

# CRW-70

## Technology Overview

Stylish Compact Size  
12X Write  
8X ReWrite  
24X Read/Audio Ripping  
Standalone Audio CD/MP3 Playback

Featuring

**SafeBurn?**





## Introduction

Yamaha's new CRW-70 of CD-R/RW drives offers 12X write, 8X rewrite, and 24X read/audio ripping speeds, and Standalone Audio CD/MP3 playback capability. In pursuit of sound enjoyment, speed, stability, writing quality and ease of use, the CRW-70 has a lot of unique technological aspects. In this document, you will see what they are and how they work.

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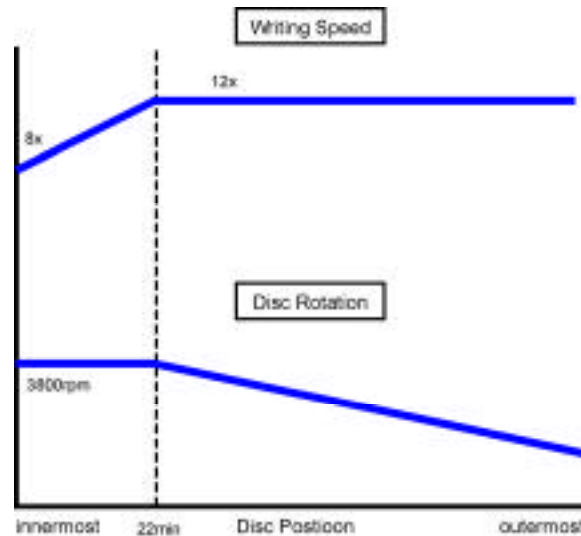
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## Partial CAV (P-CAV) writing method used in CRW-70

### Advantages of P-CAV --- “Combination of High Speed & High Quality”

Yamaha holds the opinion that P-CAV is the essential technology in developing high-speed writers with high-quality data writing. Basic reason is that P-CAV controls the disc rotation speed smoothly to achieve the shortest writing time.



### Zone CLS vs. Partial CAV

Sanyo and Ricoh introduced their CD-R/RW drives based on “Zone CLV” writing methods. Here we will present a low-level comparison between “Zone CLV” and Yamaha’s “Partial-CAV”, and explain the technical advantages of Yamaha’s “Partial-CAV”. The two technologies share a common goal: to achieve reliable high-speed writing while keeping disc rotation speeds at manageable levels. Both achieve this by limiting the writing speed for the inner portion of the disc and accelerating it towards the outer portion. Technically speaking, the two methods are completely different; however, as we will show, Yamaha’s “Partial-CAV” approach is superior.

**Zone CLV** method utilizes the existing CLV (CLV, constant linear velocity) method combined with linking technology developed for buffer underrun protection, such as BURN-Proof and JustLink. The writing of a disc is divided into several zones, and writing speed is kept constant within each zone. When it shifts up to the next speed, writing is suspended and then restarted using BURN-Proof (Sanyo) or JustLink (Ricoh).

**Partial CAV** method keeps disc rotation constant (CAV, constant angular velocity) in the inner portion of the disc as writing speed smoothly accelerates outwards until it reaches top speed. Since disc rotation speed accelerates smoothly, no suspension is necessary. After that, writing speed is kept constant (CLV) until the end of the writing.

	Zone CLV	Partial CAV
Link	Max speed cannot be reached without making links. Unacceptable for users who demand the highest achievable quality. This is especially true for audio CDs and for pre-mastering a disc for mass duplication.	Max speed can be reached through smooth acceleration without any links. Ideal for audio CDs and pre-mastering a disc for mass duplication.
Quality of Writing	Quality can be impaired, especially at the link points, because conditions such as laser power and writing strategy are completely different before and after the link.	Use of sequential writing speed allows stability while writing maintained.

For the sake of speed-up, Zone CLV method intentionally uses BURN-Proof or JustLink to patch up the



totally different writing speeds, which can be considered a “misuse” of the technology. It should be used only for “protection” purposes, as it was originally intended. At present, Yamaha is the only manufacturer that has CAV technology implemented in CD-R/RW drives, but other manufacturers are also said to be developing CAV technology. Their present introduction of products with Zone CLV can be construed as an “interim solution” for them to remain in the “X Game” (speed competition).

Yamaha holds the opinion that Partial CAV is essential technology for the realization of high-speed writing without sacrificing the quality of writing, and it will become the mainstream of the industry

## Time for writing full 80min disc

### CRW-70

Connection	Speed setting	SafeBurn	Time
USB 2.0	12x	On	473 sec
USB 1.1	8x	On	910 sec
USB 1.1	12x	On	960 sec

*Time: Actual Writing, including time for disk finalization*

USB 2.0	12x	On	421 sec
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*Time: theoretical figure, excluding time for lead-in and lead-out*

## Efficient use of High Speed CD-RW

### 8X CLV write 10X packet writing

CRW-70 provides 2x/4x/8x CLV and 4x-10x CAV mode for CD-RW media. CAV mode is suitable for random write/read access to a High Speed CD-RW disc (Packet Writing). CAV keeps disc rotation constant and does not require continuous adjustment by spinning up and down according to the point where the data is read or written.

