DENON

DESIGN INTEGRITY

DENON DN-060

MULTI-CHANNEL REAL TIME ADPCM ENCODER/DECODER (CD-I Audio Encoder/Decoder)

Denon/Nippon Columbia has developed an audio encoder/decoder unit, Model DN-060, which adapts to the proposed quality levels of the audio portion of the CD-I Green Book. CD-I is expected to boom in the consumer and educational markets soon. Extended playing time and/or multi-channel audio, images, and text data will provide vast applications in interactive courseware or entertainment software. The unit is already in service for dedicated systems as an ADPCM encoder for creating multi-channel, extended playing time discs based on the CD-I audio format. The addition of Denon's DN-060 can enhance your existing production facility. As a principal innovator in digital audio processing, Denon offers versatile options suitable for either CD-I authoring or disc production systems.

FEATURES

1. Audio signals from a maximum of 4 input channels are processed in real time into the audio format specified in the CD-I Standards.
2. Audio quality levels and other encoding modes can be programmed through the RS-232C interface from a personal computer.
3. Labels and other data created on the PC can be loaded in-between the encoded output by the addition of an auxiliary memory board for Type B.
4. A real time audio processor for monitoring enables audible checking of a virtual disc during program production or mastering processes.

MAIN SPECIFICATIONS

Model DN-060 is offered in two types; select the appropriate type and options for your needs.

DN-060 Type A (for CD-I authoring system)

Analog Audio Input	2 Channels
Encoding System	Based on the CD-I Standards o 2 Channel Real Time Process o Audio Quality Levels A, B and C

DN-060 Type B (for extended audio disc production)

Analog Audio Input	4 Channels
Encoding System	Based on the CD-I Standards o 4 Channel Real Time Process o Audio Quality Levels A and B o Optional Replacement Board for Level C o 8K Byte Aux Memory Board Provided

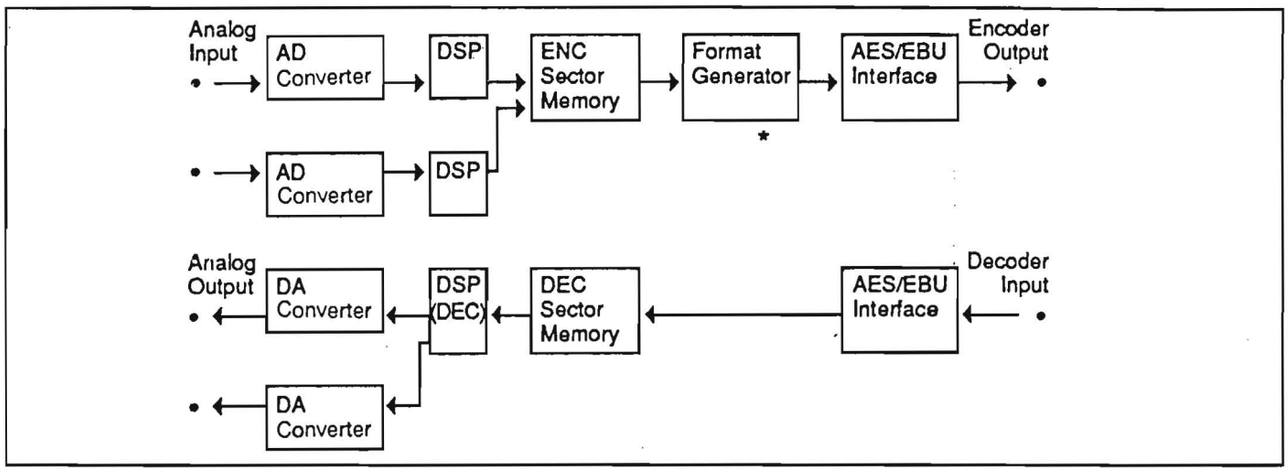
Common Specifications

Encoder Output	AES/EBU or 1610/1630 Interface Format
Decoder Input	AES/EBU or 1610/1630 Interface Format
Decoder Output	Analog Stereo, 20 dBm max.
External Sync Input	44.1 kHz, TTL Level, 50 ohms
Control Interface	RS-232C
Dimensions	Approx. 483 x 260 x 480 mm

