

An Achievement In Digital Audio

3M HCDA™ 3000 Digital Audio System

**True, Recordable Digital Audio
For Broadcasters**

From International Tapetronics Corporation/3M

An Achievement In Digital Audio To Set You Above The Competition

The broadcasting industry today is involved in a major revolution...a competition like it has never faced before. The battle being waged to obtain the attention of the audience's ear has never been greater. And the alternatives now available have grown in number and sophistication along with the trained, attuned ear of a new generation who are now accustomed to hearing quality sound.

Not only do broadcasters compete head-to-head for audience share, they compete with a new onslaught of entertainment now both available and affordable to a vast market of potential listeners.

In automobiles, radio stations compete against each other for attention, as well as against stereo cassette decks, and now in-dash compact disc players.

In the home, record albums, compact discs, cassette tapes and now stereo television, offering both stereo programming and music videos also compete for attention.

To not only succeed against such formidable competition in the audio battle, but to indeed excel, the industry must meet these challenges with the latest technology to provide the clearest, cleanest sound...a sound so pure, so true-to-life, that it differentiates you the broadcaster from your competition and gives you the competitive edge in your market.

Such an achievement is here today...a digital audio system capable of true, digital recording that combines the finest elements of sound engineering technology... and takes into account your requirements for reliability and ease of use. The system is from International Tapetronics Corporation/3M and is designed for broadcasters.

The system provides realistic sound with depth, clarity and crispness in even the most quiet passages with virtually no dropouts, noise, frequency response aberrations or wow and flutter.

This superior sound combined with your carefully chosen programming should lead to greater audience share, more advertising revenues and more profits. All this without sacrificing any of the advantages of the popular cartridge machine format, as this system includes:

■ Easy Operation

Recording and playback on a new digital audio tape cartridge

■ Instant Start

Audio at the press of a button for complete control of today's fast-paced programming

■ Automatic Cueing

Recues to the beginning of the selection or cues to the next selection without operator involvement

■ Re-Recording And Editing

Cartridges can be recorded again and again and edited or customized at the time of recording

■ Source Preservation

CD's, vinyl records and other source materials can be preserved as library masters

