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FOR PROFESSIONALS IN MASTERING, PRESSING & DUPLICATING

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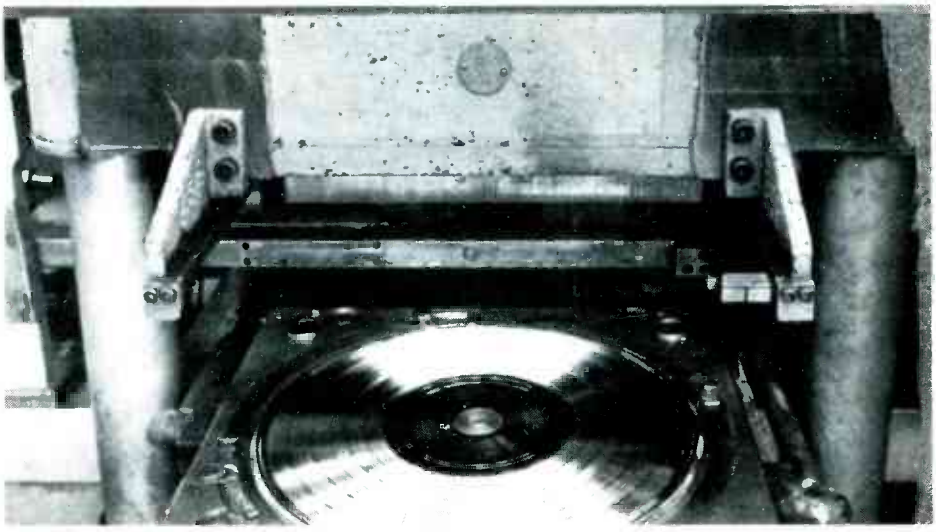

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EDITORIAL

Start of an Era?

What a turbulent year '87 proved to be with major issues affecting virtually every sector of the market. Perhaps in '88 we'll see some of the industry's major differences and problems being reconciled and we can all embark on a new, and hopefully profitable era of manufacturing.

December saw the publication of the *Gold Book* — our unique international trade guide to the manufacturing industry. Believe me, a lot of 'midnight oil' was spent compiling all the data but having seen the result, it certainly looks as if it has been all worthwhile. The *Gold Book* is designed to be useful to both record companies and manufacturers — anyone in fact who buys or manufactures records, tapes and/or CDs.

Yielding to Pressure

The notion that yield rates can actually say something revealing about a CD plant seems to me to be somewhat misleading. At a recent press conference it was fascinating to watch the reaction of the high level management of a new CD plant when questioned about yield rates. It was also disturbing. People, it seems, equate yield rates with excellence or expertise — a somewhat bizarre notion when you look closer at the facts. I suppose there can be no doubt that to those unfamiliar with the production processes to claim a yield rate in the mid nineties seems very impressive, far more impressive than an 80% yield rate for example. So what can a prospective customer deduce from this? As far as I can see absolutely nothing — unless, of course you are totally gullible.

I'm reminded of a story that happened many years ago. A UK hifi company, growing in size, needed to re-organise its final QC checks. To help speed production they decided to replace the manual checks with an automated 'go'/'no go' checking system at the end of the production line.

Eventually they decided on a suitable system and this was duly installed. All the relevant parameters were carefully programmed into the system and everyone sat back and congratulated themselves.

At the end of the first week the MD was on the war path, output was down 70% and there were some fairly heated conversations with the manufacturer of the checking system. As far as the hifi company were concerned it was obviously at fault. An engineer was dispatched post haste and he gave the equipment a clean bill of health. The MD was definitely unhappy and still insisted the equipment was faulty. Relying on that old maxim 'the customer is always right', the engineer returned and twiddled a couple of parameters to reduce the severity of the test.

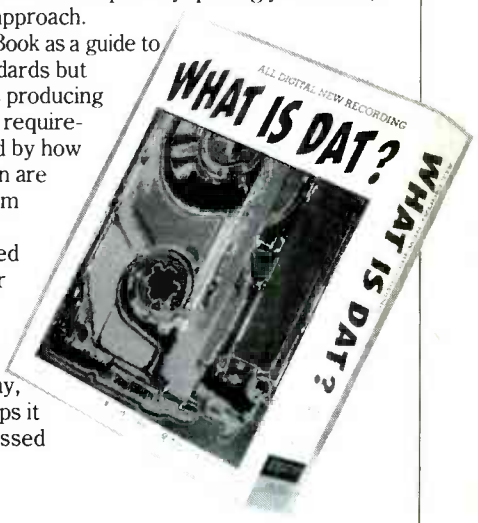
The MD was delighted, later that day he phoned the company to say all was well, the equipment had been fixed and was now passing 90% of all finished goods as acceptable. The fact that most of what was being produced was rubbish, was beside the point. The company got a lot of mileage out of their checking system. Years later the MD could still be found pointing out to visitors how this very reliable and well respected equipment could only find two faulty products in every 100! Not unnaturally people went away very impressed. It was the best bit of PR the company had ever invested in. Now I'm not suggesting such a parallel exists in CD plants but I do feel that blindly accepting yield rates as indicative of excellence is a touch — how shall I put it? — presumptuous.

We presume all CDs are made to the same standards — they're not. We presume that all failed CDs are spread nice and evenly throughout a typical day's run — who says so? In one sense an 80% yield spread evenly across the entire production run is a much better guarantee of getting your finished product on time than a rate that shuts production down for several hours or even a day, yet still (averaged over a month for example) works out at 90%.

The rate might be 80% because the standards aimed for are that much higher than anything else. If yield rates are going to prove to be a reliable indication of quality or expertise then all these facts have to be taken into account. To the plant manager, of course, there is also the additional problem of cost and wasted time. Where are the faults occurring: during pressing, after metallisation, in the printing process etc? And how is the problem spotted? In this sense yield rates are simply an 'internal' problem that determine how profitably you are running your plant. Knowing how reliable production plants are (which I presume is one of the main reasons for publicly quoting yield rates) requires a new and different approach.

We obviously have the Red Book as a guide to the minimum acceptable standards but increasingly we hear of plants producing CDs to better than Red Book requirements. But in which areas and by how much? And given this situation are yield figures based on minimum standards or higher ones?

It might well be that we need to revise overall standards, or have two (I can see the look of horror this would create). Whatever is decided, quoting yield figures in the current way, is still very misleading. Perhaps it is time the CD industry addressed itself to the problem.



