C2 Error Pointers are a form or error detection. Audio CDs have many layers of error correction and detection. What happens if there is an error which cannot be corrected (recovered)? a CD drive can either pass the audio out as is, with possible pops and clicks, or interpolate the audio, that is silence out the blocks with errors. Either way there is an error and a secure ripper might not be able to detect the error (if a re-read returns the same error...). C2 Error Pointers are a way for the drive to inform the ripper that a section of audio has an error, sounds good, except the implementation of C2 Pointers can be:

- Drive does not support C2
- Drive does not support C2, but pretends it does in the feature lookup
- Drive supports C2, actual implementation can be from poor to good.

As mentioned before, even the best C2 implementations can still let errors through, but overall using C2 with a ripper which correctly supports it (dBpoweramp Reference) is helpful, consider it an extra layer which can catch errors. There has grown a culture of recommending c2 is always switched off, this has grown up around EAC where it's implementation of c2 pointers relies on c2 alone and not secure re-reading, unlike in dBpoweramp where c2 pointers can be used. A ripper should have a test section where the detection of C2 pointers can be detected with a scratched CD.

Caching is employed by the majority of drives to improve performance, but caching stops secure extraction: when a secure ripper tries to re-rip the same section a 2nd time, instead of getting audio from the disc, audio comes from the cache (which is the same as the first rip). A secure ripper must be able to detect and invalidate the cache (by reading more than the cache value before the section of audio desired).

CD-Text was invented by Philips and Sony, audio CDs do not contain details of the track names and artist(s) on the disc - CD Text adds these details, but requires a compatible drive and disc with CD-Text (majority do not have CD-Text). CD-Text would have been a good standard if implemented on all audio CDs and drives. Computer based CD Rippers instead use the Internet to get the track names (by looking up the discs in an online database).

Copy Protections Employed

The music industry engaged in a folly around 2002, with the idea that CDs could be made unreadable on computers, but still play on CD players. The first method employed used a fake 2nd session with invalid track times, CD players can only read the first session, computers will use the last session and thus be fooled. Good CD Rippers can read the first session, then it is down to the CD drive to be able to read outside of the false first session (over-read). The method was also bypassed using the infamous black marker pen trick (draw over the 2nd session of the disc).

The 2nd copy protection employed is the deliberate inserting of noise and errors into the audio, that is right you heard it right, music companies were intentionally inserting errors into the discs, the idea being that CD players would interpolate (silence) the errors out, where as a computer would not (but could be done in software), either way playback on any device would have a sub-optimal rendition.

The final copy protection employed is the installation of a Trojan program when the audio CD is inserted in to a computer (hidden in an Enhanced CD), these Trojan programs can install filters into Windows which disrupt audio ripping. Sony experienced a huge backlash when it did just this, and hid the fact they had installed something nasty on PCs, which opened a huge security hole in PCs. For this reason it is best to disable autorun when ripping Audio CDs.

It is safe now to say that the experiment with audio CD protections has failed.