

ONE TO ONE

DAT SPECIAL
EVERYTHING YOU WANTED TO KNOW BUT WERE AFRAID TO ASK

THE INTERNATIONAL MAGAZINE FOR MASTERING, PRESSING & DUPLICATING

July/August 1988 £5.00/US \$10.00

DATテープは



コンパクトカセット	2
20-16.0=0	1
64x102x12	大
60	大
90 (90分テープ)	大
4.76	大
不可	不可

テープ幅 3.81mm
トラック間 2.53mm
ヘッドギャップ 20度 (アジャスト) 20度 (アジャスト)
ヘッド幅 13.39mm

その操作性は Dカセットに劣らない

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60 minutes Digital audio recording

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プレイのために DATの+

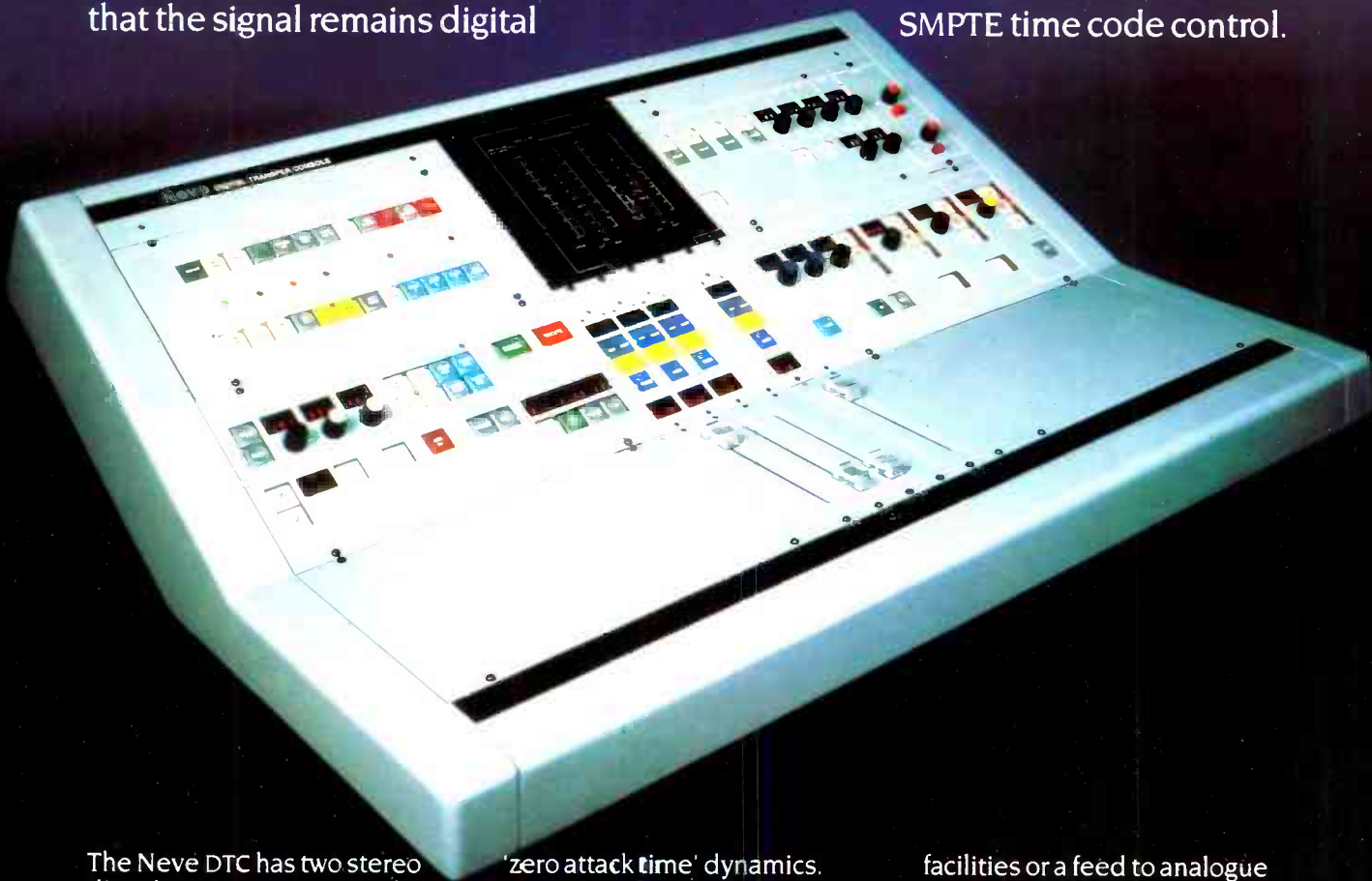
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ONE TO ONE

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Beyond question, Cetec Gauss produces the finest high-speed audio tape duplicating systems in the world. The Gauss name is synonymous with leadership in equipment technology and quality, and assures a long-term, reliable and cost-effective investment.

And now, to build on its success, Gauss is introducing for the first time a series of test equipment products designed to verify quality performances of most high-speed tape duplicating systems in the world.

The Gauss tape test system (analyzer, composite generator and test head), in fact, is the only analyzer in the industry compatible with most duplicating systems at duplication ratios through 128:1.

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Gold, graphics and other short stories

Rather than devote this month's Editorial to one specific theme I've decided to concentrate on a number of smaller items which may be of interest. First let me thank all our readers who responded so promptly to our DAT enquiry. It never ceases to amaze me that we can receive a fax reply from Singapore for example, much quicker than a locally posted letter. The results of our survey are published in this month's special DAT Supplement which we trust will be of use to all those record companies, duplicators and mastering engineers keen to move into DAT.

Ironically as we close this issue we've just been invited to join a small group of journalists who, later this month, will be able to meet Dr Itoh of TDK. The meeting should prove to be particularly interesting as Dr Itoh has played a valuable role in the Japanese DAT standards discussions. I also look forward to hearing more about what developments are currently being researched or about to be commercially introduced.

Talking of new commercial products, we were recently honoured to be visited by the managing director of JVC, Mr Kaneko. He was accompanied by Mr Honjo and Mr Niimi from JVC's US CD plant in Tuscaloosa and Mr Tanaka, manager of the planning dept. One of the main purposes of their visit was to demonstrate some of the very latest developments in CD Graphics.

CD Graphics

CD Graphics has not as yet received a formal public debut — at least not outside Japan despite the fact that the basic 'mechanism' for the system has been in the CD specification for some years. Essentially CD Graphic data is stored in the data subcodes. P and Q codes are used to identify tracks (ie number of tracks, beginning and end, playing time) and R, S, T, U, V, W codes can be used for additional text and for graphics (animated or still). These latter codes are normally left unused. By inserting the appropriate digital data at the pre-mastering stage and providing a decoder for replay a wide range of new features is opened up for CDs.

The system will work with any compact disc, and discs containing graphic data can still be used as conventional CDs on all current CD players. The very first commercial release of a CD Graphics disc is not as you might at first expect on a more obscure specialist label but from Warner Bros. Available only in the US, some US record collectors purchasing the latest Talking Heads CD (*Naked*) may be curious to know what the CD Graphics logo is that appears on a limited number of discs (about 2,000 I think). The front cover of the disc gives no clue that it is a special item, turn the jewel box over however and some discs feature a small CD Graphics logo. Without a decoder it will simply play like any conventional CD. Buried in the subcode areas however is a complete Talking Heads interview, a complete set of lyrics (displayed four lines at a time) and line by line lyrics presented in time with the music. The text is also available in three different languages.

Other discs JVC demonstrated included a classical CD featuring a series of computer pictures slowly dissolving into one another

throughout the entire audio programme, a pop item which included guitar chords displayed on a fret board and the correct fingering in time with the music or at the flick of a switch all the appropriate piano chords and melody lines once again precisely in time with the audio programme. Yet another screen provided a complete list of instruments used on each song with a marker to indicate which particular instruments had been used at any point in the song.

JVC suggested that a selector switch and the appropriate circuits could easily be incorporated into the next generation of CD players. With the CD player connected to a TV screen a menu would be provided of all the graphics programmes at the start of the disc and the appropriate programmes obtained by selecting a number from 1 to 16 on the decoder or CD player. This could provide the option of extensive sleeve notes in several languages for example for international releases or many different programmes in just 1 or 2 languages. One problem — that of providing extensive sleeve notes particularly with classical music — is thus resolved.

The current development although extremely impressive — the conventional disc and the graphics disc are on sale at the same price — is still (with all due respect) just the tip of the iceberg. Once the programmers and the graphic artists meet the challenge of this new media the value of the educational and entertainment potential could be enormous.

Gold Book 2

It is that time of the year when we start our preparations for the *Gold Book*. During this month you should be receiving a letter asking you to confirm the accuracy of your entry or (if you are new to our mailing list) asking for overall details of your company. Please make sure that you let us know that the information is correct. We have a very deliberate policy of trying to ensure that all the information is as accurate as possible and my staff have been instructed to *not* include anything that cannot be confirmed as correct.

Last year a number of companies did not get included because we couldn't confirm the accuracy of our data. In the end I believe this is the best policy as to the best of my knowledge only nine errors were brought to my attention. Two of these were from companies that had moved during production of the book, one was a printing error and five were down to us. Naturally all these errors have now been corrected and I hope we can do even better this time around. Given the large amount of data we processed I understand that the 'error rate' was well below the norm for this type of publication.

If you are reading this and haven't as yet received a *Gold Book* questionnaire then please get in touch with us as quickly as possible.

Finally I'd like to extend a warm welcome to Tanya Short who has joined *One to One* as the magazine assistant. She formerly worked for our circulation department and therefore has a good idea of who our readers are. Her main role will be to help Adrian and I produce the magazine more efficiently — If you saw the state of my desk and filing system, you'd understand immediately! Welcome aboard Tanya, now where have you hidden all this month's articles?

Carl A Snape

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New DADC president

James Frische has been named president of Sony's Digital Audio Disc Corporation in Terre Haute, IN.

Frische joined DADC in 1983 and supervised design, construction, and staffing of the facility, which opened in mid-1984. He served as vice president and general manager responsible for all engineering, manufacturing and sales operations, and was later promoted to executive vice president, handling product development and strategic planning.

"This new promotion recognizes Jim Frische's achievement in managing DADC's phenomenal growth and establishing its position of industry leadership. This is an important step in preparing DADC to further broaden the scope of its activity and pursue new market opportunities in the future," said Michael P. Schulhof, vice chairman, Sony Corporation Of America.

The 300,000 ft² DADC facility has a monthly pressing capacity of six million discs. It employs more than 500 people in the manufacture of CD digital audio, CD-ROM, CDv, CDI and CD³. In addition, 50 of the company's *DRD-100* DAT duplication units have been set up at the facility.

Prior to joining DADC, Frische was head of RCA Records record and tape manufacturing operation in Indianapolis, IN.

Enplas R-O

Enplas USA, Inc, a subsidiary of Dai-Ichi Co. Ltd, Japan, has made R-DAT shells available from its Smyrna, GA, facility. The shells are manufactured by its parent company, which has been producing them for approximately one year.

The US subsidiary has a capacity to supply approximately 3,500 units per month, according to Owen Prillaman, sales manager with Enplas. "We have completed the development of our multicavity tool so, hopefully, capacity will go up to 50,000 or 100,000 per month."

The R-O is currently available for \$2.45 each and Norelco boxes are also available from the company for \$.30 each. Among its R-O users are DIC Digital Supply Corp and Ford, according to Prillaman.

Enplas is housed in a 75,000 ft² facility, 60,000 ft² of which is plant space. Approximately 70% of its business in the audio and video small parts manufacturing, including cassette parts, gears, cams, levers, pulleys, and rollers. Its main parts customers in the US are TDK, Sony, JVC and Maxell.

BASF ship Calibration Mechanism, new tape

BASF began shipping its *Calibration Mechanism* at the end of March, and every music label involved in the manufacture of pre-recorded cassettes ordered at least one. With the recent International Tape/Disc Association's introduction of an interim azimuth standard, the tool stands a good

chance of becoming an internationally accepted standard for C-0 accuracy.

"What work remains is to develop a reference recorder that, in combination with our mechanism, will accurately and consistently define true azimuth," said the company's national sales manager of audio/video duplicator products Terence O'Kelly.

BASF calibration tapes and calibration cassettes contain three alignment sections consisting of test tones recorded over the full width of the tape: a reference level section; an azimuth alignment section and a frequency response section. They are manufactured according to the standards established by the IEC and NAB.

The *Azimuth Standard* reference cassette features a milled, metal-alloy reference cassette housing for an exact measurement standard for azimuth and head alignment and for checking the quality of finished cassettes, according to O'Kelly. The cassette housing is manufactured in Germany and is machined to tolerances of 5/1000th of a millimeter.

The company also recently introduced *Chrome-Super*, a tape that ranks one step above its *Chrome-Extra*. The *Chrome-Extra* is available in lengths of 8,200, 10,000 and 12,300 feet. The *Chrome-Super*, currently available in 8,200 feet length, offers, 2.0 dB more low frequency MOL than the company's ferric *LHD pro Chrome-Extra*, and 2.5 dB more output than chrome at 14 kHz. Its bias noise is 1.0 dB less than *Chrome-Extra*, giving it a signal-to-noise ratio that is 3.0 dB better than its predecessor.

"Print-through is outstanding for chrome tapes — a whopping 4.0 dB better than the other chromes recently introduced in the market. We expect this new BASF tape to be the ultimate tape for real time or limited high speed duplication," said O'Kelly.

In related news, BASF's *920 Loop Master* has been replaced by the improved *921 Loop Master* version. The new tape maintains the same electro-acoustic properties which give 7.5 ips performance to a master tape recorded at 3.75 ips, but it now allows it to be mechanically interchangeable with ferric running masters.

Custom DAT

Custom Duplication has joined the ranks of realtime DAT duplicators with the installation of duplication, labeling, and packaging services in its Inglewood, CA, headquarters.

Custom Duplication is a multi-faceted magnetic media duplicator serving the audio, video, and computer software markets. The facility utilizes Sony 2500 DAT units for duplication with digital audio tape supplied by DIC Digital, Hackensack, NJ. Its clients include Enigma Records which is releasing Devo and other artists on DAT.

"As demand for DAT duplication increases we will be placing more capacity on line. Most record labels are giving us Sony digital 1630 3/4 inch masters from which we clone identical DAT copies," said Bob Hiveley, Custom's president and chief executive officer.

Custom supplies record companies with all the specifications for the labels, J cards, and long boxes for the DAT cassettes. "We duplicate using professional recorders only, therefore we record digital-to-digital at 44.1 kHz sampling rate with the digital flags for copy protection," said Hiveley.

DAT sales

Sony Corporation has sold 25 of its *DRD-100* realtime industrial DAT duplication units to Loran Cassettes and Audio Products, Warren, PA.

"Loran's decision to install Sony's *DRD-100* equipment represents an important step in the process of making pre-recorded DAT software available to the market," said Thomas Hofbauer, major accounts manager, Magnetic Printing Group, Sony Corporation.

"Loran has moved so quickly into this promising business because DAT is today's ultimate format. With all the advantages of compact disc, plus programmability, its potential for use in the broadcast industry is staggering. Loran will be able to offer the software that is required for innovative DAT applications in broadcasting," said Robert T. Loranger, president of Loran.

Each *DRD-100* operates as either a master player or slave recorder and the system has been designed to allow a daisy chain of up to 50 units at a time. Several different programmes can be duplicated simultaneously by switching different *DRD-100s* to master mode, with each unit controlling slave recorders. The front-loading *DRD-100s* can be mounted in standard 19 inch racks.



New headquarters for Otari

Otari Corporation has relocated to new US headquarters in Foster City, CA. The 2-storey facility at 328 Vintage Park Drive, Foster City, CA 94404 houses 34,000 ft² of combined office and warehouse space for Otari's growing staff. The new telephone number is (415) 341-5900.

Additions include an acoustically designed listening room by RLS Acoustics of San Francisco, customer training facilities, and a special test room for the laser-based thermal magnetic video duplicator (TMD).

"We've grown to nearly 60 employees, added three regional offices in New York, Nashville and Chicago, and substantially expanded our market. Our new headquarters will facilitate our current and anticipated future growth," said John Carey, marketing manager.

Maxell increase prices

Citing the worsening yen/dollar relationship as part of the cause, Maxell Corporation Of America's Jim Ringwood has announced an approximately 15% increase in the price of its professional and industrial audio and video pancakes and cassettes. Ringwood is general manager of the company's Professional/Industrial Division, Fair Lawn, NJ.

Ringwood said the price increase is mainly due to the overall increase in the cost of doing business. "The worsening yen/dollar relationship, along with the recent price increases in all facets of our business, including materials, resins, plastics, shipping, labour costs, sales and administrative expenses, are contributing factors for this increase. The company does not expect the price hike to have a significant impact upon industry demand for its product.

Shape R-Os

Shape Inc Biddeford, ME, has scheduled to introduce R-0 cassette shells in early summer. Projected capacity of the line will be five million by year's end, according to Paul Gelardi, vice president of Shape. Shape currently has seven patents pending on its DAT product.

"We intend to be competitive with the prices in the marketplace. We will do bulk length loading for duplicators and we will provide other kinds of services such as cassette loading and packaging as well. Everybody is cautiously optimistic about R-DAT. The market is still in its infancy," he said.

RCA buy Gauss

Cetec Gauss, Sun Valley, CA, has entered an agreement with BMG Music (RCA/Ariola Music) to install its high speed music duplicating equipment in the RCA North Carolina duplication facility.

Under the agreement, RCA/Ariola will also receive Gauss' new *Tape Test System*, which consists of a composite waveform generator, analyser and test head.

Four 10-slave 2400 duplication systems will be installed in the RCA facility. The system combines a master reproducer and loopbin in a single unit designed to operate at speeds of up to 480 ips. The slave equipment operates at speeds of 32., 64: and 128:1.

PDO open sales office

Philips and Du Pont Optical (PDO) has opened a West Coast sales and marketing office. Spence Berland has joined the company as vice president of sales, and will head the office at 3815 West Olive Ave, Burbank, CA 91501. Tel: (818) 848-2442.

Berland was formerly vice president of *Cash Box* magazine, and prior to that had owned and operated a franchise office of the *Robb Report*. "With an experienced music industry professional like Spence Berland in

our new office, we will be able to offer more personal service to our growing West Coast business," said Jack Kiernan, senior vice president, marketing.

A page from the history books

Audio Matrix, founded by Milton Gelfand in 1947, has closed its original plant, 914 Westchester Ave, The Bronx, NY. The company is known as one of the pioneering processors of recording masters into metal masters, mothers, and stampers, and has now undertaken expansion of its optical disc operations in Hempstead, NY.

The first stereo LP, cut by Westrex for the late Sid Frey of Audio Fidelity, was processed at the Westchester Ave plant. Its client list included producers such as Jerry Blaine, George Goldner, Bernie Lowe, Dave Miller, Sidney Siegel and Phil Spector.

Gelfand started the plant with the processing of 10 inch 78 rpm masters into copper parts. All nickel matrices, the 45° rotating cathode, and stereo LP processing are among the technical achievements that first saw light of day at 915 Westchester Ave.

In 1965 a patent was awarded to Gelfand and Wallace Scott for specialised equipment for electroforming record stampers. The system became known as the *Audiomatic Process* and has been sold by Audio Matrix to a number of record producing companies, including CBS, RCA, and MCA. The system was also purchased by Melodiya, the Russian state-owned record company, which retained Gelfand as a consultant on record production.

Gelfand serves as the head of Audiomatic Corporation, an international marketing company which serves as the international sales arm for Electro Sound tape duplicating systems and Apex on-cassette printing equipment.

Audio Matrix is now focusing on the optical/compact disc industry, building its own electroforming equipment that includes moulded fibreglass tanks and accessories. The company has also expanded its capacity for clean room production of back-polished optical disc nickel fathers, mothers and stampers.

US tour for Lyrec

The AEG Corporation brought the Lyrec *P-2500* high speed tape duplication on an American tour. The unit was demonstrated at the International Tape/Disc Association's Third Annual *How And Why Seminar* in Marina Del Rey, CA.

Product duplicated on the Lyrec *P-2500* high speed tape duplication system using AMI/Concept Design's *DAAD* tapeless master was compared to CD in a demonstration during the seminar. According to Rainer Zopyf of AEG, which is the exclusive Lyrec distributor in North America,

only one attendee at the demonstration correctly identified the tape source.

"Now, once and for all, we've narrowed the gap between digital and analogue. Everybody is still waiting, nobody rolled over and played dead (in the analogue industry). The equipment is there, the raw material is there, it's really up to people now if they want to make a difference," said Zopyf.

The *P-2500* features vertical design and offers Dolby *HX-Pro* with a duplication ratio of 64:1. Each unit is self contained and independent of others, featuring its own dedicated power supplies, audio electronics, and bias generators. Also demonstrated was the *TR55-QC* quality control tape deck featuring bi-directional tape transport.

Sprinter pancake

Maxell has introduced two new pancakes designed to meet the needs of video duplicators utilising high speed technology such as Sony's *Sprinter*.

"Since last year, there have been many improvements made within the duplication process which have created a need for improved VHS pancake," said Jim Ringwood, general manager, Maxell Professional Industrial Division. He added that the new product, *TF20-4400GN*, offers the duplicators a longer length tape and both feature improved specifications over the VHS pancake presently available.

The *TF20-4400GN* is the newest pancake for *Sprinters* within Maxell's lineup and includes more than 14,436 feet, doubling the recording capability of last year's *TF20-2134*.

Both pancakes have been formulated with an improved base film designed to guarantee a high quality performance and level of strength to enable duplicators to drive more mass while reducing labour time.

Davkore move

Davkore, an audio and video duplicating and packaging company in Mountain View, CA, has relocated to larger quarters.

"Now that our square footage has more than tripled, we are better able to service our growing list of clients with a more efficient and organised operation," said Chris Webber, president of Davkore, 1300D Space Park Way, Mountain View, CA 94043. Tel: (415) 969-3030.

The firm's video duplication room has been expanded in an effort to improve turnaround and allow space for an increase in equipment, according to video sales manager David Lewis.

"Our new facility has a much larger assembly area that will allow us greater production capabilities for our full service packaging and distribution operating, along with more storage area for customer running masters and packaging materials," said Ray Kaiser, audio sales manager.

GCI purchases lacquer plant

GC International, a Los Angeles based manufacturing company, has acquired Capitol's lacquer audio disc master manufacturing plant, located in Winchester, Virginia.

GCI's chairman, F Willard Griffith II, stated that the plant would be moving from Winchester, Virginia, to a GCI facility in Banning, California (just outside Palm Springs) and would be placed into a wholly-owned subsidiary, Apollo Masters Corporation. Griffith said that the Apollo name would be kept and lacquer masters would be sold by Apollo Masters using the manufacturing and lacquer techniques and standards developed by Capitol.

Ralph Cousino, vice president Technology Development, Capitol Industries-EMI Inc said that this acquisition was important to the audio recording industry because of the long history of GC International's involvement in supplying aluminium substrates to Capitol and others in the audio master recording industry.

In 1975, Capitol and GC International's Raytee Division began development of a high quality substrate for this product line. In 1978, Capitol and Raytee entered into a five year contract for exclusive supply of substrates to the Capitol Magnetic Products lacquer plant in Winchester. In accordance with the contract, Raytee provided machinery to Capitol to duplicate the Raytee process internally.

Griffith said that this sale will be welcomed among lacquer master customers because it increases the availability of lacquer masters and maintains production of the Apollo line developed by Capitol. He stated that the Apollo masters would be rolling off the line from the plant in Banning in September.

Apollo Masters Corporation are located at 101 West Lincoln Avenue, Banning, CA 92220, USA.

Electro Sound appointment

Greg Speen has been appointed vice president and general manager of Electro Sound, Los Angeles. Speer, who has spent the past 12 years managing record and tape plants, assumes his new duties after serving as director of manufacturing at Memory Tech.

PDO erasable disk

Philips and Du Pont Optical (PDO) have introduced a 5¼ inch erasable optical disk that they claim can store more information than any other comparable erasable disk on the market.

The disk — PDO's first erasable product for the information storage markets — will be used in an optical disk drive system

announced by Maxtor Corporation of San Jose, CA.

The PDO disk will be used in Maxtor's new *Tahiti I* optical disk drive system.

"We are gratified that Maxtor has selected PDO as a key supplier of erasable optical material," said J Patrick Little, business manager for the joint venture's recordable products business. "We view this development as an important step by two of the leading participants in the information storage industry who have co-operated in a partnership to introduce state of the art erasable optical disk technology."

PDO has a number of similar co-operative efforts involving erasable optical media under way with several other major optical storage companies, said Little. "We anticipate being able to jointly announce the commercialisation of these products during the next year or so," he added.

Based on magneto-optical erasable technology, the 5¼ inch, cartridge-held disk supplied to Maxtor can store up to one gigabyte with seek times of less than 30 milliseconds. (A gigabyte is equivalent to one billion bytes of information or about 400,000 types pages, 4,000 floppy disks, or 20,000 images). Typical users of such technology will be business, government and the military.

This capacity will permit erasable optical disks to be used as backup storage devices to magnetic disks and in applications that include electronic network file servers, CAD/CAM, imaging and document storage. Erasable optical disk technology as a replacement for magnetic cartridge tape (where random access of information is desirable or performance is critical) is another important application.

Under development for some time at PDO research facilities in the US and in Eindhoven, these disks are the forerunners of several types of erasable optical media the joint venture is evaluating and developing. From this range of activity, those technologies which best fit the immediate and future needs of drive manufacturers will be commercialised.

"The market for erasable optical disks offers significant growth potential that PDO is pursuing vigorously," said Cornelius Klik, manager of the joint venture's professional markets for CD audio, CD-ROM, videodisk and write-once optical media, all of which are continuing to grow."

New offices for Neve

In a major expansion responding to increased sales and service requirements, Neve has announced the opening of new facilities in New York City and Nashville, TN.

The New York Office, headed by Eastern Regional sales manager Phil Wagner, is located at 260 W 52nd Street, Suite 25E, New York, NY 10019, Tel: (212) 956-6464.

The Nashville facility, under the direction of Southeast Regional sales manager Tom Semmes, is located at 1221 16th Avenue

South, Nashville, TN 37212, Tel 37212, Tel: (615) 329-9584.

Both facilities will also be staffed by Neve technical service engineers to complement Neve's extensive customer service in the US. Neve's Hollywood, CA office is expected to relocate into larger premises by early summer.

With the head office of Rupert Neve Inc, Neve's US company, located in Bethel, CT, this now makes a total of four sales and service facilities within the US.

Jewel cases up 5%

Shape announced a 5% price increase to their compact disc jewel cases, effective June 1, 1988. This is being implemented in response to the extreme increase in the price of polystyrene, the product's raw material.

"This price increase is hardly in direct correlation to the rise in the price of polystyrene, which has risen over 50% in the past year," states Wesley Phillips, product manager of compact disc packaging for Shape. "We're simply responding to this development that has affected all domestic producers of jewel cases."

Shape's jewel cases are manufactured primarily at their Dadeville, Alabama facility, where initial production began in September of 1986. Shape claim a current market share of approximately 35%.

Rental Act extension

Legislation has been introduced in Congress by the chairmen of the House and Senate Subcommittees with jurisdiction over copyright to extend the provisions of the *Record Rental Amendment of 1984*. This legislation provides sound recording copyright owners the exclusive right to authorise record rentals. Congress originally enacted the law for a five-year period.

"The practice of record rentals is unfair to creative artists and writers whose music is taken from them without payment for their work, to record companies whose source of income is from actual record sales and to legitimate record retailers whose prices include payments to copyright owners. They cannot fairly compete with those who evade royalty obligations," said Jay Berman, RIAA president.

Before the 1984 legislation was enacted, the practice of record rental threatened to grow into a massive problem for the US music industry. Other countries, such as Japan, have seen the legitimate sales of music decreased by as much as 30% because of rental stores, according to the RIAA.

Surveys there have shown that 97% of record rental store customers admitted that they tape the albums they've rented to avoid buying.

"Congress has a full schedule and a short session because of the elections this year," said Hilary Rosen, vice president, Government Relations. "Hopefully, the fact that the Bill has no apparent opposition will allow it to pass before adjournment."



10,000,000 CDs

EMI manufactured its 10 millionth compact disc in May as Eddy Grant's latest album *File Under Rock* came off the press. Grant went down to the factory to celebrate and for the first and only time clean room rules had to be relaxed because his dreadlocks wouldn't fit inside the usual cover-all headgear.

After touring the factory and CD printing and packaging operation Grant was presented

with a special gold coloured pressing of *File Under Rock*. Every member of EMI CD Services staff received a similar souvenir copy.

During the first three months of this year EMI CD Services manufactured 1 million CDs per month and is on target for a total 1988 output of 14.2 million (the factory's maximum capacity is 15 million).

Digital mastering for FPA

Video cassette duplicator Fraser Peacock Associates has taken delivery of a Sony PCM 1 inch digital mastering machine in response to increasing customer demand for enhanced audio quality. It is the first of several planned for implementation and brings the company's 1 inch mastering capacity to six machines.

Sales and marketing director,

Mike Carey, said that PCM audio quality is very useful for duplicating feature films and industrial videos as well as being critical for the music video market.

Work is also nearing completion on a clean room facility which will house 15 fully automated computer controlled tape winding systems.

Bumper payout

MCPS, which collects and distributes mechanical copyright royalties on behalf of its 10,000 plus composer and publisher members, is predicting a bumper cash payout to its members for the current financial year (year end June 30th).

Last year, MCPS distributed £17,471,047 — in itself a record. This year MCPS is predicting that royalties will break the £20 million barrier. Keith Lowde, company secretary, said: "I am very enthusiastic about the figures for this year, as our members will

receive another record pay out. We've consistently beaten last year's figures, and this is due to our continued vigilance in every market sector.

"Despite reductions in interest rates, MCPS remains profitable. This has only been made possible by the 100% increase in royalty distribution over the last five years. I am confident that, with the increased efficiencies we've been able to achieve, we will carry on improving the results for our members."

BTIA Forum

The British Tape Industry Association (BTIA) held a forum in May to discuss the future of pre-recorded videocassette business. Attendees included personnel from major studios, title owners, distributors, multiple and independent retailers, major duplicators and tape manufacturers.

The overall theme was 'Putting Quality First'. The pre-recorded cassette market has experienced rapid growth since 1985 with over £200 million in sales and £500 million in rental turnover representing a total cassette quantity in excess of 25 million units per year. The high volume figures have persuaded duplicating houses to consider

high speed technology in order to give better flexibility and a higher level of automation.

This growth has also influenced both marketing and distribution of the products. The industry is moving towards family entertainment with many best selling titles being children's programmes; with the image of the industry improving, more people are buying and renting video programmes than ever before.

In order to maintain growth and the industry's image the BTIA believe it is important to ensure that the products offered to the consumer meet all the quality requirements as the forum demonstrated.



L-R: Peter Thompson, chairman; Peter Newall, JVC; Mohsen Nooh, Sony; Andrew Bourne, Rank Video Services; Derek Mann, VTA.

Chevry leaves Midem

At the beginning of May Bernard Chevry resigned as president directeur general of the Midem Organisation to pursue other

activities. The board of the company have invited him to accept the position of president d'honneur-fondateur.

BBC Enterprises market radio

BBC Enterprises is setting up a new radio marketing section within its Home Entertainment Department to exploit all the untapped commercial opportunities offered by BBC Radio.