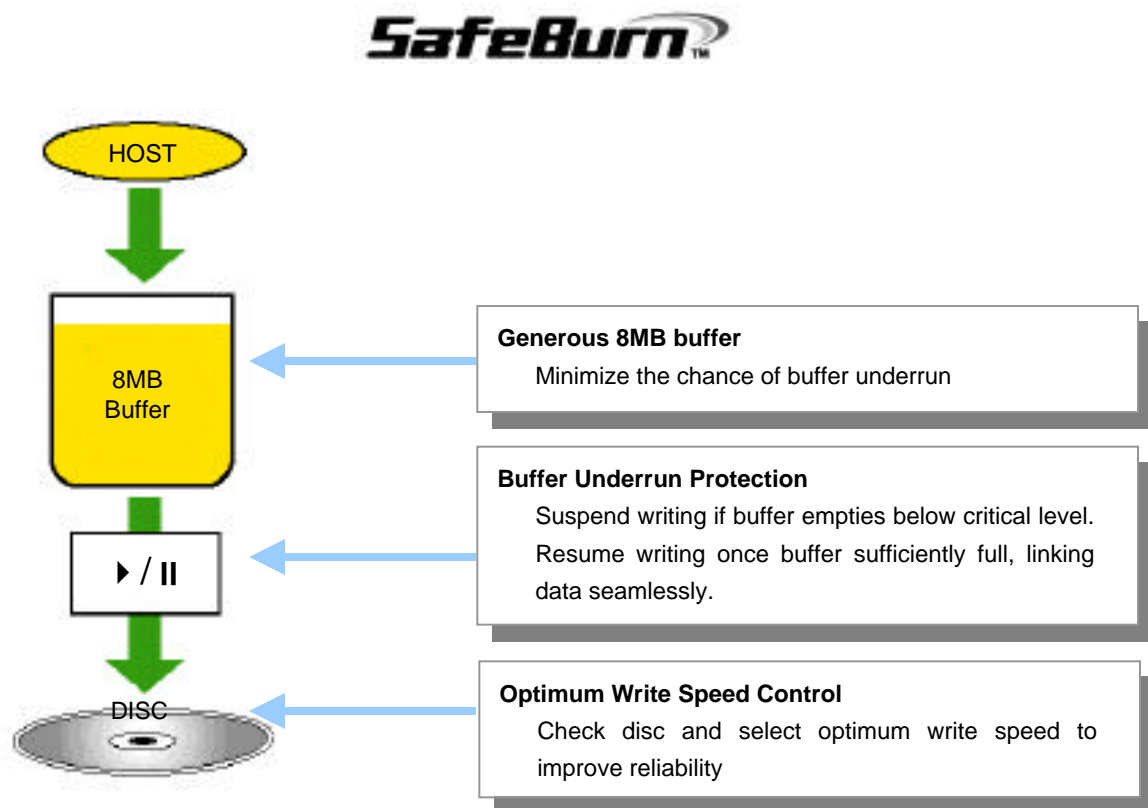
## 24X reading / audio ripping

CRW-70 offers 24x reading / audio ripping capability when it is connected with a computer via USB 2.0.

## SafeBurn Technology

### What is SafeBurn™?

SafeBurn™ is a trademark of Yamaha Corporation given for the recording protection system that not only avoids buffer underrun, but also ensures the written disc is of the best possible quality, even at the fastest of recording speeds. SafeBurn™ is *the* comprehensive concept for fast, error-proof CD recording, which includes (but is not limited to) Buffer Underrun Protection, a huge 8MB buffer and Optimum Write Speed Control.



### Generous 8MB buffer

While other manufacturer's drives with buffer underrun protection system carry only 2MB of buffer memory, CRW-70 has kept Yamaha's tradition of generous buffer memory even after adopting the buffer underrun protection system.

An 8MB buffer, four times larger than that of competitors, minimizes the incidence of buffer underrun in cases where:

- The CPU of the host PC is not fast enough.
- Other applications are running while writing.

Frequent activation of buffer underrun protection increases the time required for the completion of disc writing, because the drive has to seek for the linking point every time. Too many occurrences of buffer underrun devalue the essential nature of high speed drives. In addition, even if buffer underrun protection can make virtually seamless links, a disc with no links is more desirable than one that is full of links.

## Buffer Underrun Protection system

The Buffer Underrun Protection packaged in SafeBurn™ completely eliminates buffer underrun errors. If data transfer is delayed and memory in the buffer drops to a critical level, recording is suspended until the buffer has regained sufficient memory, after which the writing restarts virtually seamlessly from the point where it was suspended.

Yamaha's Buffer Underrun Protection has made "the ultimate accuracy of linking" a reality for the following reasons.

- **Virtually zero link**  
Data gap length is under 1 $\mu$  (Not measurable).
- **Synchronization of frequency**  
Real-time generation and use of "PLL-VCO clock" for recording from ATIP information (synchronization information on the disc) have made it possible to adjust the frequency of recording according to the wobble of the disc.
- **Optimization of laser power**  
Yamaha's own digital signal processor controls the pickup to maintain the laser power and adjust its temperature during the suspension of writing. This makes it possible to resume recording with optimum laser intensity, while ensuring the difference from the original laser power is minimized to its limit.