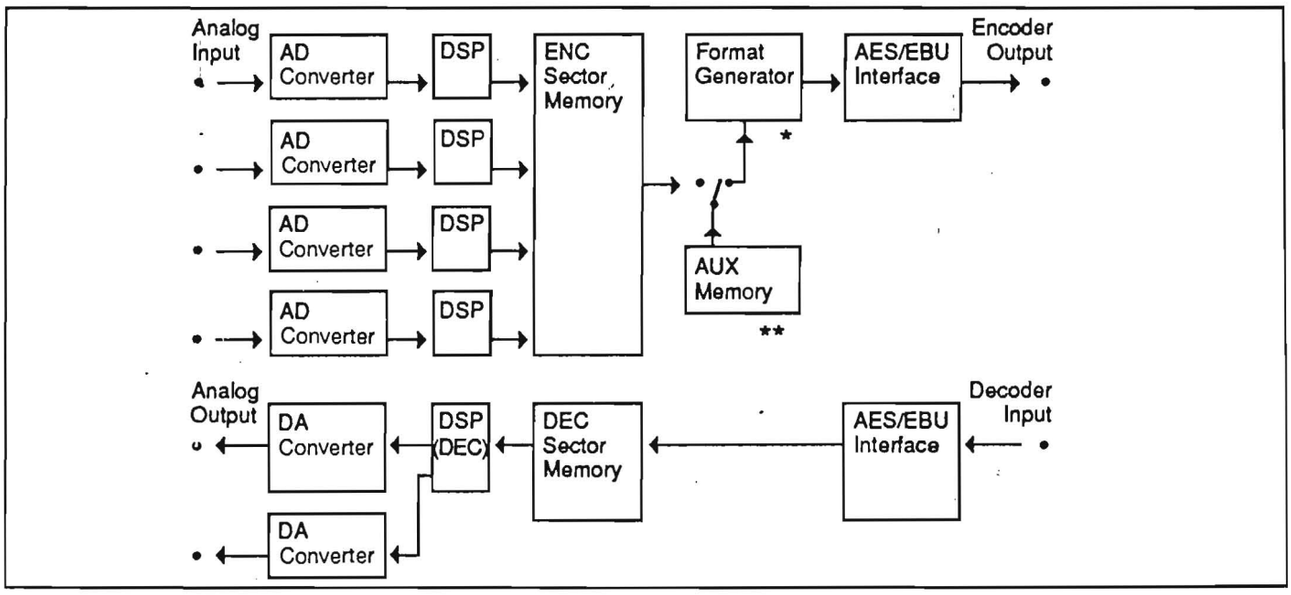
BLOCK DIAGRAMS

The input analog audio signal is converted into a 16-bit digital signal, then processed in real time in accordance with one of the desired compression levels of the CD-I audio subset. The processed digital signal is stored in a VCR or a recorder currently used for audio CD mastering.

Model DN-060 Type A, Audio Encoder



Model DN-060 Type B, Audio Encoder



* Format Generator adds Sync, Header and Audio Sub-header to the input data and converts into the CD-I format. The output data is scrambled in accordance with the CD-I Standards.

** The 8K byte Aux Memory is for adding Labels and Directories. The data from a personal computer can be loaded via the RS-232C.

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REPORT TO THE FIELD

Denon Announces Three Milestones in CD Software Technology

"Anechoic" CD of Full Orchestra, CD-ROM Premastering, Adaptive PCM CD-I

Recently, Denon held a press conference in New York with music critics, audio journalists, computer specialists and independent producers to meet with executives from Denon America, Inc. and its parent company, Nippon Columbia, Ltd., for a presentation of three behind-the-scenes advancements in Compact Disc technology.

1) The world's first anechoic recording of full orchestra, released on Compact Disc, will serve as a landmark test disc for sound engineers, audio enthusiasts and music students all over the world.

2) An imaginative Denon CD-I installation at the Silk Road Exhibition in Nara, Japan using the multi-track audio capabilities of Adaptive PCM recording (ADPCM) tied to an exciting video and film presentation.

3) Denon announced complete turnkey U.S. production of CD-ROM discs. Denon can now handle every step from premastering to pressing and packaging at Denon Digital Industries in Madison, GA.

Takeaki Anazawa

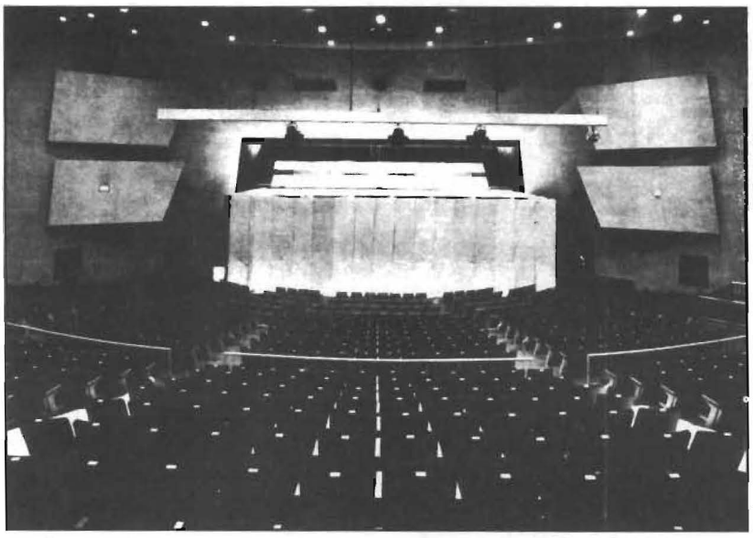
According to honored guest Mr. Takeaki Anazawa, General Manager, Software Engineering & Development for Nippon Columbia, "The announcements are only the latest in Denon's continuing efforts to push back the boundaries of CD technology. The world is just beginning to discover what the Compact Disc can do. It's an open-ended exploration, of which Denon is certainly at the forefront."