The Radio Marketing section will be headed by Sue Anstruther who has been appointed radio marketing manager.

Anstruther will be working with a producer and an assistant. Together they aim to increase the revenue already raised by BBC Enterprises from radio-related products such as books and records and through merchandising. As with all BBC Enterprises activities profits

made will be reinvested in future BBC programmes. Anstruther has already started sifting through a treasure-trove of radio archives to select some classic programmes for release on audio cassette. *The Radio Collection* will be launched in the autumn at the BBC Radio Show at Earls Court.

"The Radio Marketing section has a very exciting job to do" said Sue Anstruther, "and I believe there is a wealth of material to be developed commercially. *The Lord of the Rings* cassettes have demonstrated how successful a radio series can be with over 15,000 already sold."

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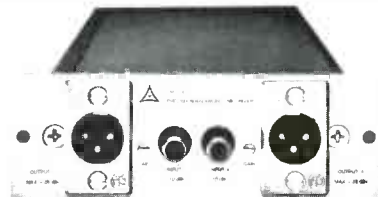
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European push for improved standards

Leading recorded music companies have joined forces in a European initiative to improve the quality of the music cassette. Members of the Music Cassette Quality Committee (MCQC) of the German Phonographic Industry Association have announced that they will be intensifying industry efforts to improve the quality of the music cassette.

Their move recognises the key role of the music cassette as a sound carrier for the industry and the special importance of European and international collaboration. The MCQC will seek the active involvement of leading hardware manufacturers and testing institutes to develop generally accepted international standards of evaluation and tolerances.

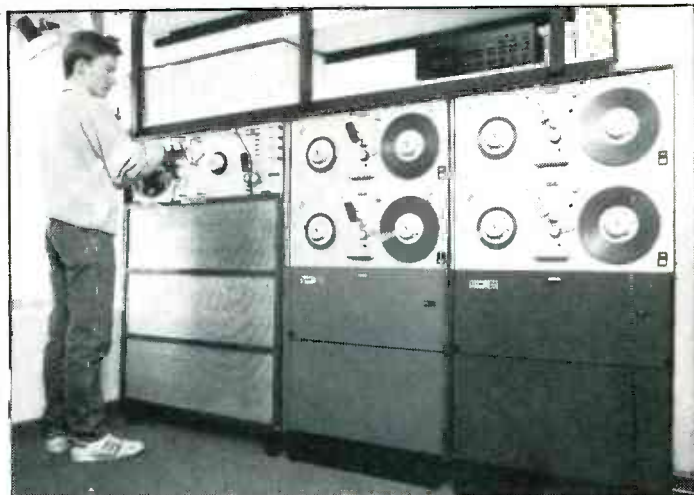
"Improving the sound quality of the music cassette is important to the growth of the industry," says Hanns-Diether Sommer of Polygram's Quality Department. "Recorded cassette sales initially suffered in comparison to LPs because of cassette sound quality

problems, but have, after quality improvements in recent years, shown much growth."

Research already undertaken by the MCQC has revealed the high degree of influence that the cassette housing construction has on final sound quality, as well as indicating that many music cassette customers underestimate the part cassette construction plays in the quality of playback.

Azimuth deviation can cause diminished sound quality and according to the committee azimuth deviation can be reduced, and sound quality improved, by using a welded cassette construction, rather than a screwed-type cassette.

Membership in the MCQC includes representatives from CBS, EMI, Hardt Cassetten, ICM, Interpress, Miller International, Polygram, Record Service (WEA), Sonopress and Teldec. Individual members provide expertise in technical fields such as development, recording, quality assurance and manufacture.



Rainhill expansion

North of England cassette duplicator, Rainhill Tape Specialists, has taken delivery of a Lyrec P-2000 high speed duplicating system as part of their

on-going expansion programme. The company has recently moved into new premises and installed automatic winders and an upgraded mastering suite.

Disctronics to go public

Following an extraordinary 18 month growth period which made it the world's third largest manufacturer of compact discs, Melbourne based Disctronics Ltd is to become a listed public company under a planned transaction announced last month.

Present owners are investment company Quatro Limited and its associated company Pro-image Studios Limited, a leading video production facility in Australia and New Zealand. Public listing is planned through BGL International Ltd which will change its name to Disctronics Limited.

Quatro and Pro-image will retain majority ownership after A\$25 million is raised from institutional investors. This issue is fully underwritten by Ord Minnett Limited.

CEO of Disctronics, Roger Richmond-Smith explains the listing as an opportunity to further expand growth of the company and its facilities. "We're a world leader in CD manufacturing

technology and rapidly expanding into areas of optical storage. Major growth this year of the Huntsville, Alabama and Southwater, UK plants means we can maintain our share of rapidly growing global CD volumes."

With a current annual capacity of 65 million audio discs, Disctronics plans to maintain a 10% share of the world CD market with additional inroads being made in the areas of CD Video, other related entertainment formats and optical storage products such as CD-ROM.

"In line with these market priorities," Richmond-Smith summarises, "head office is moving from Melbourne to New York. We're a marketing driven company with sales and marketing offices in Los Angeles, New York, London and Sydney. With around 90% of our manufacturing capacity close to our clients there, it makes total sense to move head office closer to centre stage."

EMI double 7 inch production

Since installing a Martin Cam robot arm and transfer system on their 7 inch record presses, EMI have doubled production of 7 inch singles. The package which included the Martin Cam has reduced cycle time by nearly half to 8 seconds (3,600 records in an 8 hour shift).

A further 11 cams have been ordered and were due to be in full operation by the beginning of July.

The greater speed of operation places EMI in a strong position to respond to market demand within 24 hours with singles being in the shops the morning following an order.



Channel 5 gold

Fraser Peacock recently presented Channel 5 with a gold cassette commemorating 10 million hours of Channel 5 programme duplicating. Channel 5's commercial director Roger Masters and sales and marketing

director Peter Hunsley are pictured with Fraser Peacock's managing director David Tuckman and sales and marketing director Mike Carey (L to R Mike Carey, Roger Masters, Peter Hunsley, David Tuckman).

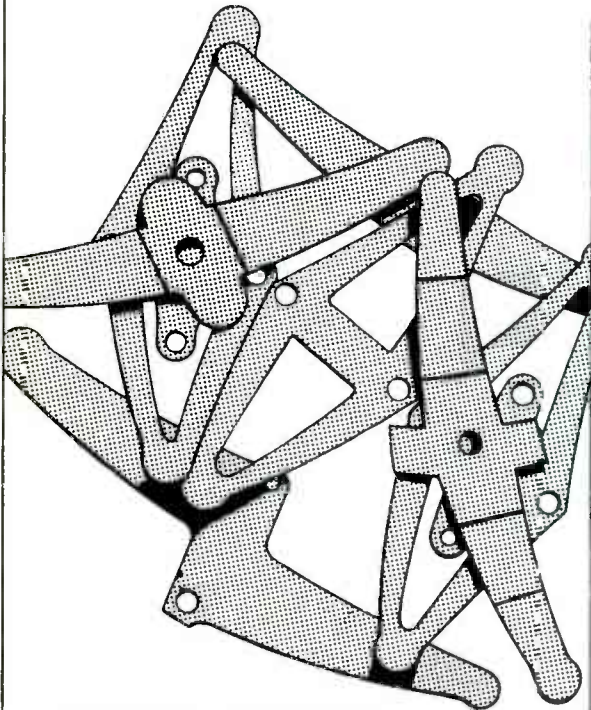
New UK agent

Lara-Stric has appointed Sternberg & Phillips as UK agent for their L sealing and shrink wrapping equipment for video and audio cassettes. Sternberg &

Phillips are located at William House, Holmesdale Road, South Darenth, Nr Dartford, Kent DA4 9JP, US. Tel: (0322) 864636.

NEW VHS REEL SPRING

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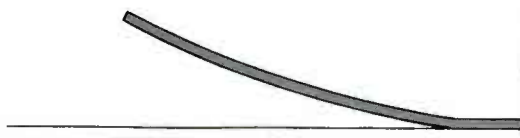
- saving of material by reducing width
- less weight, less volume.

FUNCTIONAL ADVANTAGES

- no more concentrated and outwards over cover stresses, but apportioned alternated and opposed ones;
- spring force on the reels in full compliance with international standard specifications (IEC-774).

ASSEMBLING ADVANTAGES

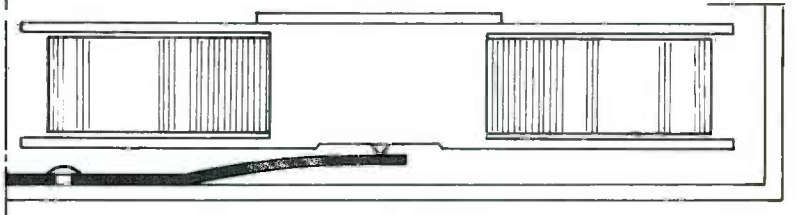
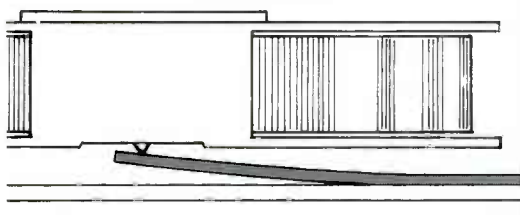
- reel spring free height reduced almost to a half;
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TapeTech rethink high speed commitment

London firm TapeTech planned to start using the DuPont/Otari Thermal Magnetic Duplication process this year to replicate video cassettes at high speed. TMD is a sandwich process, like Sony's *Sprinter*, but whereas *Sprinter* relies on a strong external magnetic field to trigger the transfer of a magnetic pattern from the mirror image master to a blank copy tape, TMD relies on heat from a laser.

To recap briefly after 18 months looking at *Sprinter*, TapeTech announced the purchase of TMD equipment from Otari in Japan, for installation at a new manufacturing centre at Wembley in North London. The £1 million deal with Otari was for delivery in June, with the equipment up and running by mid-August. TapeTech engineers had flown to Japan in February and given Otari a tight performance specification which Otari agreed to in March.

By early May TapeTech had heard nothing and alarm bells started to ring. Later that month Alistair Bowes, managing director of TapeTech, flew to Japan with technical advisor Ralph German, and insisted on seeing the Otari TMD equipment working before it was shipped to Britain. They found that although Otari had made some improvements, the system was still far below the contract specification. It still gave nowhere near the picture and sound quality obtained from realtime duplication. Otari's engineers were honest and did not try to fudge the issue.

Differential video gain was unacceptable. When the picture signal swings in black and white, the chroma level should stay constant; it didn't, and varied by 12%.

Dynamic emphasis, the signal processing used to sharpen edges in the image, were 50% too high, which gave a nasty ringing or echo effect on vertical lines in the picture.

The signal-to-noise ratio for the chroma signal should have been 35dB, but it was only 33dB. There were hue errors.

The worst results were on the linear audio track. This should have a frequency response of 20Hz to 12kHz, but tape made on Otari's TMD equipment was

achieving only 100Hz to 7kHz.

Because there are still many video recorders in use which use linear stereo, with the mono edge track split into two, and because TapeTech is heavily involved in the duplication of music tapes the company records in stereo both on the hi-fi track (buried in the video waveform) and the linear edge track. Tapes duplicated by the TMD process show unacceptable cross talk between left and right channels. Signal-to-noise ratio for linear audio was 38dB, instead of 43dB. And distortion was up to 3%. For linear stereo, the balance between channels fluctuated widely, over 1kHz, with balance swings of ± 7 db over 4kHz.

There were also troubles with the tape 'cupping'. After heating by the laser, the base film cools in a curved shape and the TMD machine has a heavy rubber roller to flatten it out. This only worked with tape made by the Dupont-Philips joint venture PDM. But in other respects the PDM tape was inadequate. If uncorrected, cupping is likely to cause edge weave and loss of sound, because the linear track is right on the tape edge.

TapeTech had already become worried about the supply of chrome tape and the quality of samples supplied by European manufacturers. TapeTech came to the conclusion that Otari had not been talking to suppliers.

Bowes and German talked to the Otari management and said quite bluntly, "We won't take delivery". And they didn't. Instead they went quite literally round the corner in Japan to the JVC factory, and placed an order for between 1,400 and 1,800 *BR7000* realtime slave duplicating machines. These will be supplied in July and be ready to work in August which is exactly when the TMD equipment should have been ready.

TapeTech currently counts its lucky stars that it wrote tight terms into the contract with Otari. Meanwhile Dutch company Hoek and Sonnopusse is going ahead and taking delivery or a mirror mother recorder and two TMD units from Otari. TapeTech has now told Otari and Dupont to get things sorted out. Doubtless they will. It helps that Dupont is

selling its share in PDM and assigning all rights on TMD to Otari. But however quickly Otari sorts out the mess, TapeTech is now committed to the installation of up to 1800 realtime slaves. The mistake has cost Otari and Dupont heavily in cash and undermined confidence in TMD technology.

Sony will surely capitalise on this by offering *Sprinter* on trial installation. TapeTech says it is still committed to TMD in the long term and does not feel tempted to switch to *Sprinter*.

TDK has been named as one of the tape companies able to supply tape for the high speed duplication processes on offer. Shortly after the announcement of the delay on Otari's TMD hardware and TapeTech's claim that there had been inadequate liaison with the tape companies, I asked for Dr Fukuzo Itoh, TDK's top tape engineer, for his view of the tape situation.

"Yes, we are developing blank tape and mirror master tape. But it is not yet ready.

"Magnetically the tape has very similar properties to ordinary tape, but mechanically it is quite different. Even a small surface irregularity can cause significant spacing loss and thus signal transfer loss. In normal, direct recording, the tape head will follow local irregularities. But when two tapes are sandwiched together, the situation is quite different. Any irregularity pushes the tapes apart. So it must be very smooth.

"There is also a need for much greater slitting accuracy and the use of special edge guides because the two halves of the sandwich must be kept in exact alignment.

"For magnetic contact printing, sensitivity is around 6dB lower than for direct recording, which means that less signal gets transferred onto the copy tape so no extra signal loss can be tolerated. For thermal contact copying, sensitivity is the same as for direct recording, but the base film for the tape has to be carefully chosen so that the laser beam does not heat it otherwise it will distort and affect sandwich contact and signal transfer."

I asked about chrome tape, as needed for TMD. Currently TDK does not make chrome tape, because the company developed *Super Avilyn* cobalt-modified

ferric coatings as a direct alternative to chrome.

"Yes, we are experimenting with chrome", says Itoh. "We are talking to both the pigment suppliers, BASF and Dupont."

Is there an alternative to chrome, with Curie point low enough for thermal duplication? And can chrome be made to work for DAT?

"That's a very interesting question", smiles Itoh. "Many researchers are looking for a low Curie temperature tape as an alternative to chrome. We have succeeded in making thin film tapes, for instance metal evaporated tape in a high vacuum, with low Curie point. But it's an expensive process and coated tape remains the only practical material for pre-recorded software. So far chromium dioxide tape remains the only convenient solution. But we are still investigating."

What about barium ferrite tape for high speed duplication of DAT tapes?

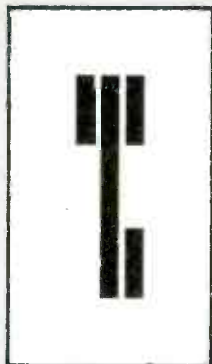
"There is no urgency", says Itoh, "because DAT is not big business. So far Sony is the only company interested in selling software. Barium ferrite is preferable to chrome for contact printing, because although it has lower sensitivity at low frequencies, it has higher sensitivity at high frequencies needed for digital recording. Yes, we are experimenting with barium ferrite tape, and buying the powder from many sources. Toshiba is the most active in this area and they claim that the cost will be comparable to other tapes. The materials are not expensive. The cost is in the production method, and we think that Toshiba's method may be more expensive than others.

"We know there were problems with the Otari machine, but we feel confident that those problems will be solved."

Dr Itoh also sits on the DAT committee. Like most Japanese engineers who have watched the DAT debacle, he now acknowledges that DAT looks likely to become an industrial tool. And he neatly sums up the situation on domestic DAT.

"All the negotiations now are turning DAT into a domestic player, not a recorder. That's the interesting part. Although it's certainly not interesting for our tape business". **Barry Fox**

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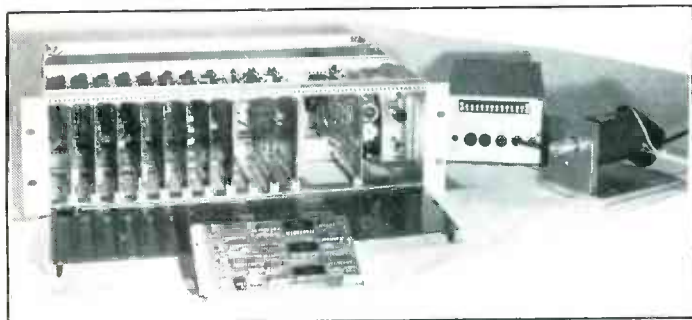
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Davies GC groove control system

London based SW Davies Ltd have developed a new *GC 821* groove control system designed to upgrade the performance of most makes of disc mastering lathes. The conversion takes between 4-6 hours and includes a new Swiss pitch motor.

Greater level and/or playing

time is achieved by division of the disc surface into 16 segments. Accurate peak recognition circuits are designed to avoid the random groove crashing found with earlier systems.

SW Davies Ltd, 5/7 Buck Street, London, NW1 8NJ, UK. Tel: 01-485 8559.

Orban 642B equalizer/notch filter

Orban have announced the availability of the *Model 642B* parametric equalizer/notch filter. The unit features dual 4-band or mono 8-band configurations, selectable by a front panel Cascade switch. Each band can be tuned over a 20:1 frequency range and tuning ranges of the individual bands broadly overlap to maximize versatility. The constant 'Q' design of the filters provides +16dB boost and -45dB cut in each band, resulting in full notch filtering capability with no interaction between parameters when one is adjusted.

The 'Q' is continuously variable from 0.29-5.0.

Noise and distortion specs have been significantly improved compared with the 622 series, and are comparable to 19-bit digital. The signal path has no coupling capacitors, ensuring lower distortion and more transparency. Special variations (*642B/SP* and *642B/SPX*) are also available with modified filters.

Orban Associates Inc, 645 Bryant St, San Francisco, CA 94107, USA. Tel: (415) 957-1070.

Shape BR193 analyser

Shape Systems Design have developed a new birefringence analyser that allows compact disc manufacturers and testers to both measure and determine the causes of birefringence. The *BR193-1* measures absolute and relative birefringence and enables the user to determine whether the problem stems from the molecular structure of the polycarbonate resin or from the stress created during the actual moulding process itself.

The *BR-123-1* retains all the features of the earlier *BR123* but

with the addition of improved optical design and enhanced software, the latter enabling the operator to easily switch between the two test modes. Owners of the previous model can upgrade their equipment at modest cost.

Shape Systems Design, 125 John Roberts Road, South Portland, ME 04106, USA.

Tel: (207) 879-0439.

International Sales: Shape International, 18843 Tulsa Street, Northridge, CA 91326 USA. Tel: (818) 368-3850.

Digitec digital switching

French manufacturer Digitec has introduced an asynchronous digital switching matrix with EBU/AES interfaces for use with CD, DAT and digital VTR machines in mastering, copying and post production applications.

Housed in a 1U 19 inch frame with switching of 16 inputs to 16 outputs (expandable up to 64x64), the matrix is controlled through parallel buses and there is a monitoring output and battery backed up memory.

Sony tapes

Sony has introduced a new range of ¾ inch digital audio cassette tapes, the *DAU* series. Targeted at the professional market for use as master tape for CD pre-mastering it is available in 30, 60 and 75-minute lengths.

The tape features a new coating formulation (cross linked binder system) which fixes fine magnetic particles to the base film of the tape. This enhances the magnetic surface layer which, combined with a carbon back

coating, provides smoother tape transit. The tape is housed in an anti-static cassette shell. The *DAU-75* has a maximum recording time of 79.2 minutes.

Sony has also introduced Betacam SP, *BCT Metal* Series video tape which the company claims offers quality approaching that of 1 inch video tape. Features include high definition picture quality, improved video signal-to-noise ratio and high quality, clear sound.

ODM LHH 3200 data formatter

ODM BV have introduced a high speed data formatter for the pre-mastering of CD-ROM and CDI discs. The system accepts data from a wide variety of sources including all normal 9-track magnetic tape formats (ANSI labelled, ANSI unlabelled and IBM labelled) and the modular construction allows for the addition of new features and extended CD capabilities in addition to specific customising for clients.

With the exception of the control terminal (*Televideo 955*),

all the system's components are housed in a rugged 19 inch rackmount cabinet. These include an Intel *310* computer with special Xylogic and TMS boards; a Telex *9250* series tape drive and a 1002 Mbyte Pertec datapack.

Pre-mastering is done in realtime and the loading procedure takes 1.2 times the program length.

Optical Disc Mastering (ODM) BV, PO Box 218, 5600 MD Eindhoven, The Netherlands.



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EQUIPMENT



Studer A730 CD player

Studer have introduced their first professional CD player with full CD and CD single (3") compatibility. The player designed by Studer and Philips CD Systems AG features a high resolution dial for frame accurate cueing, disc recognition with dynamic, non-volatile memory for 100 CDs, a directly accessible cue memory for 3 cue points per CD, and automatic cueing on

modulation start and end. The A730 player can be used flush mounted or as a desk top model. A wide variety of parallel and serial interfaces, balanced analogue and digital outputs, and separate monitor outputs are provided.

Studer International AG,
Althardstrasse 10, CH-8105
Regensdorf, Switzerland.
Tel: +411 840 2960.

Lyrec high speed updates

Lyrec are to introduce a new 480 ips loobin master. The new master will match the P-2500 series slave in design and features redesigned motors, pinch rollers and pinch roller actuating mechanism for smoother operation. Other features include crystal-controlled 240 and 480 ips tape speeds (adjustable $\pm 0.5\%$); servo controlled tape tension and speed and tension controlled loading and unloading. Tape tension is adjustable to 700 grams and tape deck functions are under microprocessor control for gentle tape handling.

The unit includes automatic bin speed calculation and regulation and features a C-100 capacity bin at 7.5 ips. A user programmable batch counter is provided.

FET head preamplifiers are used for very low noise and distortion and the new unit has separate equalization for 32×7.5 , 64×3.75 and 64×7.5 . Optional 40×7.5 , 80×3.75 and 64×7.5 equalization is also available. Equalizer amplifiers are designed

for high linearity and low settling time at all audio levels. Each channel has separate audio metering and there is adjustable gain control for matching different recording sensitivities.

A number of improvements have also been incorporated in the P-2000 and P-2500 high speed duplicating systems. The systems are now available with 80:1 duplication ratios providing a 25% increase in output and according to Lyrec with no quality degradation whatsoever. Other features include new FET playback amplifiers; second generation HX-Pro system; crosstalk improvements (80 dB Side A/Side B) and better frequency response, 1.28 kHz to 1.28 MHz (20 Hz to 20 kHz at 64:1) and a run-up time of less than 2 seconds at 64:1 with no more than 5 metres (17 ft) of tape loss.

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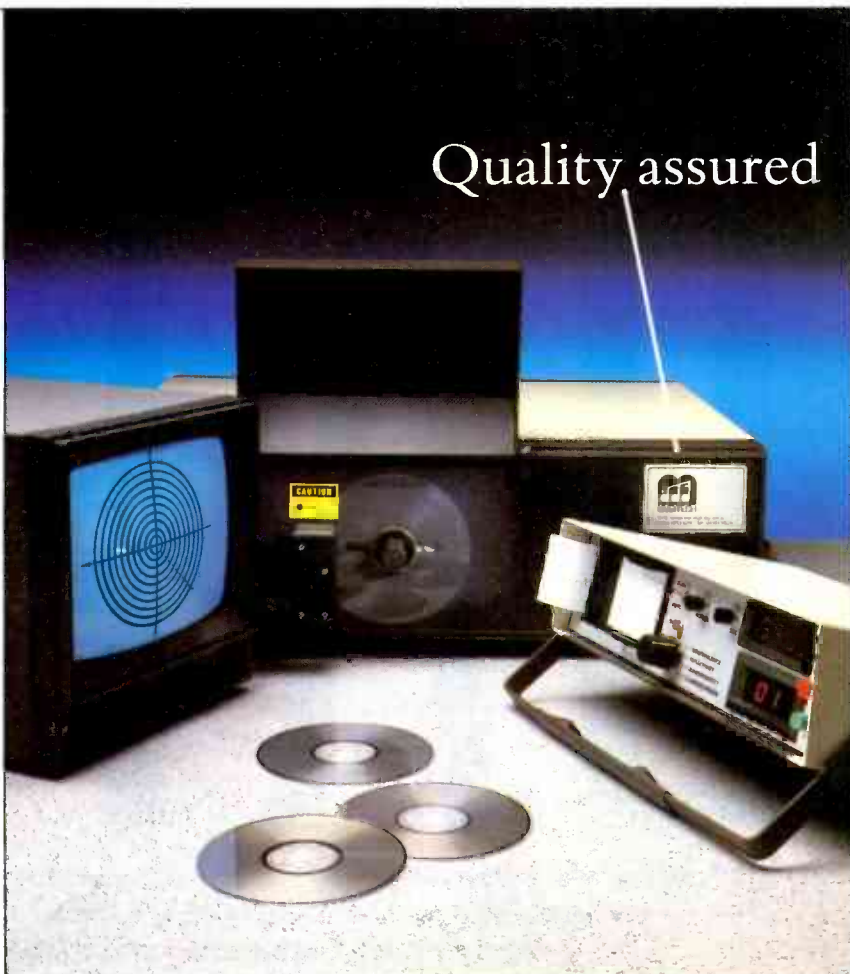
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Quality assured



Master Tapes for CDV

The CD launched by Philips and Sony in 1983 has grown faster than any other consumer product. With market penetration exceeding 20% in Japan and 10% in many European territories not only is CD here to stay but virtually every new release is launched on CD as a matter of course.

Whilst the debate still rages in relation to the size of the CD single, (is it the 3 inch or will it remain 5 inch), shipments of CD singles in the first half of 1988 are up by a factor of four on the total for 1987.

Into this arena Philips in collaboration with Pioneer and Sony are launching the new CD Video format, heralding CD sound with perfect pictures.

These CDV products bring a new dimension to the complexities of the tape masters required by the disc pressing plants. PDO UK Ltd based in Blackburn is the first European plant which can master and replicate all formats in both PAL and NTSC. Dave Wilson, PDO's customer services manager is hopeful that a single industry standard for tapes can be established so that the flexibility now enjoyed in relation to CD master tapes will extend to video.

The three products in the range obviously require different tape formats (running lengths, etc) although the basic technology remains the same.

The CD Video standard allows three product sizes, a 5 inch (120mm) version identical in size to the normal CD and 8 inch and 12 inch versions similar to the video discs currently used in interactive video for training and point of sale applications.

All these discs are intended to play on a new range of CD Video players that in addition to playing compact discs will also play the video discs. Players are already on sale in America and Japan in the NTSC format and PAL players will be available in Europe this autumn. In view of the need to ensure that these discs conform to the local TV standard, PDO is ensuring that all products are clearly identified as PAL or NTSC.

The 5 inch product comprises a 20 minute audio portion to full CD standards (this will play on any conventional CD player) plus a five to six minute video section where in addition to CD standard audio, video approaching broadcast quality is included.

As with the CD, this product is single-sided with the label details printed on the

With CD Videos hitting the streets of the US in June and the European launch announced for September, we review how this extension to the audio compact disc standard (the famous Red Book spec) has generated an extension to tape specifications and the equipment required to produce the CD Video master tapes.

reverse face. To differentiate these discs from normal CDs, they are being manufactured in gold.

The 8 inch and 12 inch CDVs are double-sided, with the 8 inch carrying 20 minutes of video and digital audio *per side* and the 12 inch a full 60 minutes *per side*. Where programme duration only requires one side, a non-playable blank side is used for the second side.

Audio and video masters

The Sony 1610/1630 PCM system provides the ideal input source for CD mastering. The sample frequency of 44.1 kHz is compatible with the CD system and the availability of digital tape analysers, operating both to verify the tape after recording and to ensure an accurate transfer during CD mastering, means that an absolute guarantee of sound integrity is possible.

The world of video, still in the analogue era has greater problems in terms of recording and playback errors, however, modern 'C' format machines provide a level of error correction for both time base errors and tape drop outs that generally provides an acceptable result.

The needs of CD Video, in terms of an excellent video source together with a suitable digital audio source are currently

being served by the synchronisation of these two tape systems. PDO is also currently evaluating the possibility of using the Sony PCM BVH 2800, a 'C' format machine that uses additional recording heads in the sync region to lay down a digital audio track. However, as the 2800 is not widely available, the standard input format at the moment is a 1 inch 'C' format video tape accompanied by a 1630 digital audio tape and the PDO Tape Master form.

Tape synchronisation

In order to synchronise the two tape systems, a number of precautions are necessary. Whilst the internal, crystal-controlled frequency source of the 1610 can be set to the required value for CD, due to internal tolerances there can be slight variations for a tape recorded on one machine and played back on a second machine under the very accurate control of a CD mastering machine. These variations are quite small and are imperceptible for CD audio. For CD Video however it is essential that the audio and tape stay in sync for programmes up to one hour in duration.

An audio tape recorded on a machine with a slightly low frequency source will run slightly faster when slaved to the CD Video mastering equipment and consequently will



PDO's CDV pre-mastering facility

CDV PRE-MASTERING

get in front of the accompanying video. To overcome this problem, it is essential that the audio recording machine is referenced from an external 44.1 kHz reference derived from the video studio sync.

PDO have developed a special box to generate this reference frequency. Taking either PAL or NTSC sync as input, it generates the necessary 44.1 kHz word clock signal sync locked to the video.* Alternatively, the Sony VSU 3310 will generate the necessary signals.

In order for the audio machine and the video machine to run in sync, it is necessary to lay down on Audio track 2 of the video tape, the SMPTE timecode generated by the 1610/1630 machine. Whilst neither of the audio tracks on the video tape are used as an audio source, it is also possible to use the remaining Audio track 1 to lay down a mono version of the sound track for reference. Synchronisation can then be achieved using for example an Adams-Smith synchroniser.

Video tape requirements

As CD Video can be manufactured in either PAL or NTSC formats, the requirements for both systems will be presented.

■ **PAL tapes:** These must conform to the 'C' format standard (*IEC Standard 558*) and follow normal recommendations for all signals. (*CCIR Report 624 (1974)*).

This means that the control track must be recorded at the 100nWb/m level (0.25y pp) must be uninterrupted and the PAL eight field sequence must be maintained. In addition, the subcarrier horizontal phase error should not exceed $\pm 20^\circ$.

An EBU timecode must be recorded on Audio track 3. This timecode must be present from the start of lead in to the end of lead out. The timecode must be phase locked to video and must be continuously increasing from any timecode between 00:00:00:00 and 22:00:00:00.

In addition the 30Hz timecode from the digital audio tape machine (channel 2) must be laid down on Audio 2 of the video tape. Both timecodes should be recorded at a level of 100(± 50) nWb/m.

The tape should be configured as follows:

At least 60 seconds of tape followed by two minutes of colour bars. 100/0/75/0 bars are preferred though 100/0/100/0 are allowed. Bars are followed by 40 seconds of video black prior to the start of active programme.