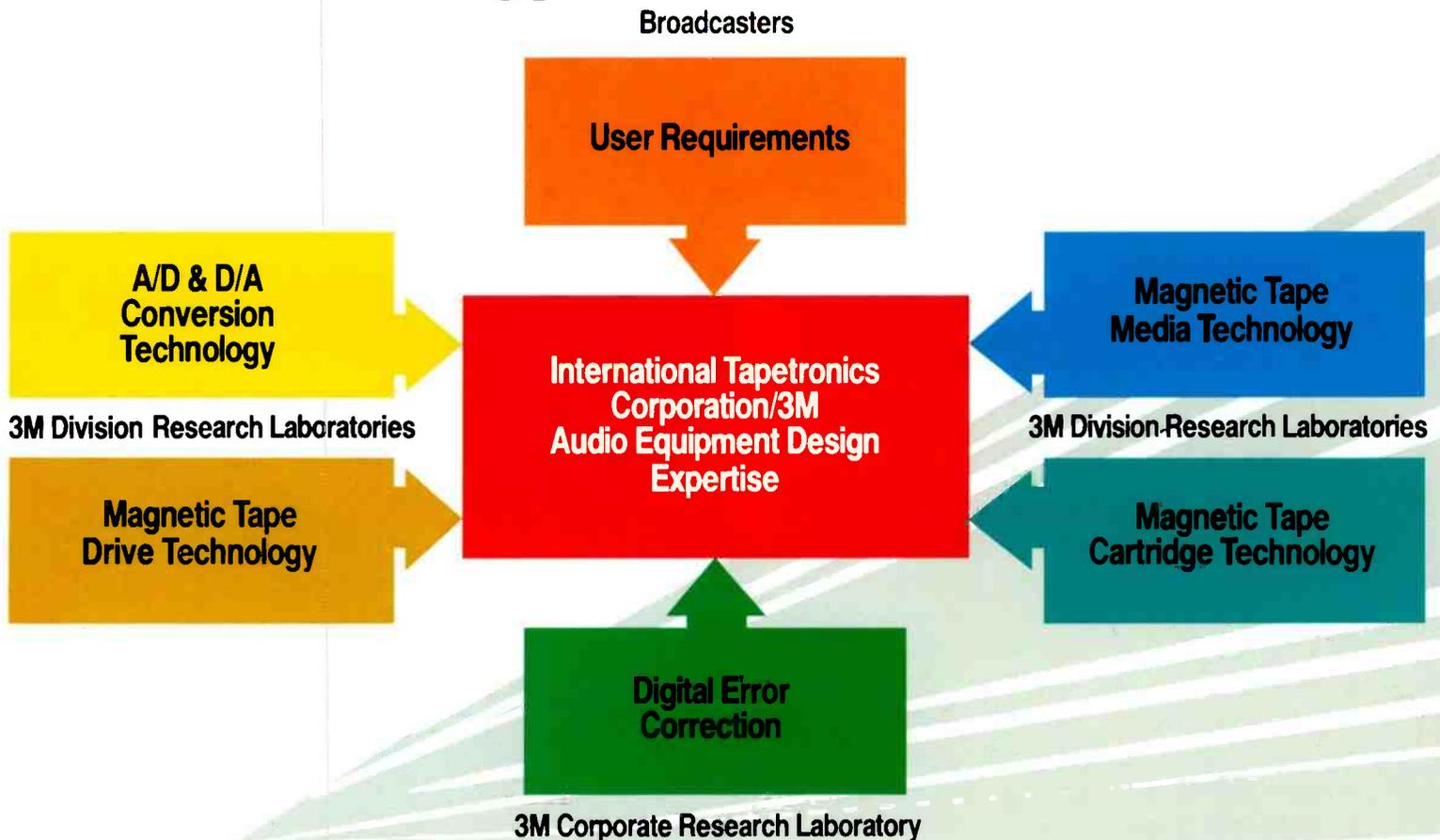
■ Facilitates Playing Correct Cut

Cartridge selections in the control room are easily identified

International Tapetronics Corporation/3M designed all of these features and more into a digital audio system capable of true, digital recording developed specifically for broadcasters...the 3M HCDA™ 3000 Digital Audio System.

The 3M HCDA™ 3000 Digital Audio System, An Achievement In Technology

The 3M HCDA™ 3000 Digital Audio System represents a breakthrough of the highest magnitude. It is a product of 3M's vast technological resources combined with ITC's knowledge of broadcasting and reputation for delivering uncompromising product quality.



3M HCDA™ 3000 Digital Audio System

ITC engineers built upon 3M's proven A/D and D/A conversion technology used within the M-81 Digital Mastering System (DMS). This 32-track digital audio recording machine is so well respected by the music recording industry that hundreds of albums each year are still produced on the DMS despite the fact 3M discontinued manufacturing it years ago.

ITC then incorporated a patent applied for error correction system designed within 3M's corporate research laboratory. This error correction system

surpasses that of compact disc players and offers state-of-the-art, third order error correction.

Both the cartridge and the drive technology designed into the 3M HCDA™ 3000 Digital Audio System are long proven through use in the computer industry. A magnetic tape, unique to the new digital audio cartridge, results from years of successful 3M magnetic tape media technology.

All of these elements along with *YOUR* requirements were brought together by International Tapetronics Corporation/3M to form the basis for an achievement in technology...the 3M HCDA™ 3000 Digital Audio System.

The 3M HCDA™ 3000 Digital Audio System, An Achievement In Design

The 3M HCDA™ 3000 Digital Audio System is a true, 16-bit linear digital audio recording system allowing for up to 20 minutes of stereo recording per cartridge without companding. The system is capable of recording a cartridge at either a 48 kHz or 44.1 kHz sampling rate. *The sampling rate will automatically be detected during playback which allows you to mix cartridges recorded at different sampling rates without operator/intervention.*

Each cartridge contains 200 feet of tape. When operating, the tape runs from one end of the cartridge to the other, while the head (the only element which ever comes in contact with the tape) remains stationary. When the end of the tape is reached, the head moves up vertically to the next track and the tape direction is reversed. This is known as serpentine recording and it provides 6,200 feet of usable recording length, or about 20 minutes of stereo recording time on 31 of the 32 tracks available.

The remaining track is used as a Directory. The Directory facilitates placing multiple cuts on a cartridge and allows operators to locate and cue to any desired cut on the tape in only 15 seconds or less!

