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“Hi-MD” Format Established:

The Music Recording MD Format Has Evolved into a Versatile Recording Media for the Broadband Era
“Hi-MD” Realizes a Maximum Recording Time of up to 45 Hours of Music, and Raises the Potential for Versatile Storage

January 8, 2003, Tokyo, Japan – Sony Corporation today announced the development of “Hi-MD,” marking an evolution of the music recording MD format into a versatile recording media that also delivers PC data such as images and text file recording capabilities, while maintaining playback compatibility with the current MD products and ensuring copyright security.

Since the introduction of the first “digital audio” MD products that enabled random access and easy editing, Sony has provided users with a variety of MD compatible products for various applications such as home audio products, portable devices and in-car systems.

The MD format is licensed by approximately 80 hardware/media manufacturing companies. Cumulative shipments of MD media and compatible products are expected to reach approximately 1.1 billion and 80 million respectively as of the end of fiscal year 2003. (Data by Sony)

With the introduction of “Hi-MD,” Sony is poised to meet the demands of a growing broadband era with a versatile media capable of recording a variety of content, such as music and images, while maintaining high quality sound and resolution.

High capacity:

By formatting an existing MD disc into the “Hi-MD” format, its density can be increased to almost double the current maximum capacity. In addition, a 1GB (gigabyte) “Hi-MD” disc has been newly developed, realizing a maximum recording time of up to approximately 45 hours of music by incorporating the first (*2) Domain Wall Displacement Detection (DWDD) (*3) technology

Since “Hi-MD” products will be compatible with current MD format discs, users will also be able to play back their existing MDs.

High quality sound:

“Hi-MD” uses ATRAC3plus (*4) audio compression technology, which delivers high data compression while maintaining quality of sound. “Hi-MD” also enables linear PCM recordings, resulting in the recording and playback of CD quality sound.

Versatile recording media:

“Hi-MD” uses the File Allocation Table (FAT) system, which enables the recording of music and other PC data files such as images and text.

Copyright protection technology:

“Hi-MD” incorporates OpenMG and MagicGate (*5) copy protection technology. In addition, “Hi-MD” music recordings preserve encryption contained within the original source.

“Hi-MD” users will be able to record various content, such as images and text files in addition to music, to a single disc and replay it on the go, at any time and any place. This makes it possible, for instance, for users to record their favorite music from their home PC to disc, play it back with their “Hi-MD” player while commuting to work, and to then connect it to a PC at work to upload stored content such as text files.

Sony will proactively promote the “Hi-MD” format industry-wide and anticipates that it will significantly contribute to the vitalization of legal music distribution. Sony will develop the MD market further by using its versatility as a recording media to explore new applications.

(*1) When using a 1GB “Hi-MD” recording disc and transferring data from a PC to the disc at 48kbps with ATRAC3plus.

(*2) As of January, 2004.

(*3) Find 1) High Capacity by Hi-Density Recording Technology section at the “Hi-MD” Format Main Features below for more DWDD description.

(*4) An audio compression technology incorporated in “Hi-MD” that realizes high-quality sound under high compression.

(*5) OpenMG and MagicGate are digital copyright protection technologies developed by Sony with the aim of protecting digital content.

“Hi-MD” Format Main Features

1) High Capacity by Hi-Density Recording Technology

Through modification of modulation and error correction methods, and greater signal processing efficiency, high-density and high-capacity recording has been achieved. By formatting existing MD discs into the “Hi-MD” format, disc density can be approximately doubled (one disc can hold up to approximately 300MB of data /135 hours of music (with ATRAC3plus at 48kbps) in the case of an 80-minute MD disc). Furthermore the 1GB “Hi-MD” disc is the first of its type to incorporate Domain Wall Displacement Detection (DWDD) technology, leading to a maximum recording time of up to 45 hours for music data.

Domain Wall Displacement Detection (DWDD) technology:

The size of readable recording marks on an optical or a magneto-optical disc depends on the spot size of a laser. Until now, it has been necessary to reduce the spot size of a laser beam in order to read out small recording marks for increasing the disc's recording density. DWDD applies a kind of Magnetic Super Resolution (MSR) technology that utilizes the temperature variation created by an irradiating laser on a disc surface in order to temporarily expand recording marks smaller than a laser beam spot and read out the stored information.

2) High Quality Sound Recording and Playback

“Hi-MD” incorporates ATRAC3plus high compression and sound quality audio compression technology, realizing extended length, near CD quality sound. By also adopting a non-compressible, linear PCM recording, “Hi-MD” compatible products enable users to enjoy the recording and playback of high-quality sound, equal to the quality of commercial audio CDs.

3) High Compatibility with PC

“Hi-MD” uses the FAT file system, making it possible to use “Hi-MD” formatted MDs and 1GB “Hi-MD” discs as versatile media for recording PC data files, such as images and text. Furthermore, as portable, rewritable PC media, “Hi-MD” complies with USB format's Mass Storage Class, ensuring that simply by connecting a “Hi-MD” product to a PC it is immediately recognized as an external storage device.

4) Copyright Protection Technology

To prevent an illegal copying of digital content, “Hi-MD” incorporates OpenMG and MagicGate technology, already adopted in Memory Stick and Net MD for content management to ensure that music content stored on a “Hi-MD” disc will be encrypted. “Hi-MD” also conforms to the Serial Copy Management System (SCMS).

"Hi-MD" Format Main Specifications

	Current MD format	Formatting existing MDs into "Hi-MD" format	Hi-MD 1GB Disc
Data Capacity	177MB	305MB	1.0GB
Laser Wavelength (?)	780nm	780nm	780nm
NA of Objective Lens	0.45	0.45	0.45
Diameter	64.8mm	64.8mm	64.8mm
Thickness of Substrate	1.2mm	1.2mm	1.2mm
Tracking Format	Groove Recording	Groove Recording	Groove Recording
Addressing	Wobbling Groove (ADIP)	Wobbling Groove (ADIP)	Wobbling Groove (ADIP)
Data Modulation	EFM	1-7RLL	1-7RLL
Data Detection	Bit by Bit	PRML	PRML
Bit Length	0.59µm	0.44µm	0.16µm
Shortest Mark Length	0.83µm	0.58µm	0.21µm
Track Pitch	1.6µm	1.6µm	1.25µm
Data Transfer Rate	1.25Mbps @1.2m/s	4.37Mbps @2.4m/s	9.83Mbps @1.98m/s

- ⚡ Figures and information above for MD and Hi-MD formatted MD are specified by the respective formats in the use of an 80-minute disc.
- ⚡ Data transfer rate above indicates a data transfer rate when spinning a disc at a particular linear velocity (a maximum data transfer rate; speed reductions due to the process of writing & verifying and USB interface are excluded.)
- ⚡ Hi-MD capacities above indicate recording capacities after being formatted.
- ⚡ 1 MB = 10⁶bytes; 1 GB = 10⁹bytes.
- ⚡ ADIP abbreviates "Address In Pre-Groove," and PRML abbreviates "Partial Response Maximum Likelihood."

* "Hi-MD" "OpenMG" "MagicGate", and "A TRAC3plus" are registered trademarks or trademarks of Sony Corporation.

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