

**1. Digital Copy Protection System: CSS “Content Scramble System”**

CSS “Content Scramble System” was developed specifically for digital copy protection of DVD-Video data. The DVD Consortium/Forum has set up the CSS Interim Licensing Organization to administer the worldwide licensing and application of the CSS technology. CSS is optional for DVD-Video.

In the CSS system, regular DVD-Video streams created by the DVD-Video authoring process are scrambled using a set of software keys appropriate to the title in question. The resulting CSS-protected DVD-Video disc therefore contains scrambled or meaningless video data. The data can only be unscrambled using a DVD-Video player with a licensed decryption chip. At this time all DVD-Video players released to market contain CSS decryption technology.

The scrambling of data occurs at the Glass Mastering stage in the disc manufacturing plant, NOT at the authoring and compression stage. DVD Authoring systems will NOT be used to make a CSS scrambled DLT Master Tape since it would be an “unprotected master.” The DLT is prepared such that it calls for CSS scrambling to be applied during the glass mastering stage at the disc plant.

The copy protection process proceeds as follows:

1. Obtain CSS Encryption Keys.

Keys are supplied only to CSS Licensees. Content providers, Authoring facilities and disc replicators may all apply for licenses. Keys are obtained by generating a “Request For Keys” floppy disc using CSS-supplied software. The CSS software prompts the licensee to choose 12-digit alphanumeric numbers for the disc and separate 12-digit numbers for each title on the disc. These 12-digit numbers are the disc and title keys. The “Request Floppy” is then mailed to CSS in Japan where the chosen numbers or keys are encrypted and the floppy is promptly returned to the licensee containing the “encrypted keys.”

Note:

Disc Keys and Title Keys must correspond to the Video Title Set Structure on the disc. There is only one disc key to specify for each DVD-Video disc but Title Keys must be specified for each Video Title Set on the disc. For instance; if a project is created with 7 title sets and only Title Set 2 is requested to be encrypted using CSS, the licensee will create a Request Floppy specifying one 12-digit Disk Key and 7 12-digit title keys requesting that only Title 2 be encrypted. Typically, all seven titles would receive encryption but the option to leave unprotected is available.

2. Create DLT Master Tape

The Authoring facility is responsible for specifying that CSS digital copy protection is applied. If a Content Provider or the Authoring facility has obtained the CSS keys for the disc, the keys are typically placed on the Master DLT Tape by the Authoring facility. If Nimbus has been asked to obtain keys for the disc, the DLT is prepared in such a way that the Glass Mastering machine at the plant is prompted to insert the floppy disc containing the CSS keys prior to Glass Master recording.

Note:

The video data on the tape is NOT scrambled but each video sector is appended to say whether or not it is supposed to receive CSS. Unless the DLT was authored with the intent of using CSS and with the specially appended sectors it can not be CSS-protected. The CSS Specifications dictate that for Motion Pictures, a maximum of 50% of the video sectors may be scrambled.

3. Glass Mastering at Nimbus CD International, Inc. (“Nimbus”)

The DLT is loaded in the Glass Mastering machine and the data formatter examines the DLT control files to verify if CSS is requested. The data formatter must contain a licensed CSS module

to allow the process to proceed. The CSS Keys are extracted from the DLT or, if not present, called for from floppy disc. Once the keys are obtained the CSS data formatter scrambles the video data during the Glass master recording process. The video data on the DLT and the Glass Master are therefore different (the Glass master being a scrambled version of the original).

4. Subsequent Manufacturing Processes

The rest of the manufacturing process for the DVD-Video discs is unaffected.

5. Data Verification

CSS encryption scrambles the data on the tape using the encrypted keys provided by CSS. The data on the DLT and the replica disc are therefore different and a standard DLT-to-Disc “Bit-to-Bit” comparison test is not possible. The CSS licensing body is aware of this and plans are underway to develop secure licensed decryption stations to allow Bit-to-Bit testing to take place by decrypting the disc and comparing directly to the tape. Such stations are not available to licensees at this time.

Note on Licensing:

Nimbus CD International is licensed by the CSS Interim Licensing Organization as a Disc Manufacturer. At this time it is not anticipated that a per disc royalty will be incurred for the use of CSS. It is likely that as the final CSS Licensing Agreements are formulated, Content Providers may need to obtain a license to have access to CSS encryption information, participate in the Licensing entity’s proceedings and generally use the technology on their DVD titles. Terms and Conditions for Content provider CSS Licenses are not known at this time. It is also likely that Content Providers may be able to use CSS Technology on their DVD discs at no charge provided they use a CSS-licensed replicator such as Nimbus who can source the CSS keys for their titles; this would not allow participation in CSS licensing activities by the Content Provider. Contact information for the CSS Interim License Organization is given below.

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## **2. Analog Copy Protection: Macrovision**

The DVD-Video Analog Protection System (APS) for the US, Japan and Europe regions is Macrovision. This is a widely-used technology for Home Video (VHS). Macrovision for DVD comes in three varieties for US and Japan.

- a. Automatic Gain Control (AGC)
- b. 2-line Color Stripe
- c. 4-line Color Stripe

Only AGC is specified for DVD in Europe.

Macrovision works by recording signals in the part of the video signal that does not reach the TV screen so is invisible on direct playback. When recording a video signal containing Macrovision, a home VCR records the entire signal. In simple terms, the Macrovision information causes the VHS recorder to malfunction and improperly record the signal such that the recorded VHS copy is greatly impaired when played back.

For DVD, Macrovision is “requested” or specified at the authoring stage such that the Master Tape (DLT) has information in the main program that causes the DVD disc to “request” a licensed player to add Macrovision to the output signal. The difference between DVD and VHS is that the

Macrovision signal is added by the hardware for DVD but is on the software for VHS. The system relies on all players having an output stage that allows a "Macrovision chip" to protect the signal.

Note on Licensing:

Nimbus CD International has signed a Replicator Agreement with Macrovision. Content Providers and Authoring Facilities are also required to sign Agreements with Macrovision to use this technology. Content Providers rather than Disc Manufacturers are liable for agreed royalties to Macrovision. For more information on the Macrovision licensing process contact:

Macrovision: Andrew Pillsbury tel. 408-743-8600  
Web site: www.macrovision.com

### **3. Region Coding**

The DVD Consortium/Forum Version 1 DVD-Video Specification has assigned 6 world regions. It is intended that all hardware imported and sold in these regions be hardware locked to play Region-Coded DVD discs that allow playback in that Geographic Region. When a DVD Disc is authored, the Content Provider instructs the Authoring facility as to which DVD Region(s) the discs are required to play in and the DLT Master Tape is thus encoded. The Region is encoded automatically on the disc during manufacturing according to the Authoring instructions. Discs can be manufactured to play in any combination of Regions or All Regions; for example, it is possible to make a disc that can play in Regions 1, 2 and 5 but not Regions 3, 4 and 6.

The purpose of Region Coding is to vary release dates for movies. For example, Spain is in Region 2 but if a DVD movie is encoded for Region 1 only (USA) it will not play in a Spanish DVD player since those players are hardware locked to only play discs coded Region 2. DVD discs can be specified to play in ALL regions or any combination of the six regions.

Region Coding is encoded in the Lead-in Control area of the disc and the Video Manager section of the data area.

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