The 3M HCDA™ 3000 Digital Audio System is available in three configurations:

■ **Reproducer**

Includes Tape Drive and rack-mounted Signal Processor

■ **Recorder/Reproducer**

Includes Tape Drive, rack-mounted Signal Processor and Record Control

■ **Recorder/Reproducer With Expanded Control Panel**

Includes Tape Drive, rack-mounted Signal Processor and Expanded Control Panel in place of Record Control





The Signal Processor contains the primary electronics for accomplishing A/D and D/A conversion, tape encoding and decoding, and error correction. The rack-mounted Signal Processor can be located remotely from the Tape Drive. This unique approach conserves space and facilitates mounting four drive units in a single rack width.

The Expanded Control Panel is an optional unit used when maximum operational flexibility is required. This unit eliminates the need for a Record Control and also provides remote control if desired.

An Achievement In Serviceability

The 3M HCDA™ 3000 Digital Audio System has been designed with serviceability in mind. Service is easy with:

- No need to make electro-mechanical adjustments
- ITC's P.C. board exchange program
- Installation and operation manual and optional technical illustrations manual
- Factory technical consultation
- Fast shipment of parts orders
- Factory repair service available

The 3M HCDA™ 3000 Digital Audio System, An Achievement In Operational Convenience

Opera

The 3M HCDA™ 3000 Digital Audio System offers uncompromisingly true-sound reproduction quality and operates very much like other ITC cartridge machines. The need for staff training is minimal because of the operational similarity.

Standby Lamp

Indicates an auto-cueing operation is taking place. If either the fast forward/cue next or the rewind/cue last lamp is also illuminated, it indicates either a cue-to-next-cut or cut-to-previous-cut operation is taking place.

Seven-Segment LED

Serves as a power on indicator and allows numbering of the tape drives as either 0-9 or A-J.

EOM Detect Lamp

Indicates detection of the end-of-message (cut) signal on the tape.

Fail Lamp

Indicates an out-of-ordinary condition has occurred.

Read Error Lamp

Alerts the operator the tape is worn, errors are beyond correcting, and the cartridge should be replaced.

Rewind/Cue Last Switch

Used to high-speed advance the tape in the opposite direction of the message (rewind). If pressed a second time, it allows the operator to cue back to the previous cut.

Rewind/Cue Last Lamp

Indicates the machine is either in rewind, or cue-to-previous-cut condition.



Start Switch

Used to initiate the playback run or record run operations.

Start (Run) Lamp

Indicates the machine is in the playback run or record run mode.

Stop Switch

Used to stop tape movement from any function in operation and to cue the machine.

Stop (Ready) Lamp

Indicates the tape is ready to start or ready for unloading after playback. When illuminated continuously, it indicates a ready-to-start condition. When this lamp is flashing, it indicates a ready-to-unload condition.

Fast Forward/Cue Next Switch

Used to high-speed advance the tape along a message. If pressed a second time, this switch allows an operator to cue to the next cut.

AUX Detect Lamp

Indicates detection of an auxiliary signal.

Fast Forward/Cue Next Lamp

Indicates the machine is in either the fast forward or cue-to-next-cut condition.

Tape Drive

tions

Increment Cut Switch
Advances the cut display once per depression.

Decrement Cut Switch
Decreases the cut display once per depression.

Time Switch
Toggles the time display back and forth between counting up or counting down during playback.



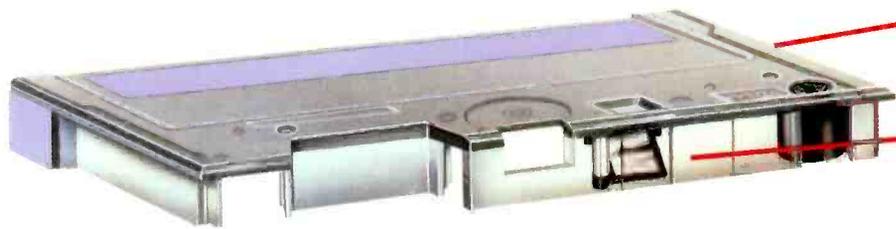
Time Display
This 4-digit LED shows message running time in minutes and seconds.

Cut Number Display
This 2-digit LED identifies the current cut while in playback, record, ready-to-start, or standby condition. If the cut increment switch or cut decrement switch is pressed during playback, the 2-digit display will flash, indicating the next cut to be played.

Record Control

The 3M HCDA™ 3000 Digital Audio Cartridge, An Achievement In Media

The 3M HCDA™ 3000 Digital Audio Cartridge is a single length tape cartridge. There is only one length to stock, meaning less unused or incorrect cartridge inventory. Each cartridge is capable of up to 20 minutes of stereo recording time and of holding up to 31 separate cuts. When recording time remains, additional cuts can be added to a cartridge without re-dubbing. The following are other advantages:



Small Size

2.415 x 3.188 x 0.570 inch size allows easy handling and storage.