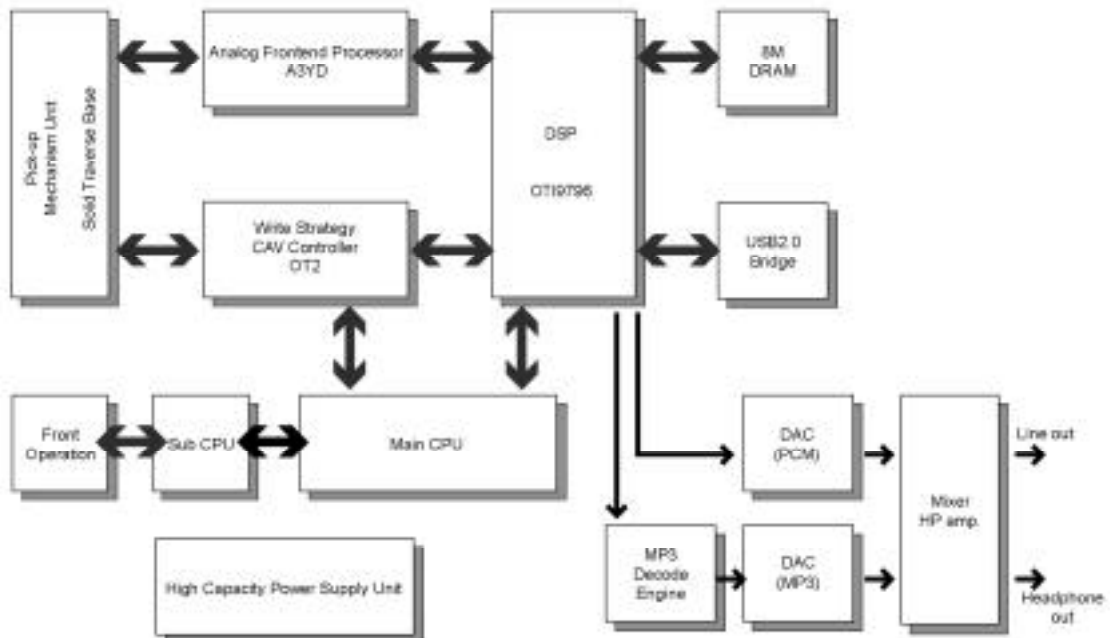
## Optimum Write Speed Control

### **Benefit of Optimum Write Speed Control**

The Optimum Write Speed Control function automatically adjusts writing speed to the optimum level for each kind of disc, and removes user concerns about recording speeds and the CD-R disc's compatibility. Simply by setting the writing speed at 12X, the CRW-70 checks the characteristics and conditions of the inserted disc and automatically selects the maximum optimum writing speed for the disc to ensure data reliability when the disc is read back by CD-ROM drives or CD players.

## Stand Alone High Quality Music Playback Capability

CRW-70 can be used as a stand-alone Music CD/MP3 player without connecting a personal computer. It provides both audio line out and headphone out. To avoid unexpected audio noise from drive mechanism, CRW-70 uses a solid traverse base. Also CRW-70 comes with high capacity power adapter, which supplies clean and sufficient DC power to audio circuit and CD-R/RW mechanism.





## Specifications

Model Name	<b>CRW-70</b> External USB (2.0/11)
Interface	USB 2.0 (USB 1.1 compatible)
Data Capacity	650MB (74min), 700MB (79min)
Burst Transfer Rate	480M bps (USB 2.0)
Writing Speed CD-R	1X, 2X, 4X, 8X (CLV), 8 – 12x (Partial CAV)
Writing Speed CD-RW	2X, 4X, 8X (CLV), 10X (4X-10X Full CAV)
Reading Speed	24x (max.) Full CAV
Data Buffer Size	8MB (3,224sectors)
Average Random Access Time	150 msec. (reading)
Disc Loading Type	Top door type
Writing Methods	Disc-at-Once, Session-at-Once, Track-at-Once, Packet Writing
Writing Formats	CD-DA, CD TEXT, CD-ROM, CD-ROM XA, Photo CD, Video CD, CD-I, CD EXTRA
Stand Alone Audio Playback Capability	Audio CD MP3 file : up to 192K bitrate, 300 files (max), 8 directory level down
Power Supply	5V DC $\pm$ 5% , 12V DC $\pm$ 10%
Weight	560g (without AC adaptor)
Accessories	Blank CD-R, Blank CD-RW USB Cable AC adaptor, Audio Cable (stereo mini type) Owners Manual Software Guide Software
Software	Ahead: Nero 5.5, InCD, NeroMIX, ,Nero Toolkit

### System Requirements

PC/AT-compatible computer

CPU	Pentium II-class or higher, 300MHz or faster
RAM	RAM 32MB memory (64MB or more recommended, 128MB for XP)
Requirements	USB 2.0 ports (or USB 1.1 ports)
OS	Windows 98 SE, Windows ME, Windows 2000, Windows XP