Pre-recorded DAT

Having recently returned from Japan (more about this next month) I naturally spent some time looking around record shops. Contrary to popular opinion, DAT is not taking the country by storm and I had to search high and low for any evidence of pre-recorded DATs. The only example I could find of a pre-recorded DAT was the tape shown above: A limited edition audiophile recording costing ¥6000 (£25 approx).

It proved quite revealing that this was the only pre-recorded copy of a DAT cassette I saw during my two week stay in Japan.

Carl A. Snape

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Audiofile at Tape One

Tape One Studios in London have recently opened a completely new CD pre-mastering suite at their Windmill Street complex. Included in the comprehensive range of equipment is a Neve *DTC-1* digital transfer console and the AMS *Audiofile*.

"It became obvious that editing on U-matic cassettes had a limited future", explained Barry Ainsworth. "The search for new ways to edit led us to AMS and their *Audiofile* system."

To complement the *Audiofile* system a digital transfer console was needed. "Our spec required at least three stereo inputs under timecode control plus comprehensive EQ and limiting. With two Neve *DSP* consoles already in use, the newly developed *DTC-1* digital transfer console was the obvious choice."

Teldec DMM CD launch

At a special press conference during the 83rd AES Conference Teldec Schallplatten announced the official launch of DMM CD with the introduction of full DMM CD production facilities at Teldec's West German pressing plant. Members of the international press were invited to compare both a conventionally-produced compact disc and the same programme produced by the DMM CD process.

In his opening statement Manfred Atzert, Teldec's managing director commented, "Teldec with its pioneering work in DMM CD establishes new technology standards which enhance record manufacturing.

For over five years Teldec's DMM technology for mastering analogue records has been successful throughout the world. Now we have developed this technique even further so its advantages apply to compact disc. DMM CD masters can be cut in any professional recording studio. CD mastering is no longer restricted to the world's few CD factories."

Gotham Audio announced that North America sales and licensing for end users will be under their auspices and that Gotham will begin delivery of the Neumann mastering equipment early this year.

Midem 88

According to the organiser's, this year's Midem will be strongly influenced by the appearance of compact disc. In addition to the general promotion and exposure of the medium to record companies, Midem is providing a useful opportunity for CD plants to promote their facilities to the record industry at large.

Figures for Midem 87 included attendance of some 3,666 record industry visitors from 53 countries representing in all some 1,624 companies.

The 22nd Midem — International Record, Music Publishing and Music Video Market, will be held at Cannes, France in the Festival Palace from the 25th to the 29th January 1988.

In addition to compact disc, one of the highlights of this year's show, according to Bernard Chevry, president-commissaire general, will be CDV.

Stab in the back

According to a recent BPI press release the failure of the Government to include a proposal for a blank tape levy in the long-awaited Copyright Bill is described as "a stab in the back for the UK record industry, a triumph for short-term political expediency over long-term legal objectives".

The BPI which has been campaigning for a levy for the past fifteen years is gravely disappointed at this latest reversal of government policy and disturbed at the manner in which it has taken place.

The BPI Director General John Deacon commented: "We were entitled to expect a levy to be included in the Bill. It was established Government policy — outlined in a Green Paper, the 1986 White Paper and in numerous policy statements since that time. As recently as June this year background briefings at the time of the Queen's Speech made specific reference to the levy. Its removal has been shrouded in a veil of secrecy with the BPI not being afforded the courtesy of discussing the situation with the latest minister responsible.

"It appears that the Minister now regards the levy as a tax, a direct contradiction of previous statements most recently the Conservative Central Office's own policy statement in May this year.

"If the public were able to copy newspapers and books with the ease that they copy records and tapes there would be an immediate outcry from proprietors and publishers which it is difficult to imagine the government would ignore.

"The record industry, however, is evidently seen as a public benefactor, a kind of cultural soup kitchen in which everyone may eat irrespective of their needs. It is an incredible situation. Like it or not, the home taping problem will not go away; indeed with the advent of DAT and rental shops it could become far worse. We would expect responsible ministers to look very carefully at the situation and explore with the record industry acceptable solutions."

The press release goes on to say that, "The decision to leave the law as it stands is an insult to a dynamic British industry which is uniquely successful in international terms and shows a scant regard for the true purpose of copyright which the government itself recognised as being vital to the well-being of creative industries. Where Britain once led the world in copyright it now lags sadly behind the rest of Europe, a situation which can only get worse in the years to come as other countries introduce levy legislation.

"The BPI will be considering carefully the other aspects of the comprehensive bill and taking steps to ensure that the omnibus reform of copyright law is effective and capable of adapting itself to changes in technology which will inevitably occur during its life."

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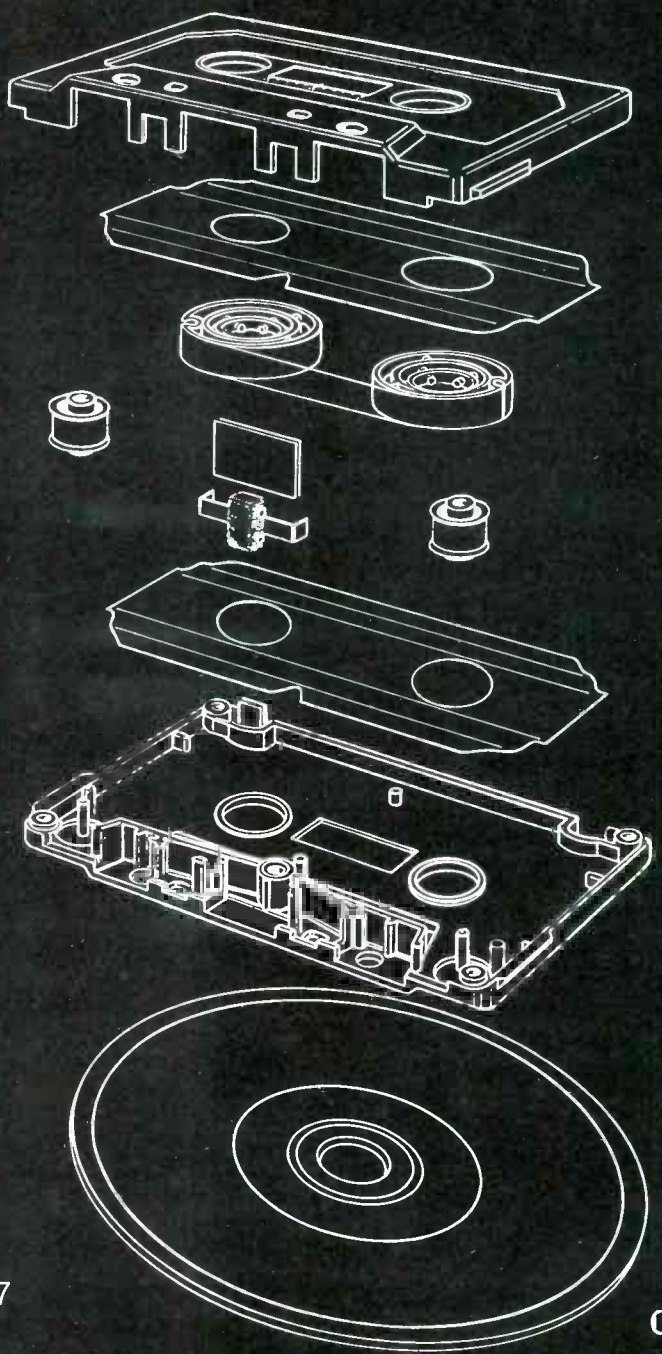