Anechoic CD of Full Orchestra

"Anechoic" recordings deliberately eliminate the echo, reverberation, and hall resonance that sonically define the space in which the recording was made. Devoid of this information, "anechoic" recording is a uniquely revealing test of recording technique, playback audio systems, and playback room acoustics.

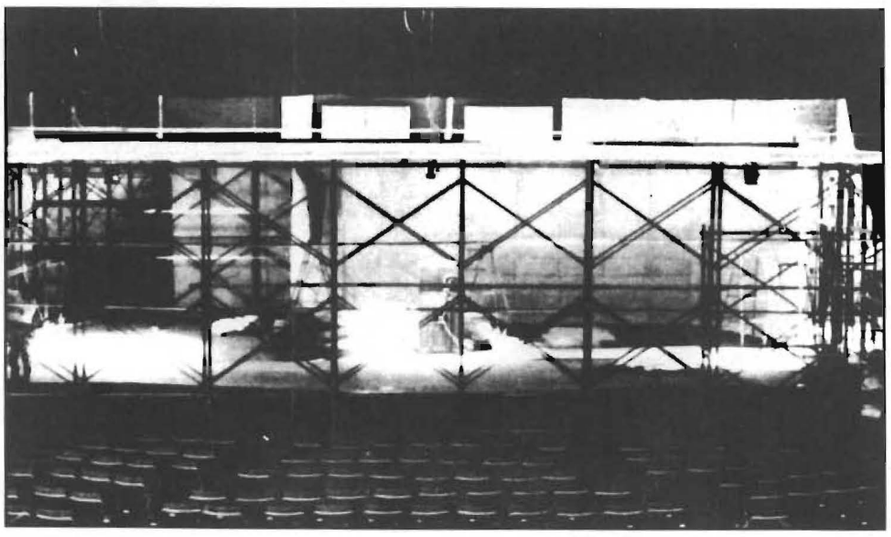
This is why Denon undertook the considerable difficulties of producing the world's first anechoic recording of full orchestra, a recording which is also the world's first anechoic CD. (The last generally-available anechoic recording was produced nearly 18 years ago by the BBC and consisted of chamber music.)

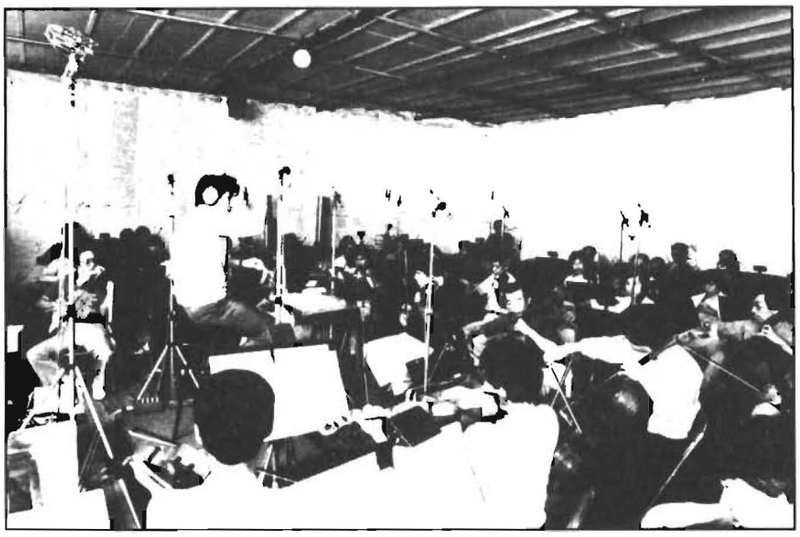
Because most purpose-built anechoic chambers are scarcely large enough for a few musicians, Denon's first challenge was to find an anechoic environment large enough for full orchestra. After enlisting the orchestral forces of the Osaka Philharmonic, Denon decided to build a temporary anechoic box on the stage of the Minoo Civic Hall in Osaka.