Durable Cover

Resistant to breakage during normal usage.

Textured Drive Belt

The textured finish of the drive belt increases tape control and stabilizes tape tension during high speed operation.

High Speed Drive Roller

Facilitates high speed operation while extending cartridge life.

No End-Play Hubs

Each hub has a molded-in plastic spring to ensure consistent track alignment throughout the length of the tape.

Magnetic Tape

A 3M formulated tape specifically selected for high density digital audio recording.

Stippled Baseplate

Produces a perfectly flat surface insuring consistent head to tape alignment.

Tape Cover

A plastic cover protects the tape from damage and contaminants when the cartridge is not in use.

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EOM Record Switch

During the recording process, this switch records an end-of-message (cut) signal when pressed.

EOM Record Lamp

Indicates an end-of-message (cut) signal is being recorded.

AUX Record Switch

During recording, this switch records an auxiliary signal when pressed.

AUX Record Lamp

Indicates an auxiliary signal is being recorded.

Keypad

The 16-switch Keypad consists of digits 0-9, a delete key, cut key, clear key, time key, and two scrolling keys. The Keypad instructs the Tape Drive to perform various cueing and locating functions.

Rewind/Cue Last Switch

Used to high-speed advance the tape in the opposite direction of the message (rewind). If pressed a second time, it allows the operator to cue back to the previous cut.

Rewind/Cue Last Lamp

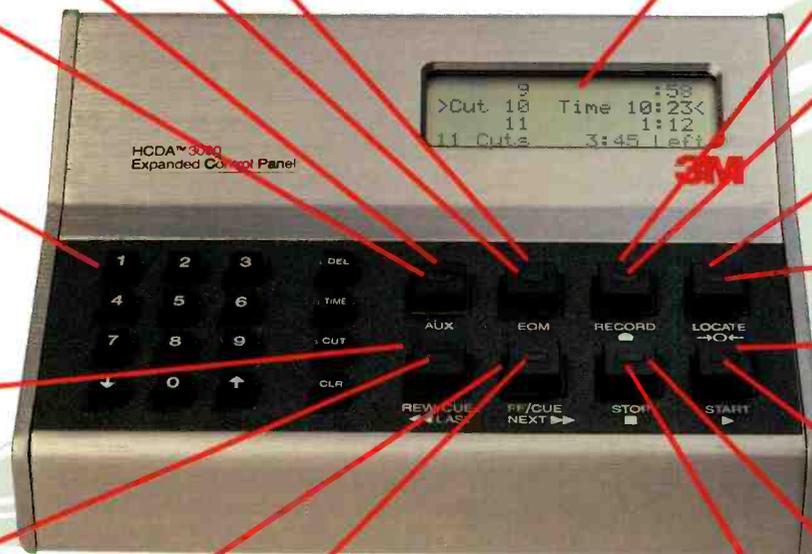
Indicates the machine is either in rewind, or cue-to-previous-cut condition.

Fast Forward/Cue Next Switch

Used to high-speed advance the tape along a message. If pressed a second time, this switch allows an operator to cue to the next cut.

Fast Forward/Cue Next Lamp

Indicates the machine is in either the fast forward or cue-to-next-cut condition.



Display

This 4-line x 20-character LED display provides feedback on Keypad instructions, cut number, track information, time, signal status (EOM & AUX), error status, and overlevel conditions.

Record Set Switch

Places the system in the ready-to-record condition.

Record Set Lamp

Indicates the machine is ready to record or in the process of recording.

Locate Switch

Used to instruct the Tape Drive to locate a specified cut.

Locate Lamp

Indicates tape drive is locating a specific cut.

Start Switch

Used to initiate the playback run or record run operations.

Start (Run) Lamp

Indicates the machine is in the playback run or record run mode.

Stop Switch

Used to stop tape movement from any function in operation and to cue the machine.

Stop (Ready) Lamp

Indicates the tape is ready to start or ready for unloading after playback. When illuminated continuously, it indicates a ready-to-start condition. When this lamp is flashing, it indicates a ready-to-unload condition.