For details regarding cassettes/boxes please refer to:

ICM Ltd.
Mühlebachstrasse 27
CH-8800 Thalwil
Switzerland

Telephone 41 1 720 29 42
Telex 826805 icm ch
Telefax 41 1 720 37 97

ICM
SWITZERLAND

For details regarding compact discs please refer to:

ICM Diessenhofen Ltd.
CH-8253 Diessenhofen
Switzerland

Telephone 41 53 787 87
Telex 45 896 416
Telefax 41 53 784 41

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Distronics acquire US Laservideo

International CD manufacturer, Disctronics Ltd has acquired LaserVideo Inc — the largest US owned CD producer — in a cash and stock transaction totalling US $55.5 million.

The LaserVideo plants in Huntsville, Alabama and Anaheim, California, and Southwater, England will produce a total of 65 million units per annum. This will make Disctronics the world's third largest producer of compact discs (after Philips Dupont Optical and Sony) capturing 20% of global production and achieving this in less than 18 months since Disctronics original Australian plant began construction.

LaserVideo, formerly a wholly owned subsidiary of the diversified Chicago technology company, Quixcote Inc., adds a major customer base through sales offices in New York and Los Angeles.

Roger Richmond-Smith, CEO of Disctronics, says the addition of LaserVideo completes the global network of Disctronics factories and client service offices. "As the world's major independent," he says, "we can significantly enhance our commitment to customer service for majors and independents alike in what is an increasingly global market. And we will not have a label of our own whose catalogue competes with clients' priorities.

"We now have a balanced global capability in the compact disc and optical storage industries which will create greater effectiveness in production, supply and product development for our combined operations.

"There is total compatibility between LaserVideo and Disctronics in terms of client list, technologies and personal and, most importantly, in philosophy. As a company we put customer relationships and quality of service first. This commitment gains real depth from the global combination."

Jim DeVeries, CEO of LaserVideo (who continues as a board director of Distronics Ltd.) says: "Joining the Disctronics worldwide network means new opportunities for us to better serve our established customer base and new scope for applying LaserVideo technologies. It also means we can add global potential to our people's career opportunities."

"We are set for major controlled growth in 1988," adds Ron Reddy Normula, who continues as president of Disctronics Manufacturing Inc.

LaserVideo's pioneering work in mastering videodisc and CD-ROM plus audio compact disc dates from 1979. In the US, it is the second largest producer. The Anaheim plant (the only CD plant on the West Coast) also offers custom mastering services for write once and erasable disc manufacturers — American, European and Japanese. The Huntsville plant, additionally, offers comprehensive warehousing and drop shipping facilities and has a current annual capacity of 25 million units with provisions for the existing capacity to be doubled with minimal capital expenditure.

The company's Anaheim plant specialises in research and development and manufacturing video discs, CD-ROM, and mastering equipment. Video compact discs (CDV) have already been premastered and are scheduled to be pressed in this month.

Disctronics established overseas customer support offices in Los Angeles and London prior to opening its first plant and has maintained and a global computerised tracking system to service the US and European clients as if they were just around the corner. The acquisition of Disctec Ltd, in July provided a production base in the UK/ European markets and present LaserVideo operations now allow for even swifter servicing of North America clients.

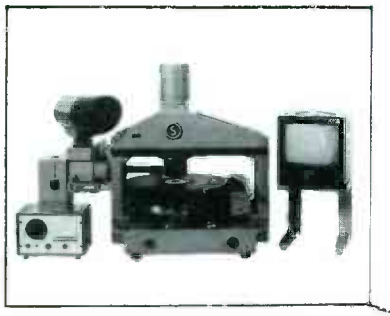
Johnson names Bindie

Amir Bindie has been named as a senior design engineer for Electro Sound. Bindie has extensive audio and telecommunications design experience in both the US and Europe.