Each programme must start with 2 seconds of video black, or a still picture, to align with the 2 second digital silence (pause) on the audio tape. Some players will skip this second 2 section on the disc.

The maximum programme durations are 60 minutes for the 12 inch disc, 22 minutes for the 8 inch disc and 6 minutes for the 5 inch disc. The timings for NTSC are slightly less.

Because of the high performance of the CD Video system, it is necessary to provide material of the highest possible video quality. The lowest acceptable signal-to-noise ratio of

the programme material is 40 dB. Video signal levels should not exceed 110% although overshoots are automatically clipped.

Maximum chroma level must not exceed 100% though a more pleasing effect will be achieved on disc if large areas of highly saturated colours are avoided. Colour burst signal should normally be present throughout even for monochrome signals.

The tape should finish with a minimum lead out of video black lasting 60 seconds for 8 and 12 inch. For 5 inch this should be timed so that the total programme plus video black is at least 7 minutes.

■ **NTSC Tapes:** These must conform to normal industry recommendations as for PAL.

The main differences are that the Audio 3 timecode should preferably be SMPTE non-drop timecode (drop frame is allowed) and this must not cross 00:00:00:00 at any point in the tape.

100/7.5/75/7.5 colour bars are preferred though other bars are allowed. The set up level of 7.5 IRE should be maintained in the video black of lead in and lead out.

The programme durations for NTSC are slightly less than PAL with the 12 inch disc carrying 60 minutes, the 8 inch 20 minutes and the 5 inch, 5 minutes. This also means that the lead out requirements for 5 inch are such that a total programme (plus lead out) of 6 minutes is required.

Audio tapes

In common with video tapes, normal industry standards should be maintained. The $\frac{3}{4}$ inch tape, to the Sony 1610/1630 standard should be produced using the phase locking equipment previously discussed to ensure the sample frequency rate of 44.1 kHz is maintained.

The tape shall be such that average, hold and parity errors do not occur during programme and mute errors do not occur during lead in, programme and lead out.

Timecode should not cross 00:00:00:00 anywhere during the tape and must not exceed 01:39:59:29. The tape must also start with a 2 minute lead in during which timecode must be valid. This is then followed by the standard 2 second pre-pause. Audio programme times must conform to the corresponding video tape except of course on the 5 inch disc where the audio for video is preceded by a maximum 20 minutes (PAL and NTSC) audio section.

In general it is recommended to maintain a headroom of 1 to 2 dB under clipping level.

One set of tapes is required per disc side.

Tracks and chapters

As with CD audio, the CD video disc is divided into a series of tracks. During the introductory phase, in addition, discs will carry chapter code information as for Laservision discs.

For the 5 inch disc, the audio tracks are

numbered from 1 onwards with the final track containing the video taking the next available number. So for a typical disc the audio tracks will be numbered 1, 2 and 3 and the video track will be numbered 4. Some confusion is possible due to the fact that most CD Video players are pre-programmed to play the video track first. However as the discs are fully compatible with CD audio, when played on a standard CD player, the numbering will be consistent.

Track information for PQ coding is required, quoting audio timecode plus the corresponding video timecode for the video part. There is no reason why the video part should not contain more than one track although the 5 or 6 minutes available means that typically only one clip will be included.

All 8 and 12 inch discs must contain at least one track/chapter. For films, it may well be that further chapter coding is not necessary. For most music formats, however, it is likely that extensive use will be made of these facilities. In total 79 tracks are allowed per side although the minimum duration of a track is 4 seconds. Track numbering must be consecutive but does not have to start with 1.

For each track, both the audio timecode and the corresponding video timecode are required. It is often useful to produce a U-matic or VHS cassette of the programme with audio and video timecodes burnt in to provide this information frame accurately.

As with CD, determination of track positioning is a mix of technical and creative expertise. PDO recommend that track coding is corrected by minus 5 frames at the start of a track and plus 5 frames at the end to prevent audible effects caused by different fade in/fade out times of players. However, it is essential to consider both video and audio events in determining track positions. It would be normal in for example the track coding of a CD of a symphony to position track 2 slightly before the first note of the second movement. It is likely that the video event that signifies the start of the movement could well be a caption on screen a number of seconds earlier. Hence some form of artistic compromise is required to achieve the most pleasing effect. As both the video and audio timecode have to be determined to an accuracy of two frames there is no technical compromise possible.

PDO under the leadership of Gert-Jan Vogelaar at the ADVA department in Baarn in the Netherlands has developed a full set of technical specifications together with a series of *Tape Edit* forms that are required with tapes. Copies of these together with information concerning production capacities, packaging and pricing are available from the Customer Services Department at PDO Blackburn. Tel: +44 254 688414.

Technical advice on tape premastering is available from Tony Holden or Allison Ross on +44 254 55248.

* Details of the PDO ODM sample frequency unit are available from Clement Stricker. Tel: +31 407 19111.

Tap Code

A New Industry Standard?

Opening up a whole new world for automated duplication, as well as solving some major problems for distributors." That is the description given by John Gardner, managing director of Tape Automation, of the company's new video encoding system which was launched at the end of March.

Tap Code and *Tap Trak* are magnetic tape coding systems which enable video film distributors to determine the legitimacy and identify the production history of any one of their products, at any time, anywhere the need arises.

Although the two systems are designed for different applications — *Tap Code* for use with pancake duplicators like the Sony high-speed *Sprinter* or Tape Automation's realtime ETD system, and *Tap Trak* for realtime in-cassette duplication — the fundamental idea is the same: to put on every tape a complete production record, located after the end of recorded programme material and impossible to copy back-to-back, which will enable distributors to tell if the product is genuine and, if it is, quickly read its entire production history to identify the duplicating house, time and date of duplication, and even the different machinery involved in the process.

The idea stemmed from Tape Automation's work in America during a project to develop the *XENON* video cassette loader to handle pancake tape duplicated at high speed on the Sony *Sprinter*. That project, which ultimately led to Sony becoming agents for the *Xenon* loader in Japan, was a success.

Prior to that, the company had concentrated on designing and manufacturing sophisticated high speed blank tape loaders. However, the work with the Sony *Sprinter* led us to investigate several problem areas in

Ray Worth explains the revolutionary new tape coding system from Tape Automation that is already generating a lot of interest among duplicators.

the duplicating side of the business which were in turn causing problems for distributors.

Golden Opportunity

Pancake duplication overcomes a lot of the problems generated by in-cassette duplicating; particularly the heavy commitment to QC viewing and materials checking.

Although the company could guarantee high speed, automatic loading of any pancake produced on the *Sprinter* (even if it contained several different films of varying lengths) it still left a lot of people — distributors and duplicators — grappling with trying to keep track of all the different films they were loading, and having to maintain cumbersome, labour-intensive control systems to ensure that each cassette is correctly labelled — and quite often getting it wrong.

As well as difficulties with incorrectly labelled cassettes, there was the problem of identifying returns. There was simply no way a distributor could reliably tell who had duplicated the tape, where and when, or even in many instances whether or not the copy was genuine.

It was in this area that Tape Automation's expertise in sophisticated tape handling and

control systems could be put to good use. In fact it was seen as a golden opportunity for the industry as a whole to be able to adopt a system whereby the authenticity of any video programme could easily be checked, and its production history readily traced, while at the same time enabling duplicators to operate more efficiently and economically by having the ability to automate production from sub-mastering, right through loading and labelling, to sorting and packaging.

And so *Tap Code* was born.

Because of the potential of such a universal coding system, a considerable amount of time and research was spent before formulating a coding specification.

The main criteria for *Tap Code* eventually became:

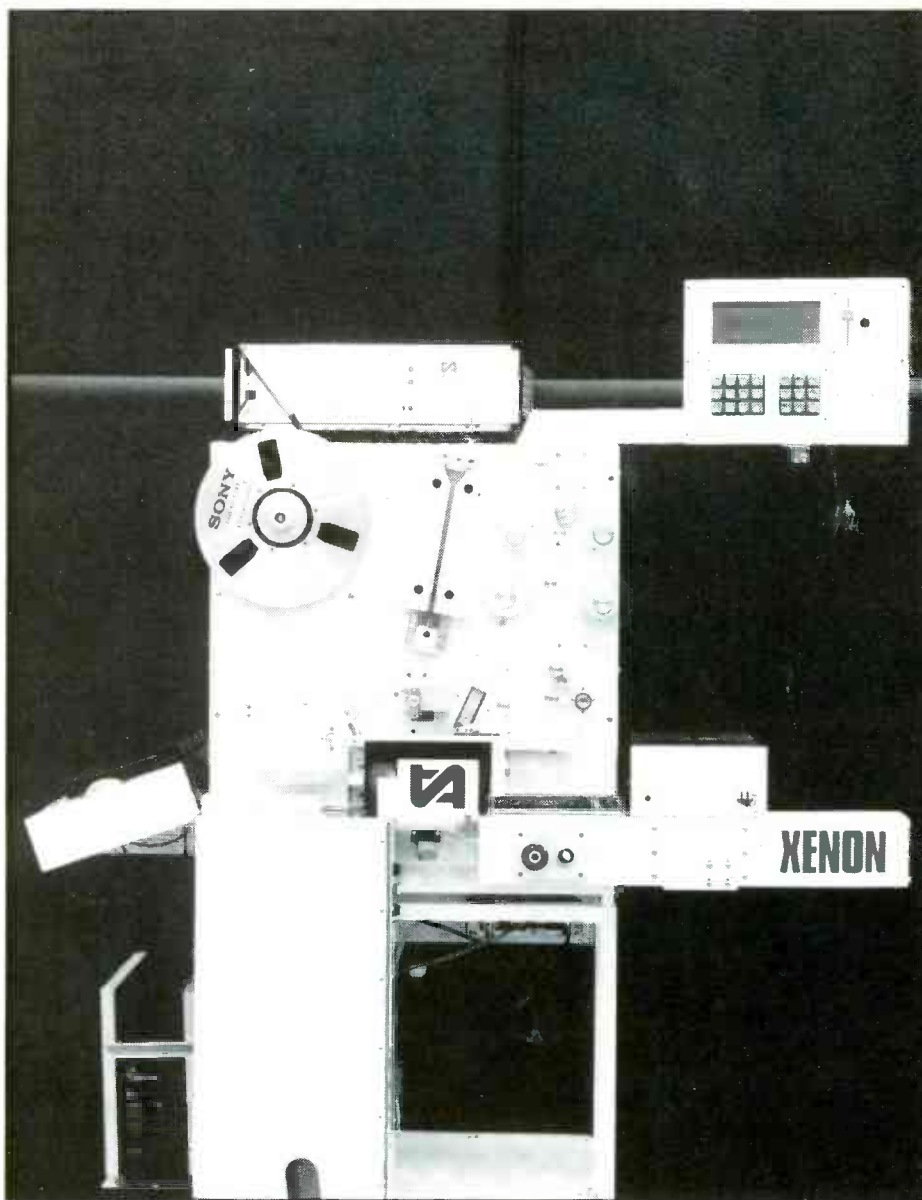
- It should be compatible with any form of pancake duplicating.
- It should be located at the end of each film so as not to impinge in any way on recorded programme material.
- It should not form part of the viewable programme material.
- No part of the code should be copyable by 'back-to-back' recording.
- It should be capable of being easily and quickly decoded by an inexpensive, lightweight reader.
- It should not incur great capital expenditure costs for duplicators.
- Every tape produced under the system should be recorded with its own individual production record.

Mastering

The basic equipment required is a standard desk-top computer with *Tap Code* controllers which interface between the computer and the sub-master generators.

Tap Code is encoded in two parts: Global Information and Local Information. When

VIDEO DUPLICATION



Complete system with controller, labeller and error checker.

duplicating using high speed processes, the Global Information is entered into the computer at the sub-mastering stage.

Global Information is recorded at the end of the sub-master and remains *unchanged* for every copy generated by that particular sub-master. It consists of:

- **CATALOGUE NUMBER** of the film being duplicated.
- **COUNTRY CODE** which can be used for a variety of purposes, for example as a suffix to the Catalogue Number to distinguish between different language versions of the same film.
- **TITLE** of the film being duplicated
- **UNIVERSAL PRODUCT CODE** used particularly in the US.
- **LENGTH** of the film in meters, including leaders, trailers and any other video generated material.
- **SUB-MASTER VTR ID** which, together with the catalogue number becomes a unique identifier for that particular sub-master.

At this stage (ie mastering) is to record this Global Information on the sub-master tape.

The computer also prints two labels for fixing to the sub-master spool and library case. The labels show all the Global Information in text form, plus the catalogue number in machine readable format. This enables the sub masters to be stored away with the certainty that they can be identified for future use. Obviously, if for some reason the labels are lost, the Global Information is still recorded on tape and can be read as required.

Duplicating

Local Information is generated automatically during duplicating. Local Information consists of:

- **DUPLICATION DATE**
- **DUPLICATION TIME**
- **TAPE STOCK ID** — read by the operator from the pancake of raw tape prior

to start-up.

■ DUPLICATOR NUMBER

■ **SEQUENCE NUMBER** — the number of the current copy being duplicated. Each pancake starts with Copy 1 and carries on until the pancake is exhausted.

Each high speed duplicator is connected via a *Tap Code* controller to the master computer, and every operator is issued with his or her own computer-readable ID badge.

Duplication takes place as normal with the exception that before starting production the operator uses a 'wand' to read into the computer his badge ID, together with any identifying code on the pancake of raw tape. (It is worth noting that several manufacturers of raw tape are now coding their products in *Tap Code* compatible format.)

The computer will not allow production to start until it has this information. It then performs a security check to ensure that the operator is authorized to be working that particular shift with that particular sub-master. If anything is suspect duplication cannot begin.

At each pass in the duplicating cycle the Global Information recorded on the sub-master is transferred to pancake, with the Local Information added automatically by the computer and the *Tap Code* controller.

The end result is a pancake of duplicated programmes, each programme having its own unique *Tap Code*.

While duplication is taking place the computer is recording all this information to disk. This means that the duplicating house has a record of every copy produced, which can be organized into a variety of production reporting options.

Virtually any number of duplicators can be linked into the master computer which in turn performs a supervisory role, displaying which machines are currently 'on-line'; the titles currently being copied by individual machines; the number of times a sub-master has been used: operator IDs and production tallies.

Pancakes produced by realtime duplicators using Tape Automation's ETD system are encoded with exactly the same information. The difference between the two is that ETD does not require a sub-master for each duplicating slave.

ETDs are standard duplicating house VTR slaves which have been modified to accept pancake duplicating. They are normally operated in banks under one or more master VTRs, with the computer interfacing between the VTR and its slaves.

Global Information is still entered only once to the master computer, which then calculates the order in which different titles should be duplicated, taking into account priority and the most efficient use of pancake tape.

The computer outputs the appropriate Global Information after each recording pass, following which Local Information is added by the individual ETDs.

Regardless of whether high speed or

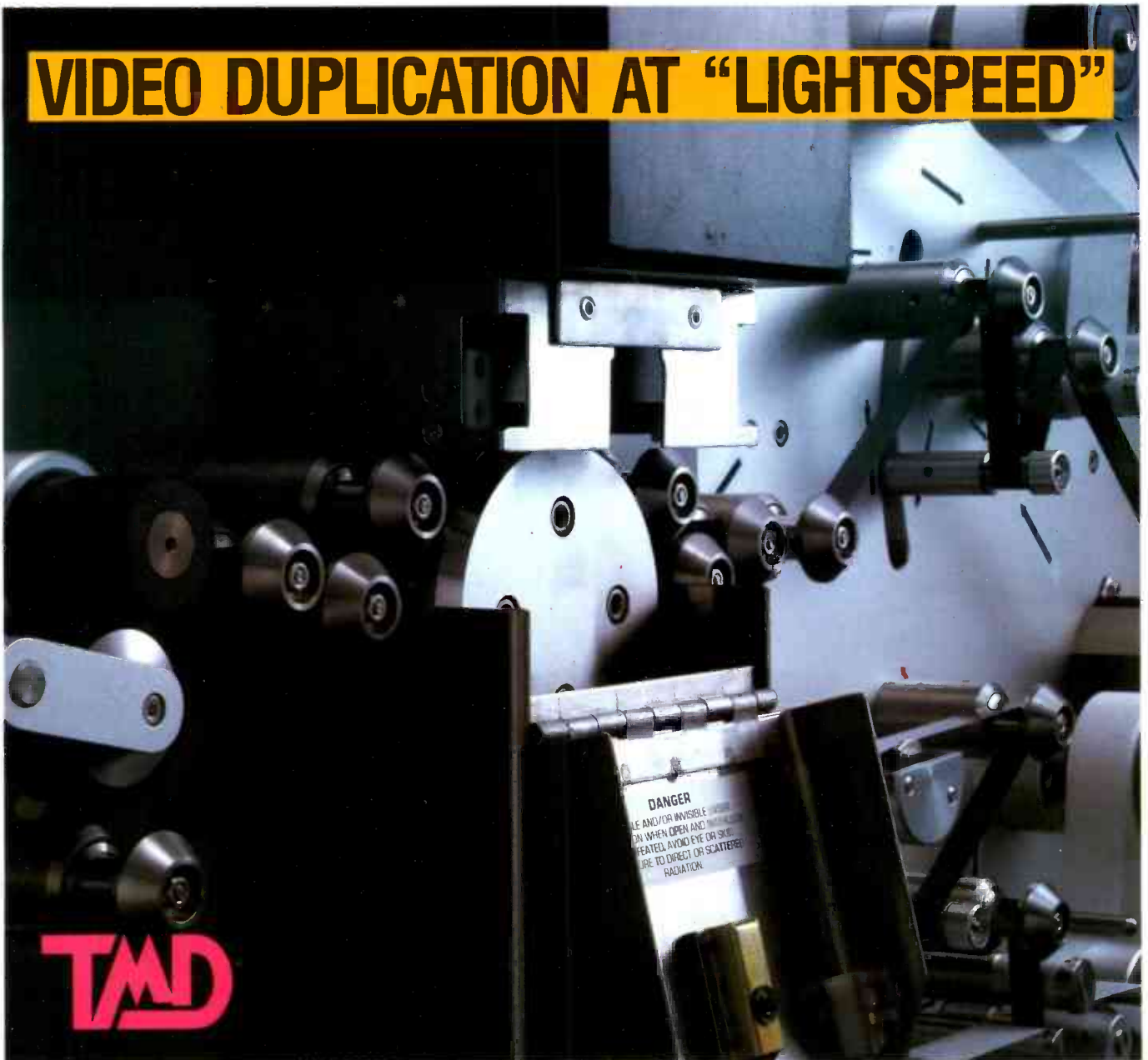
ONE TO ONE

THE PERSONAL MAGAZINE FOR MASTERING, PRESSING & DUPLICATION



DAT SUPPLEMENT

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Loran Cassettes: DAT duplication in the US

Independent record labels like GRP, DMP, Narada and Enigma are considered by many to be pioneers charting the outer reaches of music technology with a foray into DAT. Others consider these labels simply as sound businesses run by forward-thinking people who have seen the path into the future and have started down it. Like the clients they serve, those duplicators who have entered the DAT market can be seen as technological pioneers or smart business people — or both.

There are, at press time, four facilities duplicating DAT in the US. While Sony continues development of a high speed DAT duplication system (expected to be available by the end of August) the prevalent equipment for realtime duplication has been the company's *DRD-100* system. Loran Cassettes and Audio Products, which has been duplicating DAT since January, 1988, has installed 25 of the units in its facility in Warren, PA. In addition, the company has purchased the Kenwood line of test equipment that includes the *DR-5750A* decoder, *DB-5740* jitter analyzer, and *DA-5730* encoder. It performs its own loading utilizing the Otari *T-650* DAT loader.

The facility's DAT clients include the Ford Motor Company, GRP Records, Sea Breeze, Narada Productions, and Sheffield Labs. At press time, the company was also anticipating duplication jobs for Dorian Recordings and Rykodisc. The average run for these labels number in the several hundreds.

Loran Cassettes And Audio Products is a division of Loranger Manufacturing Corp. It was established in 1978 by the late J Albert Loranger Sr and the company has progressed from the manufacture of C-0s and Norelco boxes to establishing its own

Despite all the controversy, it is possible to get DAT tapes duplicated in the US. Susan Nunziata looks at the US market and at DAT duplicators, Loran Cassettes, in particular.

brand of audio cassettes. Loran also provides full-service high speed and realtime analogue tape duplication. It currently employs more than 400 individuals and utilises 130,000 square feet of space.

Company president Robert Loranger, a 1973 graduate of Cornell University who holds a BS in engineering, was selected as *Man Of The Decade* by The Society of Audio/Video Consultants for contributions made to the home entertainment industry.

On a custom basis the company services a series of *Fortune 500* companies with precision plastic moulded, musical duplication and other assembled products. Its primary products are supplied for the computer, electronic, automotive and audio industries. The company has grown at a yearly rate of 20 to 30% and, according to Loranger, its

present business suggests a growth potential of 50%.

"Our company has built its reputation around driving quality effort, trying to do things a little differently or uniquely. We've applied those techniques and technologies to what we're doing here in R-DAT. I guess it's a cultural evolution. Loran's mission is to improve continually its people, products and services, positioning itself at the cutting edge of audio technology at a competitive cost to meet its customer needs," said Loranger.

Establishing DAT

Setting up a DAT facility requires approximately \$80,000 worth of quality control digital testing gear, as well as a \$300,000 to \$400,000 investment in DAT duplication equipment including Sony PCM *1610* and *1630* and *DAQ 1000* PQ generator. Loran's DAT capacity is currently between 8,000 and 9,000 units per week.

According to Robert Loranger the none-too-shabby investment required for DAT is well worth the risk. "We have a belief in the technology as an extremely viable musical lunar landing for the consumer and for the professional market. As I began to study DAT technology I became more convinced how great it was. It's one of the technological wonders of the world."

He noted that early entry into any

technology gets a company down the learning curve early. "If it becomes a high volume product we could be looking at DAT for \$2 to \$3 at a duplicator level. We're really looking at an advanced technology that came in today at half of the real cost of a CD when CD entered the market. It's very short-sighted to take a look at this technology and say it's too expensive.

"Consumers will not be denied

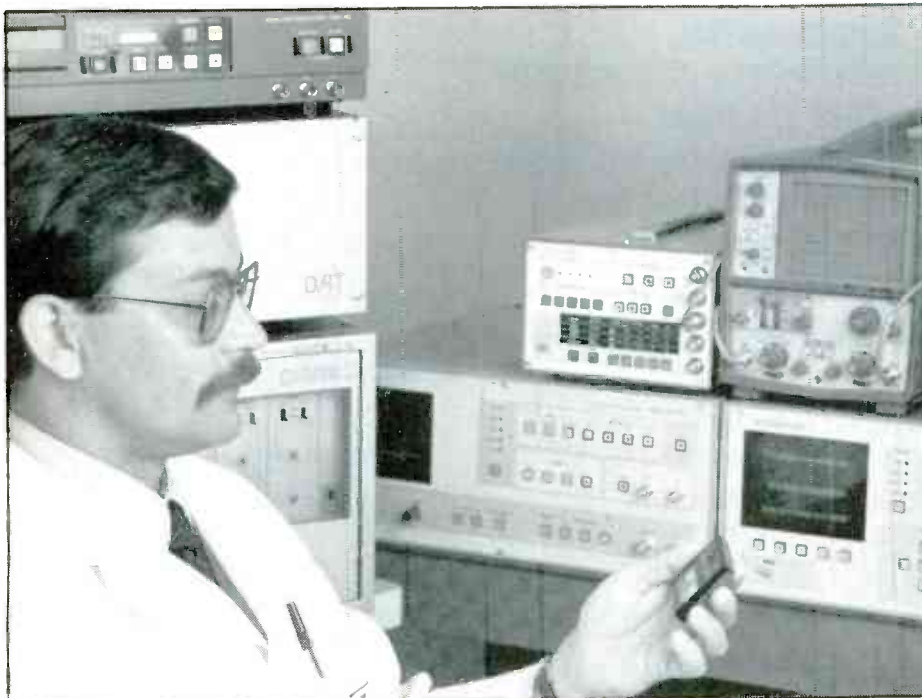


Plant at Warren, PA.

DAT SUPPLEMENT



Clean room environment for duplicating



Stringent QC checks

something they really want. When there is a primary demand for a new product that is technologically superior, and they get to taste it a little bit, whether it's grey market or not, it's eventually going to create its own inertia," said Loranger.

The number of suppliers is still limited however. DIC Digital Supply Corporation, Hackensack, NJ, and Sony Magnetics Products Company has emerged as the primary suppliers of tape. Enplas USA Inc, Smyrna, GA, a parts supplier, and Shape, Inc, Biddeford, ME, have announced the availability of R-0 shells. Enplas has already marketed its product, for approximately \$2.45 per unit, and Shape expects to have product available by late summer. Loading

equipment is available from Otari and will be introduced by King later this year.

"The key with DAT is to work with the suppliers that exist and keep at them. We think we have adequate sources, but we'd like to have choices," said Loranger. He stressed that, as prices gradually decline, "you can't just look at cost, you have to watch performance characteristics, track density, things that make this a much more demanding product."

Process control

In practice, Loranger has found certain surface issues which must be addressed, such as assuring the right inspection criteria. "It's not a turnkey deal where you

can just stick the tape in and let it roll. Quality control is the most important issue — it really should be called process control, understanding the process, what the variability is in product, what we call statistical process control."

Loranger made some suggestions on the appropriate set-up for R-DAT manufacturing which must revolve around two issues: the room requirements and the equipment requirements. A clean room is fundamental to the process at this stage. Loranger suggested a Class 10,000 clean room environment for duplication. "You can't afford the issues that a non-clean room environment might introduce into the product," he said.

Listening consoles and electrical conditioning are necessary, as are the Sony PCM-1630, DAQ 1000, and the Sony ASI-100 signal converter which combines the PQ generator and PCM information. A digital tape monitor should also be part of the set-up so that the product can be listened to throughout the process.

The quality control room should also be a clean room. Loran utilizes *Statistical Process Control* through a PC which databases information from the computer interface. The QC room should also feature another DAT player.

In its test equipment literature Kenwood states that the DAT unit is broadly divided into tape, a servo system including a head mechanism assembly and signal processing system. In the signal processing system, the performance has become acceptably stable due to the simplified electronics made possible by LSI technology. Therefore, the playback performance for the R-DAT unit depends primarily on the signals applied to the signal processing system. In other words, the evaluation of the tape and servo system provides evaluation of the whole R-DAT unit. The performance includes tape running characteristics, durability, physical and electrical characteristics.

Essentially, equipment is able to isolate parts of the system so that one can input data that is incorrect, read it out on the tape, and look at pattern differences between the correct and incorrect information. "Don't develop specifications without understanding the process. We really need to set meaningful specs. To set meaningful specs we have to understand what the process is about. If the process does not deliver product that you can use, no spec is good," warned Loranger.

Understanding what comprises a rational sample is half of the battle. Constant on-going databasing is an important part of any setup, but is even more crucial when one is dealing with a new format. "You really have to observe and interpret the data. You look at central tendencies, the dispersion of the data, is it tight to a particular axiom, what the shape of the frequency is. The key in this whole game is understanding variation.

Cause and effect

"You need to isolate the special cause/

DAT SUPPLEMENT

effects from the common cause/effects. The special cause/effects are things the worker can affect because he understands something went wrong. It got too hot today — it's a special effect — turn the heat down. The common cause/effects are the issues the management needs to address. Sometimes it's a complete process change; sometimes it's capital investment to change, alter, or redesign; sometimes it's research and development.

"You look at both and you try to sort out all the special causes and alert the worker to those types of things that are special causes so that it doesn't take a corporate executive at the upper levels to make decisions about how product's being made down at the lower levels," said Loranger.

The loading process is, in some ways, more critical than duplication. Wind movement and speeds at which the tape is loaded are two more chances for the product to pick up dust. A Class 1000 clean room is recommended, based on experiences of video duplicators who have undertaken loading. Length verifiers, torque measuring equipment, and a computer terminal for databasing should all be part of the loading set-up. Loran is developing its own torque measuring equipment in-house. "You need to know your process to understand it, and you need to monitor your process," said

Loranger.

Direct printing is the mode of choice for labelling. Loran is operating a pad transfer printing method which offers high-quality, multi-coloured printing, utilising 2-stage ink for durability and environmental stability.

"The clean room environment is fundamental. We think it's an important 'cutting edge' difference. You've got to take those extra measured steps to make sure it's done right. You can get it done probably at home with the error correction codes, but when you're talking about production processes, you don't want to enter these special cause problems into the process if you can help it."

Extra steps also include Table Of Content function, without which Loranger felt DAT is not as good as a CD. Ford insisted on TOC capability because it wanted to emphasise the user simplicity of the product. "Without TOC on R-DAT you don't know where you are. Instead of daisy chaining some pro decks we had to get the capital required to put in the table of contents, which really makes the product in a real sense, consumer usable. The simplicity issue is now a fact. We think it will facilitate this medium significantly," said Loranger.

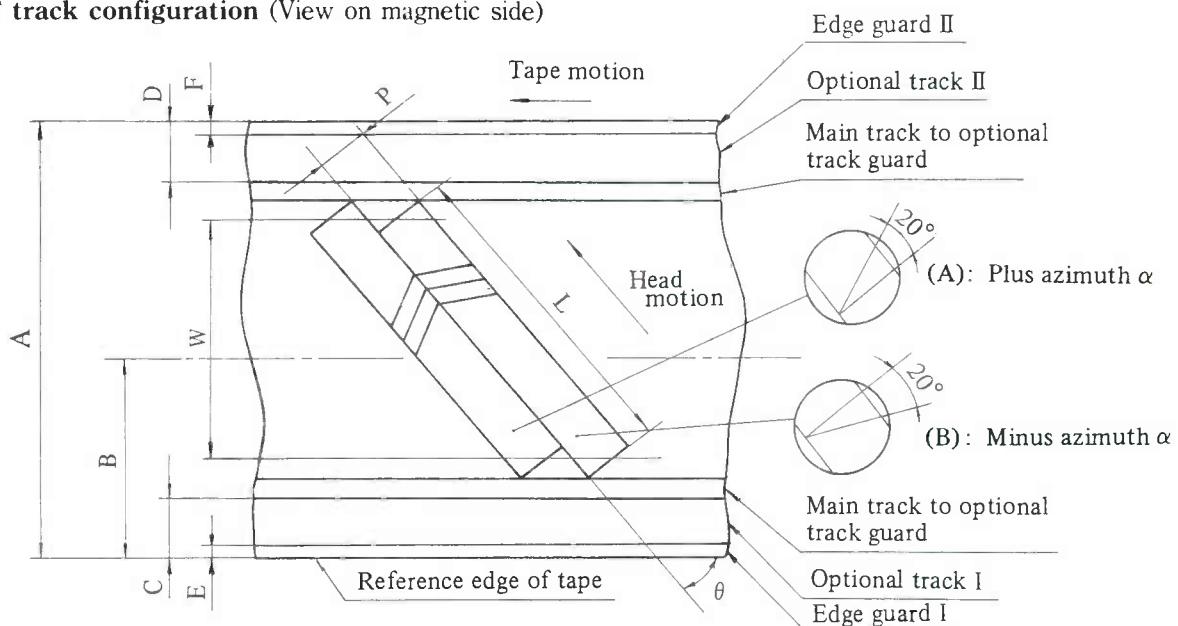
"Another aspect of DAT that is exciting is the adjunct field of computer application. It can offer tremendous information storage

capability at extremely low cost. Three R-DATs, with the amount of information they can store will hold all the names listed in all the telephone books in the US. A brief case full of R-DATs will store the Library of Congress. It's taking us in the tape theatre a significant step beyond anything we've ever done to date."

