



***A new addition to the Philips “intelligent drive” features, Seamless Link acts to manage and minimise the effects of buffer under run (BUR), a common cause of wasted discs during the CD writing process.***

## INTRODUCTION

Today, burning discs with a CD writer has become a common method of storing and distributing data, text, video and audio files for PC users. With advances in writer speeds and performance, greater ease of use, improved writing application software with “drag-and-drop” functionality, and simple Graphical User Interfaces (GUI), users today require less time and hassle when burning their first disc.

Other advances in CD writing are related to write integrity, and ensuring optimal writing on nearly all media, as example, with Philips Thermo Balanced Writing (TBW) and Self Learning strategies.

However, even with exponential strides in ease of use, and a mainstream place in new PC systems for CD writers, users, especially those with older systems, still face an occasional buffer under run error message. A less frequent error for users of new PC systems, BUR is still an annoying problem.

While first addressing the problem via a software solution (“Ultra-Buffer™” in co-operation with AHEAD), Philips now takes the solution a step further, by placing the solution “on board” the CD writer. For both users of new and older systems, Philips Seamless Link “on board” offers an excellent management solution for BUR without tying users to a specific application software provider.

*Let's make things better.*



**PHILIPS**

# ABOUT BUFFER UNDER RUN (BUR)

Buffer under run can occur when the users' PC or a host PC cannot supply a steady and uninterrupted flow of data from the data source, typically a CD ROM or HDD, to the internal DRAM buffer of the CD writer (writer buffer) (Fig. 1). If this transfer of data to the drive writer buffer is interrupted, then the buffer is not kept full (Fig. 2). If the interruption is long enough, the "writer buffer" gets empty, the writing process stops and the disc is ruined (Fig. 3). Buffer under run occurs most frequently when users are writing to a CD-R or CD-RW disc in either Track-at-Once (TAO) or Disc-at-Once (DAO) mode.

The causes of BUR have been numerous and are related to the PC system, the system configuration or set up, and the CD writer itself. Most sources of BUR have been reduced in newer PC systems (with faster CPUs and HDDs with transparent Thermal Recalibration), and by improvements in both CD writer and the application software.

Fig. 1, Typical CD writing process: The data that needs to be written on the disc is transferred from the source over the system bus, and is put into the DRAM buffer of the CD writer. From this buffer, the data is put onto a disc in the writing process.

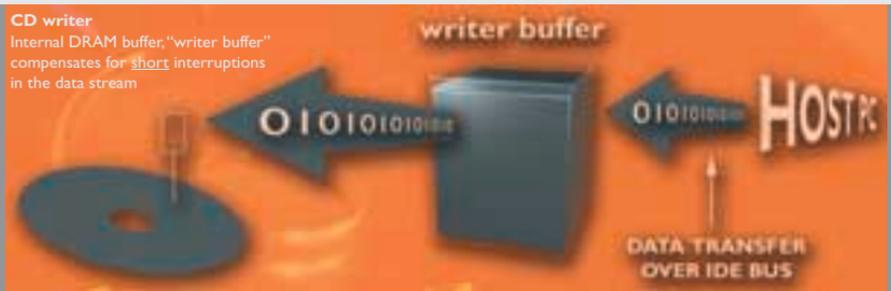
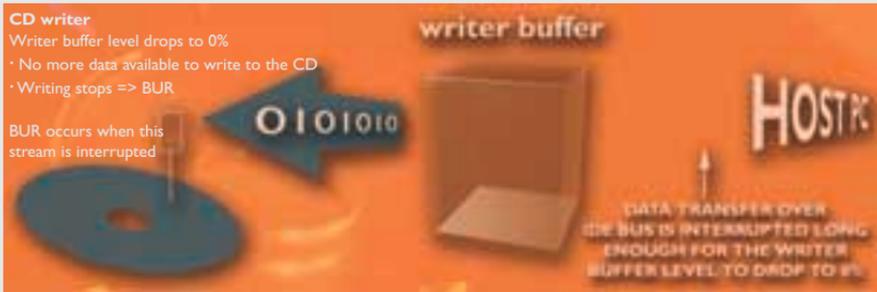


Fig. 2, Typical CD writing process: Short interruptions in the transfer of the data over the IDE bus will cause the writer buffer level to drop.