SIBERT INSTRUMENTS

AT

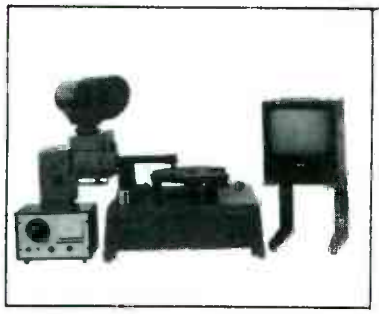
THE CENTRE OF



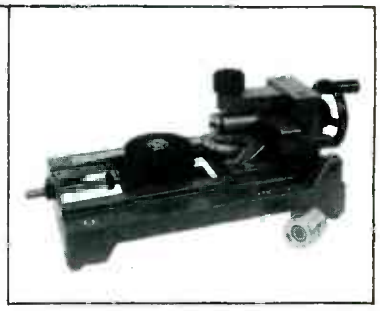
CENTRE PRESS

OUTSIDE DIAMETER PUNCH

TEST TABLE



TRIMMER



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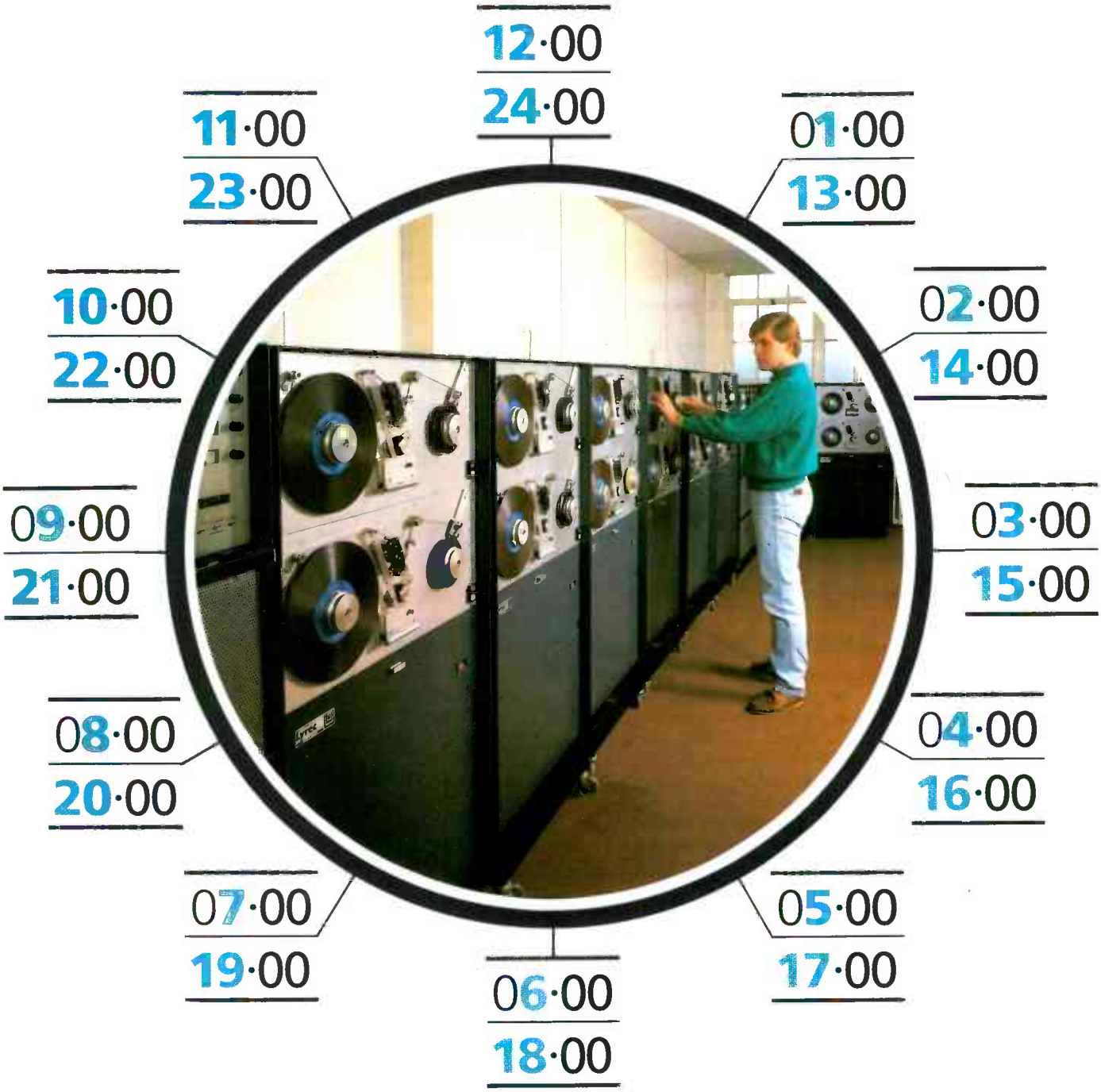

"I know I can rely on my Lyrec equipment to produce the goods to a constantly **high quality** and **at** a **speed** to meet my most demanding delivery deadlines – without breakdown *and* using minimum operator supervision."

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Lyrec U.K. Ltd., Ardhaven House,
Old London Road, Milton Common, Oxford OX9 2JR
Tel: 08446 8866 Fax: 08446 8810

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Agfa tape products

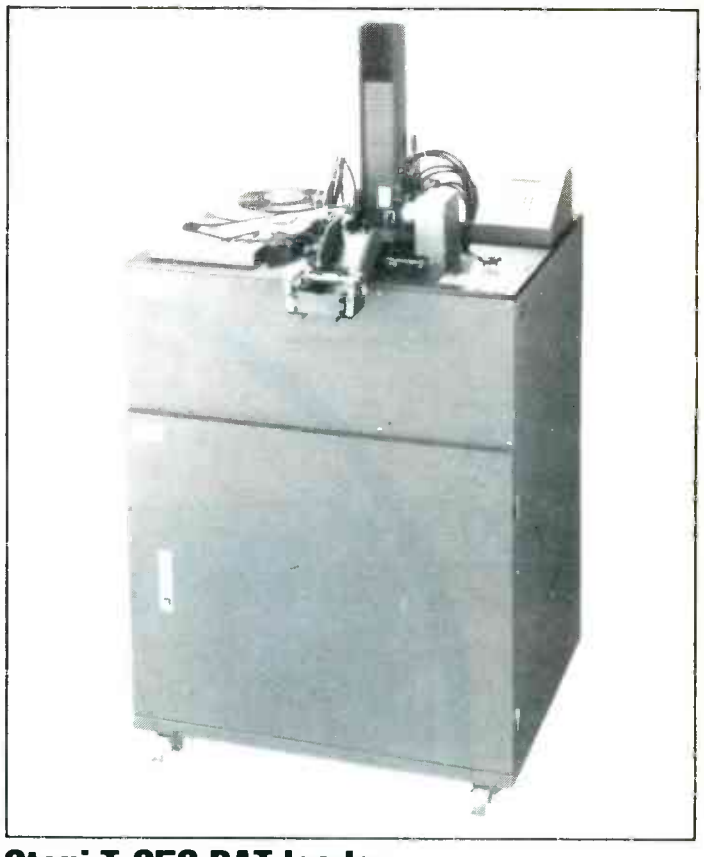
A number of new tape products have been introduced by Agfa. *PE 619i* is an improved version of *PE619* audio duplication tape. The new version is a premium grade ferric tape for high quality and cost effective music and spoken word applications. It features the same electro-acoustic properties as *PE 619* but the handling characteristics have been significantly improved. The new tape being cleaner to work with and with improved reliability.

PE 619i pancakes are available in 8,200 and 12,300 ft lengths for C-60 cassettes and 15,000 and 11,500 ft lengths for C-90s.