Expanded Control Panel

The 3M HCDA™ 3000 Digital Audio System Preliminary Specifications

Power:

- A. 90-132/180-264 VAC
- B. 47-440 Hz

Power Consumption:

- A. TAPE DRIVE: 22W in standby, 60W in play
- B. SIGNAL PROCESSOR: 50W play, 80W record/play

Frequency Response:

- ± 3dB, 20 Hz to 18kHz
- ± 5dB, 10 Hz to 20kHz

Dynamic Range:

>90dB

Harmonic Distortion:

<.03%, 20Hz to 20kHz at maximum input/output level

Intermodulation Distortion:

<.03% for any two frequencies, 100Hz to 20kHz at maximum input/output level

Audio Input Level:

- 18 dBm to + 18 dBm adjustable for maximum output. Transformerless balanced 20K bridging input

Audio Output Impedance:

25 ohm termination impedance

Audio Output Level:

+ 22 dBm, transformerless balanced output
+ 18 dBm, before clipping into a 600 ohm load

Flutter:

Below measurable limits

Timing Accuracy:

Controlled by crystal oscillator

Start Time:

150 msec.

Stop Time:

5 msec.

Tape Speed:

52 IPS nominal tape speed
120 IPS fast forward/rewind tape speed

Play Time:

20 minutes maximum

Fast Forward/Rewind Time:

20 seconds maximum

Channel Use:

- A. 16-bit/48K samples per second, multiplexed into one digital channel
- B. 24-bit/4K samples per second, second user channel

Sampling Frequency:

48kHz or 44.1kHz

Quantization:

16-bit linear per channel

Error Correction Method:

Multi-orthogonal convolutional code (patent applied for)

Error Concealment Method:

Digitally synthesized mute

Track Configuration:

32 Tracks total
31 Audio tracks
1 Directory track

Pre-Emphasis:

- A. None or CCITT J.17 standard
- B. None or 50/15 microseconds (compact disc type), optional

Ambient Operating Parameters:

- A. Temperature: 40 to 113 degrees F. (- 40 to + 45 degrees C.)
- B. Relative humidity: 20% to 80%
- C. Maximum wet bulb temperature is 79 degrees F. (26 degrees C.)

Dimensions:

- A. Width:
TAPE DRIVE: 4 1/4" (10.79 cm)
SIGNAL PROCESSOR: 19" (48.26 cm)
RECORD CONTROL: 4 1/4" (10.79 cm)
EXPANDED CONTROL PANEL: 7 9/16" (19.20 cm)
- B. Depth:
TAPE DRIVE: 16" (40.64 cm) Add 3" (7.62 cm) for connectors
SIGNAL PROCESSOR: 14 1/2" (36.83 cm) Add 3 1/2" (8.89 cm) for connectors
RECORD CONTROL: 16" (40.64 cm) Add 3" (7.62 cm) for connectors
EXPANDED CONTROL PANEL: 6 5/16" (16 cm) Add 1 1/4" (3.18 cm) for connectors
- C. Height:
TAPE DRIVE: 5 7/32" (13.25 cm) Add 1/3" (.847 cm) for feet
SIGNAL PROCESSOR: 5 1/4" (13.34 cm)
RECORD CONTROL: 5 7/32" (13.25 cm) Add 1/3" (.847 cm) for feet
EXPANDED CONTROL PANEL: 3 5/16" (8.41 cm) Add 1/8" (.318 cm) for feet

Weight:

TAPE DRIVE: 11 lbs. (5 kg)
SIGNAL PROCESSOR: 18 lbs. (8.2 kg)
RECORD CONTROL: 5 lbs. (2.3 kg)
EXPANDED CONTROL PANEL: 4 lbs. (1.8 kg)

Specifications above are applicable at a sampling rate of 48kHz. International Tapetronics Corporation/3M reserves the right to change products and specifications without notice.

International Tapetronics Corporation/3M "The Leader in Reliability and Service"

International Tapetronics Corporation/3M offers a variety of financial options designed to fit your needs, as well as a new, generous trade-in policy. Call today for more information on ITC's complete line of audio equipment.

- 3M HCDA™ 3000 Digital Audio System, "An Achievement"
- The Performance System, 99B Recorders and DELTA Reproducers

- The Economy System, DELTA Recorders and OMEGA Reproducers
- AUDIO SWITCHER, "The Advantage"

When newer technology emerges, it will come from International Tapetronics Corporation/3M, "The Leader in Reliability and Service". To order or for more information call toll free 800-447-0414. From Alaska or Illinois, call collect 309-828-1381. In Canada, call Maruno Electronics, Ltd., 416-255-9108.