Denon brought in the Technical Research Laboratory of the Takenaka Construction Co. to build the anechoic box.

Naturally, the box made no provision for ventilation. And naturally, the sessions were scheduled for mid-July. To keep the orchestra at least marginally comfortable, the producers brought in large blocks of ice.

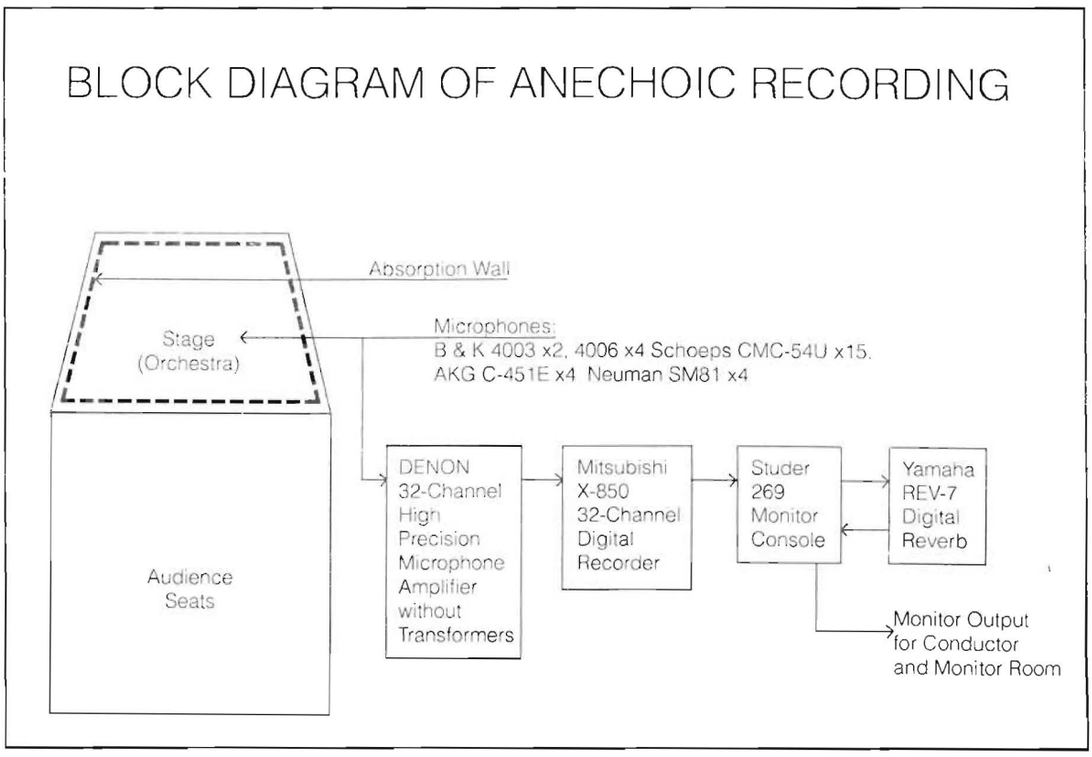


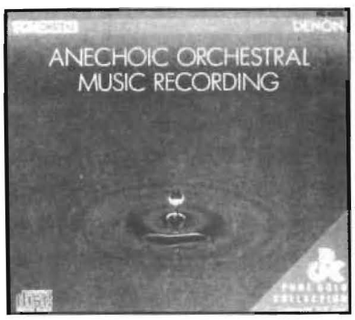


Imagine 100 musicians in July, in a box, with no air conditioning.

Heat was not the orchestra's only challenge. The unfamiliar sound of the anechoic space itself has a strong influence on the performance. In particular, pauses in the middle of a work tend to be shorter than normal. For this reason, Denon provided the conductor and musicians with monitoring headphones that added artificial reverberation for a more "natural" sound.

The recording equipment included 29 specially selected B & K and Schoeps microphones, a 32-channel microphone amplifier developed by Denon for this recording, and a 32-channel PCM recorder developed with the cooperation of Mitsubishi Electrical Industries.





The CD contains the following six parts:

1) Full musical recordings, with orchestral works from each period of Western music history, from Classical to late Romantic.

2) Brief samples of the music for quick comparisons.

3) Musical samples with the synthesized reverberation of three famous concert halls (Vienna's Musikvereinsaal, the Amsterdam Concertgebouw, and Boston Symphony Hall).

4) For score reading and music appreciation, a repeated excerpt (20 bars) from the Brahms Symphony No. 4, 1st movement, demonstrating multi-track reconstruction, starting with the timpani only and building to the full orchestra.

5) A comparison of different sound gathering methods, including one-point stereo, one-point with auxiliary microphone, and multi-microphone techniques.