Agfa have also introduced a new open reel digital tape for DASH and PD format recorders. *PEM 291D* is claimed to featured an exceptional carrier-to-noise (C/N) performance providing extremely low error rates. The new tape will be available in ¼, ½ and 1 inch widths and 5,000, 7,500 and 10,000 ft lengths.

Finally, still on the digital front, Agfa have launched their first R-DAT tape. Playing time is 60 minutes and the tape will initially be available in Europe.

Agfa-Gevaert Inc, Magnetic Tape Division, 100 Challenger Road, Ridgefield Park, NJ 07660, USA. Tel: (201) 440-2500.



Neumann DMM CD mastering

Neumann have released details of their DMM CD cutting system. In all the system requires five major components, three of which are manufactured by Neumann. These include the *CML 88* mastering lathe, the *CSM 88* signal processing and monitoring electronics and the *RH 88* embossing head. To complete the system a IBM *PC* and Sony pre-mastering set up (U-matic, *1630*, PQ generator and EFM encoder) are required.

The *CML 88* lathe contains several important operational elements including the drive system, which features a brushless, air suspension motor with 3-point bearing; pitch drive employing a precision lead screw with double regulated DC motor; a motor driven laser reading system and the embossing head suspension which features fine height adjustment and integral amplifiers to drive the piezo electric stylus and monitor its movement. All the main electronic control circuitry is housed in the 19 inch rack under the lathe. Functions are continuously monitored in realtime and transmitted (via a RS232 port) to the *PC*. All mechanical assemblies and boards are designed to be easily removed and replaced.

The *CSM 88* monitors the CD signal and controls the processing and pre-equalisation. Being a microprocessor controlled system, it also functions as a character generator and can provide identification data for directly embossing on the glass blanks. The system also includes an oscilloscope with switchable access to various internal test points.

The *RH88* embossing head contains the embossing diamond (supplied directly by Teldec) and suspension system. Replacement of worn styli is said to be quick and easy with the electro-magnetic pressure system being monitored by an optical sensor.

In addition to the above hardware, Neumann supply all the control software for use with the IBM. Menus provide basic data and various operating values can be changed by the operator within previously defined limits. Test and calibration checks are available and the software also provides for status and error messages.

Availability is expected to be early this year.

Georg Neumann GmbH, Charlottestrasse 3, Berlin 61, D-1000, West Germany.

Otari T-650 DAT loader

Otari have introduced a R-DAT loader which automatically winds, cuts and splices 10.5 inch pancakes into empty, pre-leadered cassettes. The T-650 contains a 35 piece supply magazine and finished cassettes are automatically loaded onto the user's conveyor belt. A 32-digit LCD gives details of piece count, tape tension and winding speed. Tape remaining is automatically measured and can be displayed on the LCD if required.

The *T-650* loading speed is variable within two ranges: High speed — 3 preset positions and Low Speed — variable between 0.3-1 ms.

Detailed error indication is provided on the LCD to aid maintenance and a cue tone detector is also available as an optional extra. Power requirements are 100-240 V and an air line pressure of more than 5 kg/m^2 is required.

Otari Electric Co Ltd, 4-29-18 Minami-Ogikubo, Suginami-ku, Tokyo 167, Japan. Tel: (03) 333-9631.

RTI D11 dropout analyser

The RTI *Tapechek D11* is a microprocessor controlled tape analyser designed to locate and count video and RF dropouts. It is claimed to work with any format VCR/VTR — without modification — and is capable of checking pre-recording tapes for RF dropouts without erasing the programme itself. Sensitivity for both dropout depth and duration is variable (−10 to −26dB, 1dB steps and 0.5 μS to 34.5 μS, 0.5 μS steps, respectively).

A switchable alarm is provided warning the user that the tape under test has risen above the preset number of dropouts in a given evaluation period.

A further feature of the *D11* is the provision for printed readouts. These provide dropout counts for each period, total dropout count, over-alarm occurrences, tape ID number, date, inspected tape length, dropout depth, duration and alarm set-up details. Intervals are selectable in 15, 30, 60 or 120 second intervals per line on the printout.

Research Technology International, 4700 Chase Avenue, Lincolnwood, IL 60646-16889, USA. Tel: (312) 677-3000 or (800) 851-4028 (Toll free).

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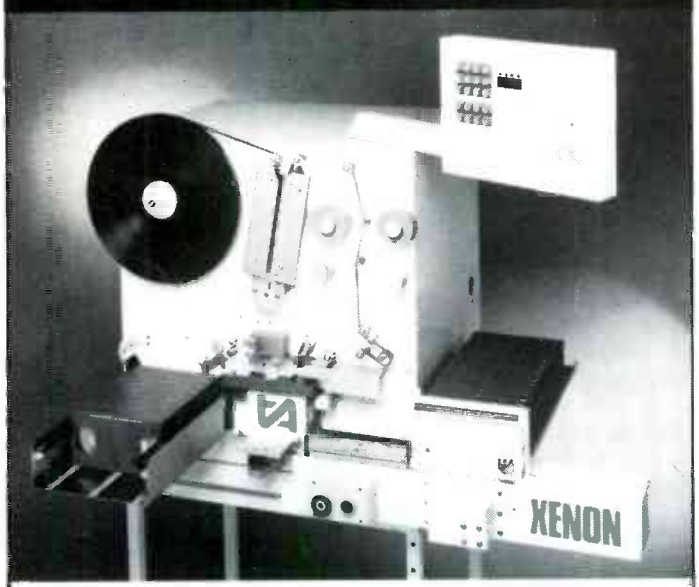
XENON



VIDEO LOADING IN THE 1990s

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PLUS – cue-tone option for pre-recorded pancake loading.

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3M new products

3M have introduced a number of new products and improvements of interest to mastering facilities. Joining the existing 60 minute U-matic tape are two new products, a 30 minute version (AUD 30) and AUD 75 with 75 minute recording capability. All AUD tapes have been developed with advice from 3M's Data Recording Products division and CD pressing operations and include 3M's proprietary and patented anti-static system. With this system both shell halves and internal components are treated with a special compound that permanently dissipates static electricity which could otherwise result in audio dropouts.

Upgraded reels have also been introduced by 3M for all mastering and digital (¼, ½ and 1 inch) products. The new reels have been redesigned to improve winding characteristics and provide added reliability.

A new digital audio splicing tape (*#8175*) has been introduced. Using synthetic adhesive for consistency and maximum shelf life, the adhesive is claimed to prevent creep and drying out, regardless of age. In order to prevent recorders from incorrectly identifying splices as 'end of tape' indicators (due to the clear backing), *8175* has a black base.