Loranger recently addressed attendees of the International Tape/Disc Association's Third Annual How And Why Seminar on the importance of quality control in R-DAT duplication. In his presentation he called R-DAT the perfect marriage of technology with simplicity and noted that, while legislation may delay its progress, consumer demand will propel the medium. Unofficial estimates state that there are between 3,000 and 7,000 R-DAT recorders currently in the US. According to Ventura Development there will be approximately 12,500 consumer DAT players sold in 1988 and that will increase at an annual rate of 222% to over 1.3 million by 1992.

"Right now it is mostly the smaller labels that are going to try to use DAT to leverage their products, much as GRP did with the CD. GRP was our first DAT client. It's a great product, and I'm experienced enough to know that great products sometimes don't make it. But when the industry satisfies the consumer, it ultimately satisfies itself."

DAT track configuration (View on magnetic side)



The width of each optional track including edge guard (0.1 mm) shall be 0.5 mm.

- | | | | |
|---|---------------------------|----------|-------------------|
| A | Tape width | C | Optional track I |
| W | Effective recording width | D | Optional track II |
| L | Track length | E | Edge guard I |
| P | Track pitch | F | Edge guard II |
| B | Track centre | θ | Track angle |

Source: March 88 DAT Conference

Light at the End of the Tunnel?

Firms investing in equipment to mass duplicate pre-recorded DAT cassettes are putting money on a long shot. All the signs now are that the record industry has killed DAT as a domestic format, thereby once again shooting itself in the foot.

DAT will surely survive and flourish as a tool for professionals and broadcasters, with a few sales into the high end amateur hi-fi buff market. But there is still no sign of any firm agreement between the hardware and software industries on a formula which would make DAT acceptable as a mass consumer format. And time is fast running out.

For record companies and duplicators to earn revenue from pre-recorded DAT software there must be a reasonable park of DAT recorders and players in homes and cars around the world. Professional users are not interested in buying pre-recorded tapes.

There is only one country in which DAT is on open sale to the public — Japan. But after over a year, sales are still pitifully small.

"Do you know how many DAT recorders were sold in Japan last year?" asks Ken Kuno, general manager of the Technics export division in Japan. "Just 30,000. And this year there may well be less. It's partly to do with the price, but mainly the lack of software. We at Technics want to introduce a total system so that the software and hardware can create a market together. Unless DAT is 100% backed from the software industry it won't succeed."

Technics (the hi-fi division of Matsushita, the largest consumer electronics company in the world) has developed a portable DAT recorder, the *SV-MDI*, which is the first in the world to save space and weight by using a half size head drum (15mm instead of 30mm). The Technics portable sells for around £1,150 in Japan but is not yet available in the West. This is because the Japanese electronics industry has held firm on its commitment not to sell DAT hardware into the US and even those firms which have promised to break ranks and launch DAT in the US (eg US Marantz and Casio) have found their supply lines firmly blocked.

Barry Fox looks at some of the main issues surrounding DAT and checks on the latest developments both for and against the format.

In Europe, however, Sony has been taking advantage of its well organised network of professional dealers. These are openly selling DAT, ostensibly to professionals, but realistically to anyone who wants to buy. Shops in Tottenham Court Road have Sony DAT decks in their windows. Tape shop Playback imports direct from Japan and provides customers with the necessary step-down mains transformer.

Sony dealer HHB recently announced a 'major marketing drive' on Sony's 'DAT family'. Ken Kuno of Technics hints that his company may soon follow Sony and start selling the *SV-MDI* portable through professional outlets. If this happens, other Japanese companies will follow suit. Although this will put a wider range of DAT recorders onto the market, the price level remains high (well over £1,000) and the market for pre-recorded software remains insignificant.

For DAT to become a consumer product, and make investment in the duplication of pre-recorded software a safer gamble, the software and hardware industries must agree on ground rules. And so far there are no signs of agreement.

Copyright protection

When the US National Bureau of Standards demolished Copycode in its blistering report published in February, even CBS, the IFPI and RIAA had to admit that the anti-copy system on which they had publicly pinned their faith was a loser. This left the hardware companies free to look at other, more realistic, curbs on what the record industry fears most — digital cloning of pre-recorded software.

While CBS, the IFPI and RIAA were still claiming that Copycode worked well, and had no audible effect on normal reproduction, the hardware companies hands were tied. If they argued that Copycode was unreliable and degraded the sound of normal reproduction, they were accused of self interest: all they could do was sit back and wait for good audio sense to prevail and bury Copycode.

It is unlikely that many people in the software industry realise the extent to which the DAT format has already been designed to offer a degree of copyright protection.

A DAT recorder will refuse to make a digital dub of any digital signal which contains a copy-prohibit flag in the bit stream. Presence of this flag has no effect on conventional reproduction but it will stop a digital recorder dead in its tracks.

The CD standard already makes provision for the use of copy prohibit flags, although some record companies do not bother to insert them into the bit stream. With this in mind, some manufacturers eg Philips, ensure that if a CD player has a digital output, it automatically inserts its own copy prohibit flag.

To reinforce this bar to digital dubbing, domestic DAT decks will record at sampling rates of only 48kHz or 32kHz. This provides a match with digital sound from satellite and the facility for studio quality analogue dubbing, but prevents direct dubbing from CD at the CD standard sampling frequency of 44.1kHz.

Although the record industry is quick to point out that an analogue dub from CD to 48kHz DAT causes only a minimum loss of quality, the real turn-off for the consumer is that an analogue dub of a CD contains none of the index codes on the original disc. These codes must be laboriously re-entered by hand and looseness in the DAT standard means that codes entered on one machine will often not decode accurately on another.

For most people — as proved by slow DAT sales in Japan — it makes better sense to use a high quality analogue cassette deck costing a quarter the price of a DAT deck and for which there are plenty of pre-recorded

musicassettes available.

With Copycode discredited (and along with it the ears of CBS, the IFPI and RIAA) the hardware companies kicked around an idea proposed last year by Philips. This has become known as Unicopy or Solocopy. Quite simply the DAT recorder adds its own anti-copy flag to any recording made through its digital or analogue line inputs. In this way one DAT deck cannot dub digitally from another DAT deck.

This answers the warning put forward by George Martin last year when the IFPI used him as front man to sell the virtues of Copycode.

"The awesome thing about digital taping", said George Martin, "is that it isn't just taping, it's cloning. However many copies you make the product is just as good as you get in a studio."

Solocopy prevents digital cloning from DAT deck to deck. Nevertheless the RIAA, nothing daunted by their unhappy experience with Copycode, came up with other ideas designed to extend the effect of Solocopy by limiting the number of copies made from a compact disc. These involved the use of memory inside a CD player or DAT deck, to recognise when a disc had been copied and then put a block on the output of further digital signals from the same disc.

Obviously the idea is a loser. Sooner or later the memory will fill up and the system grind to a halt. Also the RIAA was apparently overlooking the fact that a new generation of amplifiers and signal processors will take the digital output from a CD player for normal reproduction. People who bought discs would only be able to play them once through a digital amplifier even if they had no intention of copying!

Philips viewpoint

Philips has been cast in the role of villain on DAT, with Japanese manufacturers arguing that the Dutch company has been trying to delay DAT for a variety of reasons, for instance to be sure that there is no loss of royalty revenue from CD and to give slow moving Eindhoven researchers a chance to catch up on DAT technology. In fact the Philips labs at Eindhoven are well advanced with their work on DAT with some interesting new designs at the prototype stage. They have long been ready to sell a DAT deck made by Marantz as an interim measure.

It is true that Philips wants to see the growth of CD continue, because the Philips/Sony patent pool earns a 3 US cent royalty on every CD pressed anywhere in the world. But it is entirely untrue, as some press reports have suggested, that Philips wants to protect royalty earnings from conventional compact analogue cassette. Philips has *never* earned royalties on compact cassettes. It was not for want of trying, but negotiations with the Japanese broke down twenty years ago and Philips was forced to adopt the

The real problem over the adoption of Solocopy as a standard for DAT is enforcement

compromise approach of granting royalty free licences to control the standard.

The real problem over the adoption of Solocopy as a standard for DAT is enforcement. Because the compact cassette, and later CD, were patented by Philips (with Sony joining in on CD) and because manufacture is under licence, Philips as patent holder has had the chance to curtail a licence if a manufacturer is straying from the standard. We have this situation to thank for the fact that a compact cassette made anywhere in the world will play on any analogue cassette deck, and a CD bought anywhere in the world will play on any player.

With DAT there is no comparable situation. No one firm owns all the patents on DAT or is in a position to grant a manufacturing licence. The standard for DAT is the result of agreement reached by a committee of manufacturers. Although the Japanese, and Philips in Europe, would surely stick to any agreement reached on Solocopy, there is a good chance that maverick manufacturers in Korea and Taiwan would stray from the agreed anti-copy standard and start selling DAT decks which copy anything and everything.

Explains Gijs Wirtz, Philips product manager of DAT:

"The standard is really just a recommendation and it is too loose. This has created problems of incompatibility between tapes recorded on different machines, mainly on the use of subcodes. That is why a sub group of the DAT committee, which agreed the original standard, is now meeting to try and agree a tighter standard. This will then be put to the IEC."

Adds Bob Van Meurs, managing director of hi-fi at Philips:

"The DAT standard is not really a standard. There is no control, no punishment if anyone strays. We need legislation after agreement to ensure copyright measures."

This is the only way that DAT will reach the consumer market. The hardware companies must agree on a technical standard, and the software companies (represented by the IFPI) must agree to what the hardware companies have agreed to propose. Then the IFPI can lobby the US Government and Common Market legislators, to pass whatever laws are necessary to block the import of DAT recorders into North America and Europe unless they meet the agreed standard.

Currently there is dissension in the hardware industry, with a split between the Japanese manufacturers and Philips (with Grundig) in Europe. Jan Timmer, who went back to Philips from Polygram last autumn to head Philips Consumer Electronics division, is the man in the middle. Says Timmer:

"You must understand that I cannot comment on the discussions over DAT because I have promised my Japanese counterparts that while negotiations are still pending I will not bring news to the marketplace."

But the jigsaw is not hard to piece together. With Copycode dumped, the hold-up now is that the hardware industry cannot agree on a proposal to put to the software industry via the IFPI. The sticking point is not a technical issue on Solocopy, but more basic and subtle. The Japanese do not want to enshrine on a piece of paper any admission that home taping represents a problem for the software industry, whereas Philips is prepared to make this admission. And without this admission the software industry won't consider proposals.

So far there has been stalemate, with amendments bouncing backwards and forwards between Holland and Tokyo. The general feeling in the industry seems to be that if anyone can get tripartite agreement, it is Jan Timmer. But by the time agreement is reached, chip sets have been redesigned to accommodate whatever technical solution is to be made the standard, and politicians have been lobbied to enforce the agreed restrictions, DAT will very probably be dead as a consumer format — with eraseable CD the new bogey.

The Japanese are reluctant to admit that taping represents a problem, because they see it as a sure way of bringing a levy or tax down onto their tape and recording hardware. On this front the situation changes almost daily so no one in the Japanese tape or hardware industry will risk giving an inch. After pendulum debate the British Government threw out the idea of a tax on tape, dropping the proposal from its *Copyright, Designs and Patent Bill* published last October.

Subsequent behind the scenes lobbying (eg Richard Branson has been knocking on Lord Young's door pleading for a tax) failed to change the Government's mind. But then, in May, the House of Lords gave its final decision in the long running dispute between Amstrad and the record industry on the legality of selling double deck cassette recorders. Although the law lords decided five/nil in favour of Amstrad and had Alan Sugar proclaiming, "We are not going to be bullied by powerful record and music industry pressure groups into withholding from consumers the advantages of developing technology", the BPI noted that the, "judgement could not have come at a better time".

In fact the BPI had gone so far as to ask the Law Lords to issue their judgement while the copyright bill was still being debated by Parliament. The five Lords, while finding in favour of Amstrad, had suggested that the law needed updating. Sure enough, soon after the Amstrad decision, the British Government Standing Committee, which was debating the Copyright Bill, voted 13:11 in

DAT SUPPLEMENT

favour of an amendment which put the principle of a tape tax back into the Bill. This vote followed a curious alliance between the record industry and some members of the Labour Party who were so anxious to vote against the Conservative Government, that they were prepared to overlook the fact that they were voting in favour of a tax which they would normally have screamed out of court.

No one can now safely predict whether the tape tax will find its way into UK law, when the copyright bill passes through the final stages of debate in Parliament.

Meanwhile the Common Market legislators in Brussels have finally published their long-awaited Green Paper on Copyright. In this 300 page document, the European Commission calls for copyright legislation to be harmonised across the entire EEC by 1992. It is a discussion document. Nothing will happen in a hurry. As the document says "... legislative initiatives will be proposed as appropriate."

The section on private copying carefully ducks the issue of levies and spoilers, with suitably vague language. It is in fact exactly the kind of document you would expect to come from a gaggle of Brussels eurocrats who are unable to agree on any positive recommendation.

In Britain debate still rages on how a tax on tape would be distributed, if Parliament decides to impose it. Although there are easy ways to get round the imagined obstacle of taxing the blind (eg the record industry could subsidise post free mail order sales of untaxed tapes to anyone registered as blind or partially sighted) the levy scheme inevitably means greater rewards for the already highly paid — because levy money

will be distributed on the basis of other royalty earnings.

The best suggestion to date, surprisingly from the corridors of power inside one of Europe's top leading record companies, is to forget all about distributing tax revenue to musicians and give it instead to charity — say half to the blind and half to the deaf.

New threat?

By stifling DAT, with cartel refusal to release software and a concerted campaign to colour the format as the latest Japanese trade bogey, the record industry has achieved something which until recently seemed out of the question — they have given the electronics industry breathing space to develop new low cost technology which can make erasable CD available at prices below those asked for DAT.

Whereas the DAT medium is ideally suited to the release of pre-recorded software, and was thus potentially a money-spinner for the record industry, erasable CD has only one function — to record sound with digital quality identical to a pressed CD, either from a digital satellite sound broadcast, from Nipam digital stereo TV sound or from commercial CD releases.

The recent announcement by Tandy that it would be selling an erasable CD system, called *Thor*, within two years for under \$500 caused widespread excitement. Sceptics believed that the Tandy announcement was out of character, over-ambitious and in some respects downright misleading; although Tandy claimed that *Thor*-CD was the result of in-house research, it later transpired that Tandy had been working with another American company, ODI of Oregon and

bought a licence under ODI's patents for erasable disc technology. But by then the die was cast and the publicity was on the wires.

It is now irrelevant whether Tandy does or does not come to the market with *Thor* within two years and at under \$500. All the major electronics companies, especially in Japan, are looking again at their erasable disc technology. This has been under development for at least a decade and has so far been aimed mainly at the computer market where low price is not the first consideration. But these companies dare not sit back and let Tandy create a standard for audio CD recording.

Market analysts BIS Mackintosh recently predicted that erasable disc technology, which had been waiting in the wings for nearly twenty years, was at last due for a breakthrough. Although BIS were talking mainly about disc as a computer storage medium, following announcements by US company Maxtor, the predictions are likely to hold good for the consumer audio market.

Even if Tandy fails to deliver as promised, it now seems likely that giants like Matsushita, Sony, Hitachi and Philips, will be in a position to offer low cost erasable disc technology for the consumer market in a couple of years.

So the difficulties faced by DAT, coincident with Tandy's publicity hype for *Thor*, could well change the face of audio history. If, as now seems increasingly likely, DAT fails to reach the consumer market this winter it may well be that the trade, press and public may finally lose interest in DAT and set their sights instead on the promise of erasable CD.

DAT bit assignment (ID1 to ID7)

	Usage	Bit assignment
ID1	Emphasis	B5 B4 0 0 : Off 0 1 : 50/15 μ sec 1 0 : Reserved 1 1 : Reserved
ID2	Sampling frequency	B7 B6 0 0 : 48 kHz 0 1 : 44.1 kHz 1 0 : 32 kHz 1 1 : Reserved
ID3	Number of channels	B5 B4 0 0 : 2 channels 0 1 : 4 channels 1 0 : Reserved 1 1 : Reserved

	Usage	Bit assignment
ID4	Quantization	B7 B6 0 0 : 16 bits linear 0 1 : 12 bits non linear 1 0 : Reserved 1 1 : Reserved
ID5	Track pitch	B5 B4 0 0 : Normal track mode 0 1 : Wide track mode 1 0 : Reserved 1 1 : Reserved
ID6	Digital copy	B7 B6 0 0 : Permitted 0 1 : Reserved 1 0 : Prohibited 1 1 : Reserved
ID7	Pack	B5 B4 Pack contents

ID1 to ID6 must be recorded.

ID1 to ID6 should have the same information in one interleave pair data blocks.

When no ID7 is used, these codes should be logical zero '0'.

Source: March 1988 DAT Conference



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Digital Audio Tape Technology

The introduction of DAT has brought with it new tape manufacturing problems and new solutions. Taiyo Yuden, the manufacturer of That's Tape has considerable experience in magnetic materials technology and is indeed one of the few companies in the world who supply the basic magnetic raw material (ferrite powder) to the main tape manufacturers. This year their annual sales are projected at ¥73,000 million (capital as of August '87 was ¥14,556,601,001) which makes the company, although perhaps not so well known in the West, a major company in Japan.

Taiyo Yuden was formed in 1938 and initially started with research and development into ceramic capacitors and seatite. Today, in addition to ferrite products they also manufacture capacitors, ICs and solar batteries. The first That's Tapes were marketed in October 1984 after Taiyo Yuden had developed their own Type IV (metal) particles in September '82 and a new Type II (high position) particle in July '83. Marketing of the That's DAT tape began in Japan in March 1987.

The manufacturing of That's DAT tape involved the design and construction of an entirely new, interactive 3HD manufacturing system in order to create a magnetic tape with a high coercivity (approx 1,480 Oe) and a surface roughness of only 0.017 µm. the new process also ensures that the magnetic particles will only be needle-shaped with very little shape deviation. None of the magnetic particles show cavities and each contains high density magnetic components.

The binder material, used for coating the tape base, is a multi-functional plastic material with high affinity to the magnetic particles as well as to the carrier material. In order to evenly disperse the magnetic particles in the binder layer with sufficient high density a brand new pebble mill had to be developed. The previous steel or glass balls of approximately 3mm diameters have been replaced by ceramic balls with a diameter of 1mm, a material of nearly diamond hardness. The effect of this new mixing process is shown in Fig 1.

Further improvement of the tape surface

DAT tape is not an easy product to manufacture. For Taiyo Yuden it involved a completely new process.

characteristics was achieved by adding an organic material which demonstrates a high affinity to magnetic particles on one side and water repellent properties on the other. This

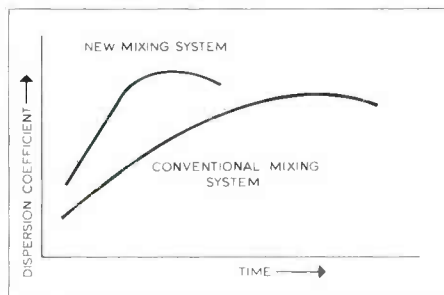


Fig 1: Magnetic particle dispersion

special material invades the binder layer and provides firm bonding of the magnetic particles to the binder. When the material is specifically matched to the magnetic particles and the binder the result is a coated surface high in abrasion resistance and other favourable surface characteristics.

Due to the mechanical and magnetic properties required in the DAT format, That's engineers felt it very important to design a formulation with a very low dropout rate. Even though all current DAT players are equipped with effective error correction circuits, the effectiveness of these circuits is to some extent limited. This means that high demands in terms of recording and reproduction quality can only be fulfilled by a high quality magnetic tape.

Even the best magnetic tape will not function properly if the tape to head contact is impaired by dirt and dust particles and fingerprints and cigarette smoke deposits can adversely influence recordings and playback. For these reasons the DAT cassette is of fully enclosed design.

Despite this precaution dust particles may

	T-120	R-DAT	Unit
Cassette dimensions	73×54×10.5	73×54×10.5	mm ³
Tape dimensions			
Width	3.80	3.81 (+0, -0.02)	mm
Width tolerance	0.004	0.006	mm
Thickness	13.4	13.0 (±1.0)	mm
Playback characteristics:			
Tape speed	8.15	8.15	mm/s
Recording time	120	120	min
Sampling frequency (SP operation)	48	48	kHz
Quantisation	16	16	bit
Frequency response (±0.5 dB)	5-22,000	5-22,000	Hz
Dynamic range	96	96	dB
RF characteristics			
RF recording level at 4.7 MHz	+0.5	±2	dB
RF output level 130 kHz	+0.1	-3	dB
4.7 kHz	+1.0	-3	dB
RF frequency response 1.5 MHz/130 kHz	+0.8	-3 +2	dB
4.7/1.2 MHz	+0.2	-2 +3	dB
Overprint response 1.5 MHz to 130 kHz	+0.4	-2	dB
4.7 MHz to 1.2 MHz	-0.6	-3	dB
Carrier/noise ratio	+1.4	-3	dB

Table 1. Specifications of That's T-120 cassette compared with the R-DAT standard specifications.

still be generated by tape abrasion inside the cassette. This has been prevented by the use of durable and abrasion-proof materials. A special slip foil, to which a low friction surface layer is applied by means of spray-coating, provides smooth tape travel without excessive friction, so consequently the tape transport requires very little traction power which in turn favourably contributes to its useful life.

Fig 2 shows the frequency response of a DAT tape showing the correlation between output level in dBm and frequency in Hz. The corresponding values of a conventional high quality metal tape are also indicated for comparison.

The original particles of a high quality magnetic powder must feature a distinct needle shape, and shape deviation must be low. None of the individual magnetic particles should have cavities and each one must contain high density magnetic constituents.

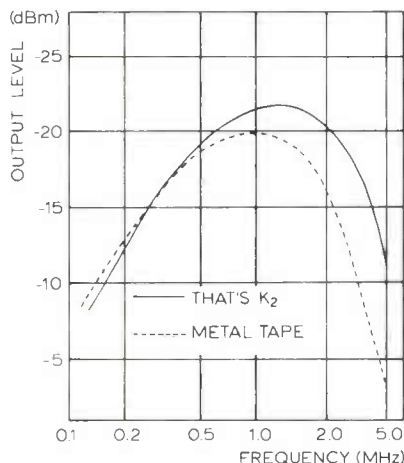


Fig 2: RF frequency response

Manufacturing process

Ferro-II chloride ($FeCl_2$) is used as base material for the magnetic powder to assure high purity. Additives such as sodium hydroxide ($NaOH$) for neutralisation and ammonium hydrate (NH_4OH) for oxidation, yield a new compound, called goethite ($FeOOH$). Impurities such as insoluble ingredients would impair crystal nucleation, which is an important pre-stage for the growth of the desired goethite crystals.

Crystal nucleation determines the crystal structure of the final magnetic powder which in turn is responsible for the shape of the uniform particles recovered from this magnetic powder. Even by optimising material density, temperature, reaction time and selection of suitable nucleation materials, crystal growth can be postponed which means it no longer occurs during the initial crystal nucleation process. In many instances this has been the reason for irregular crystalline structure of the final product. Uniform temperature and material density dispersion during the reaction and a selection of suitable processing techniques which do not impair the formation of needle shapes is the process That's use to prevent the build

up of undesired crystalline structures.

By cleaning, drying and dehydration at temperatures from 200 to 300°C an intermediate product, hematite (Fe_2O_3), can be obtained from goethite. A third material, magnetite (Ferro-II-III-Oxide Fe_3O_4), is recovered from the hematite by reduction in a hydrogen (H_2) atmosphere at temperatures between 300 and 500°C. The resulting magnetic particles are of uniform shape and have several cavities, through which hydrogen and oxygen can escape, but their magnetic properties are still insufficient. Therefore they are converted to magemite (Fe_2O_3) by oxydation heat treatment at temperatures between 150 and 300°C.

This magemite is compressed by a sintering process at temperatures of up to 800°C in order to achieve uniform dispersion of its ingredients, while simultaneously

removing the cavities of the original magnetite particles. The temperature must be accurately controlled during this process. Temperatures too high cause loss of needle shape and agglomeration (melting together) of adjacent particles. If the temperature is too low, optimum magnetic properties of the particles can not be obtained.

By adding another metal compound it is possible to remove the cavities and achieve a uniform dispersion inside the particles at relatively low temperatures. This also provides good magnetic properties without affecting their needle shape. Thus the conditions for a high density needle structure with good magnetic properties are provided.

The above information was based on material supplied by Taiyo Yuden and Hans-Peter Siebert, Funkschau magazine.

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DAT Tape Survey

Listing includes manufacturer's main address only. For international distributors or local suppliers please check entries in the *One to One Gold Book* and the address list at the end of this supplement.

AGFA				<p>Agfa-Gevaert AG Postfach, 5090 Leverkusen 1, West Germany. Tel: (02 14) 3 01. Telex: 8510420. Fax: (02 14) 30 43 60.</p> <p>Available in 60, 90 and 120 minute lengths.</p>
AXIA				<p>Fuji Photo Film 2-26-30 Nishiazabu 2-Chome, Minato-Ku, Tokyo 106, Japan. Tel: (03) 406 2424/2804. Telex: 324306.</p> <p>Available in 46, 60, 90 and 120 minute lengths.</p>
BASF				<p>BASF BASF Aktiengesellschaft, Gottlieb-Daimlerstrasse 10, D-6800 Mannheim 1, West Germany. Tel: 0621 4008-1. Telex: 462621 BASF D.</p> <p>Available in 60, 90 and 120 minute lengths.</p>
DIC				<p>DIC Digital Supply Corp 2 University Plaza, Hackensack, NJ 07601, USA. Tel: (201) 487-4605.</p> <p>Available in 15, 30, 45, 60, 90 and 120 minute lengths. OEM supplier.</p>
JUST				<p>Just The Old Forge, Shipmeadow, Beccles, Suffolk, NR34 8HJ, UK. Tel: 0502 716056. Telex: 265871 (quote 72 MAG 35322). Fax: 0502 717387.</p>
MAXELL				<p>Hitachi Maxell Ltd Ginza Toho Seimei Bldg, 3-3-1, Ginza Chuo-ku, Tokyo 104, Japan. Tel: 03 564-0801. Telex: J26391 MAXELL.</p> <p>Available in 46, 60, 90 and 120 minute lengths.</p>

DAT SUPPLEMENT

PLAYBACK



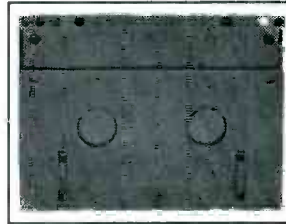
Playback

15 Percy Street, London W1P 9FD, UK

Tel: 01-631 0939

Available in 15, 30, 46, 60, 75, 90 and 120 minute lengths. OEM Supplier.

SCOTCH



3M

Magnetic Media Division, 3M Center, St Paul, MN 55144-1000, USA.

Tel: (612) 733-1959.

Fax: (612) 736-1246.

Available in 46, 60, 90 and 120 minute lengths (available Oct 88).

SHAPE



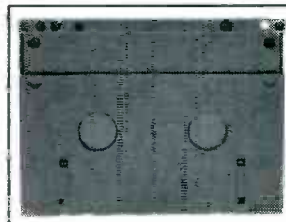
Shape Optimedia Inc

Route 109 and Eagle Drive, Sanford, ME 04073, USA.

Tel: (207) 324-1124. Telex: 5106008653. Fax: (207) 490-1707.

Bulk and OEM loaded DAT cassettes.

SONY



Sony Corporation

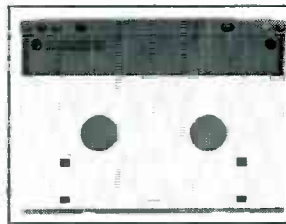
Magnetic Products Group, 6-7-35, Kitashinagawa, Shinagawa-Ku, Tokyo, 141 Japan.

Tel: (03) 448-2111.

Fax: (03) 447-2880.

Available in 46, 60, 90 and 120 minute lengths.

TDK



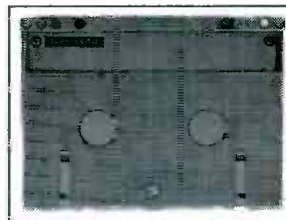
TDK Corporation

13-1 Nihonbashi 1-chome, Chuo-ku, Tokyo, 103 Japan.

Tel: (03) 278-5111.

Available in 46, 60, 90 and 120 minute lengths.

TECHNICS



Technics

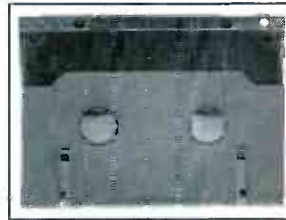
Matsushita Electric Industries, Audio Div, 1-3 Matsuo-cho, Kadoma, Osaka 571, Japan.

Tel: (06) 282-5111.

Fax: (06) 282-5740.

Available in 46, 60, 90 and 120 minute lengths.

THAT'S



Taiyo Yuden Co Ltd

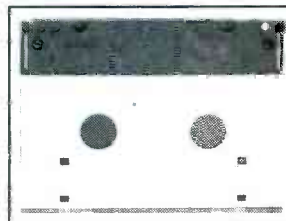
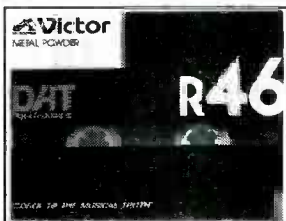
Matsumura Building 16-20, Ueno 6-chome, Taito-Ku, Tokyo, Japan.

Tel: 03-833 3961. Telex: 265 5169.

Fax: 03-835 472/4.

Available in 46, 60, 90 and 120 minute lengths. OEM supplier.

VICTOR



JVC

Victor Company of Japan Ltd, Magnetic Products Division, 1030 Motoyoshida-cho, Mito City, Ibaraki-ken, 310 Japan. Tel: 0292-47-3111.

Telex: 3 6 32289 VICTOR J.

Available in 46 (2 versions), 60, 90 and 120 minute lengths.

DAT Notes

ALL QUIET ON THE EASTERN FRONT?

Vicki Hyde checks out Japanese feelings about DAT.

Japan's DAT manufacturers are holding their breath, waiting to see what will become of the promising digital market currently under fire because of copyright and protection disputes.

Once thought likely to develop into a multi-million dollar market both domestically and abroad, the Japanese DAT market is now under a cloud, with most manufacturers preferring to adopt a 'wait and see' attitude. They are waiting to see if any agreement concerning copyright and technical standards can be forged to allow the worldwide marketing of the high quality digital products.

The dispute has been particularly strong between Japanese manufacturers and US record companies. Concern about the threat to their sales, as well as the more altruistic motive of protecting artistic properties, led the US companies to threaten law suits and political action should the Japanese attempt to release DAT products on the US market.

To date, only a relatively low number of DAT machines have made their way into the US from Japan, and the majority of these have been in the form of playback-only devices which do not permit any recording onto digital media.

The recent rejection of a proposed Copycode device by the US National Bureau of Standards had raised some hopes in Japan that the market would open up. However as one industry source put it, they "had planned to introduce products in the United States but withdrew those plans after the recording companies threatened to sue".

