



## ***We Rescue Data From Obsolete Carriers; Reliability of Recordable CDs***

*Leo Backman/DigiOmmel & Co.*

***Can you still access, display and export your old computer data? If the answer is maybe, perhaps or simply don't know, wait no longer. Do not let photographs, text documents, spreadsheets or other digital content become corrupt and eventually inaccessible. In these cases your data is lost forever! To offer our clients another chance at their data preservation and perpetuation, we collect and maintain a wide selection of obsolete disc, memory card as well as tape-based drives and readers. The latter part of this documents discusses the reliability of recordable CDs, and possibilities of rescuing data from previously 'unreadable' discs.***

### **Disc formats we can currently process:**

Compact Disc (all derivatives)  
Digital Versatile Disc, DVD (all derivatives)  
Blu-Ray Disc  
Mini Disc-based formats (all derivatives)  
Jaz Disk (1/2 GB versions)  
Zip Disk (100/250 MB versions)  
SyQuest (44/88 MB versions)  
Sony M.O. (Magneto-Optical Disc), 44/88 MB versions

### **Tape formats:**

DAT, DDS (all versions)  
ZX microdrive  
Sony AIT format (8mm videocassette)  
Quantum DLT

## Memory card types:

Compact Flash  
SD, Mini/Micro (Secure Digital), all versions  
Smart Media Card  
MMC (Multimedia Card)  
MS (Memory Stick), all versions  
xD Picture Card

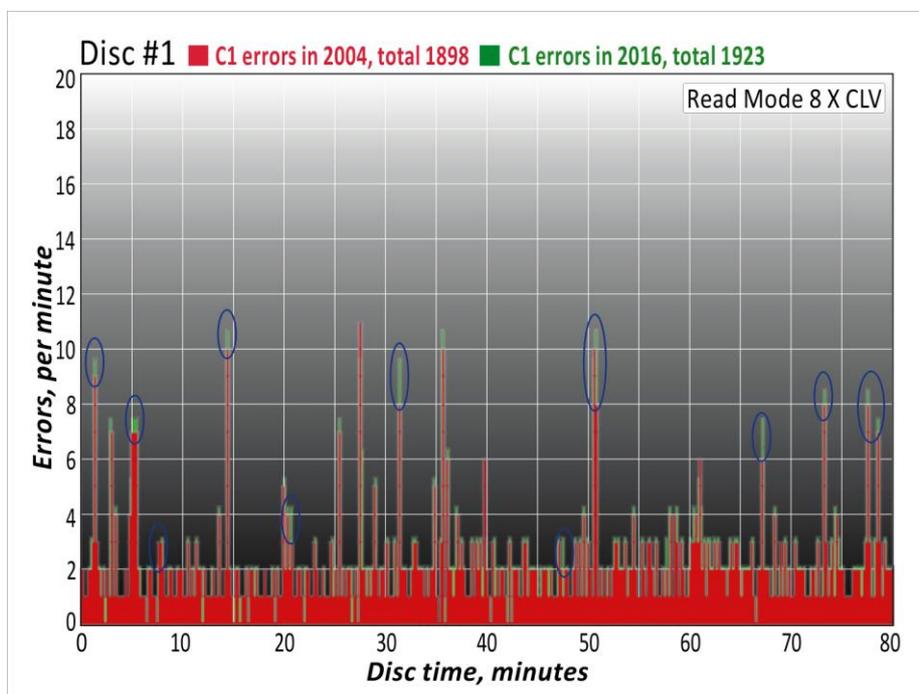
## Recordable Compact Discs, reliable data carrier or not?

The beginning of 21<sup>st</sup> century saw a tremendous, if relatively short-lived proliferation of recordable Compact Discs or CD-Rs. Due to significant price reduction, individuals, as well as official communities started using CD-Rs for storing music, photographs and other digitized databases.

Consequently, there were much debating concerning the longevity and reliability of CD-R as a data carrier. In 2004, we made a series of test recordings on 12 different CD-R brands, taking 10 discs from each brand. Immediately after the recording, the discs was carefully analyzed and documented in terms of their data layer deformations, error type identification and distribution. Since then, the discs have been kept in archive storage and only taken out for periodical error analysis, in 2007, 2010 and 2016.

## Stable and unstable CD-Rs

Our findings suggest that CD-Rs from the turn of the century fall broadly into three categories in terms of storage life. In the first group, the read-out error counts and distributions have remained essentially the same. The discs with lowest initial error count (fewer than 2000 corrigible C1 type errors across the 80-minute disc), show almost no change after the 12-year storage time.