Magnetic Media Division/3M, 3M Center, St Paul, MN55144-1000, USA. Tel: (612) 733-1110.

Sony PCM-2000 DAT recorder

The *PCM-2000* is Sony's first professional portable DAT recorder. It features digital servo control for use under adverse conditions, 2× over sampling, AES/EBU I/O capability, SMPTE/EBU timecode facility, word sync input and recording capability at 48kHz, 44.1kHz, 44.056 kHz and 32kHz (digital input only, analogue inputs automatically disconnected).

The unit can operate continuously for 2 hours with fully charged NP-1A batteries or can be powered with an optional AC adaptor.

Balanced XLR-type inputs can be switched between mic and line, the former featuring 48V and 12V switchable powering. A multi function LCD provides comprehensive data and includes a battery-saving memory facility. Displayed functions include: sampling frequency; elapsed or remaining tape time; Start, Record and Erase ID, Transport, Search and Servo modes plus Dew, Battery Low, Caution warnings and Emphasis indication. The meter section contains a 28-segment level indicator, 'Over' indication, battery voltage and RF output level.

Sony Communications Products Company, Professional Audio Division, 1600 Queen Anne Blvd, Teaneck, NJ 07666, USA. Tel: (201) 833-5200.

SPT 350 video tape winder

The Strand Precision Technology video winding system is designed to reduce tape damage by ensuring the oxide surface (other than at the cleaning station) never comes into contact with the machine parts. Meeting JVC specifications the *SPT 350* is a double pancake design with auto threading and changeover. A patented double vacuum trough ensures maximum tape length accuracy. Variable acceleration and de-acceleration ramps are provided and the unit features fully adjustable splicing station, vacuum trough, pancake changeover, air guides (all) and leader tape arms.

The comprehensive LCD has a battery backup enabling up to 10 years data storage. Optional extras are available.

Other features include a 21 V-0 cassette magazine; auto winding of optimum number of cassettes for programmed cassette length; tape twist and tape void detection, hard copy facility, full diagnostic programming and faster rewind times (E180/T120, 17.06 sec; E120, 13.64 sec; E90, 13.58 sec and E60, 10.04 sec).

Strand Precision Technology Ltd, Strand House, Condor Close, Woolsbridge Industrial Park, Three Legged Cross, Wimborne, Dorset, BH21 6SZ, UK. Tel: 0202 825253.

Ampex Betacam SP

Ampex have released a new Betacam SP recorder and SP video tape.

The *CVR-75* is a full function record/play/edit VTR featuring AST (Automatic Scan Tracking) and a built-in time base corrector for broadcast quality still frame and slow motion. Also featured is Dynamic Motion Control capable of 'learning' a variable play profile and replaying it on command. Colour video may be viewed at up to ×5 normal playback speed in both forward and reverse.

Dolby C-type noise reduction is provided on the two longitudinal channels. In contrast to other small formats, Betacam SP allows users to choose between high performance metal particle tape and less expensive conventional oxide tape.

Released to coincide with the despatch of the new SP recorders is Ampex *298* metal particle video tape. Two lengths will be available: a 30 minute cassette and a 90 minute version. The new 1500 Oe tape can be used for playback on both Betacam and Betacam SP equipment, however Ampex *298* can only be used for recording on Betacam SP equipment.

Ampex Corporation, Acre Road, Reading, RG2 0QR, UK. Tel: 0734 875200.

ODC optical mastering system

The Optical Disc Corporation *530 Compact Disc Mastering System* is part of a family of products for mastering and recording videodiscs. The *ODC 530* is based on the *ODC 510* laser videodisc mastering system originally developed in the early seventies. Recording is via a 50 mW argon ion laser operating at 488 nm with wideband acousto-optic modulation. A 5 mW helium neon laser is used to control the focus and also to provide realtime playback of the disc during recording.

An air bearing spindle is used to support the glass master and the spindle is driven via a phase locked servo motor. The transport assembly is mounted on a specially designed high rigidity casting with separate air suspension. The transport system is maintained within a Class 100 environment (filtered, positive pressure).

The basic electronics are supplied in the *ODC 530 Recording Console* which contains all the power supplies, control, monitoring and servo electronics. The transport and recording console are designed to be used as an integral unit. A second unit (the Auxiliary Unit) is available which contains all the necessary digital audio and subcode processing and master tape playback.

Unlike conventional photo resist mastering the ODC system uses DRAW (Direct Read After Write) technology which provides immediate verification of the recorded signal on the glass master.

ODC claim a number of advantages for their system. These include simpler preparation of the glass master as no adhesive layering is required and unlike the photo resist method, baking does not affect sensitivity. No development process is required so realtime feedback monitoring is possible.

The system can master up to a maximum disc size of 240 mm with optional centre hole. Overall size is 54 × 31 × 60 in (WxDxH) and weighs approximately 750 lb.

Optical Disc Corporation, 17517-H Fabrica Way, Cerritos, CA 90701, USA. Tel: (714) 522-2370.

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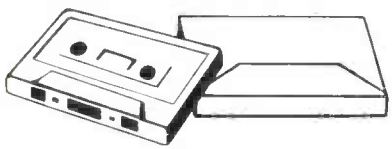

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EQUIPMENT

Readers are reminded that due to the international nature of One to One we sometimes feature products that may not be available throughout the world at precisely the same time. Even with major international companies, some products may only be available locally or in one specific territory initially. As a guide, the published address we use in this section relates directly to the actual source of our information.

Concept Design tapeless master

Concept Design have developed a digital audio analogue duplication (DAAD) system. Designed to replace the loop bin in conventional high speed analogue duplicating systems the DAAD system consists of a disc-based system for storing and reproducing the digitised master. The digital master can be prepared from an analogue master tape or directly prepared in realtime from a digital tape (44.1 kHz sampling, 16-bit linear quantisation). Side A and Side B can be loaded simultaneously via the twin AES/EBU inputs and there is a direct Sony 1610/1630 interface and direct digital ports for high speed loading from a digital source library (10:1).

The system will store up to 50 minutes of stereo (each side) or 1,000 Mbytes of formatted data. Reproduction ratios are 80:1, 64:1 and 1:1 selectable via plug in modules. Other ratios are available on request.

Features of this tapeless master system include ultra low maintenance, digital audio quality, C-100 capacity, compact design, no azimuth-induced master errors and simple operator controls.