6) Test signals for room measurement, including single-frequency sine waves, pulses for FFT testing, wideband pink noise and white noise, and 1/3 octave band noise.

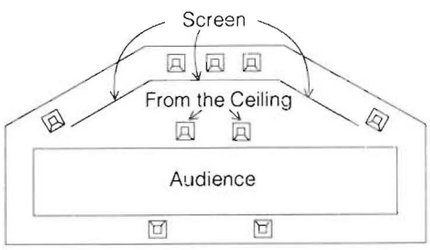
The disc should prove an invaluable tool in architectural acoustics, making possible tests that would otherwise require the presence of a live orchestra. The anechoic recording can also be used to test audio systems and listening rooms. It provides music students with the opportunity to gain a better understanding of the structure of a musical work and instrumental combinations, and the disc provides special tracks for score-reading. The Denon Anechoic CD is available as catalog number PG-6006 from Denon America Inc.

CD-I Extravaganza with ADPCM Audio

Since Victorian times, World's Fairs and trade expositions have featured the public debuts of important new technologies. At this summer's Silk Road Exhibition in Japan's Nara Prefecture, an audio/video extravaganza with hardware design by Nippon Columbia became an impressive demonstration of the new Compact Disc-Interactive (CD-I) format. CD-I taps the Compact Disc's tremendous storage capacity for a whole new world of CD software with computer interaction, text, graphics, video and sound. The Denon system included 73 Laser Disc players with direct-view monitors, three 35mm film projectors, a "stock" Denon DCD-1500 II Compact Disc Player and the new Denon DN-060 ADPCM Encoder/Decoder for CD-I.

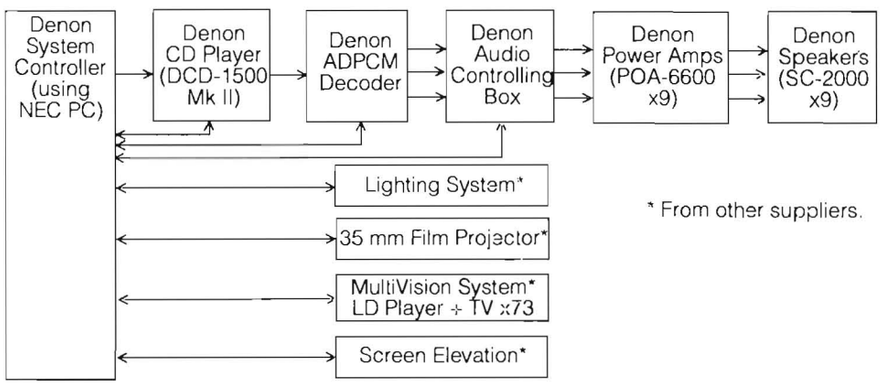
The entrance to Silk Road Exhibition in Nara.

Main Theater of Silk Road of the Sea Pavillion



Audio: 8 channels ADPCM (Level B) synchronized with film projectors.
Visual: 35 mm Film Projectors x3 and 29-inch TVs, x73

Block Diagram of Theater



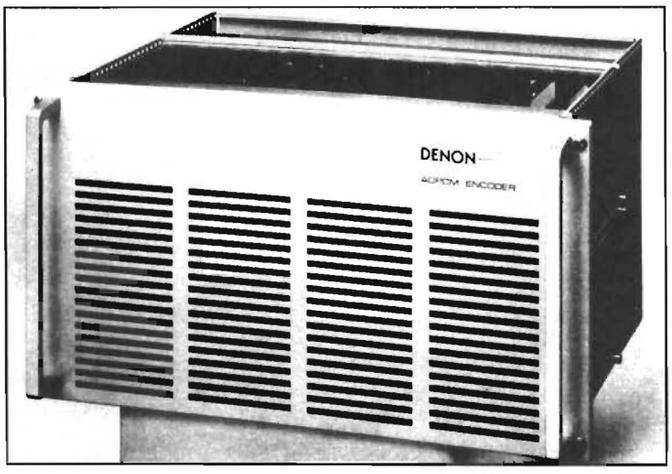
The DN-060 is a professional authoring/production component designed to realize the potential of CD-I audio. Unlike the familiar audio-only CDs, CD-I can store digital audio in any of four levels of sound quality.