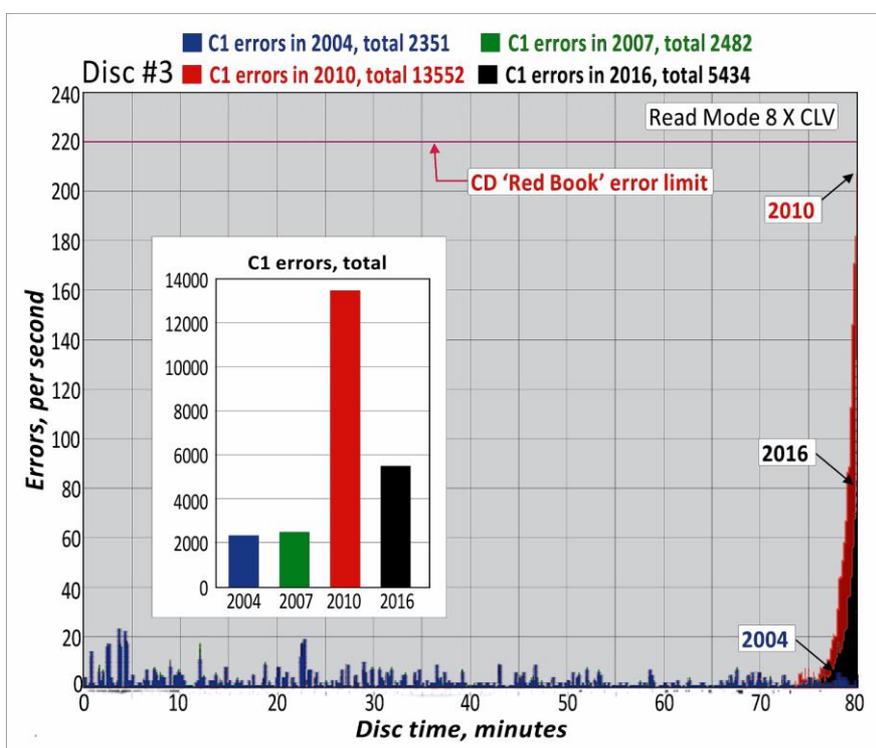


**Figure1. A CD-R with very few initial errors. The local error count has increased by no more than 3. The overall error distribution is practically unchanged after 12years of storage.**

The second group includes discs showing relatively high number of C1 (corrigible) errors in 2004. In these discs, a portion of the C1 errors have changed into more serious, but still corrigible C2 errors. However, some of the C2 errors these 'medium-grade' CD-Rs had in 2004, have turned into CU (incorrigible) errors over the years.

The third group contains discs with initially high amount, or noticeably uneven distribution of errors. Among this group, we found that the error count has, and is still increasing. Oddly enough, the initially high error count in some of the discs, have decreased since their previous analysis!

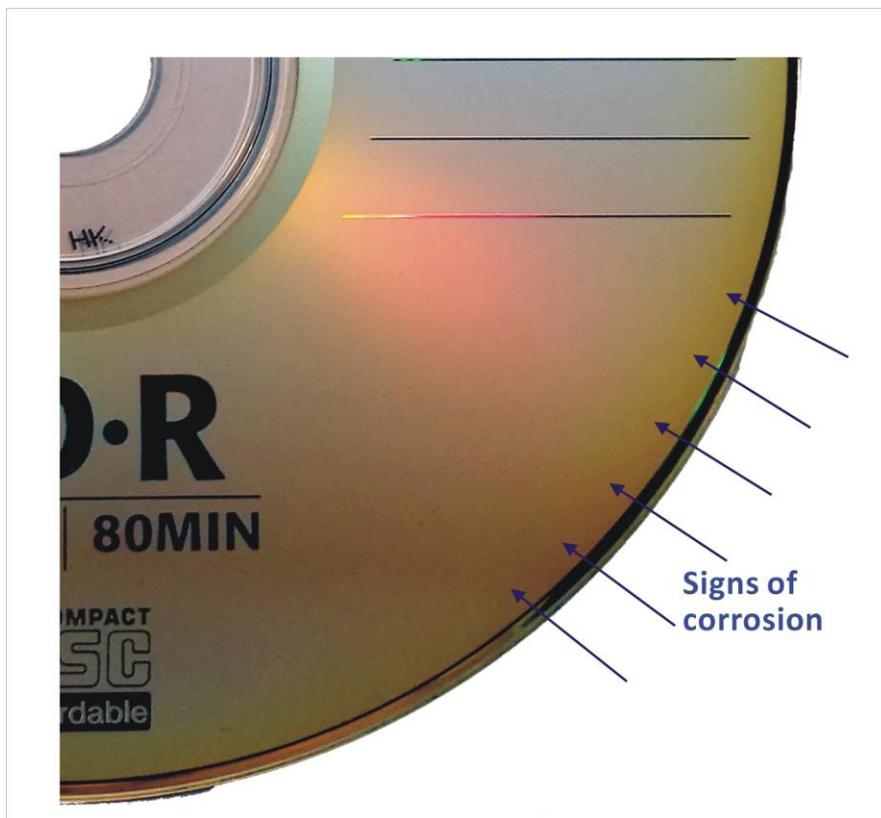
In these cases, some CU errors detected earlier, have actually disappeared or changed into corrigible C1 and C2 errors. While such a change is good news for a particular disc – a partially unreadable disc becoming readable once more – it still suggests the disc's data layer is optically, physically or chemically unstable.



**Figure2. A CD-R with relatively high error count at the outer rim area (77-80 min). Substantial variations in C1 errors from 2004, 2007,2010 to 2016 were measured. Since 2010, the error count on the rim area has actually dwindled, suggesting the data layer is still unstable.**

### **Rust around the rim**

In some of the 12-year old discs, there are visible signs of corrosion onset around the rims. There have been reports how the paper sheet, placed inside the CD case was found to emit sulphurous fumes. The fumes were believed to induce corrosion of the disc's reflective layer. In our test batch, however, CD-Rs with no paper sheet inside the case also show corrosion in the rim region.



**Figure3. A CD-R from a 12-year archive storage has signs of proceeding corrosion on the rim area.**

We are currently developing a special CD drive for rescuing data from 'unreadable' audio CD-Rs. It seems an improved could be accomplished up to 8-times speed, significantly reducing the transferctime of hard-to-read CD-Rs.

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