Due to the fact that there are no multiple passes of the master (in the traditional sense) deterioration and/or degradation is avoided. A special conversion package for Gauss or Electro Sound slaves is available and the system is directly compatible with the Concept Design *Tape Manager*.

General availability is expected to be later this year.

Concept Design, Rt 8 Box 215-A Tucker Street Extension, Burlington, NC 27216-0215, USA. Tel: (919) 229-5559.

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US REPORT

Ads On Tape

What better way to let clients know about the versatility of a car stereo than to give them a tape to take on the road? Delco Electronics, a manufacturer of automotive cassette players based in Fort Wayne, IN, incorporated an audio cassette in its magazine advertisement as part of its efforts to reach the owners of auto fleets.

The advertisement, which appeared in *Automotive Fleet* magazine, encouraged fleet owners to request Delco cassette players in their General Motors cars. Delco is a subsidiary of General Motors/Hughes Corporation.

The cassette was produced by Absolute Recording, Elkhart, IN, and duplicated by PRC Recording Co., Richmond, IN.

"We think it was a unique way of getting the message across," said Mark Schonhoff, fleet manager with Delco. "In terms of sales, we've got a lot of responses from our sales representatives who tell us it opened doors with clients. We think it was beneficial and accomplished what we set out to do." Schonhoff noted that the company has used cassettes for informational give-aways as well.

MTC Video Loader

An automatic videocassette changer designed to mount on the face of a recording VCR has been announced by Mycomp Technologies Corporation, Costa Mesa, CA.

Scheduled for October distribution, the changer loads and unloads up to four videocassettes, according to Frank Hofmeister of MTC (200 McCormick Ave, Costa Mesa, CA 92626; (714/545-5111). Duration of a single loading and unloading operating cycle is less than 15 seconds.

"The concept of some form of automation in the video duplication process is badly needed," said Hofmeister. "The interest in this system is very high. It is not so much a reduction in labour, but it also leaves the videocassette untouched by human hands and will cut down on some VCR maintenance."

World Records reduces prices

Promted by growing American volume and a weak Canadian dollar, World Records has reduced its prices on 45rpm singles and album packages. Based in Browmanville, Ontario, the company is Canada's largest supplier of custom records, tapes, and packaging, according to company president R J Stone.

World also has compact disc pressing facilities, noted Stone, and accounts run from the Salvation Army in New York to Canada's CBC Enterprises, as well as independent labels from Alaska to Hawaii. "Our strongest area is, in fact, that we have facilities for graphics," said Stone. "That seems to be our strong point, especially with US clients."

World Records (Baseline Rd West, PO Box 2000, Browmanville, Ontario L1C 3Z3, Canada, (415) 576-0250), utilizes Electro Sound 8000 systems and has a capacity of 150,000 cassettes per day. Its LP capacity is 80,000 per day, according to Stone, and its seven-inch capacity is 60,000 daily.

Pirate gets five years

A counterfeiter found guilty of one count of criminal copyright infringement and one count of smuggling counterfeit tapes into the US has been sentenced to five years in prison and fined more than $180,000.

Kenneth Eugene Flick, found guilty of importing counterfeit tapes from Taiwan and distributing them in fleamarkets throughout the south-eastern US, was also sentenced to five years probation and 150 hours of community service.

Flick was discovered when an incriminating telex from his supplier was uncovered by a Recording Industry Association Of America investigator who turned it over to the FBI. The illegitimate tapes had been shipped in boxes containing legitimate sound equipment.

CBS/Fox & Shape

Shape Video of Kennebunk, ME, was named CBS/Fox Video Quality Vendor, 1986. Paul Gelardi, president of Shape Video, received the award from Barry Schwab, director of engineering, and Carl Mitchell, manager of quality systems engineering with CBS/Fox.

Shape has been manufacturing videocassettes since 1980 and has worked with CBS/Fox since 1981. The company is the largest independent manufacturer of VHS videocassettes in North and South America, according to Gelardi.

Gelardi lauded CBS/Fox's exacting standards in the material they purchase. "We look forward to continuing our quality performance to CBS/Fox," he said.

Copyright Infringement

CBS Inc, Atlantic Recording Corp, Elektra/Asylum/Nonesuch Records, and Warner Brothers have been awarded a total of $300,000 in damages to be paid by Steven J Bennett, a counterfeit cassette producer.

The fine, imposed by Judge William D Keller in US District Court for the Central District of California in Los Angeles, is the maximum amount of statutory damages applicable under US Copyright Law. Bennett infringed upon six copyrighted sound recordings owned by the four companies.

The suit, filed against Bennett by the companies in September, 1986, followed his guilty plea to one count of criminal copyright infringement in November 1985. Included in that plea were the same six titles which formed the basis of the later civil judgement.

The criminal indictment against Bennett was based on an FBI raid on his premises during which approximately 9,000 counterfeit tapes, 100,000 insert cards, 400,000 labels, 12,000 cassette boxes, and four high speed duplicating machines were seized.

3-Inch CD

Pocket Classics which feature 20 minutes of programming on a three-inch compact disc have been introduced by Delos International. The discs may be accommodated in existing CD players through an adaptor developed by Shape Inc, Biddeford, ME.

Delos is providing the adaptor with its initial release, D/PC 2001: *A Sonic Odyssey*, which has a suggested list price of $3.99. The Santa Monica, CA, company has introduced 20 titles to the consumer market.

Elvis Microcassettes

The estate of Elvis Presley has approved a variety of memorabilia that commemorated the tenth anniversary of his death on August 16. A 20.5-inch Elvis In Concert replica, complete with micro cassette player and 13 of the artist's songs, was among the approved products introduced at Graceland, Memphis, TN, during a weeklong Presley tribute.

The replica, which is designed by New York's Starr Associates, features songs duplicated from original RCA masters onto microcassettes designed by the Japanese firm Bandai. The cassettes were duplicated at TDK's facility in Japan.

Bandai designed the cassette player and manufactured the cassettes for Starr. Each cassette plays in a continuous loop, with a playing time of three minutes. "It's fortunate that Elvis' songs are only three minutes," said Jerry Schneider, creator of the product and partner in Starr. "We're contracting 24 additional songs from RCA. The music has very fine clarity."

In addition to the microcassette player, the stage houses a storage area and strobe light. The product was in development for nine months and will be made available this month at a suggested list price of $199, according to Schneider. Four volumes of songs will also be available.