CD-I AUDIO SPECIFICATIONS

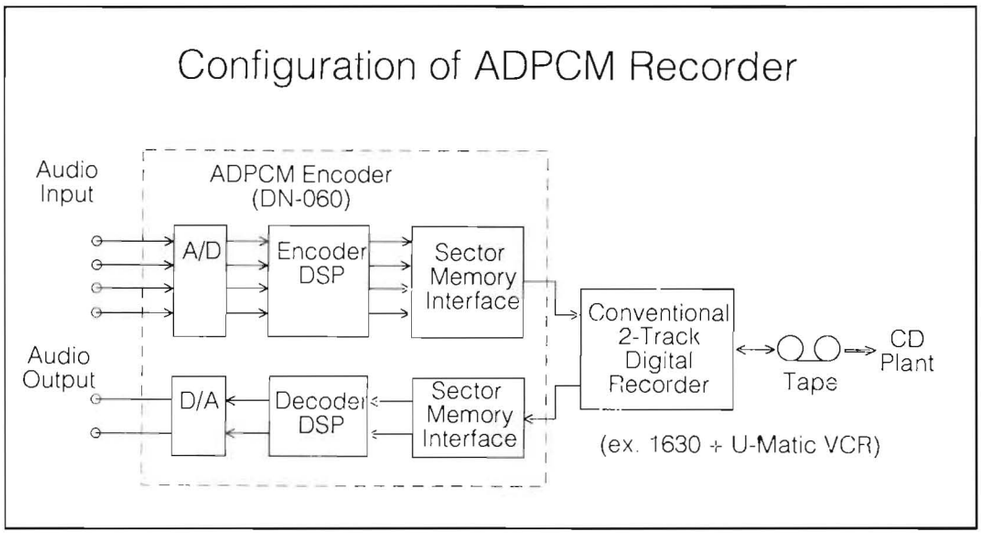
NO.	LEVEL	SAMPLING FREQUENCY	BITS	RANGE	COMPRESSION
1	Digital Audio	44.1 kHz	16	20 kHz	1
2	ADPCM Level A	37.8 kHz	8	17 kHz	1/2
3	ADPCM Level B	37.8 kHz	4	17 kHz	1/4
4	ADPCM Level C	18.9 kHz	4	8.5 kHz	1/8

While the first level is identical to the coding system of today's audio-only CD, the others use sophisticated data compression techniques for multi-channel or extended-play sound. CD-I can encode up to 16 channels or up to 19 hours of sound on a single 4.72" disc. The secret is a coding system called ADPCM, short for Adaptive PCM recording. In the CD's PCM digital audio system, the quantity of each sample is completely defined by its own 16-bit word. In ADPCM, samples are partly defined with reference to previous samples, a procedure that maintains sound quality while reducing storage requirements.

Denon's DN-060 Adaptive PCM Encoder/Decoder for CD-I Authoring and Production.



The creation of the DN-060 is just one way Denon is preparing for the many possibilities of CD-I. Denon has also created a CD-I Video Encoding System that converts video and RGB signals into the CD-I video formats. Denon's system, consists of resolution conversion and coding conversion software that runs on a 32-bit UNIX workstation from Nippon Unisys Information Systems.



Denon Introduces the DRD-8000 Digital BGM Player

The following are preliminary specifications for the DRD-8000 being introduced at the November AES conference in Los Angeles. All specifications are subject to improvement.

ADPCM encoded CD-ROM discs offer extended hours of audio playback applications such as Back Ground Music (BGM). Model DRD-8000 is a dedicated CD-ROM player for processing various levels of ADPCM audio signals based on CD-I specifications.

Features

1. Specially formatted disc in a cartridge allows either 8 tracks of monaural or 4 tracks of stereo music playback. Tracks are consecutively played back upon loading of the cartridge or powering up.

2. 8 hours of monaural or 4 hours of stereo music playback is possible from a single disc. If required, repeated playback or 12 hour (12 selection) programming is possible.

3. A built-in power amplifier (20W, monaural) and a microphone input can serve as a stand-alone BGM system in a moderate size application. Music is muted by 20dB when microphone volume control is turned on.

4. The disc is loaded while stored in an exclusive cartridge for easy operation and disc protection.

5. The disc drive and laser pick-up mechanism can be serviced as a replaceable unit.

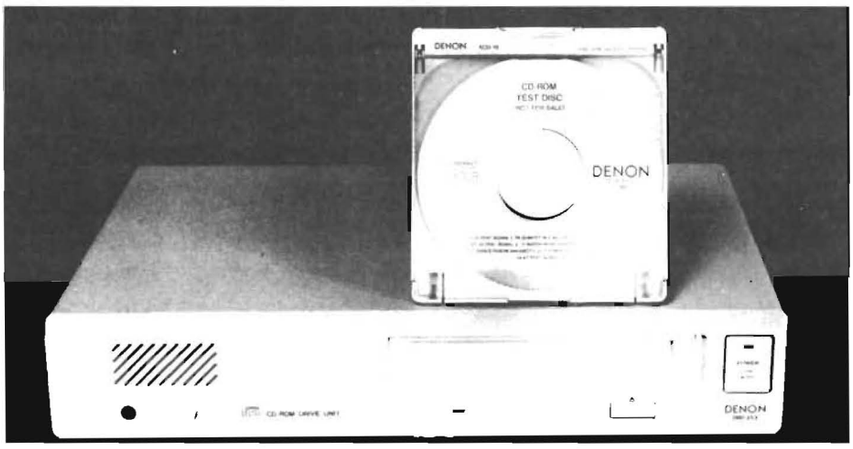
6. Audio controls include volume, tone and microphone volume. AUX input terminals are also provided.