Sony considers that there may be some light at the end of the tunnel. Company spokesman Frank McGee says that they are still waiting for critical approval from the recording industry — "It's slow coming, but it is coming," he says.

Announcement of a useable procedure for erasing and re-recording over CDs does not appear to have fazed the company any. Tandy made its announcement of erasable CD technology to great fanfare, but Sony says that they have yet to see any hard technical specifications for the system, and so are not particularly worried about any threat to the already precarious DAT market.

"Outside of a few general ideas, we don't have any information on what the 'new breakthrough' is," says McGee. Like most Japanese electronic manufacturers, Sony has its interests in many areas and is also working on the development of erasable CDs as part of its computer-related development.

Sony is considering the use of its DAT technology in the computer industry for backup storage of large data files. "There is a market out there (for this)," McGee says, "a small one".

One of the main problems in developing the DAT market has been the relative lack of software to use with the machines, exacerbating the problem of consumer recording off other media.

"People are still waiting for the software," says McGee. Last winter, he added, a number of small companies announced the production of DAT software, such as Edison Records, utilising master tapes obtained outside Japan.

"They do have plans to introduce software in Japan to appeal to the Japanese consumer," he says. However, it will be a considerable length of time before the DAT media has any significant impact on the retail audio market in Japan.

Otari find that the lack of software for DAT and the continuing problems associated with it has caused problems for them in the marketing of their DAT loader. The company has spent three years developing the loading



device, predominantly for marketing in Japan, but has found that the DAT dispute has effectively slowed sales for them.

The dispute is basically between the hardware manufacturers and the recording industry, says Hisao Suzuki of Otari's International Division. "We can do nothing until the hardware starts selling and demand for software increases," he says, "so we will just wait and see".

A few years ago, Suzuki adds, everybody expected the DAT software market to really take off with the development of the audio devices, both recording and playback versions. When the hardware manufacturers began their initial sales last March, he says, they expected good sales but within a few months they found that sales were almost at a standstill while everyone, both the audio industry and the consumers, waited to assess the situation.

Suzuki sees some hope for the situation in the tie-up between hardware manufacturers and software producers, such as between Toshiba of Japan and EMI of the United States, or in the recent purchase of CBS Records by Sony.

Suzuki considers the situation to be a difficult one to resolve, particularly with respect to the US. "Perhaps it may be possible to negotiate with Europe," he suggests hopefully.

Otari sees little likelihood of getting involved in settling the issue themselves. "We have no direct connection to (help) settle the issue," says Suzuki. "In our case we can only wait, as the hardware manufacturers are the ones directly involved in selling the equipment."

To date, the company has been able to sell around 10 of its high speed DAT loaders, to major Japanese tape manufacturers and at the pilot plants of DAT equipment manufacturers. "The hardware manufacturers had the loader installed for test purposes," says Suzuki, as the loader allows them to gear up for eventual mass production of their machines.

"Most of the tape manufacturers are ready to produce tape, but the installation of equipment (for mass production) is not complete," says Suzuki. Most of them, too, according to Suzuki, are waiting to see what will happen before committing themselves.

As regards the possible computer applications, Suzuki thinks that the market is very limited in terms of the applications of his company's machine. "Our loader can make 100,000 to 120,000 cassettes per month," he says, "and tape consumption (for data file applications) is not so high."

The problems of the market do not appear

DAT SUPPLEMENT

to have deterred JPI (Japan Program International) from its aim of mass duplication of DAT software. The company uses Sony's DRD-100 and accepts five types of master tape for the production of DAT cassettes.

Hitoshi Saito, a company spokesman, is aware of the controversy surrounding DAT, as he warns all potential clients that all rights have to be cleared before any duplication can be made.

DAT MASTERING

Bill Foster examines the current state of DAT in the UK professional market.

About a year ago in this magazine, I predicted that R-DAT would replace *F1* as the low cost digital system within two years. Having reached the half-way stage this prediction would seem to be well on course.

Most studios should by now have amortised their *F1*'s and be able to upgrade to the technically superior R-DAT system without undue financial hardship. The question, though, is whether to purchase a domestic R-DAT recorder, or one of the costlier 'professional' Sony *PCM 2500* machines. Those still deliberating may wish to weigh up the pro's and con's.

There are now in excess of 1,000 R-DAT machines in regular use in the UK, and although a portion of these are Sony *PCM*

conversion if a digital domain transfer is to be achieved — and these devices are expensive.

Suddenly the post production house comes back into its own. A good sampling rate converter will cost around £8-£10,000, which is not the kind of expense most studios are prepared to consider. After all, if the price of an SFC is no obstacle the studio might as well purchase a 'pro' version of R-DAT and record at 44.1kHz.

Without wishing to sound like an ad for Sony — currently the only supplier — (*But you're going to anyway!* — Ed) acquiring a *PCM 2500* is really the most logical course for all seriously minded studios, and one which a great many are already taking. But for those on a lower budget, and for certain facilities who wish to use the machines principally for playback, the outlay for a *PCM-2500* is not always justified.

Cassette manufacturing facilities are a case in point. One of the beauties of the brilliantly thought out R-DAT system is that whilst certain record functions may be inhibited on some models, almost all machines have the ability to playback any of the other R-DAT formats. So a cassette plant could buy a domestic machine which records only at 48kHz, but handle any 44.1kHz (or even 32kHz) tapes which might be sent to them.

I will not dwell here on how this useful feature is achieved as it has already been well documented elsewhere* and organisations such as APRS have run seminars on the subject. The fact that it does work allows a far greater number of audio facilities to experiment with this fledgling, but already

definitive work on this subject.

I think it's unlikely that R-DAT will replace CD as the favoured domestic digital carrier for some time yet. (In fact, with the pace at which technology moves today it may never do so.) But, as a reasonably priced and reliable medium term storage system for the studio and audio manufacturing industries, R-DAT is likely to be around for quite a while.

IN PRAISE OF DAT

Ian Jones, managing director of UK pro-audio sales company HHB, airs his views on DAT.

At HHB we have a long track record of expertise in the highly specialised area of digital audio. Quite simply, we believe that in any professional audio application, digital audio recording should be a prerequisite. For the professional, the benefits of digital, in terms of superb audio performance and a complete lack of signal degradation after successive editing are, we feel, beyond reasonable argument. Certainly, in the professional environment, these facts outweigh the subjective opinions of a vociferous minority. Not surprisingly, HHB is firmly committed to expanding the digital universe.

As many audio professionals realise, this commitment is nothing new. Six years ago, with the introduction of the *PCM-F1* portable digital system based on the Betamax VCR, HHB recognised an opportunity to expand that universe. At the time, Sony Broadcast, the UK professional arm of the Sony Corporation, became concerned that our marketing of the *PCM-F1* and later the *PCM-701ES*, would have an adverse effect on the sales of larger, fully-professional digital 2-track hardware, notably *PCM-1610* based CD mastering systems. However, this proved not to be the case. EIAJ format technology introduced thousands of professional users to digital audio that would not have invested the many thousands of pounds required for overtly professional hardware. Furthermore, many of these customers went on to purchase large scale digital recording hardware later, including digital multitrack equipment.

And so we come to DAT. A superb high-performance format with so much potential for the professional, it is much more than a convenient replacement for the *PCM-F1* and *PCM-701ES*. Our belief in DAT is very strong. Both our own experience and that of our customers confirms that error rates are very low and drop outs extremely rare. Furthermore, both rewind and access speeds are very rapid, saving time and money. All this is supported by space saving hardware and simple controls. It should not be



2500's the majority are 'grey import' domestic Sony's, Aiwa's and the like.

These domestic machines, whilst offering most of the features of their more expensive counterpart have one major drawback. They do not (without some serious tinkering) record at the compact disc sampling frequency of 44.1kHz.

When recording and playing back in the analogue domain this makes very little difference — the quality still basically matches that of any other current digital recorder. The principle problem when using the domestic R-DAT system comes into play if a digital transfer to a CD master is required.

With *F1* it was possible to make direct transfers to the *1610/1630* system using one of the readily available digital interfaces. However, domestic R-DAT, with its frequency of 48kHz requires sampling rate

widely used, format — at a price which will not break the bank.

The record companies themselves are operating a kind of 'double standard' with regard to R-DAT. Whilst their marketing and press departments are loudly proclaiming that they will have nothing to do with a format which they claim will destroy sales of CD, the A&R and production departments are all ordering machines with which to listen and approve studio mixes and mastering EQ's.

One major label now has a DAT copy of every CD tape master to save the high cost of producing CD test pressings. Others will surely follow suit.

* Those wishing to know more about R-DAT, and digits in general, are recommended to read *The Art Of Digital Audio* by John Watkinson. Written in a style which can be understood by technical and operational engineers alike, it is arguably the

DAT SUPPLEMENT



Ian Jones

surprising that so many musicians, producers, broadcasters and institutional users have embraced the format so firmly.

HHB's DAT marketing drive started last year. From the very beginning, it has reflected a similar strategy to the one we have employed so successfully in the past. We offered both professional equipment in the shape of Sony Broadcast's *PCM-2500* and lower-cost hardware in the form of the *DTC-1000ES*.

As leading distributors for Sony's consumer division at Sony UK as well as Sony Broadcast, it was always our intention to supply official UK models from the word go. With Sony Broadcast's *PCM-2500* — essentially a heavily modified version of the *DTC-1000ES* consumer machine with professional inputs and outputs, this represented no problem. However, in spite of assurances that the *DTC-1000ES* would be launched officially onto the UK domestic market last October, the introduction never materialised. With the DAT issue still a hot political potato, Sony UK was requested to back down by its senior management in Tokyo. Consequently, with expensive advertising and direct mail literature already produced — we had already made a major capital investment in the introduction of the *DTC-1000ES* — we were forced to import *DTC-1000* recorders from outside the country, these machines representing our first shipments.

While not supportive or complicit with this move, Sony Corporation understood that we were already significantly committed. Most important of all, the company appreciated — at the highest level — that HHB is not interested in supplying the domestic marketplace. 100% of our customers are audio professionals, be they musicians, producers or broadcasters, or from institutions and industry.

Early this year, Sony Corporation itself made its position with HHB clearer, when it

sanctioned our role as professional distributors of consumer equipment. All *DTC-1000ES* models we now supply are full-specification UK models, with UK standard power supplies. Approval came from Sony at the highest level in Japan — but with the important proviso that we both market and sell the equipment concerned purely to professional, rather than domestic users.

At the end of the day, the proliferation of DAT recorders within the professional environment — be they consumer or professional machines — will build on the success of the *PCM-F1* and *PCM-701ES* and that DAT will become a 2-track mastering standard for many applications within the next two years.

However, we hope that DAT is launched onto the UK's domestic market soon. We don't think it's going to replace the conventional audio cassette overnight. We also believe it offers little threat to the compact disc. Fundamentally, DAT's domestic launch will create a new consumer standard that will — alongside CD — work to create a more powerful demand for high quality recordings. This demand will do much to support the infrastructure of digital recording technology in which we are encouraging our professional customers to invest.

We have already sold a great many of all four Sony recorders and demand is very strong, and the new format is already selling at a rate that far outstrips the demand for ELAJ format recorders at their peak. Irrespective of its fortunes on the domestic market, DAT is already a success story for the audio professional.

CLASSICAL DAT For the 'classical' view on DAT, Peter Herring speaks to Capriccio and Target Records.

Target has been marketing Capriccio DATs in the UK since last September and Jeremy Elliot claims a lot of interest, not least on the professional side. With a dealer price of £14.50, and a recommended retail of £23.99 (although some have pushed that to £24.95), he reports sales of up to 50 tapes on certain titles, with London retailer Covent Garden Records a particularly good outlet.

The DATs draw mainly on Capriccio's catalogue of digital masters and are not being released alongside the CD and MC versions, emphasises Elliot. Overall, he rates the response to DAT as, "Far brighter than I expected."

Political considerations were of little concern to Capriccio. Says Moll: "All the discussions exaggerated the problems. Only a certain part of the population wants to copy and that's the pop music lovers, not the

classical enthusiasts. I believe, in a year or so, nobody will be talking about the 'problem' of DAT."

Duplication of Capriccio's DATs has been done by the label's parent company Delta Musik of Königsdorf. A selection of DAT players was bought in Japan, shipped to West Germany and tested. Several were very good, says Moll, but the Technics model was the one chosen for duplication. Originally this was done on pre-packaged blank DATs, principally from Sony, but now Delta have acquired a DAT loader and is using pancakes from Daiichi-Seiko of Japan.

Capriccio are aiming for timings of around 60 minutes per DAT (although an early Bach issue offered only 44) because, argues Moll, "The comparatively high price demands that sort of quantity. All the tapes are replicas of the CD masters with all the usual subcodes. These may differ from the CD, however, depending on whether it makes sense to incorporate a particular code on the DAT."

Moll claims "absolutely no problems" with regard to matters such as tracking error on his DATs and reports a lot of response from around the world, with most sales — not surprisingly — in Japan: "A leading Japanese audio magazine declared our DAT better than the CD equivalent; they found the sound 'smoother.'" Altogether, he estimates worldwide sales of 25,000 since August 1987.

As to manufacturing costs, he concedes, "It's been very expensive due to the low production runs, and we've had no experience to go on. Economically, it doesn't make a lot of sense, but it *does* make sense for us to be in DAT from the beginning. We wanted to work with DAT, we wanted to get experience, and that was more important than making a profit."

DAT masters have been prepared by outside studios, principally one in Stuttgart which Moll describes as, "People who know about classical music." On the first duplicating run, every tape coming off has been, and is still checked, despite the zero fault rate. Argues Moll: "If 10 or 20 suddenly weren't correct, that could cost us more in solving the problems than it does paying for the checks to be made."

Looking ahead, he foresees Capriccio's important classical releases soon appearing simultaneously on four sound carriers — LP, MC, CD and DAT — with some 50 new DAT titles appearing during the remainder of 1988.

"As far as the professional side is concerned, I'm sure DAT will be the sound carrier of the future in studios. It's so small, and it's cheaper and better than U-Matic. I expect Sony to bring out their true professional recorder in a year or so.

"On the non-professional side, I think it will become irresistible. The Japanese have just released the third generation of players for around DM1,000 (around £260), and I can't believe that Sony has bought CBS not to take advantage of its back catalogue. But I have to admit we'll be much happier as soon as Philips release their first DATs!"



DAT Crusader

I'm on a bit of a crusade. DAT is not even in its infancy; it is still waiting to be born." So says Robin Barnes of Touchstone. Although the company has been involved in the loading and duplication of video cassettes for some fourteen years now. Barnes' heart is clearly lost to the DAT cassette. "Go on, pick one up; I bet you like it," he urges. It must be love.

Touchstone claims a first as a UK video loader over 10 years ago. The company manufactures and duplicates video cassettes and as such is very much established in the field. "Video is what we do for a living. DAT is our bit on the side." He's quite a character.

And some bit on the side it is too. This family business first considered the possibility of DAT manufacture and duplication two years ago ("Then I was crazy; now I'm just a bit peculiar!"). Today they are not only the first to be fully geared up and running but in addition to duplicating for third parties, they have also launched their own DAT label — TPL Digital Music. They will also be introducing a range of blank DAT cassettes (Just DAT) and will also manufacture OEM brands if required.

The heart of the system is an Otari T-650 DAT loader housed in a Class 100 clean room. "We already had a Class 1000 clean room for the video tape which we upgraded

Some say it will never happen, some say it will. Some sit on the fence. Not so the DAT Crusader as Janet Angus discovered on a recent visit to Touchstone.

to Class 100 two years ago when we knew we would be doing DAT," explains Gwyneth Barnes.

The mastering room itself is more akin to a recording studio control room than the more typical factory mastering 'cupboard', complete with mood lighting and controlled acoustics. In it there are three PCM-2500 DAT master machines, a Sony PCM-1630, a pair of JBL monitors and an Akai PG1000 matrix which assigns any combination of 100 Sony DTC1000ES machines in the realtime duplication racks to any of the three master machines.

There is also a Tascam 388 8-track mixer which will eventually be put into use editing compilation cassettes (ie inserting SMPTE timecode).

The realtime machines, located in racks in an adjacent room have all been modified to overcome the copy prohibit technology and enable them to record at 44.1. Once loaded the cassettes are on-body printed with a Tampoprint TT80/311 machine and then packed on an Edwards overwrapper. There are also extensive in-house artwork/print facilities originally established for the video side of the business.

In fact a lot of Barnes' confidence comes from the experience he already has under his belt in video. He is convinced that this gives him the edge on audio cassette duplicators who are used to working high speed with loopbin systems, whereas video has always been and so far remains very much a realtime business.

Quality control takes place at four different stages of the process and currently is being carried out 100% on every single cassette. As Gwyneth says, nobody can afford to have anything going out less than 100% perfect on DAT. The first check takes place after loading, then once duplicated, again after printing and finally when packed.

Once duplicated QC personnel listen to the tape all the way through checking initially the start IDs — both their presence and quantity. Eventually it is hoped that they will be able to simply then go to the end and ensure that the programme is complete. Typical problems so far have been with the number of start IDs present, as all sorts of spurious things may trigger the machine to insert one when not necessarily appropriate. Since it may simply be an electrical problem, a faulty tape will be re-recorded in order to establish whether the problem lies with the tape or the machine. Each tape has its machine number written on it for instant identification. When the system was first set up Touchstone had terrible problems with power surges for six months during which time they kept wondering whether they were doing something wrong. Thankfully it seems to have resolved itself.

Future developments

When it is available Touchstone will be purchasing the Sony ASI-100 signal converter which will perform processes such as adding error correcting signals and subcode signals and RF modulation of the signals. It is not yet commercially available as the absolute format of the subcode area has yet to be finalised. What this actually means is that the manufacturer has to worry about the start IDs himself which requires a little

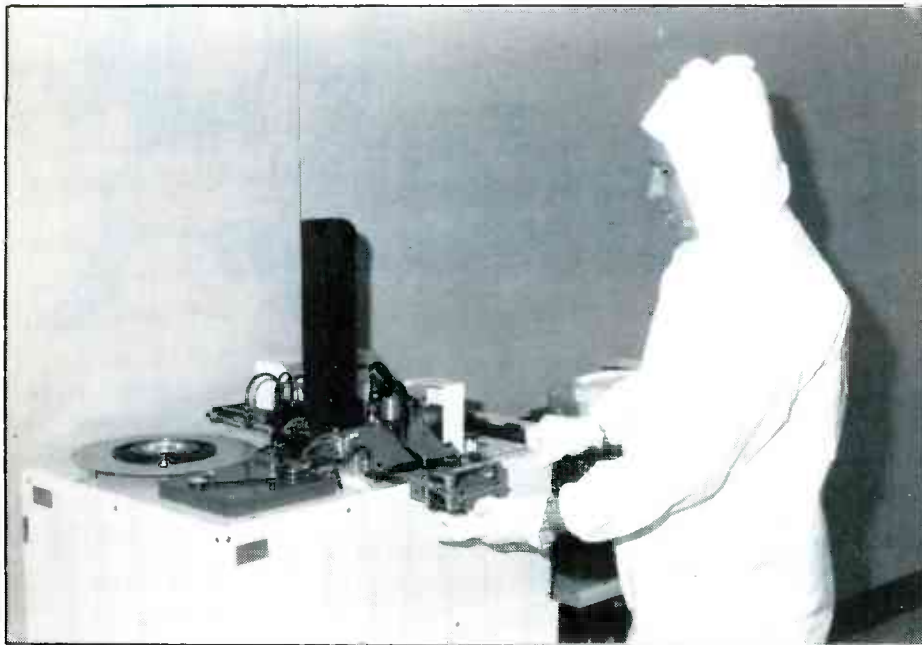


Gwyneth Barnes



Robin Barnes

DAT SUPPLEMENT



Clean room conditions for DAT loader

more preparation. What you can read off a tape is dependent entirely on what your particular hardware is able to read. Possibilities include start IDs, track number, track listing and search and eventually table of contents (although this is not yet available). Otherwise it is possible to utilise search and skip ID and play order just as you can with a CD.

Similarly they have ordered the *Sprinter* high speed duplicating system from Sony and are eagerly awaiting its availability. The main problem is a shortage of barium ferrite tape which is currently enjoying enormous popularity as the base material for credit cards and ID cards being introduced the world over by stores, banks, telephone companies, etc. Supplying a lone DAT producer is very low on the list of customer priorities. Meanwhile the realtime method more than suffices.

"Long term we can't think of realtime audio duplication because of the sheer quantities involved but it will be several years before we need to consider high speed," says Robin. "Besides, in video we do millions of realtime cassettes a year. Audio duplicators are horrified by realtime. It doesn't frighten me at all. You don't get into a game without understanding the rules, and we have been at this one a long while. Loading isn't as easy as it sounds; there are all sorts of problems. The reject rate is hundreds not handfuls and it all goes back to the manufacturer. I'm sure everybody will get it right but there is a learning curve. Our's has been 14 years. As far as we are concerned, loading and duplicating DAT is exactly the same as for video tape."

Copyright

There are plenty of arguments against DAT being bandied about and the one which very obviously preys hardest on Robin's mind

is the problem of copying.

"If you care to make a pirate copy of a CD onto compact cassette you can make a better copy than the ordinary factory made cassette. If the music industry thinks the public doesn't know that, well . . ." The way he sees it is that DAT is just another tape. There have always been pirates and there always will be but why then kill the technology? Would it not be better to police the pirates?

"I draw an analogy with bank loans and the interest payable thereon. Stealing titles is equivalent to the interest you pay, but you are still making money on the ones you sell. People at the BPI like to think that people will never copy again. I'm afraid unless you uninvent the tape recorder that is not going to happen.

"There is also an argument for the fact that if you have bought the software once, copying that at home is not the same as selling a copy to someone else. I say police the pirate market rather than worry about home taping. I can't see what all the fuss is about, it's just another tape isn't it? Of course I'm against copying but I just don't see how you can stop it."

Touchstone believe that the BPI are suggesting that its members should not release DAT software.

"When video came out there were fears of it affecting television and nobody would be able to show reruns of programmes whereas in fact it created a whole new industry. When the compact cassette was first introduced there was all the same hue and cry, the same with CD. It's all hype."

Cost

Another factor against DAT is its seemingly prohibitive cost. Although Robin disagrees that it is prohibitive he nevertheless argues that there is no reason

for its high price.

"Everybody says it is expensive but that's just greed. Compare the amount of plastic in a video cassette and a DAT cassette. Compare the amount of coated tape. Yet a video cassette can be produced for under one pound and a DAT costs five. Why? Somebody wants to recoup the investment on the R&D in DAT very, very quickly. Why should it cost 100 times as much? Somebody's making some money somewhere. Of course it's a bit blasé to say they are charging 100 times more when I can see that if people are now going to master (and they already are) on DAT the tape manufacturer will sell less tape than for 2 inch masters."

His argument extends to the hardware. A DAT player looks similar to a video recorder and therefore presumably has a similar number of components inside.

"If you can buy a brand new video player in America for £100 you must be able to do the same with DAT. The components can't cost more. The chips exist. You can't say you can't make them for the same price. You can if you want to. You can easily make a DAT player for £300 by the ton and sell them by the ton too."

Of course it is not as simple as that, there is a status quo to be maintained. R&D costs certainly need to be recovered; before a new medium can take off there has to be manufacturing capability to meet demand, similarly duplicating capacity etc. Nevertheless Touchstone are in no doubt that DAT is going to arrive in a big way and soon. Robin cites the lateral thinking of Edward de Bono.

"I am 99.9 recurring per cent certain that the price will come down. I don't see the logic in killing the system because it is expensive. If it has been invented already surely it is better to lower the price now and sell. All the big manufacturers have large quantities of machines in bond which have not been released because of all the politics. Nobody admits it but we all know it's true. They are now out of date and will have to go onto the market cheaper for a start."

Touchstone is not unaware of corporate power.

"If I'm too mouthy, and I can be, the big boys can stamp on me. But I want to do this with them. DAT is so much better than compact cassette I just hope common sense will prevail."

Touchstone is making its own bid for affordable hardware. They are currently negotiating with German manufacturer ITV to produce a DAT personal 'Walkman' in the £200-£300 price bracket. Meanwhile in the UK we can expect DAT machines readily available in the high street at around £750 this summer.

"All the shops in London's Tottenham Court Road would buy the machines if you could supply them. If you think £700 is a lot of money for people to pay, you and I live in different worlds. There are a lot of people who can afford that; look in any traffic

DAT SUPPLEMENT

queue." Gwyneth quotes figures like 30,000 machines sold in Japan alone with no software to go with them.

"I would say that was pretty good going wouldn't you? There are already 4,000 machines in the UK. As a long term thing you can't say that it is a bad outlook."

Sourcing materials

July sees Robin and Gwyneth on a regular whirlwind tour of Singapore, Hong Kong, Taiwan, Japan and the US. "It is the only way to keep ahead and know what is going on. It is something we do regularly."

Amongst other things they need to source materials. Touchstone currently uses R-0s and tape from Japan. They already mould their own library cases and plan to eventually manufacture R-0s too.

"By the time I get back from Japan at the end of July I hope we will be talking sensible prices to offer record companies."

The other problem Touchstone is tackling, probably in Hong Kong, is the manufacture of a new type of packaging/presentation. Because of the difference in physical size, the perceived value of a compact disc is higher than that of a DAT cassette. When you hold a CD in your hand you feel as if you're getting more for your money. Touchstone have designed what is essentially a double CD case inside which the

cassette may or may not be placed depending on whether you want live stock on your shop shelf. This overcomes several problems in one fell swoop. The shops do not have to find yet another type of display unit, the DAT cassette has as much presence on the shelf as the compact disc and there is as much surface area for library cards and promo artwork as there is for a CD. As for high speed future, surely the answer to the barium ferrite shortage would be to opt for Otari TMD which utilises lower coercivity tape?

"I tried to buy one," explains Robin. "I was told effectively that I was the only potential customer and they were too busy with their video customers to worry about my needs. Anyway, there would be some interesting problems with TMD in a clean room I would imagine."

Software

Well that only leaves the software, and there certainly seems to be plenty of that on its way. TPL Digital Music introduced 16 titles at the APRS in London during June. They have also duplicated 16 further titles for Chord Records and there are several others in the production line. At the time of writing Enigma Records were planning the release of their entire catalogue on DAT.

"We have been very careful in our choice of material. And we have turned a lot down

because in the end it will come back to us. We sent one tape back four times. We are essentially looking for well recorded music. A lot of it is classical but I think there are other people than classical music buffs who appreciate quality. Anything recorded on 2 inch tape whizzing past at 30 inches per second has a very high bandwidth so it is only right to pass that on, whether it is contemporary rock or classical music. We plan to introduce as much material as we possibly can. I want everybody to be as thrilled with it as I am. It's a great system."

Apart from applications in the music industry DAT has potential in computer streaming. "There is a gigabyte of information on a cassette, and although it cannot be accessed as fast as disk it is very good for archiving."

The final word must inevitably be left with Robin:

"DAT is an express train which has left but not yet reached the first stop to pick anyone up. When it gets started it will be very difficult to stop. We have to try to raise the profile which none of the major record companies nor Sony are doing. We are not in a position to change the world but we can influence some people's misguided thoughts. I cannot disagree with the logic that says it will fail; I can just think of lots of good reasons why it won't."



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Tel: 01-636 3434.

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TN 37203, USA.
Tel: (615) 254-8825

Finesplice
1 Summerhouse Lane,
Harmondsworth, West
Drayton, UB7 0AW, UK.
Tel: 01-564 7839. Telex: 265871.

Iberofon sa
Avenida de Fuentemar 35,
Poligno Industrial de Coslada,
Madrid, Spain.
Tel: (91) 671 22 00/04/08/12/16.
Telex: 42797. Fax: (91) 6713909.

James Yorke (Recordings) Ltd
Westend, High Street,
Northleach, Gloucestershire,
GL54 3HE, UK.
Tel: (0451) 60666. Telex: 43269
ROMPAC G. Fax: (0242) 222445.

Masterdisk Corporation
16 West 61st Street, New York
NY 10023, USA.
Tel: (212) 541-5022. Fax: (212)
265-5645.

**McClea Place Mastering
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225 Mutual Street, Toronto,
Ontario M5B 2B4, Canada.
Tel: (416) 977-9740. Fax: (416)
977-7147.

**Omega Audio & Productions
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8036 Aviation Place, Dallas, TX
75235, USA.
Tel: (214) 350-9066. Fax: (214)
350-8342.

Per Meistrup Productions Co
Motorgangen 7-9, PO Box 34, DK-
2690 Karlslunde, Denmark.
Tel: +452 151 300. Fax: +452 151
644.

Real Recordings
Newton Green Cottage, 86 Ashton
Lane, Sale, Cheshire, M33 1WF,
UK.
Tel: 061-973 1884.

TAM Studio
13a Hamilton Way, London N3
1AN, UK.
Tel: 01-346 0033. Telex: 265871.
Fax: 01-346 0530

Tape One Studios
29-30 Windmill Street, Tottenham
Court Road, London W1P 1HG
Tel: 01-580 0444/5/6/7. Fax: 01-
580 5455.

The Lacquer Channel Ltd
3015 Kennedy Road Unit 10,
Scarborough, Ontario, M1V 1E7
Canada.
Tel: (416) 291-6009. Fax: 299-
1398.

Townhouse Studios
150 Goldhawk Road, London W12
8HH.
Tel: 01-743 9313. Fax: 01-740
1180.

Utopia Recording Studios
Utopia Village, 7 Chalcot Road,
London NW1 8LH, UK.
Tel: 01-586 3434. Telex: 298701.

DAT Duplicators

Chandos Records Ltd
Commerce Way, Colchester CO2
8HQ
Tel: (0206) 577300. Telex: 988755.
Fax: (0206) 41104.

Custom Duplication Inc
3404 Century Blvd, Inglewood,
CA 90303, USA
Tel: (213) 670-5575. Fax: (213)
412-2731.

Delta Musik GmbH
Zur Muhle 2, Frechen 4,
Konigsdorf, West Germany.
Tel: 022 346 1015.

**Digital Audio Disc Corporation
(DADC)**
1800 Fruitridge Avenue, Terre
Haute, IN 47804 USA.
Tel: (812) 466 6821. Telex:
276112. Fax: (812) 466 9125.

Iberofon sa
Avenida de Fuentemar 35,
Poligno Industrial de Coslada,
Madrid, Spain.
Tel: (91) 671 22 00/04/08/12/16.
Telex: 42797. Fax: (91) 6713909.

ICM (Switzerland) Ltd
Bohnrainstrasse 14, CH-8800
Thalwil, Switzerland.
Tel: 01/723 63 33. Telex: 826805.
Fax: 01/723 63 63.

James Yorke Ltd
Yorke House, Corpus Street,
Cheltenham, Gloucestershire,
GL52 6XH, UK.
Tel: 0242 584222. Telex: 43269
ROMPAC G. Fax: 0242 222445.
1180.

JPI
801 9-1-7, Akasaka, Minato-Ku,
Tokyo 107, Japan.
Tel: 03 470 5576. Fax: 03 470
5090.

Koch Digitaldisc
A-6652 Elbigenalp 91, Tirol,
Austria.
Tel: (05634) 6444/6445. Telex:
05581. Fax: (05634) 6444-70.

Koch Records GmbH
Hermann-Schmid-Str 10. 8
Munchen 2, West Germany.
Tel: 089-7256095. Telex: 521 3408
koch d. Fax: 089-7254759.