Fig. 3, Typical CD writing process: Buffer under run occurs and results in writing failure, disc is ruined.



Several primary sources of BUR are:

- Insufficient PC processing power (low speed CPU, DRAM size, no DMA support)
- System configuration not optimal (DMA switched off)
- Too much user interaction during CD writing (launching or running additional applications)
- Insufficient performance of the source drive (CD ROM or HDD in user system or network)
- Insufficient performance from the mastering software, espec. at higher recording speeds
- Insufficient performance of the writer (not enough internal memory or buffer...)
- Scratched or dirty media (source drive needs multiple retries to successfully read)

## BUR MANAGEMENT FROM PHILIPS!

Seamless Link, the Philips solution, is a BUR management solution that is "on board" the drive and prevents a lost disc when a buffer under run occurs during TAO or DAO writing. Detecting the clues of a imminent BUR ahead of time, Seamless Link pauses the writing in a controlled way, and restarts the writing when the danger of the BUR is gone. The result is effective with most older systems, when proper system set-up is done, and Seamless Link works transparently with most writing application software.

The primary benefits to users of both new and older PC systems are:

- The Philips "intelligent drive" pro actively manages the consequences of a BUR during CD writing
- The solution allows users greater ability to launch and run other applications..., or surf the web, while burning a CD.

Although Seamless Link is an excellent tool for managing the impact of BUR when it occurs, Seamless Link does not improve writing quality.

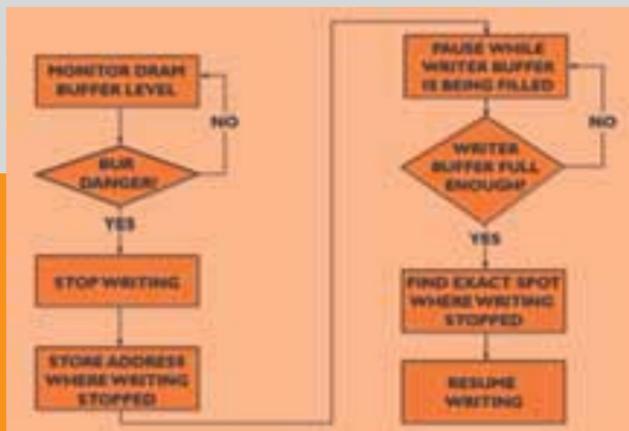
For improvements in writing quality, refer to the Philips' Thermo-Balanced Writing (TBW) white paper.

# HOW SEAMLESS LINK WORKS

The Seamless Link algorithm (Fig. 4), constantly monitors the writer buffer level. If the writer buffer level drops below a threshold value, the algorithm concludes that a BUR is imminent and stops the writing process in a controlled way. This means that the data stream from the buffer to the disc is halted, and allows the buffer to be filled up again.

The exact location where the writing stopped is stored in the drive's internal memory. In the meantime, the buffer level is continuously monitored and as soon as the buffer is full again, the algorithm will let the drive seek to the location where the writing stopped. It then resumes the writing process as soon as the laser is on the exact spot where the writing stopped. This type of writing eliminates the gap, which occurs between two individual writing operations during traditional writing. Hence the name Seamless Link.

Fig. 4, The Seamless Link algorithm:



## SUMMARY

Seamless Link offers excellent management of BUR incidents when writing CD discs in Track-at-Once (TAO) or Disc-at-Once (DAO) mode. By utilising the Seamless Link algorithm to monitor the CD writer buffer, chances of a ruined or wasted disc are made remote.

In addition, Seamless Link gives end users greater confidence in running other applications during the CD writing process, AND freedom from the time and frustration of retries due to a buffer under run incident.

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