DRD-8000 Preliminary Performance Specifications	
Type	Digital BGM Compact Disc
Format	Digital BGM format exclusive use Mono: 8 tracks Stereo: 4 tracks
Playback Duration	Mono: 8 hours Stereo: 4 hours (when disc is played back without interruption)
Audio Channel	Mono/Stereo auto-selection system
Frequency Response	50Hz to 16kHz ± 2dB
Distortion	0.5% or less (at 1kHz 0dBm, Aux. output)
S/N Ratio	68dB (weighted) or better
Power Amplifier	
Number of Power Amps	1 unit (Mono)
Number of Outputs	2 outputs (4-ohm & constant voltage)
Output Power	20W max. at 1kHz, 5% distortion (4-ohm or constant voltage)
Preamplifier Output	
Number of Outputs	1 pair stereo-outputs (Left & Right channels. Mono signal is sent out form L and R connectors when mono disc is played back)
Output Level	0dBm ± 3dB at 1kHz, 600-ohm loading
Channel Separation	50dB or more, at 1kHz
Microphone Input	
Number of Inputs	Single input (6.3mm diameter microphone jack)
Input Level	0.32mV, suitable for low impedance microphone
Frequency Response	200Hz to 6.3kHz
Line Input	
Number of Inputs	Single input for external signal (including input selector switch)
Input Level	150mV (-16.5dBv)
Impedance	47k-ohm or higher
Power Source	120V ± 10%, 50/60Hz, single phase (other voltage on request)
Power Consumption	Approx. 125W
Cartridge	Approx. 127mm X 135mm X 8mm
Disc Loading	Front loading system with cartridge
Dimensions	434mm (W) X 110mm (H) X 295mm (D). Height includes rubber feet. Depth excludes height of knobs and heat-sink.
Installation	Stand alone type (for rack mounting, brackets are available as an option)
Environmental Conditions	Temperature range in operation: +5 to 40°C (centigrade) Humidity range in operation: 25 to 85% (barring dew formation)

One-Stop Shopping for CD-ROM Software Preparation

In an important development for computer software, Denon is one of the first companies to exploit the Compact Disc's data storage capability of over 600 megabytes. (A full CD-ROM disc holds the equivalent of 1500 floppy disks, 360K each.) Starting in June, Denon is accepting customer data tapes for CD-ROM premastering at its Parsippany headquarters. Denon's CD-ROM Demo Disc, with computer and audio data (catalog number TD-9046) is available by request through the Denon CD Products Group. CD-ROM master tapes are sent for pressing at the Denon Digital Industries plant in Madison, Georgia. Average turn-around time from receipt of prepared data tapes to delivery of CD-ROM discs is a mere five days.

As early as 1983, Denon research teams were investigating uses for CDs above and beyond the audio applications for which Denon has demonstrated its industry leadership. Most recently, Denon began production of its second generation of CD-ROM drives, the DRD-250 Series.



Denon DRD-253 Stand Alone CD-ROM Drive.