**Loran Cassettes & Audio
Products**
10-48 Clark Street, Warren,
PN 16365, USA.
Tel: (800) 633-0455.
Fax: (814) 723-9490.

Maynard International Ltd.
12 Chiltern Enterprise Centre,
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UK.
Tel: 0734 302600.
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Schufelstrasse, CH-8863
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**Omega Audio & Productions
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8036 Aviation Place, Dallas, TX
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Tel: (214) 350-9066. Fax: (214)
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Motorgangen 7-9, PO Box 34, DK-
2690 Karlslunde, Denmark.
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644.

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13a Hamilton Way, London N3
1AN, UK.
Tel: 01-346 0033. Telex: 265871.
Fax: 01-346 0530.

Technetronics
PO Box 496 Matlack Industrial
Park, 201 Carter Drive, Suite 300,
West Chester,
PA 19381-0496, USA.
Tel: (215) 430 6800.

**The Tape Duplicating
Company**
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London N7 9HN.
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Touchstone

The Old Forge, Shipmeadow,
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UK.
Tel: 0502 716056/717387.
Telex: 265871 MONREF BASE G
(then quote) 72 MAG 35322.
Fax: 0502 717124.

Vicor Music Corporation

Vicor Building, 782 Aurora Blvd,
Cubao, Quezon City, Philippines.
Tel: 7213331/32/33/34. Telex:
42056.

DAT Equipment

Asona Audio-Technik

Bahnhofstrasse 60, D-7634
Kippenheim, West Germany.
Tel: (0) 7825-1068.
Telex: 754325 AUVIS D.
Installations and consultants.

Audio Design

Unit 3, Horseshoe Park,
Pangbourne, RG8 7JW, UK.
Tel: (07357) 4545. Telex: 848722.
Fax: (07357) 2604.
Manufacturer of the *PRODAT 1*
and *PRODAT 2*. Both use the
Sony *DTC1000* R-DAT unit in a
rack mounted package. Additional
professional features including
1610/1630 interface, word clock
out and video synch with the
PRODAT 2.

Digital Audio Tape Ltd

498-500 Honeyput Lane,
Stanmore, Middlesex, HA7 1JZ,
UK.
Tel: 01-952 5262. Telex: 21400
KEMPNR G. Fax: 01-952 8061.
DAT shrink wrapping and
packaging equipment.

Dusenbery Europe Ltd

Shuttleworth Road, Bedford,
MK41 0HS, UK.
Tel: 0234 49561. Telex: 826450.
Fax: 0234 61844.
Manufacturer of precision slitler/
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Fostex Corporation

3-2-35 Mucashino, Akishima,
Tokyo, Japan 196.
Tel: 0425-45-6111. Telex: 2842-
213. Fax: 0425-46-3198.
Professional R-DAT recorder
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HHB Ltd

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Tel: 01-960-2144. Telex: 923393
Fax: 01-960 1160.
Complete range of Sony pro and
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King Instrument Corporation

PO Box 1070, 80 Turnpike Road,
Westboro, Massachusetts, 01581
USA.
Tel: 617 366 9141. Telex: 948485.
Fax: 617 870 5932.

UK: dBm Ltd, 159 Park Road,
Kingston-upon-Thames, Surrey,
KT2 6DQ, UK. Tel: 01-547 1229.
Telex: 889294. Fax: 01-549 2858.

Asia: Globe Precision Products Pte Ltd.

514 Chai Chee Lane #06-16,
Bedok Industrial Estate,
Singapore 1646.
Tel: 449-7700. Telex: RS36963.
Fax: 445-3339.
Microprocessor controlled R-DAT
loader (available last quarter of
1988):

Matsushita Electric Industry

Audio Division, 1-4 Matsuo-cho,
Kadoma, Osaka 571, Japan.
Tel: (06) 282-5111.
Fax: (06) 282-5740.
Portable DAT recorder.

Otari Electric Co Ltd

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Suginami-ku, Tokyo 167, Japan.
Tel: (03) 333-9631. Telex: J26604
OTRDENKI. Fax: (03) 331-5802.
USA: Otari Corporation.
328 Vintage Park Drive, Foster
City, CA 94404, USA.
Tel: (415) 341 5900. Telex:
6503028432. Fax: (415) 341 7200.
UK: Otari Electric Co Ltd.
22 Church Street, Slough, SL1
1PT, UK.
Tel: 0753 822381. Telex: 849453
OTARI G. Fax: (0753) 823707.

Germany: Otari Electric
Deutschland GmbH.
Gielenstrasse 9, D-4040 Neuss 1,
West Germany.
Tel: (02101) 270411. Telex:
8517691 OTEL D.

Singapore: Otari Singapore Pte, Ltd.

625 Aljunied Road, 07-05 Aljunied
Industrial Complex, Singapore
1438.
Tel: 743 7711. Telex: RS36935
OTARI. Fax: (743) 6430.
T-650 R-DAT cassette loader and
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Playback

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Sony Broadcast Ltd

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Fax: (0256) 474585.
PCM-2000 portable DAT recorder
and *PCM-2500* studio DAT
recorder.

Sony Corporation of America

Magnetic Printing Group, Mail
Drop 3-16, Sony Corporation of
America, Sony Drive, Park Ridge,
NJ 07656, USA.
Tel: (201) 930-7288. Fax: (201)
573-8608/8826/8873.

Sony *DRD-100* industrial DAT
units.

Sony Magnescale Inc

Toyo Building, 9-17 Nishigotanda
3-chrome, Shinagawa-ku, Tokyo,
141, Japan.
Tel: (03) 490 9481. Telex:
02466289. Fax: (03) 490 8028.

USA: Sony Information Systems

Company, Sony Drive, Park
Ridge, NJ 07656, USA.
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Fax: 0784 67271.
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and *DTC-1000ES* DAT recorder.

Tapematic Spa

Via Vimercate 32, 20060
Ornago (MI), Italy.
Tel: 39-39 6010145. Telex:
340233. Fax: 39-39 6010558.
Model 2100 R-DAT loader
(available late 88/early 89).

Tape Automation Ltd

Unit 8, Haslemere Industrial
Estate, The Pinnacles, Harlow
CM19 5SY, UK.
Tel: (0279) 635300. Telex: 818442.
Fax: (0279) 411573.
DAT loader (to be introduced later
in 1988).

Teac Corporation

UK: 5 Marlin House, The Croxley
Centre, Watford, Herts, WD1
8YA, UK.
Tel: (0923) 225235. Fax: (0923)
36290.
USA: 7733 Telegraph Road,
Montebello, CA 90640, USA.
Tel: (213) 726-0303
Tascam *DA-50* DAT recorder.

DAT Tapes

Agfa-Gevaert AG

Postfach, 5090 Leverhusen 1,
West Germany.
Tel: (02 14) 3 01. Telex: 8510420.
Fax: (02 14) 30 43 60.
UK: Agfa-Gevaert Ltd
Great West Road, Brentford,
Middlesex, TW8 9AX, UK.
Tel: 01-560 2131. Fax: 01-847
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USA: Agfa-Gevaert Inc
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Tel: (201) 487-4605.
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Minato-Ku, Tokyo 106, Japan.
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Hitachi Maxell Ltd
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Magnetic Products Division, 1030
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Ibaraki-ken, 310 Japan.
Victor Company of Japan Ltd, 4-1
Nihonbashi Honcho, Chuo-ku,
Tokyo 102, Japan.
Tel: 0292-47-3111.
Telex: 36 32289 Victor J.
USA: JVC Magnetics America Co,
1 JVC Road, Tuscaloosa,
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Koch Digitaldisc
A-6652 Elbigenalp 91, Tirol,
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Tel: (05634) 6444/6445. Telex:
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Koch Records GmbH
Hermann-Schmid-Str 10, 8
Munchen 2, West Germany.
Tel: 089-7256095. Telex: 521 3408
koch d. Fax: 089-7254759.

Matsushita Electric Industry
Audio Division, 1-3 Matsuo-cho,
Kadoma, Osaka 571, Japan.
Tel: (06) 282-5111.
Fax: (06) 282-5740.
Range of branded tapes.

Maxell see *Hitachi Maxell*

Nippon Columbia Co Ltd
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Tel: (03) 584-8111.
Fax: (03) 586-1859.
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**Pangbourne Musical
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Tel: (03) 448-2111. Telex: 22262.
Fax: (03) 447-2880.
UK: Sony UK Ltd, Professional
Tape Group, Sony House, South
Street, Staines, Middlesex TW18
4PF, UK.
Tel: 0784 67480. Telex: 925671.
Fax: 0784 67271.
USA: Sony Magnetic Products,
3175A Northwoods Parkway,
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Fax: (404) 446-3615.
Range of DAT tapes including DT-
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437 2126.
Distributor of Fuji, TDK, That's
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CPO Box 1780, Seoul, Korea.
Tel: 02 756-5151 Fax: 02 752-
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USA: Sunkyong Inc, 17106 S
Avalon Blvd, Carson, CA 90746,
USA.
Tel: (213) 327-5010.
UK: Sunkyong Europe Ltd,
Sunkyong House, Springfield
Road, Hayes, Middx UB4 0TY,
UK.

Tel: 01-561 1200/8686.
Telex: 22426 SKYLDN G.
Fax: 01-561 7626.
Range of branded and OEM DAT
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Uneno 6-chome, Taito-Ku, Tokyo,
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Tel: 03-833 3961. Telex: 265 5169.
Fax: 03-835 4752/4.
Germany: Dataline/That's Tape
Mannheimer Str 15, 6000
Frankfurt, West Germany.
Tel: 69-239395. Fax: 69-231566.
That's tape K2 series and OEM
supplier.

TDK Corporation
13-1 Nihonbashi 1-chome, Chuo-
ku, Tokyo, 103 Japan.
Tel: 03 278-5115.
UK: TDK UK Ltd, Pembroke
House, Wellesley Road, Croydon
CR0 9XW.
Tel: 01-680 0023. Telex: 946727.
Fax: 01-680 8330.
USA: TDK Electronics, 755
Eastgate Blvd Garden City, NY
11576, USA.
Tel: (516) 627 0238
Range of branded tapes.

Technics see *Matsushita*

That's Tape see *Taiyo Yuden*

3M
Magnetic Media Division, 3M
Center, St Paul, MN 55144-
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Fax: 0344 58278.
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R-O, Cases and Components

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Tel: (0628) 72546. Telex: 849485.
Fax: (0628) 71744 R-Os.

Enplas
USA: Enplas USA Inc, 2000
Windy Hill Road, Smyrna,
GA30080, USA.
Tel: (404) 435-3131. Fax: (404)
435-2447.

ICM (Switzerland) Ltd
Bohnrainstrasse 14, CH-8800
Thalwil, Switzerland.
Tel: 01/723 63 33. Telex: 826805.
Fax: 01/723 63 63.
USA: ICM Inc, 8110 12th Fairway
Lane, Humble, TX 77346, USA.
Tel: (713) 852-8333. Fax: (713)
852-9281.
R-Os and raw materials.

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Buttikon SZ, Switzerland.
Tel: 055/67 4 14. Telex: 875144.
Fax: 055/67 20 50.
R-Os, raw material supplier.

Shape Optimedia Inc
Route 109 and Eagle Drive,
Sanford, ME 04073, USA.
Tel: (207) 324-1124. Telex:
5106008653. Fax: (207) 490-1707.
R-Os and DAT library cases.

Sunkyong Europe Ltd
Sunkyong House, Springfield
Road, Hayes, Middx UB4 0TY,
UK.
Tel: 01-561 1200/8686. Telex:
22426. Fax: 01-561 7626.
R-Os, cases and other DAT
components (available late 1988)

Yearnbadge Ltd
16 Cleveland Drive, Laleham,
Middlesex, TW18 2SW, UK.
Tel: 0784-57403.
Blister packaging service for DAT.

DAT Test and QC Equipment

Kenwood Corporation
Shionogi Shibuya Building, 17-5
Shibuya, 2 Chome, Shibuya-ku,
Tokyo 150, Japan.
USA: Kenwood USA Corporation,
2201 East Dominguez Street,
Long Beach, CA 90810, USA.
Tel: (213) 639-9000. Fax (213)
604-4487.

Sony Corporation
Audio Device Business
Department, Component
Marketing Group, 4-10-18,
Takanawa, Minto-ku, Tokyo 108.
DAT Standard calibration tape.

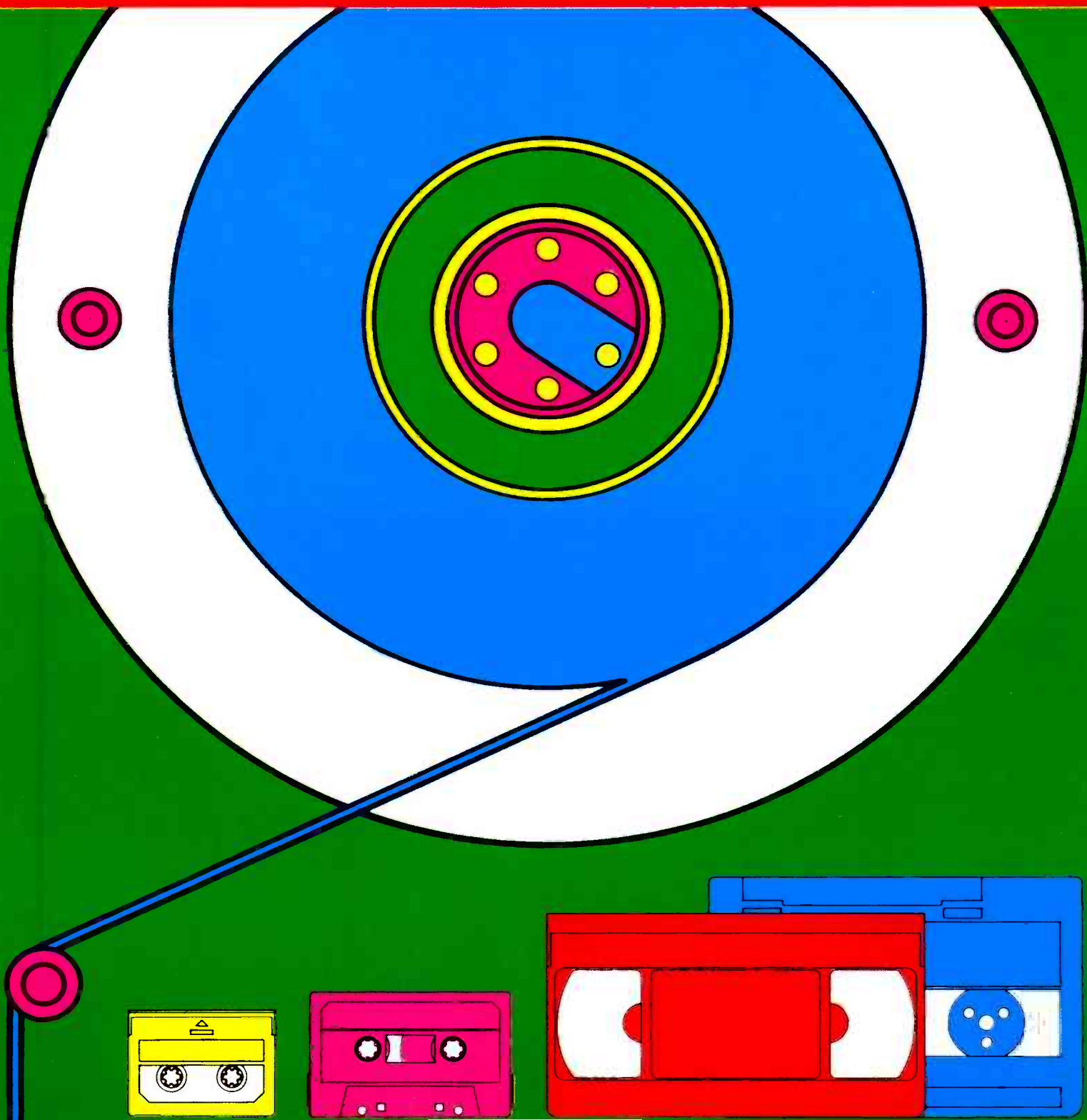
Sony Corporation
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Magnetic Product Group, 6-7-35
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VIDEO DUPLICATION

realtime duplicators are used, the end product is a pancake of duplicated programmes, each programme having its own unique identifying code on tape located at the end of the recording.

Recorded pancakes can be stored indefinitely. For convenience it would be normal practice to fix an identifying label to the pancake. However should the label be omitted or lost the pancake can still be loaded automatically because each programme on the pancake has been Tap Coded.

Loading

Loading involves the use of 'intelligent' loaders which are capable of interfacing with a *Tap Code* controller and printer.

Recorded pancakes are transferred to the loading room where they are loaded into cassettes by *Tap Code* loaders. Loading is completely automatic. The only requirement from the operator is to install the pancake, thread the tape through the guides, and press the start button.

A *Tap Code* controller then takes over, reading the information encoded on tape and instructing the loader to proceed accordingly.

Tap Code is recorded at the end of each programme during the duplicating cycle. So, because the pancake is presented to the loader 'backwards', the last programme recorded on the pancake will be the first to be loaded, and the *Tap Code* will automatically be at the beginning.

However, it would be extremely rare to find a pancake filled completely with an exact number of duplicated programmes — there is invariably a length of blank tape left over. Prior to 'intelligent' loaders any blank tape had to be cut off manually before the pancake could be loaded, wasting both time and tape. Now, because an 'intelligent' loader can handle both blank and pre-recorded pancakes, this problem no longer arises.

The loader begins by searching for the first *Tap Code* (which will have a high sequence number as it will be the last once duplicated on the pancake).

While it is searching it loads the blank tape into a cassette. When it finds the first *Tap Code* it either finishes the cassette off and marks it as a blank, with the length of tape it contains printed on the spine, or rejects it, depending on control data for blank tape length which is determined by the duplicating house.

After it has found the first cue-tone the loader will carry on automatically until it detects the sequence code '1', which tells it that it has one more programme to load and then the pancake will be exhausted.

The loader establishes how much tape to load to cassette by reading the programme length section of each *Tap Code*. While most pancakes will contain several copies of the same programme, this 'intelligent' approach to loading means that, if necessary, the pancake could contain any number of different programmes, each of a different length, and still be loaded completely automatically. There is much more to it than that however.



Tap code controller

Key Aspect

The *Tap Code* controller also instructs an integral printer to print selected parts of the duplicated programme's *Tap Code* to the spine of the loaded cassette.

This is the key aspect of *Tap Code*. The information printed on the cassette spine is unique and applies exclusively to the programme in that particular cassette. Regardless of any human confusion or material faults, the spine of the finished cassette will always display exactly what programme it contains, both in text and machine readable format. (Any material defects like faulty cassette shells or tape voids will be detected by the loader which will then reject the cassette without printing any information to the spine.)

Throughout the loading the *Tap Code* controller is passing the information it collects back to its host computer, which is networked to each of the loading stations. As with the duplicating stage, the computer will record to disk and display a running account of the programmes loaded, production counts, run times, and so on, all of which can be kept and used for future analysis.

However, it is the printing on the cassette spine of the programme's title, catalogue number and production record which ensures that every cassette is instantly and individually identifiable, and consequently opens the door to automatic labelling, sorting and packaging.

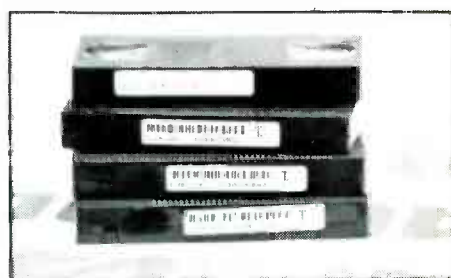
This reference will accompany the cassette throughout its working life. As well as the programme title in text form it will show, in machine readable format, several sections of the *Tap Code* recorded within the cassette. The sections of *Tap Code* printed on the spine will depend on the requirements of the duplicating house or distributor, but would normally include Catalogue Number, UPC Code, Sub-master VTR and Loader ID.

In-cassette coding

Unlike pancake duplicating where materials can be coded and traced through the whole process from sub-mastering to packaging, by its very nature in-cassette duplicating cannot track a complete product and materials history.

But distributors still need to be able to establish the legitimacy of their products and to establish at least some data on their production histories.

The ideal solution from Tape Automation's viewpoint would be for in-cassette



Tap code labels

duplicators to switch to ETD production. This involves modifying existing VTRs to 24-hour, realtime pancake duplication which is fully *Tap Code* compatible.

But recognizing that there will always be a need for in-cassette duplicating on short batch orders, Tape Automation developed *Tap Trak*, a modified version of *Tap Code* which, although it cannot give the guarantee of 100% accurate labelling and full product history tracing provided by *Tap Code*, does enable the legitimacy of the product to be checked, together with the duplicating house, time and date of production and the machinery on which it was produced.

The end result is that, no matter how a video programme is produced, *Tap Code* and *Tap Trak* will enable the distributor to take a lightweight, portable decoder into any outlet at any time and carry out an absolute check at the point of sale/hire to establish the legitimacy of his cassettes, who duplicated them, when, and on what machinery.

Potential

When Tape Automation originally set out on this project they envisaged the outcome as a fairly rudimentary barcoding process which would facilitate automatic labelling.

TA have come a long way from that to a sophisticated system that enables distributors to determine quickly, at any time during the life of a cassette, whether or not any of it is a genuine copy, and to read a detailed record of its production history, down to the time and date on which it was duplicated, and even the machinery involved in the duplication process.

Although targeting *Tap Code* and *Tap Trak* specifically at the major distributors, we are also talking direct to duplicators about the opportunities *Tap Code* creates for them. The response so far has been very encouraging.

The potential of *Tap Code* and *Tap Trak* is enormous. Currently this is only at the beginning, and the future holds even more exciting prospects, with virtually fully automated duplicating plant right through from sub-mastering to sorting, labelling, packaging and despatch.

New applications seem to be occurring every day. In fact, at the launch of *Tap Code* at our Harlow base in March, it was pointed out to us that *Tap Code* and *Tap Trak* would provide an ideal vehicle for an independent computer assessment of the video rental and sales charts.

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DAAD

Digital Concept

Everyone has predictions on what the next decade will bring to the world of audio. One can expect that the virtual smorgasbord of formats we have available today can only grow. The buzzword is 'new' and rhetoric on how these new products will affect the existing formats abounds.

The life of the analogue cassette has been a great cause for speculation with CD blossoming, R-DAT taking root, and the seed of erasable CD just being planted. There remains a vast plain of digital product yet to be harvested. Utilising digital technology for recording and mastering has helped to improve analogue sound, and strides have been made in improving the materials and equipment involved in duplication. AMI/Concept Design, based in Burlington, NC, has brought digital technology one link further into the analogue chain by introducing a digital loopbin system.

American Multimedia Inc (AMI) was founded in 1978, a relatively new company in the tape duplication business. Headed by president Richard Clark, it has grown quickly since its beginning. AMI is a diversified company with divisions involved in video duplication, video post production, printing, and several other areas as well as audio duplication.

The fastest growing and perhaps most well known division is Concept Design, a company developed out of AMI's engineering division. Concept Design was developed out of the need for improvements in the cassette industry. The company set about redesigning AMI's machines and has grown into a major manufacturer of products designed to make better cassettes for duplicators.

The products available from Concept Design include *The Eliminator*, an upgrade package for 760 and 770 loaders, an *End of Batch Predictor*, a servo loopbin designed for modification of Electro Sound master transports, a fast feeder, a magnetic storage indicator, a QC analyser, and ultra precision sliping equipment.

AMI/Concept Design is probably best

Susan Nunziata talks to Richard Clark and Bob Farrow of AMI/Concept Design about the use and development of DAAD digital duplication.

known, however, for the development of its *Digital Audio Analog Duplication (DAAD)* system. After approximately three years of development, the system debuted at the 83rd Audio Engineering Society Convention in New York last fall and has received a positive response from all reaches of the duplication industry.

The company has taken orders for approximately 36 systems and has undertaken a building project expected to generate *DAAD* systems at a rate of one per week. Three have been manufactured thus far: the first system will go to RCA Records; the second is destined for Warner Brothers, the third is being installed at AMI's plant in Burlington, NC. These initial installations will serve as beta test sites. The company also plans to bring systems into Japan to share it with duplicators there, a number of whom have already visited AMI.

"The reaction of customers has been one of extreme excitement where they feel, in spite of all the progress that's been made in the industry which has led to the overall quality of cassettes being the highest level ever, finally we have a quantum leap. Incredible improvements have been made in the past three or four years but they've all been incremental improvements. They come in small steps and they have built upon each other. And finally, with a *DAAD* duplication system for the first time we've got something and it's a major breakthrough," said Clark.

The *DAAD* system features a tapeless master, hermetically sealed drive unit, optional high speed loading (10:1), and digitally generated cue tone. It operates at

80:1 or standard 64:1 and is compatible with Electro Sound, Cetec Gauss, and Lyrec slaves. It operates from standard 1630 masters and tests have also been run using DAT masters.

"At this point I am reluctant to brag about the success of how DAT's working out without a little more experience with it. However the initial results look very promising and we feel that there's at least a cost-affordable alternative for the small duplicator — those who want to get involved in digital mastering but don't want to fork up the \$35,000 or \$40,000 it takes to get into the 1630 system," said Clark.

AMI is currently working with Sheffield Lab to introduce direct encoded digital mastering — live direct to digital encoded masters designed to dump directly into *DAAD*. "It's like a refinement in the mastering process. It seems to produce a level of quality better than what we've experienced up until now. There are still a lot of areas left unexplored that the possibility of a digital duplicator opens up and DAT is one of these areas where a lot remains to be seen what we can do with it."

The concepts of digital processing for *DAAD* masters and digital EQ and limiting are also being toyed with in the Concept Design lab. "The possibilities are definitely open in an entirely new direction now. That's what I'm excited about. We finally have something that's a new field, related to what we've always been in. Opening up that digital format is just an endless possibility. Because every major duplicator has been and is now using the digital mastering system for interchanging the masters. That's been pretty much an accepted thing. But they've been extremely limited as to what they could do with it. All it was was a transfer process. Now we finally have a tool that lets us work with that format. It still remains to be seen what we could do with it," said Clark.

A team of approximately 10 engineers headed by Concept Design's director of engineering, Bob Farrow, worked to develop *DAAD*.

TAPE DUPLICATION

I asked Bob Farrow how the project got underway?

Bob Farrow: "Our company has wanted to do something along the lines of a digital master for a long time. But the cost has always been prohibitive. Our early work was to establish some answers to a couple of questions; the kind of questions that have to be resolved before you start a major project and commit a lot of funds.

"Over three years ago we began trying to determine if it was possible to convert digital audio back into analogue at a high duplication ratio. We contacted a number of companies that make modules for conversion and asked if they were fast enough. Most of the answers we got were either 'we don't know' or just plain 'no, they aren't.'

"Trying to convert digital audio which is 16 bits PCM requires a unit with a high degree of resolution, a type of component that is readily available in the audio industry. None of these things has to go fast. We were left looking at another industry — the video industry — where they have some very fast converters that will convert digital back to analogue signals. Usually these lack two things. One, they lack resolution because when you're putting a picture on a screen it's not necessary to have extremely high resolution for positioning. Whether a dot is 100th of an inch to the left or right of where it should be makes not a whole lot of difference on a radar screen for instance. It's still an airplane no matter where it is. If it's only off by a few fractions of a millimetre, you know approximately where it is. Resolution has never been a big factor for people in video. In many cases they didn't use 16-bit resolution; many of them were only 10- or 12-bit resolution, which, if used for audio, means we can't get the signal-to-noise ratio that we need.

"We attempted to even use multiple digital to analogue converters — in other words let two of them share the job. We eventually got a pair that would work at 64:1."

Susan Nunziata: "Where did you get these?"

Bob Farrow: "They were Burr Brown. They were, believe it or not, off the shelf components at that time, but the fastest we could achieve was about 64:1. Three years ago we thought that was probably as good as it needed to be. So that was the first question that was answered. We had a solution, we built the thing, tested it, and put it on the shelf.

"The next big stumbling block was the middle of the picture. You've got three pieces to this puzzle: how do you convert the analogue to digital; how do you store it; and then finally, how do you convert it from digital back to analogue?"

"The third piece is where we began, with the conversion from digital to analogue. The first piece of the puzzle we didn't have to build. That's readily available. Anybody who owns a Sony 1610 or 1630 or their studios has been converting analogue to digital quite

Every major duplicator has been and is now using the digital mastering system for interchanging the masters.

successfully. We said that when we build this project, we're just going to adopt the Sony format as most of the industry is using it and we don't see it changing any time soon. (This was three years ago.)

Solid state

"So we're back to that middle block, the storage device. That was a serious problem. At that time, years ago, everything pointed to using solid state digital chips. Even though it was prohibitively expensive, it still looked like the way to go because there was a trend in the industry that these chips became cheaper each year. They were more plentiful, they became larger — in other words they stored more per chip each year — and consequently, it looked like if you could project one year to the next that at some time two or three years into the future it would be cheap.

"Unfortunately, what we could not project was the Japanese had decided to control the semiconductor market. They found out that back when they had 64k chips, when the first personal computers came out, they had a tremendous amount of the market share. Then when the 256k chip followed them, the manufacturers realised that what had happened was they had made their own competition; people were no longer interested in the 64k chips. They wanted the 256ks so they made obsolete a lot of their fabrication facilities that were set up to make 64k chips. That drove the price of 64k chips down and it didn't really help the price of 256k chips.

"Now, they have pretty good control over the market. They're relatively slow to release the new products, the 1 megabyte and the 4 megabyte chips have prices that are proportional to four times what the older parts were in many cases. It's sort of a supply and demand thing, where they're very carefully controlling the supply. Consequently, this nice projected price decline for solid state parts has never really occurred."

Susan Nunziata: "What would it cost you to build with solid state chips today?"

Bob Farrow: "If I were building today with solid state chips, it would cost about \$250,000, which may not be too prohibitive. The price on those chips, whether you buy 500 or 10,000, is the same rate now. So there's no real price break. Also, the waiting list is rather long for large quantities of chips.

"So there are a lot of things that say that solid state isn't the way to go. We do look to the future and say that, yes, some day those parts will get cheaper and because they are solid state and easy to work with, it is the ideal way, given all choices to store the data. We have a design that we've already built that

does use them. And you may see us implement it two years from now or whenever the cost of those components gets low enough. But it might be two years from now. In the meantime we're going to produce DAAD with a very special form of hard disk drive."

Disk drive

Susan Nunziata: "What went into the development of the hard disk drive?"

Bob Farrow: "Once we had decided that we knew how to convert the digital back to analogue, we approached a number of the major record companies and one of them, RCA Records, said that they were extremely interested. When the time came for a digital bin to be designed they would be interested in participating. They provided funding for it, and some of the initial engineering, including the original specifications.

"It was at that point that we decided it would have to be done with some sort of disk drive. We had done a lot of research comparing different devices. We've compared the solid state chips with optical drives. There are a number of optical drives out — laser disc, if you want to call them that — of different sizes, not just the ones that you're familiar with, the CD at five and a quarter inches but 8 inch drives and 12 inch drives. All of them kind of share the same negatives.

"Cost wasn't a big factor, they weren't very expensive but most of them had a lot of errors and they couldn't go very fast. The errors you can correct. The CD does it all the time, but it doesn't transfer data very fast. If you're talking about a duplication ratio of 64:1 you're no longer talking about a 176 kilobytes per second. You're talking about multiples of that, 64 times that for instance. It became a limiting factor. The other media that's out there, like digital tape (most of which is not fast and not extremely reliable) was kind of out.

