1 audiot tracks layout which is obtained by modifying the single-wav cuesheet, so our cd players will be able to distinguish between the hidden material and the normal track. Of course, here too there will be the track-shifting (which will annoy purists), but **not** the possibility of tinkering with the cuesheet in order to place the hidden track on a different, favourite position since the **physical contents are left untouched**.

There could be a further refinement when it comes to cuesheets-editing: that is, some hidden pre-T1 bonus tracks *do not start immediately*, but after a while: e.g. when the entire pregap is played, the music comes after some seconds of digital silence. The shortcut here is to write again **two Indexes** referred to our Track 00: if for example we have a pregap of 02.45.00 but the music actually starts at -2.20.00 (you can accurately verify this value by opening the .wav in your audio editor), we'll write e.g. in our edited-corrected gaps .cue:

FILE "00 - Hidden Track.wav" WAVE
TRACK 01 AUDIO
TITLE "Hidden track"
PERFORMER "Artist"
INDEX 00 00:00:00
INDEX 01 00:25:00

.. so your cd player will skip the first 25 seconds of digital silence and start directly at Index 01, that is when the hidden musical content actually starts. The same kind of edition can be of course written on the unedited, Corrected Gaps .cue and on the Image .cue.

... So in the end the 'dedicated' releaser can create one or more of those modified cuesheets of his choice and put them inside the release folder, adding of course a brief explanation about the purpose of these added .cue files (he can always put a link on this guide :D). The user will have plenty of choice about what he prefers: play the files directly on his computer with no cuesheet fuss whatsoever, or burn a simple, exact 1:1 copy of the original with the corrected gap settings 'Compliant' .cue file, or again choose for a personalized copy with the added possibility of direct access to the hidden musical content and / or separation betwixt the hidden track and the first one.

Recap on T0

On the **releaser** side, the only necessary steps are:

- a) Action - Append gaps to next track to let EAC rip the first-track pregap too;
- b) Create Cue Sheet - Corrected Gaps to write a 'Compliant' cuesheet equivalent to the alternate chosen extraction method

c) Ask a mod for the permission!

Optional steps are the creation of one or more 'edited' cuesheets to include in the package.

On the **user** side, to burn the cd with EAC he can choose between up to four possibilities (depending how many alternate .cue files have been included in the release):

1. Normal **Corrected Gaps** cuesheet: a neat, complete 1:1 copy, layout included. The hidden track stays hidden, and the only way to play it is to rewind the cd player on negative time values before the start of track one;
2. **Index-modified** cuesheet: Index 01 of first track is moved back to 00:00:00, so the player will start from the hidden material and go straight to second track: there is no separation (physical- or layout-based) between bonus and first track, so there's no possibility of direct access to T1;
3. **Image-modified cuesheet**: after the physical separation of the hidden material from first track, the cuesheet is manually modified to have the player taking into account the additional, N+1 tracks layout (TOC is modified). Gives the added possibility of placing the hidden track in whatever position of the disc.
4. **Layout-modified** cuesheet: After having merged the complete musical content in a single file, the equivalent 'Image' cuesheet is edited in order to create a N+1 disc layout, with the player starting from the bonus track.

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Mod-Edit by Frieden: made this one "sticky".

Guide revisions

2006-02-10: version 1.3, added extended intro section on EAC gap settings and cuesheets, overall deep revision of part I. Changed again thread name to reflect the definitive object of the guide.

2005-09-29: version 1.2, added section dealing with pre-first track hidden musical content; changed thread name to reflect the widened object of the guide.

2005-09-08: version 1.1, added hints to create a pregap file for already existing releases.

2005-09-03: version 1.0, initial release by Lontananza, made "sticky" by Frieden.