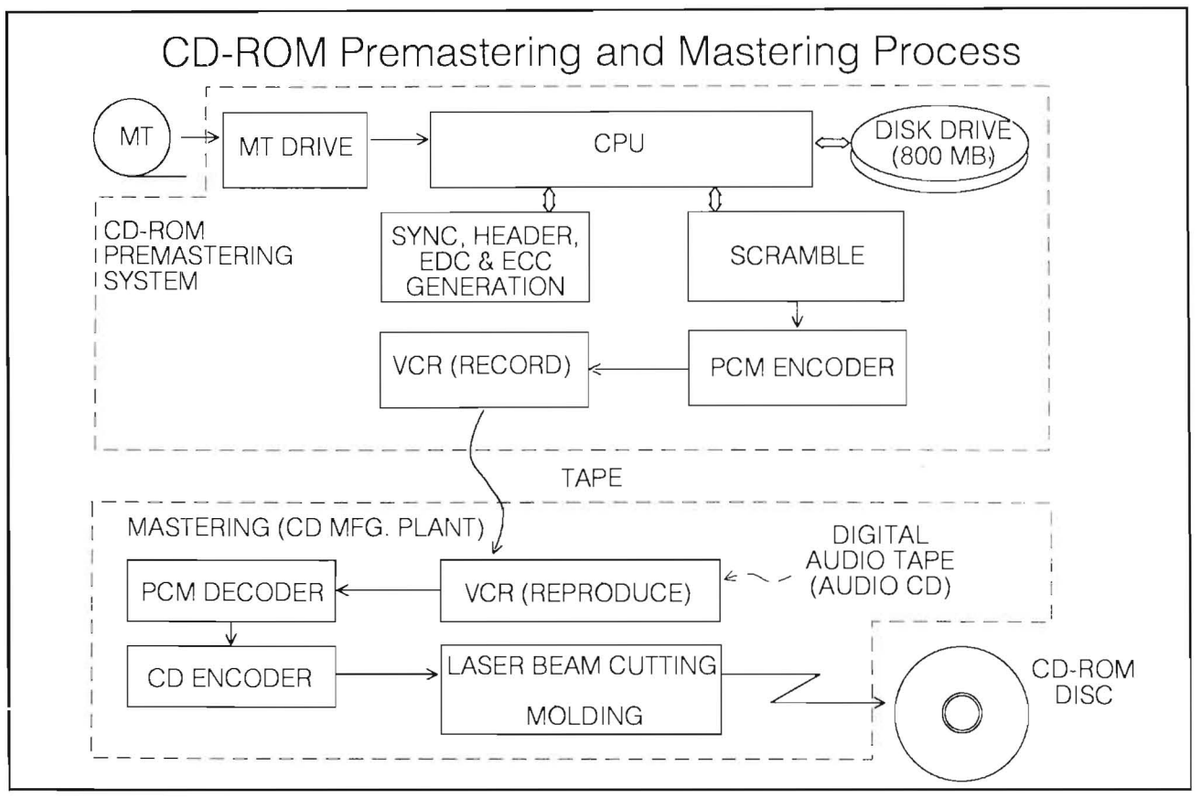
According to Ben Garcia, who is responsible for sales and market development of both Denon CD-ROM Drives and CD-ROM Data Discs, the premastering process at Denon works as follows:

I. Customer creates database with all necessary software to retrieve data. Retrieval software is typically included on the final CD-ROM disc.

II. Database is sent to DDI in Madison, Georgia for premastering where data is converted to a format for storage on optical disc according to "Yellow Book" standards.

III. Data is read into the premastering station and EDC, ECC, synchronization and header bytes are generated in real time. The master tape is sent to Madison, Georgia for mastering.

IV. The CD-ROM master tape goes through the same CD manufacturing processes as a digital audio master.



"Denon holds a unique market position in CD-ROM," Garcia says, "by providing a single source for premastering, mastering and pressing CD-ROM software in addition to manufacturing disc drives. It's the advantage of one-stop shopping."

Denon Digital Industries CD pressing plant in Madison, Georgia.

DENON ANECHOIC ORCHESTRAL MUSIC RECORDING
CD ORDER FORM

DENON CANADA INC.
17 DENISON ST.
MARKHAM, ONT.
L3R 1B5

No. _____

SHIP TO: Please print clearly; this is your shipping label.

Name _____

Street _____ Apt. _____

City _____

Prov. _____ Post Code _____

Day Phone ( ) _____

Evening Phone ( ) _____

Sorry, we can only ship to Canadian addresses.
No P.O. Box Orders.

Method of Payment

☐ Check or Money Order payable to DENON CANADA INC.
enclosed Amount $ (Sorry, no C.O.D.s)

☐ **VISA**

Card Account Number (All Digits)

Credit Card Exp. Date

Customer Signature _____

CD Number	Qty.	CD Title (Please Print)	Price Each	Total	Office Use Only
PG-60006		Anechoic	59.99		

*** SALES TAX 8% ONTARIO Residence Only**

Total Amount		
Sales Tax*		
Shipping		
TOTAL		

ORDERING INFORMATION

Delivery: We require a street address for all deliveries, and cannot ship to P.O. Boxes or any address outside of Canada. We ship orders as received and will notify you if a delay of over 30 days is anticipated.

Guarantee: Should any item you order from DENON arrive damaged or is defective in any way, it may be returned within 90 days for replacement or refund.

Shipping: A $3.50 shipping and handling charge is included on your order form.

Sales Tax: Ontario Residence are subject to 8% Ontario Sales Tax.

Customer Service: Inquiries on orders or general questions on this Special Offer should be addressed to:

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DESIGN INTEGRITY

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