"That left us with Winchester type hard drives. We had a lot of information we wanted to put in slowly and get out rapidly. We found a company that specialised in a drive that utilised 14 inch platters and a large number of heads and could be tied in parallel.

"We found it was originally designed for applications around US Air Force flight simulators where they were trying to simulate what a pilot would actually see if he were flying across the terrain looking at a radar screen. Apparently what they have is a large number of maps stored in a main computer bank and they can download small sections of this giant memory into the disk drive. The disk drive then allows very rapid access to information. So as the pilot changes manoeuvres, the updates come quickly so his screen looks live. It looks like he's flying, looking down at that radar screen. When he exceeds a boundary that's beyond the map that's in the particular memory, it switches to another disk drive and he flies from that one. Each time, according to his flight plan, the

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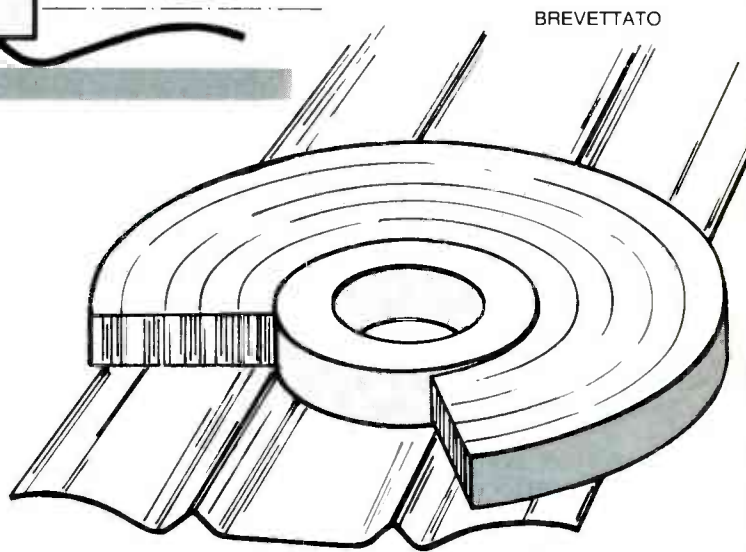


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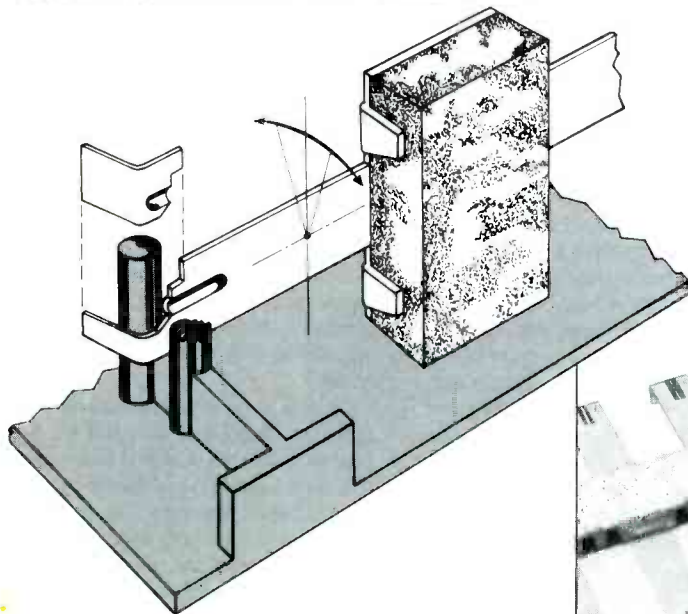
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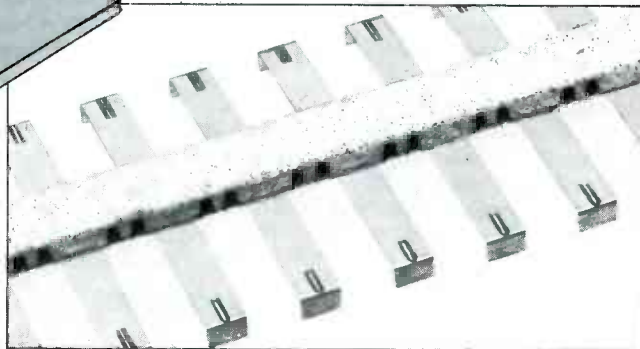
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TAPE DUPLICATION

Consequently, we're faced with a very serious problem: how do we detect and correct flaws that are left in this disk? We came up with a rather novel solution to this.

main computer downloads these small chunks of the map library, so he can fly from place to place all over the world.

"The interesting thing was that this drive was extremely fast. It could be loaded very fast. It was very expensive. It exceeded \$250,000 per unit and we need two of them. That's half a million dollars just for the disk drives! We discovered that one of the attributes of this drive wasn't necessary: its ability to load up very rapidly (90:1). We really didn't need that since most of our source material was low rates of transfer. So we said, why don't we have it redesigned so that it could load slowly (10:1) but playback fast (64:1). We came up with a reasonable figure.

"The first drive cost over \$100,000 but that was just the first. What we had them do was build a drive based on the original design, modified and actually simplified in certain respects, to our specifications. We did add a few things. Normally when you have a disk drive of this nature, you have 14 inch platters and you have multiple platters. Each platter has two surfaces; therefore you can record on the top and bottom surfaces. In our case we have eight surfaces. Normally, you would find in that surface a number of flaws. Consequently, there would be errors and these pose some problems.

Error correction

"The disks themselves are preselected so the size of the flaw is limited. The systems can easily detect scratches or dents or even high spots and discard that disk. But as the dimension gets smaller, and we get down to the point where we are looking at errors caused by magnetic media itself, they become microscopic and you can no longer easily detect them.

"Normally you put the data in with additional information that is used for error detection and correction. As you take it out you compare the data against this specially coded information to determine if it has flaws. Then you run a process where you try to reconstruct the data. That's an error correction scheme.

"Most of these error correction schemes are done with dedicated parts which run slowly. Consequently, we're faced with a very serious problem: how do we detect and correct flaws that are left in this disk? We came up with a rather novel solution to this.

"Once the disk is built, and we have a sealed chamber, you could find these flaws. You can write to the disk and read from it and say 'uh huh, now there, what do you do about it.'

"The disk drive is unique. It has spare

heads. We can electronically switch them in. When we find these flaws we map them out so that they become transparent. Whenever the disk is told to place data in the flawed sector it goes to the new address. Consequently, we just map the flaws out in advance. We don't wait until after we put music in to see if we have them, but find out before we even use the disk. It seems to work very well.

"It's a very large disk; these things are 520 megabyte disks and there are two of them, one for the A side of the cassette and one of the B side. We go through and locate the flaws. It takes several days because you have to read each track repetitively and look at it under various conditions. We still do error detection. Every word that's put in has a parity bit added. If it does have a parity error, we treat it just a like a Sony 1630 does."

Susan Nunziata: "What do you do about head crash problems?"

Bob Farrow: "The drive has one other neat attribute. It does not land its heads. That's a neat trick. All the Winchester style disks, from the earliest ones, are designed around technology that's really a combination of aerodynamics and recording. The rotational velocity of the disk causes air to drag along its surface and that air is trapped on the surface underneath the head. The head acts as a wing and the air causes the head to lift.

"Because of the high reliability needed by military equipment, this drive company, which specialises in nothing but military hardware and very small industrial applications, built a drive where the heads have a lift mechanism. So when you turn the drive off the lift mechanism cranks the heads up. They don't land, they're actually pulled up in position and locked. That eliminates a lot of the causes for head crash.

"Because it's mechanical, the drive has a limited life expectancy. It's rated around 20,000 hours. What happens is that the bearings which hold the whole mechanism begin to wear slightly causing a wobble. This is detectable. In other words, the data starts to have more and more errors because the heads themselves are flying up and down. Consequently, our circuits start reporting more and more of these errors, and we can give you very advanced warning, telling you that the disk needs to be taken out of service.

"It takes about 15 minutes to change disks. The repair of the disk is not done in the field, it's done in the factory, but it's not an extremely serious problem.

System layout

"We modelled this system as closely as we could as to what is being done with analogue tape. We're trying to replace a 4-track duplication master so we modelled this system after that. Even the buttons and things that the operator use don't have computer names, they have tape names like load and duplicate instead of read and write. That keeps it simple from the standpoint of the training process.

When there is a question we run a test. And we know what the limiting factors are with tape. We use it every day.

"The unit itself is small. It can actually fit in the place of a loopbin. It's very compact, it's only about 49 inches tall, it's about 3 feet deep and 2 feet wide."

Susan Nunziata: "How are disks loaded?"

Bob Farrow: "We have two ways of loading. We can load directly from a 1610 or a 1630 or we can load from an R-DAT machine which we now do. We just reproduce our masters on an R-DAT machine and download them with another R-DAT into DAAD which is real inexpensive and convenient.

"We're working on something else that will be coming out later this year. That is a high speed load. There will be an intermediate storage that allows you to put your master on intermediate and that becomes a library copy. Any time you wish you can get that copy and dump it into a DAAD at a rate of about 10:1 which translates to one hour master in six minutes. We do it now in 'half time'. If you have a one hour master we load in 30 minutes because we load the front and back at the same time.

"We have 2:1 loading that way. You just make up an A master and a B master and put them both in. That's another nice thing about our system. A and B are virtually independent systems. You can load the A side of the cassette and then the B or you can load the B first or you can load them both at the same time. For test purposes, you can literally swap anything from side A into side B."

Susan Nunziata: "What is the total price of the system?"

Bob Farrow: "It runs about \$105,000. There's one option that we call a *Real Time Monitor*. In the process of designing this, we said, 'let's be sure that we cover everything that is done in mastering, duplication and quality control, so that the people involved with this don't have to be extensively re-trained'.

"There's one phenomenon that occurs in tape duplication that we could not figure out how we could duplicate. It was rather funny. It's not uncommon for quality control to say, 'We've been listening to the first run of a particular product and we think we hear something about one minute into the first side'. What normally happens is quality control goes back to production and they say, 'stop production, pull the master out of the bin, and take it back into the studio. We want to listen to the master, and compare it to these cassette tapes. We want to find out what this funny sound is because if it's in the source tape and it's what it is supposed to be, that's fine. If it's in the master not in the source tape, then we have a problem, we have to stop'.

TAPE DUPLICATION

"With a digital bin, you can't do that. There isn't any tape to pull out of the bin. If it's not in the source but it's in the cassette you can only always make assumptions as to where it came from. So we designed a circuit that will let you listen to what's in the bin in the digital domain. It will grab it, store it and stop and let you listen to it in realtime. You can walk up to *DAAD* with a pair of headphones, punch in the number, time, starting at cue and it will grab that minute when it comes up and hold it for you. That's called a *Real Time Monitor*."

Susan Nunziata: "What slaves are recommended for use with this?"

Bob Farrow: "I won't say recommended, I will say which slaves have been tested. So far we have run tests on the Electro Sound *8000* which was modified to run at 80:1.

"We've done some work with Gauss. Their *2400* system is what RCA is going to be using with their system. Warner Brothers will be using the *8000s* which have been modified. We've also run some tests on Lyrec."

Design considerations

Susan Nunziata: "How much time was involved in the development of the disk drive?"

Bob Farrow: "From conception to delivery, it took about six months. You have to remember the disk was already available. They did not build it from scratch. They modified an existing structure.

"The other problem was deciding how we were going to utilize this disk, what kind of errors were not acceptable and how to take care of the ones that were there. When you look at the signal-to-noise ratio of analogue cassette tape and you say, 'In the digital domain, what does that 65dB represent?' For every bit you get 6dB of signal-to-noise; therefore you have 72dB signal-to-noise ratio. That's good compared to a cassette tape. There's a problem. If you did use 12 bits you'd be quite shocked. It would be noisy. It's a little difficult to explain except that digital noise is not like analogue tape hiss. It has a signature you can hear. If I made you a tape with a 12-bit master it would sound noisy. An analogue master may sound better in this respect. Twelve bits mathematically says it's enough; until you've heard it, you don't know that it's not enough. Thirteen bits is marginal, 14 is fine, 15 and 16, of course, are exceptional.

"If a dramatic improvement were seen in tape or if metal tape were to be made more readily available you could still use *DAAD* because *DAAD* is a 16-bit system which allows an awful lot of room for improvement in the cassette medium or any other media for that matter.

"This whole design would be impossible for us to accomplish if we didn't have a tape plant of our own. If we were an engineering firm just sitting out there in the middle of nowhere with the same people and the same equipment, we would only be a third done, maybe not even that, and that's because

We can load directly from a 1610 or a 1630 or we can load from an R-DAT machine which we now do.

there are a lot of things that we learn by doing in our own tape plant. When there is a question we run a test. And we know what the limiting factors are with tape. We use it every day. That makes design decision much easier. Without a tape plant that would be an impossible task."

Susan Nunziata: "What are some of the limiting factors?"

Bob Farrow: "You can't record the system cold and play it hot. In other words, more than 10 degrees is considered an unacceptable temperature change. We don't have any problems with things like humidity because it's a sealed chamber. *DAAD* requires the same environment as any office computer.

"We're limited in time. We can store about 50 minutes worth of music on each side of *DAAD*, so 100 minutes is our maximum. We guarantee 96 minutes.

"Another limiting factor is how fast you can load it. We're going to get around that. *DAAD* takes data in only at one speed, 10:1. Now, we have a special buffer that takes the data that comes slowly from the R-DAT machine or the *1630* and build it up into a chunk. Then we burst it into *DAAD* at high speed. So *DAAD* is already built to take it fast. We've just got to make a source that's faster.

"The price for the system, \$105,000, is a limiting factor in some people's budget."

Susan Nunziata: "Do you expect that price to go down?"

Bob Farrow: "It will probably go up. We will attempt to keep the price constant but quite frankly I have a feeling the disk drive manufacturers after this initial run is going to want to raise prices on subsequent runs if they're smaller."

Savings and improvements

Susan Nunziata: "Will cost be a problem?"

Bob Farrow: "At 80:1, the savings that just those slaves generate is enormous. They are running about 25% faster than the standard machines. Add to that the savings and quality because you don't have to throw away as much product. You get a quality saving, a dollar figure because your product is so much more consistent. You don't have to replace worn masters, they don't wear. Those sorts of things start adding up over a period of time."

Susan Nunziata: "On the finished cassette, what improvements are made in the

audio quality?"

Bob Farrow: "One, there is dramatic improvement in the signal-to-noise ratio. The master does not contribute to the noise floor of the tape. And that's because it's a 16-bit PCM mastering source. It's essentially taking your *1630* copy and running it at high speed.

"You have other induced errors with analogue loop ends that are speed related. The left and right channel phase relationship, or azimuth, is always jumping around. With *DAAD* it's a fixed rock solid relationship which improves the stereo image. You can acoustically pick out placements of instruments extremely well. *DAAD* affords a very high degree of left/right channel separation. You lose a lot of it when you put it on a piece of cassette tape but at the source it's incredibly high. It's like 80dB separation between left and right channel. These are just some of the things. Imaging, noise, frequency response are all improved.

"One other small factor which can never be over-emphasised is that if you make a cassette it's going to be just like every other one you make because the master is just not wearing out."

Susan Nunziata: "From an engineering standpoint, what would you say is most remarkable about the system?"

Bob Farrow: "I think cost versus performance is one of the remarkable things. We have cut no corners in performance.

Whenever a question of cost versus performance has arisen, we've always gone for the performance side because we feel cassettes still have a long way to go. Their life and cassette technology is dependent on things like *DAAD*. *DAAD* will extend it and keep the cassette at the top of the consumer's interest. Everybody thinks that cassettes are convenient, but it is also important to make the cassette sound good. I think if you have *DAAD* cassettes and you play them on a properly adjusted machine you can enjoy the fact that a piece of audio cassette tape can sound really good.

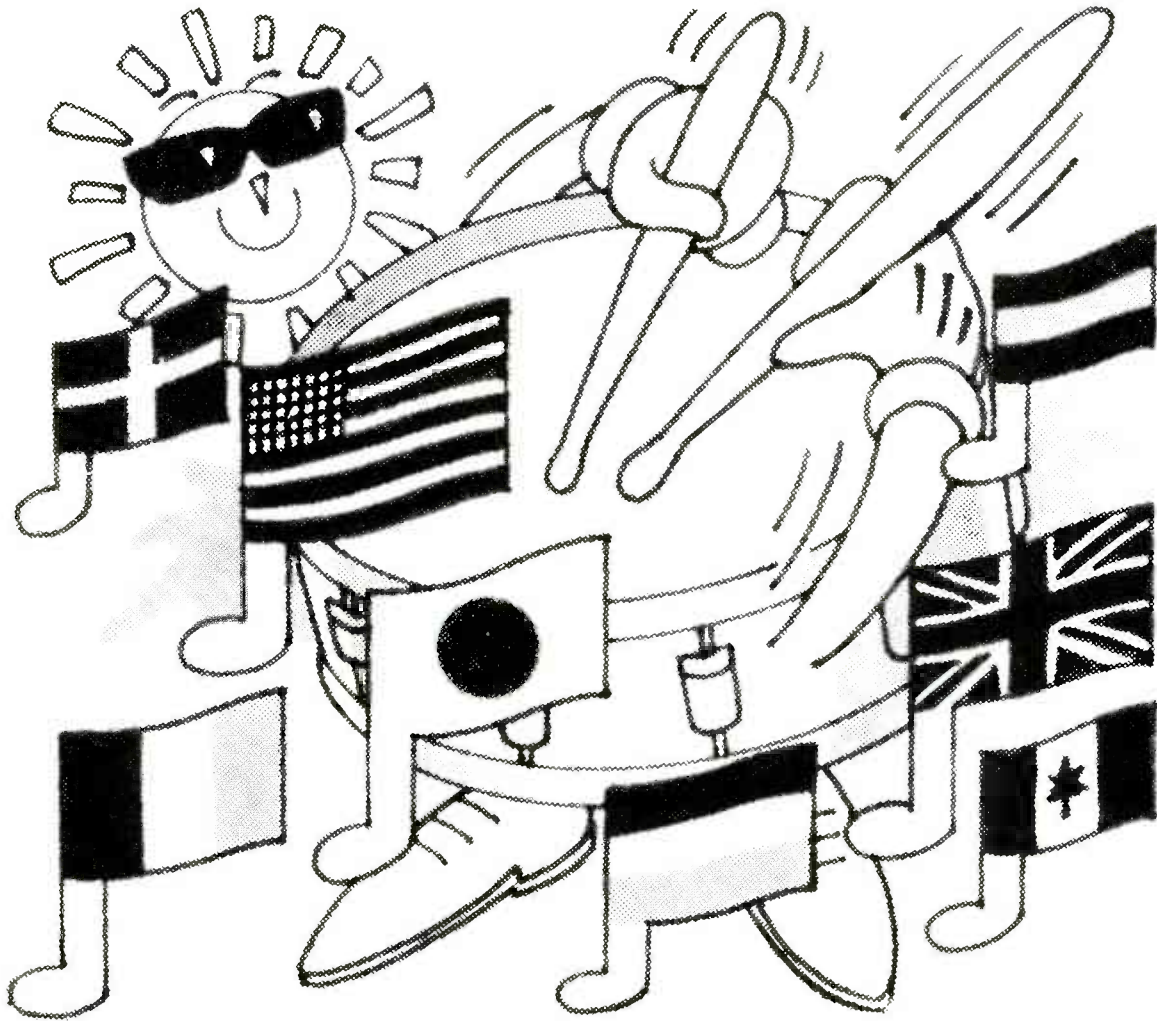
"I do hope that *DAAD* will make a difference in the life of the analogue cassette. I know it does make a significant difference in quality. If it does one thing, I hope it allows the consumer to buy pre-recorded product that sounds as good as he can make it himself. That's always been a real bug in my head. It's embarrassing to tell somebody you're in the cassette business, you make pre-recorded product and the guy snaps back with 'I can make a better cassette than I can buy'. I know positively that *DAAD* can produce a better cassette at 80:1 than the consumer can make at home at 1:1.

"Obviously we're using a million dollars worth of equipment to do it, but the economy is still there because we're making thousands of copies per hour. It can be affordable and it is very high quality at the same time. I think that is the most important issue: to make a better product a little less expensive if possible. If we can achieve that we've been successful."

I know positively that *DAAD* can produce a better cassette at 80:1 than the consumer can make at home at 1:1.

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Cooper on Cutting

Some people say going to a cut with me is worse than going to the dentist," confesses Ian Cooper. The fact that he is running one of Britain's premier cutting and copying facilities at Virgin's Townhouse in London would, however, tend to belie this revelation. With over one and a half decades of cutting experience under his belt Cooper has every reason for quiet confidence. He has come a long way from his early days at Pye Studios where his cutting room was situated between the ladies and gents toilets and en route to the main cutting room. Not only that — the loos used to block regularly and the manhole cover to access them was situated underneath his cutting lathe! All in all it was a bit distracting to say the least.

Today sees him resident in Townhouse Cutting Room 1 which he set up for Virgin back in 1980. His self assured professionalism is thinly disguised behind a light hearted irreverent attitude to his work. Almost from the word go he built up an impressive and loyal client list. The hit list is no less impressive dating back to his first: *Popcorn* by Hot Butter which, along with songs by David Cassidy, Judge Dread Big Five, Madi Gras and Gary Glitter Part I were all simultaneously in the top ten, all cut by Cooper.

So what is so unique about his cuts? "Nothing," he answers. "Looking back on it I have people who have been with me for years. Why? Because of my bad jokes; I make good tea; I don't know." He puts it down to straight forward honesty and unpretentiousness.

"If people say to me 'I want this cut flat,' I say OK I'll cut it flat. When I say flat I mean flat: switch everything out — high frequency limiters, the lot; just let it tear through. Well that's what they asked for but they say 'Where's the 40 filter in the bass end?' and I say you said flat. 'But surely that's standard procedure?' Since when? As far as I'm concerned that's rubbish. I've always believed in telling the truth. There are always people who know more than you do and as long as you respect that fact then you will survive.

"As regards the mystique of cutting; as far as I'm concerned there isn't any. I've got no sound of my own. I use my pair of ears and I've got my own ideas. ; I think I'm right most of the time but I'm quite happy for people to prove me wrong."

Cooper learned his craft on a Scully lathe.

Janet Angus visits Townhouse Studios in London and talks to Ian Cooper about fish tanks, waste disposal, alien space ships and disc cutting.



Ian Cooper

"Looking back on it, although it could be awkward at times, considering it was mechanical it was a very good piece of machinery. And all the valve Pultecs, Haeco cutting amps, Westrex heads; it just had a sound of its own. It was lovely stuff."

As the Neumann system increased in popularity throughout Europe, Pye slowly turned all three of their rooms over to German technology. The trend was for flat tapes which the Neumann was able to transfer through onto disc a lot truer than the valve system.

"The valve had a certain character, but people didn't want character, they wanted it flat. Whether it sounded any good was almost irrelevant. The valve had a peculiar top end, or there was too much bass off the cut. Five years previously it would have been great but in those days people didn't want it, so I found I was struggling a bit.

"A lot of it was to do with the valve's inherent distortion syndrome. You could cut

things louder and you didn't hear distortion so much because it seemed to disguise it. There were a lot of good things about the valves."

The culture shock of moving onto the Neumann *SP272* with its high powered cutting amps made its mark.

"It was totally different technically — you just pushed buttons and it all worked. Having said that I think I cut more hit records on my old valve equipment in the short time I had it than I actually did when I had the Neumann gear at Pye. Working the old equipment was a nightmare. It made me learn not to trust anything. I used to get swarf blockage and things like that. The swarf sticks around the stylus and ruins it, and it can damage the cutting head, so you have always got to be on your guard. It taught me today, even with things being 99% reliable, not to trust them. I find more often than not when I'm working I'm pacing up and down just checking things, because it will happen. The one time you've turned your back it will happen."

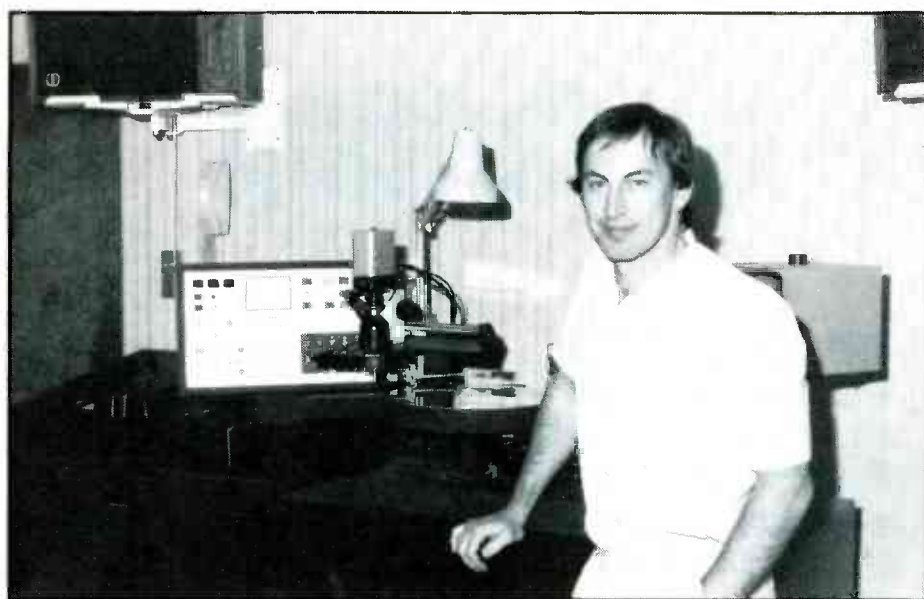
In fact the whole valve system was pretty temperamental.

"The valves used to crackle and the way I got round that was to undo the back, stop the tape and just give them a little tap with the end of a screwdriver and then they would calm down. Sometimes I did get a bit enthusiastic and tap them too hard and they'd explode!"

The cutter heads also broke on a regular six monthly basis and since they had to be despatched to America for repair, they would only just arrive back in time to replace the next one. The new Neumann system brought precision and high technology to cutting.

"But really since then things haven't changed technically that much. The amps certainly haven't. The *VMS80* funnily enough is very like my old Scully. It is a lot more versatile than the *VMS70*. I can control the depth more accurately; the land between the grooves can be controlled by meters. It's just a nice piece of equipment; very accurate. But it does take me back to the Scully: you had the so-called computer (which was the varipitch) working and there were times when I felt it was not doing it properly and I would do it manually instead. You used to kind of bodge your way through it so sometimes I'd start an album with the grooves veering the way the lathe wanted to do it and then all of a sudden — when I took over — you could see the whole cut change completely. Some of the cuts used to look amazingly peculiar.

DISC CUTTING



DMM lathe

"In that sense I can do the same thing with the *VMS80* — switch off and do it manually. I have done a few times, yes. For fun! Just to actually see how it would handle. Obviously the old rules still apply and you work out that if you've got let's say 60% depth and 40% land, whether in today's technology you can actually put that onto a single and still have it behave perfectly alright. The answer is yes it does. But the fact is it does make life a bit more awkward for yourself so you might as well not bother and use the computer. You've got to try these things out to find out what it's all about. But when I first saw the *VMS80* my first comment to Neumann was it's just like my old Scully. They weren't very pleased."

His three years at Utopia were no less innovative with the first Eastlake designed cutting facility in Europe. The Eastlake studio design was rapidly becoming all the rage and to have a similar room in which to cut appealed to many musicians and producers alike. The upgrading in status was no less appreciated by the cutting engineer. Fish tanks, mood lighting, and wonder of wonders, carpet on the floor, were almost too much to cope with. This brought Utopia a great deal of business in spite of the fact that Cooper decided to instigate a new method of invoicing: charging by the hour rather than by the cut. The result was vastly increased charges which, after initial resistance from the record companies, were accepted as commercial reality.

"The first bill I sent out like that was for Arista, for £500. They rang up and said 'I think you made a mistake, it should be £50'. There were one or two people who were quite shocked, but we were spending four to five hours or longer cutting an album. People began to realise that it was fair and right. The quicker you are in and the quicker out, the cheaper it is. More often than not if a cut is attended it takes twice as long. If something didn't work in the studio they used to leave it till the cut and try this and that."

Branson offer

The prime example was the one which led Richard Branson into the cutting field. "I was summoned by Richard Branson of Virgin because he had just had a cutting bill for an album, I think it was by Steve Hillage, for £3,500, which was a lot of money then. Even so, because we felt a bit sorry for Virgin we had let them have the 22 lacquers that were scrapped at cost price, which we thought was nice of us."

The long and short of it was that Branson decided he would rather pay that sort of bill to a facility of his own and Cooper was persuaded to change allegiance and set the whole thing up.

His first encounter with the Branson camp had been several years earlier at Pye.

"I remember being warned one day because I had these kind of hippies come down to cut an album. At the time my boss said, 'What the hell are all these hippies doing down here?'. I told him I didn't know — they were from Oxford or somewhere. The Manor (studio). There were these babies walking around chewing drum sticks and eating jam doughnuts and getting in all the drawers and everything. It was revolting. I was told 'We don't want this kind of thing down here laddie; you've got to get rid of them'. Needless to say they went on to bigger things."

At that time Cooper decided to go for another Eastlake room because of public demand and company image rather than from any specific acoustical motive.

Monitoring and other headaches

"The thing that you could say with an Eastlake room was that they were always consistently wrong. You know where they are wrong. It would be daft to say it's right. No monitoring is right. That's what I like about working in an Eastlake room. If I had my chance now I wouldn't have one, not

because they are difficult to work in but because I don't think they are necessary. Speakers seem to have got more efficient."

"If I had a box room — nice big square room with windows looking onto the street it would be lovely. But the fact is you've got to have big monitors because you deal with so many people who want to blast their ears to death so there's blood pouring out of them. Then you've got those who want to work on Yamaha *NS10*s all the time. You have to cater to everybody's monitoring needs."

Cooper himself does not often use the main Eastlake studio monitors, preferring recently acquired Revox *Studio 4s* which are driven by a Neumann amplifier.

"I don't think they would work quite so well with any other amplifier because Neumann are German and Revox Swiss; the two countries are near each other — it's something to do with the air. You can't have a Japanese speaker with an American amplifier; it just wouldn't work."

"I like the Revoxes, hate Yamahas, and have a lot of respect for Auratones."

One of Coopers 'tricks' has been to monitor singles and albums on a single Auratone speaker. He says that over the years the stereo picture has been getting wider and more confusing for the human brain to ascertain what is actually going on. In addition to locating the movement of the stereo, your brain is trying to interpret the actual sounds.

"We've only got our two cars and the sound is coming at you. I feel I can't necessarily identify between what is actually happening. Going down to one Auratone gets rid of the stereo problem and you just EQ things and only refer back to your main monitors or Revoxes. It's very interesting working like that and I learned a lot from it. Most of the time now I just work on the Revoxes."

Another pet Cooper hate is that popular mastering medium, the Sony *F1*.

I hate them. Why? Because I do. I've had so many problems with them. People come in with piles of tapes and say 'Here's the album' and you have to explain to them they need editing. I don't like the sound — the top end isn't particularly good. I know for the actual money it's a brilliant piece of equipment but I think they should take all *F1*s, put them on an alien space ship and send them all off into orbit. Nine times out of 10 there have been mechanical things wrong with them — the tape twists, drop-outs; I've had out of phase *F1*s — you name it I've had it."

His experiences have not been restricted to *F1*'s either. There was the Dolbyed 3M digital tape when that machine was in its infancy.

"I thought it was a joke when it said Dolby on the box. I put on the tape and there was a 1K tone, a 10K, then the bass and then the Dolby tone. The music came on and yes, it was Dolbyed. I had another one from the States from a Sony machine. God what a claim: two different digital systems both

DISC CUTTING

Dolbyed! It sounds like the Ian Cooper book of gags but if it's going to happen to anybody it'll happen to me. Nothing surprises me nowadays."

A more common mistake is the writing of 'digital' on the tape box when it is in fact analogue and vice versa.

"What you've got to understand is that what's written on the box is not necessarily true. It's all these little peculiar things that happen to you that make the job a little bit different. Keeps you going."

Townhouse Cutting Room became so busy and successful that Branson decided a second was called for. A smaller version of Cutting Room 1 was built. "One is a Eastlake room and the other is a copy of it. About four years ago Tom Hidley came and said he would modify the room for a small fee because his calculations had been a little bit wrong. I said 'Yeah? Well I could have told you that.' This kind of room isn't necessary at all these days for a post production facility. It's just a waste of time and money."

DMM

Due to the lack of lacquers, as Cooper puts it, Townhouse sources most of their's from Transco although they still have some Pyral in stock. "In fact most of the stuff we keep here is six months out of date because I've always believed in having the stock sitting around and getting used to the atmosphere. This allows all the gases to get out before we utilise the lacquers — I've known them to be sitting around for many years and there's been nothing wrong with them, although factories might say there can be. A brand new lacquer can be too new because the solvents in them haven't actually dried off; you might get problems with the stylus wearing badly, bad noise — all sorts of things crop up."

However, as he says, lacquers are a thing of the past, not simply because supply is drying up, but because Townhouse has opted for the Direct Metal Mastering process. The first independent company in the world to do so, they had considerable problems persuading Teldec to grant them a licence. Once that hurdle was successfully negotiated they then clashed with Neumann because they wanted to cut singles on it — something the system was not designed to do.

"We thought DMM would be a step in the right direction. I know records are disappearing but we felt that our clients would like the best that we can offer at the moment. We asked Teldec for a licence and they told us to go away because we didn't have a factory. They couldn't understand why we wanted one or how we could do work for lots of other companies.

"We eventually managed to get hold of one, paid our exorbitant licence fee and were away."

The first problems came with the early acid coppers. Once pyrophosphate coppers were introduced the system proved to be very

good. Apart from teething problems such as, Why did the diamond stylus fly off and go down the pipe never to be seen again? Or why did the diamond go into the steel? Why is it that it won't cut 12" 45s at really high level? Why should it be that with lacquer you cut deep and with DMM you cut shallow?

"The whole system was the opposite to conventional cutting and we had a lot to learn. The stylus flew off because the level that was going on to that disc was rather loud and it just snapped, disappeared and that was it. I was busy in the swarf jar looking for the diamond, but it was so small you can't find it. We haven't had one go since but it was just a sheer fluke I was actually looking down the microscope at the time and saw it disappear. I couldn't believe it!"

Cooper is an unwavering fan of DMM.

"It is a better end result than lacquer any day. Sibilance is almost a thing of the past. It is good for albums, singles and certain kinds of 12 inch singles too. (The system doesn't particularly like cutting deep and the way a lot of things are recorded on 12 inch mixes in particular — the stereo is opened up — and things go berserk which can throw the system into a few problems because it works at a much higher speed than the VMS80.) The VMS82 (DMM) has bass limiters which can come into operation when the stereo gets too wide or things are looking dodgy. But having said that you don't need to cut loud because the quality is better than that of lacquer. You can afford to cut quieter because it is a more pristine sound. The clarity makes it seem better and the top end is clearer. The old syndrome of just piling on the level (which I've never necessarily believed in) has come true with that system. There have been many cases with 12 inch singles where I haven't really cut much more than an ordinary single because there's not much point. I'd much rather get a cut that is clean and clear than something that's loud and distorted. I did that years ago; I've kind of changed my tack."

Apart from the audio benefits of DMM, Cooper believes that the technology has brought a closer affiliation between cutting room and factory. The communication lines have had to open up as the processes overlap. He feels a bit sore that the DMM technology has not received as much promotion and acceptance in the UK as it deserves. As far as he is concerned the technology, developed from the laser disc system, should have been around years ago. He resents the efforts he is required to put in to convince clients of DMM's advantages since they are so obvious to him. A little hype and publicity could have gone a long way to making his job simpler. Even so 50% or more of the work that passes through Townhouse will be DMM.

Standards of quality

The standard of mastering may have been improved by technology but that is more than Cooper can say for studio masters over the past 10 years. He theorises that computer

mixing processes may be to blame for the bland results.

"I like things to be so I can hear them. I suppose I'm hankering after the 'the vibe was right' kind of feel and in a lot of cases automated mixing doesn't give you that. It gives you great control over everything but at the end of the day the whole feel is lost and the EQ is wrong in the sounds that come out. People come in here with their perfect mixes but they sound terrible.

"Consequently you think 'here we go — a bit of middle, bit of top, needs this, needs that' and you try to extract those frequencies out of the tape that will give it a bit of welly, a bit of impact. Then again by doing that you upset the mix and then you have to start compromising. I would EQ a lot more into things but I'm restrained by the presence of the client. I just feel that maybe if things were better when they went into the desk then they'd come out better at the end.

"There are people who use an SSL console very nicely as a volume control and it sounds superb. And people are amazed how they do it. The answer's simple: Don't do anything. Simplicity is the whole art. There is nothing nicer for me than doing a cut that's flat. If it sounds fine, great — go ahead and do it. But the quality of tapes coming out of studios these days is a bit poor in a lot of cases. Must try harder. Six out of 10, see me!"

For his part he always feels that because of time pressure his part in the chain could have been done just a little better. "There are little things that you might want to do. People might not even hear the difference but I would know. You might wish you had done the cut slightly different — a little tweak here and a little tweak there would make all the difference to me personally."

It is difficult to judge when to stop tweaking things but Cooper is sure he knows.

"Just take that up a dB or do something like that and it would just make it. But the fact is you haven't got the time."

With the advent of CD and DAT, quite apart from DMM, what of the future of the cutting room? As far as Cooper is concerned the whole idea of a 'cutting room' as such is already a bit dated.

"It has become a transfer room, it's become a psychiatrist's room, it's become everything and the actual physical art of cutting is getting less." He goes on to say that the physical side of cutting has never been the greatest part, but rather the preparation. This is not going to change whatever the medium. Yes working with 1/2 inch, 3/4 inch and digital require different approaches but Cooper simply 'bulk erases' his brain and goes for what he believes to be right for the job in hand.

"I don't have a particular sound as such and I think you'd be daft to do that."

Virgin has already invested in its own CD plant and no doubt will be looking at DAT as it becomes an accepted music medium. The future of the Townhouse 'psychiatrist' is assured.

GAUSS DUPLICATION

Last November, Cetec Gauss celebrated its 15th anniversary. The company is part of the Cetec Corp, a collection of totally autonomous divisions which range from Gauss's duplication equipment and loudspeaker lines to Cetec Guardian, a plastic injection moulding company that specializes in moulded medical supplies, disposable syringes, plastic valves, etc.

Jim Williams is president of Cetec Gauss and his role encompasses two very diverse areas of audio: loudspeakers and duplicators.

"It's two completely different markets, two completely different marketing techniques," said Williams. "In the loudspeaker market we deal with rep, dealer and distributors and with the duplicator it's basically direct sales. So it's two different selling points altogether and two different kinds of marketing."

Area representatives are used for duplication sales in various key countries of the world. Cetec Gauss's duplication support crew consists of eight different companies worldwide, each of which has its own engineering staff to provide service, installation, and backup support in addition to sales. "Even though everyone talks about how small the world is, it's still a long way from here to Hong Kong or China, or some place in the middle of Europe," said Williams.

Having someone that can respond a little quicker and be more in tune with their wants and needs and also be more in tune with the language problems of a certain area makes for a lot better communications."

The company's Sun Valley facility contains approximately 28,000 square feet for duplication manufacture. Since an inventory of finished goods is not held, large warehousing facilities are not necessary.

"Each system is basically built with the customer's input and tailored to their needs and wants. The system is generic up to a point and then in its final stages track configurations may differ, equalization, duplication ratio requirements, all those things are really customer driven.

The standard Gauss 2400 high speed duplication system features a patented drive system that utilizes two capstans, one on either side of the head assembly. A closed loop drive system is formed and, coupled with a vacuum capstan, achieves a pinch

Gauss equipment is known the world over. Jim Williams talks to Susan Nunziata about the company and the duplicating products they produce.



Jim Williams, president

rollerless dual capstan drive system. Three speeds — 120, 240 and 480ips are selectable by the operator. There are no rotating component parts in the system and the compliance chamber is self-serving. The slave includes Dolby *HX Pro*.

"We have the ability to provide preset selectable duplicating conditions," said Williams. "It can be anything like all three of the same dupe ratios with three different kinds of tape or three different kinds of equalization or three different duplication ratios or a combination of all of those. When you're talking tape type, time constants, duplication ratios, and you mix all those things together, you end up with quite a maze."

Cetec Gauss has manufactured an average of 150 to 180 units annually in the last three to five years. While the company's export sales have improved steadily, sales growth in the US has undergone a decline. Nationwide economic problems, uncertainty about new formats, have contributed to a hesitancy among duplicators to make purchases.

"The business is obviously like a yo-yo. That's one of the problems in this business. It's become more of an up and down roller coaster than in the past." In the last couple of years one factor has included not knowing what the growth rate of the analogue cassette is in the long term.

"It's caused our users to take a shorter look at their forecasting and also their capital equipment commitments. A lot of big companies are pulling back their requirements. It's made it more difficult for us to forecast and it's put a bigger demand on us because we're needing to respond quicker."

Direct sales

Direct sale is the key to success in marketing duplicating equipment. The manufacturer must be available from the beginning to recognize the particular needs of each client and work with them at meeting those needs.

Cetec Gauss distributes brochures which outline the basic equipment available and Williams stressed the importance of continual client education.

"A lot of customer product problems are a result of not thoroughly understanding the whole process. It's more than just understanding that you go out and punch that button and it does something magic and all that and out comes a nice product. You could start out that way but in any system it changes from day to day. You just can't go and push another button to make it perform better the next day. You have to understand the whole process. And we have to continue the education process on our part. It's really a matter of being there and communicating with the user in their environment.

It is not uncommon for a sale to take as long as one year during which uncertainty as to whether or not to make the investment, is a constant consideration for duplicators.

"It's also not uncommon, when they know they're going to do it that it still takes three

TAPE DUPLICATION

or four months or more to finalise a sale."

Manufacturing

The company utilizes a manufacturing process it calls linear throughput. Duplication equipment is created in a modular sub-system fashion. "What we do is run the sub parts and the subassemblies in larger quantity batches and we build out for 150 record amplifiers."

This process allows production to be accomplished with a smaller nucleus of personnel. Several people can build the same subassemblies for one or two days then move on to another subassembly. The completed subassembly is sent through quality control and pre-testing before it is placed in the finished goods department where the actual masters and slaves are constructed.

"We pull a kit and the kit will consist of all of the subassemblies to build a complete slave. Once you've got all the subassemblies pre-built and all the boards pre-built, it takes less than a day to build the set. But our linear throughput averages about a 30-day cycle. So that allows you more flexibility and also if we're forecasting out, like I say it's put a bigger burden on me because a lot of the duplicator parts, a lot of those things are very specialized custom things in lead time and also a lot of electronic components now because of what the industry is doing."

Williams is faced with a material management problem that is growing more difficult. "It's not untypical for some of our component lead times to sometimes be as long as six to eight months. We're having to commit and make a decision on how much I'm going to build eight or nine months downstream."

The economic uncertainty that faces the business today has prompted some of Gauss's clients to pull back their forecast which furthers the problems of material management. In 'the good old days,' Williams said he knew in May what would be needed 12 months out front. "Now everyone's pulled back and people are not very committed. First they say I don't know and then they call you up and ask if they can have a new system in 30 days. We are trying to forecast for this on a lot of things way out front so we're not overburdened by over-forecasting and killing ourselves on inventory. Keeping that flow coming and yet being able to respond to the real short lead times of the customers is getting tougher and tougher."

Cetec Gauss uses computer programs for some of its forecasting and a crystal ball for the rest. The process of keeping forecast and inventory in balance requires continually looping back through its material requirement report.

Quality assurance is achieved through a quality circles programme where each member of the manufacturing programme is involved in quality awareness. Mutual discussion among the various production departments is necessary for this problem-



Assembly

solving approach to quality.

"What could be an end quality problem from the test department, where they're finding the same kind of problem recurring, could be the result of another process or it could be a dimensional design problem, or anything. Until you get that loop closed and look at it, what's a problem in the test department might not be indicated to the manufacturing because the test department simply corrects the problem and goes on. In the end result, everything is fine, but that doesn't solve the problem."

Quality checkpoints are placed in various stages of the manufacturing process, including inspection of incoming raw materials. "We have keyed critical dimensions that are absolutely necessary for us to 100% validate. On the incoming material, the tolerances in some of the parts are extremely tight. We're talking plus or minus maybe 100 or 200 micro inches, and in those types of things, we 100% inspect everything coming in."

The batch manufacturing process serves a dual purpose: it provides better flow as well as utilisation and optimisation of production personnel; and it allows in-process inspection that might include anything from visual checkpoints to burn-in racks.

Wiring harnesses and chassis are tested on a test fixture that checks copper connections and other details. Those boards and subassemblies are then sent into a final test department. Mock test fixtures are set up for boards and put through a series of tests. In some cases, the board is then pre-set with some nominal alignments and adjustments and put in the normal operating range for fine tweaking and final assembly.

Boards are also tested on a burn-in rack to assure that the equipment passes the steep



Testing

curve rate of early electronic component failure. "We burn in everything for 50 hours and the premature electronic failure rate will, more than 99% of the time, occur in the first 50 hours of its life. Once you've gone past the first 50 hours the component failure percentage goes way way down."

While some of the manufacturing processes are automated, the volume of work does not demand full microprocessor control. "We use some soldering tanks and some trimming machines and things like that. We do wire stripping in machines — it's just standard manufacturing equipment, nothing fully automated."

The company designed and built its own test equipment which is based around a small computer which monitors and logs all information.

"You don't go out and buy an automated test fixture to build a record amplifier, so we have designed and built mock-up test fixtures for every type of board that's in the system. It's a big console, it's a computer controlled test system that does all the final testing of the slaves. We set up and calibrate the system and run tests on it with test data and then we play that test data back and the computer then controls the tests, runs the tests. It is an instrument controller and it is also a spectrum analyzer."

All test parameters, graphs, charts, performance, frequency responses, and distortion measurements are printed out in a multi-page report that includes the serial number of the unit it describes. A copy of this report is given to the end user and another is kept at the plant.

"The production people have written across the production blackboard that quality is built-in not tested in. They believe strongly in that."

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Getting in on the Factory Act

In terms of exploiting new formats and associated innovations, independent record labels have frequently displayed a degree more daring, imagination and decisiveness than their bigger brethren. They enjoy a flexibility and acuity of response that comes from the absence of accountant-heavy administrations and decision-making processes based around several months' worth of internal memoranda. And that advantage has paid off handsomely for the 'indies' in recent times: most were quicker off the mark than the majors (Polygram excepted, of course) when CD became available, and were duly rewarded in the early years of shortage. Now, several are making bold commitments to CDV and DAT at a time when the formats are viewed elsewhere with, at best, caution and, at worst, suspicion bordering on hostility.

However, being at the 'leading edge' does have its frustrations, not least the hazardous occupation of learning by the seat-of-your-pants! Such must be forgivable within the record company itself — an undulating learning curve is to be expected — but it becomes worrying when the label finds its suppliers 'busking it' in similar fashion. As co-founder of highly enterprising 'indie' Factory Records, Tony Wilson puts it:

"Please get to understand CDV mastering: if only so that I don't have to!"

Wilson, presenter of — among other things — an arts programme for Manchester (England)-based Granada Television has a keen interest in the coming together of high quality sound and pictures, especially in the CDV format, but Factory's first ventures into CDV have highlighted the radically different production challenge it presents. Wilson sees it this way.

"Up to now, in film and video, there's always been a pre-production stage where sound and vision came together. But now, with CDV, they're separate right up to mastering and this is bound to create problems."

He is surprised that others seem blissfully unaware of this new dimension, and the extra

Whilst most record companies complain about three different formats Factory Records put out material on five. Peter Herring looks at this adventurous independent that plays the game according to their own rules.

expertise it demands, but admits to being very impressed by the CDV facilities now being established by PDO at their nearby Blackburn, Lancashire facility. Noting that both PAL and NTSC lines were up-and-running, Wilson was quick to spot a golden opportunity to further the reputations of

Factory's roster of artists in CDV-deprived America. But then, recognising opportunities has always been fundamental to the growth of the label in its comparatively brief ten year existence.

New Wave

It was noting the unsatisfied demand for recordings of Manchester 'new wave' bands of the late Seventies that led to the founding of Factory by Wilson and club-owner Alan Erasmus. The name was adapted from that of Erasmus's Moss Side venue where performers such as Joy Division, Durutti Column and Cabaret Voltaire had been playing to enthusiastic local audiences. A 2 record 7 inch sampler was produced, complete with a package of stickers and posters for sale at the club and eventually through mail order, using specialist distributors such as Rough Trade and Red Rhino.

The musicians' relationship with Factory was unusual to say the least: no binding contracts, no pressures to meet release deadlines, and a fifty-fifty split of the net profits. Wilson and Erasmus were not looking to become record moguls: the label was a 'springboard to communication', something emphasised by taking the name Factory Communications.

As the label has grown, such ideals have had to be modified to a certain extent: overseas licensing demands contracts to be drawn up, and the sudden loss of the highly-successful Railway Children to Virgin wounded deeply. Now, concedes Wilson, they will simply have to put new signings under contract, "to protect our investment", although there is no intention of adopting other 'big-company' practices.

"We still do no conventional promotion," reveals Wilson's co-director Tina Simmons. "We don't advertise, we don't plaster the streets with posters, although we've complied with our distributor's wishes for point-of-sale material in the shops."

Simmons joined Factory in Manchester four years ago after handling the label while at



RECORD COMPANY VIEWPOINT

co-distributors Pinnacle (they shared the role with Rough Trade). Now she is in day-to-day charge of Factory's production requirements, which increasingly include releases in no less than five formats: vinyl, MC, CD, CDV and DAT. Although a southerner herself, there is frustration with a UK record industry that still believes the best ideas still only come out of London. And she is similarly candid about the production business, especially when it comes to CD price-wars.

Tony Wilson believes that, despite Factory's early entry into CD, "a year was still wasted. We lost time on CD; we took it for granted that having Nippon Columbia as our Japanese distributors would be a guarantee of early access to CD pressing. It didn't turn out like that."

He adds: "Like a lot of independents, we're grateful that Steve Mason (now with Pinnacle) had the foresight to book time for us all with Nimbus soon after their plant opened."

Although four or five sources have been used since then, the bulk of Factory's production remains with Nimbus despite, reveals Tina Simmons, the efforts of others to prise it away.

Price war

"There's not only been a CD price-war, but a company war, with one company causing a lot of the problems as far as I could see. At a time when we were paying £1.85 to £1.95 per disc in the UK, our Australian subsidiary Factory Australasia decided to manufacture their CDs at Disctronics in Melbourne. Disctronics then offered to take on our UK requirements there, too, at £1.15 per disc, including shipping and import duties. And we're just an indie: they must have gone to everyone. Then came their purchase of Disctec (the UK pressing plant originally set up by Phil Race of PR Records) and that's when everyone started panicking. Suddenly telexes were flying reducing CD prices everywhere.

"I really do believe they thought that because they were dropping the prices by half there would be a bigger swing to them. I didn't like that: I'm terribly British and I stuck with Nimbus (although we were also placing some work with MPO in France). I know it's dog-eat-dog, but I didn't like their approach.

"Now I'm paying 95p per disc and 65p for CD singles, including jewel case (we do our own print with James Upton) and that phenomenal decrease was all started by Disctronics."

I asked how that compared with current CDV pressing prices and Simmons opted to relate that to their dealer price: £3.85 instead of £2.85. The extra £1 took care of the considerably higher mastering costs of CDV (£1,200 compared with £250).

Like Tony Wilson, she admits to being a little 'green' when Factory first embarked on CDV, and was equally surprised to find many on the manufacturing side weren't all that much wiser.

CDV

"There was a lack of knowledge of the requirements for CDV, like not being able to use our existing 1 inch video master and the digital audio track off the *PCM-1610*. We discovered we had to make a master video corresponding exactly to the digital sound master, complete with timecodes. It had to be spot-on. Normally, the sound is transferred to the 1 inch video, so it doesn't matter if there's any stretching — it goes with it.

"Now synchronisation is critical. Luckily our first CDV used a dance troupe to accompany the music, not the band itself (Durutti Column), so no lip-sync was required.

"We also didn't know about the limitation of the video track on 5 inch CDV to 5 minutes. We wanted to use a seven minute single! Never mind, we thought, we'll edit the video and send them that. It's not that easy. You have to run your digital audio master and then edit that to match your edited video."

Factory's involvement with video started some six years ago with the setting up of a separate division called Ikon specifically to film locally-based bands on stage. Everybody benefitted: the band acquired a free promotional video; Ikon could market it, with the band getting a percentage; and the video could be shown as part of the club's entertainment for its customers. An interest in CDV sprang naturally from that. The Nimbus 'guidelines' on CDV were duly studied, but Simmons and her colleagues have been disappointed that after giving such good service on CD, the Welsh plant's expectations to be on stream for CDV in early 1988 haven't been fulfilled. She wonders whether, under the influence of media baron Robert Maxwell, Nimbus's development efforts are being directed more towards CD-ROM — "which is quite understandable, but doesn't interest us."

An approach was made to PDO Blackburn on CDV last October, with initially little response, apart from being shunted along to Polygram. The reply from Hannover was, "We're launching CDV next year." Fine, countered Simmons, I want to manufacture some, to which the answer was, "You can't do anything until March", (which was, of course, the since-postponed launch date in question).

"Don't they want to promote the medium?" thought Simmons. She had better luck with MPO/Maying in France who said they were actually producing CDVs and sent along the very first to come off the line, the intriguingly titled, *Digital Sex*.

Factory's intention was to release Durutti Column's *When the World* simultaneously in an unprecedented five formats last November. They didn't quite make that, the CDV featuring the album single and the DAT being delayed by a couple of months.

While not blaming MPO entirely for the delay on the former, she is a little annoyed that they didn't reveal to her that, although

they could press the discs, mastering would still have to be done by Philips in The Netherlands. It's possible, of course, that MPO assumed every interested party knew that, but how far should record companies be conversant with current technical constraints?

Despite the delay, Simmons was delighted with the result: "Visual clarity is superb — like watching a silver screen! It's a wonderful piece of technology."

Tony Wilson is similarly enthusiastic: "CDV will delightfully complement DAT; they'll run parallel. Personally, I look forward to renting movies on CDV, but that prospect terrifies the industry. They're sure films will be copied on to videotape so the rental potential is being played down.

"Time-wise," he adds, "the 8 inch format is very interesting: just right for a collection of singles," (although Wilson has a low opinion of the general standard of pop videos — "a miserable object that does a disservice to an artist's image, and does no service to his music").

He continues: "I would hope the CDV and the CD single become one and the same thing. I don't see why not — it would save a lot of duplication. Of course, we're having to issue CD singles as well as CDVs at the moment since the latter are not Gallup chart-approved. But is it worth the bother of mastering the two? Putting on the video should only cost an extra quid."

Factory pressed 2,000 with MPO of the first Durutti Column CDV and sold the lot ("We think people are buying them irrespective of whether they have a CDV player," feels Tina Simmons) and have now placed pre-orders of 6,000 each on two New Order discs. This time, though, they'll be produced not in France, but just up the road from Manchester at PDO Blackburn. Recalls Simmons, "After our initial enquiry, we had a phone call from PDO who said, 'We hear you've done a CDV' — they had no idea who we were! Two guys came down to discuss the technology with us and a visit to the plant was arranged. Manufacturers need to help record companies in this way.

"It's going to be very useful to us now that PDO can master for CDV as well as press. In addition to the two currently going through, we're planning a Joy Division 'retrospective'.

"PDO are also doing some of our CDs now, although we wouldn't pull out from Nimbus who have been very helpful to us."

DAT

While CDV seemed a natural progression for Factory, I was intrigued to discover the impetus for the DAT venture. Didn't the controversy surrounding it deter them?

"Not at all," answers Simmons. "Frankly, we think the BPI's attitude is a farce. When there was lot of talk about DAT in late '86. Alan Erasmus started contacting people like Sony and JVC both in the UK and Japan. What he learned stimulated us to advertise a DAT, along with all our other product, for release

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early the following year”

Did the 'hate mail' start arriving?

"Funnily enough, no. Nobody complained. Vini Reilly of Durutti Column approved of the idea, and we discovered that we could get the master done at Townhouse. PQ-encoded using the same flags as the CD. We were determined to take a more positive approach to DAT.

Tony Wilson, adds: "Getting the DAT done involved a lot of cloak-and-dagger work but I knew we should be doing it."

He concurs with Tina Simmons on DAT politics and the BPI:

"The BPI is a funny sort of organisation. I think the attitude to DAT is Canute-ish, and if you want to play King Canute, fair enough. Everyone seems to be overlooking the fact that you can't copy digital-to-digital and, anyway, why not use the anti-copy flags that are already available?"

He feels the real threat is not going to come from copying on domestic DAT machines, but from the use of portables. Factory bought a Sony DAT portable, the size of a VHS library case, from a Japanese journalist who came to interview them with the machine! Fit an extension mic, says Wilson, take it to a concert and you've got a great bootleg. But, then, he has controversial ideas on that:

"I think bootlegging is a wonderful thing! It enhances a performer's 'aura'. What are a few bootlegs when you're selling, say, 12 million Springsteen albums? Record companies do not understand the merchandising element — apart from a record, cassette, CD, whatever, you're buying a piece of the group.

"If any DATs should have an inhibitor added, it's those made on portables like this."

"The people who are complaining most," argues Simmons, "are the ones with pop artists, the ones with a big investment to recoup. That's where the main anti-DAT lobbying is coming from, because the longevity of popular artists can be pretty short these days."

In the production of Factory's *legitimate* DAT, the complications came at the duplicating stage, with no one in the UK able to undertake it. Eventually, they were directed to MIL of West Germany, although the problems didn't end there.

"Manufacturing took an inordinate amount of time," muses Simmons. "We ordered an initial run of 500-600 and the Germans completely under-estimated the time required. They came through in dribs-and-drabs, and it took two months to get 500 tapes through. These promptly sold out, with 50% going for export, and we had to re-order straightaway! To be honest we didn't know you couldn't high speed duplicate for DAT, but why didn't somebody tell us?"

Tony Wilson recalls: "Even when the tapes did start arriving from Germany, our difficulties weren't over. For one thing, we didn't have a machine to play them on! So we took them to places we knew had DAT

players, Mute Records and the Tears For Fears studio in Bath, for example, and listened there. That was when it emerged that two tracks were missing!"

But he concedes that what *was* there was "startlingly good".

"I was blown back through the wall! Vini Reilly thought it was significantly better than the CD"

"I was blown back through the wall! Vini Reilly thought it was significantly better than the CD — he could listen comfortably at a much louder level to the DAT. Listening to it was as good as listening to the studio master."

Factory's DAT duplication is now entirely in the hands of Touchstone in the UK. They've produced the first double-DAT, New Order's *Substance*, which adds up to 148 minutes. A compilation of Joy Division, to complement the CDV mentioned earlier, was also in hand.

"Touchstone are very good," insists Tina Simmons. "Their quality control is very critical: they called us to say there was a dropout on one New Order track, but it turned out it was the drummer deliberately missing a beat. But it's reassuring that they take that sort of trouble.

"It's a lot better than some cassette duplicators we've dealt with, people who let batches go out with one channel missing. Last summer we had 85,000 of a new release going out only to discover that some had a dropout on one side. I had to go out on radio stations to tell people to get them changed — we simply didn't know how many were faulty. Eventually it added up to 200 returns. We were using three duplicators then, but now we concentrate everything with Alex."

Simmons has been delighted with the response to the DAT issues, guessing Factory's best market to be Japan where pop DATs are still in short supply. She is less happy, though, with current UK pricing:

"The trade price on our DATs is £11.99, which covers manufacture and mastering and mechanical royalties (based on the CD rate, since MCPS haven't set one for DAT yet). We kept the DAT price as low as possible to see how it would go, and reckoned on a retail price of £16 to £17. I was astonished to find out they were being sold at £24.95. The trouble is, the public thinks it's the record companies being greedy. They don't know how much the retailers take."

Singles and vinyl

She is similarly annoyed about the £6.99 price tag on CD singles, feeling they should only be in the £4.99-£5.50 range:

"We've always tried to keep prices at a reasonable level. Our 7 inch singles carry a dealer price of 90 pence, yet they're still sold at top whack. If you follow the BPI/

MCPS guidelines, then the mark-up on singles should be 25% which would make ours £1.19. No way do we see that! The 12 inch singles should sell at £2.13 plus VAT, but they're usually £3.50."

On the subject of vinyl singles, both Simmons and Wilson predict the imminent death of the 7 inch. Remarks the former: "Factory has never done volume sales on 7 inch singles, and now they're a total waste of money for us. The only reason we put them out is for the cult dance market and for radio stations who won't play 12 inch or album tracks. Together, they're probably keeping the 7 inch market alive. It'll be interesting to see what effect Richard Branson's proposed Radio Radio has on that, since he is determined it will be an album-playing station."

Tony Wilson adds: "The changes that have occurred at Factory have gone hand-in-hand with the death of the vinyl single. What's more, the old LP rules don't apply anymore — there's no 'side two' needing a good track to start it off. Now it's 50, 60 continuous minutes and that's bringing about some interesting conceptual changes."

But vinyl album pressing will continue for the foreseeable future, with product sourced at three plants: Mayking in France, Lambourn and Damont/Lyntone in the UK. Simmons says of them:

"Mayking offer extremely good pressings, although ferry strikes have given us problems in the middle of a major release (why they didn't airfreight I don't know). For large volumes, we go for split runs, and Lambourn, who are owned by our distributors Pinnacle, are good for smaller volumes. But it's a small operation and we can't afford backlogs.

"We get good pressings from all of them. I'm sure there are places that use, say, poor vinyl, but the savings aren't worth it at the end of the day. Vinyl is still important to us."

The future

Staying ahead in technology is one way of keeping talent and Tony Wilson thinks they'll be looking at solid-state storage in a couple of years time, while his partner Alan Erasmus enthuses about miniature high quality videocassettes with digital sound. The company has invested in a film screenplay and is encouraging its artists to develop their talents into soundtracks: New Order have music on four or five current US film productions.

Concludes Tina Simmons: "We give them the availability: encourage them to utilise the formats available. We've more going on here than at some majors, where the innovative side is several levels removed from the top. Here, everybody is allowed to develop — in any direction — but from a stable base. That's what keeps this 'factory' working." ■

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