AEG moves

The audio systems division of AEG Corporation has been consolidated and relocated to 2201-K Fifth Ave., Lakeland, NY 11779. Telephone (516) 467-1200.

Previously split between operations in Somerville, NJ, and Nashville, TN, the company found the need consolidate the operations and expand. "The growing interest in AEG's recordings, duplication, and loading products has dictated that we increase warehousing and parts stocking capabilities," said Rainer Zopfy, general manager, "as well as consolidate our service departments to enable more thorough cross-training and improved response time when service is required."

Susan Nunziata.

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E 11, E 21, E 31, E 12, E 22, E 32, Bler and Radial Noise. Obviously you can also have a digital analysis by computer.

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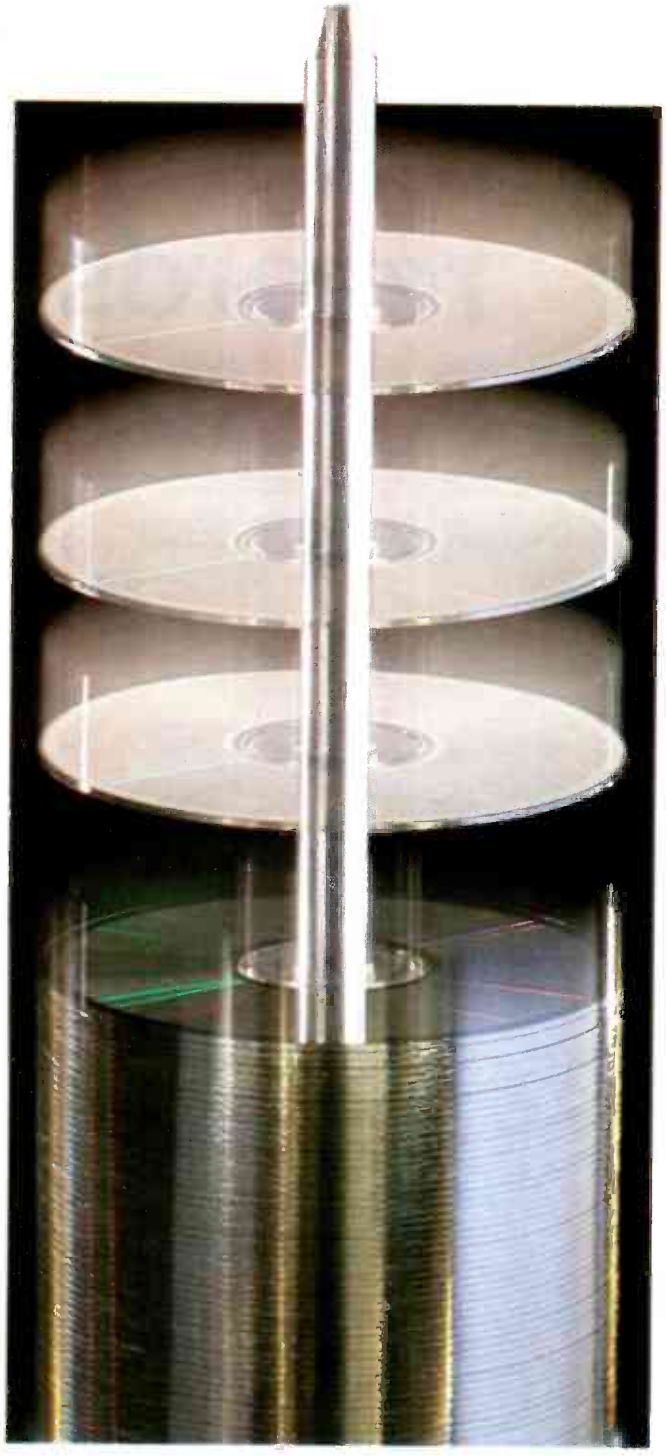

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C-0: Technology and Practice Part 1

John Fisher considers the performance parameters of the modern C-0 in this first of a three-part series on shell technology.

The C-0, that mere 'container' for duplicated tape, is so often neglected or deliberately ignored. The more enlightened record companies — who have discovered the marketing value of improved duplicating stock such as chrome and of techniques such as *HX Pro* and *XDR* — can be persuaded with difficulty to pay a little extra for these 'hi-tech' features. But it is much more difficult to persuade them to pay more for high quality C-0s, as most duplicators are only too aware.

The C-0 protects the tape from dust, dirt and handling. Yet the C-0 is far more than a plastic container. It provides essential mechanical elements that complement those in the tape transport. It is the vital interface between the tape and the cassette mechanism. As such it is subject to considerable environmental and handling abuses in addition to the rigours of normal operation, particularly in the car cassette and headphone portable player.

Regardless of the merits of the new tape formulations, new tape heads and improvements in mechanical performance of tape transports, the C-0 is the final arbiter of whether (and how consistently) these improvements can be realised. It affects the frequency response and phase stability achieved in the replay machine; the hum levels achieved; the wow and the flutter; the mechanical noise; the quality of the wind and the problems of jamming; the battery consumption in portable replay units; and the 'playability' of the cassette when it has been left in a car in the sun or in freezing conditions overnight. The C-0 affects the variation in performance between differing replay tape transports. It also affects the longevity of a musicassette even if the cassette appears to perform well initially, reputations suffer if it jams after a little use.

Far from being a bit of plastic to be bought in at the lowest possible cost, the good C-0 is a vital, complex and precision element in the reproduction chain. Some duplicators (and just a few record companies) are increasingly aware of this. But the importance of C-0 quality is still too often overlooked in the quest to cut costs.

Changing attitudes

However, there are signs that this attitude may be changing. 'Clear' cassettes are becoming a marketing feature. Now while the colour or transparency are of little or no intrinsic importance in terms of performance, this heightened consciousness of the C-0 may be important in improving the general standard of C-0s used — particularly if the C-0 is suddenly seen as a selling point. Why not 'high-tech' C-0's too? And by all means let them be transparent, if that is more appealing to the purchaser and lets him see what sort of C-0 he is getting for his money.

Regardless of the CD or R-DAT, the compact cassette has great potential. Technically, there is scope for further improvements in duplicating that enable very similar quality to be offered, using established technology — at an affordable price. The number of players and recorders in the field is vast, is still rapidly rising, so the market is a sure and very important one. Moreover, though the ability of cassette recorders to record is so often seen by the industry as a drawback, this very facility and their ease of operation makes them popular — and will continue to sustain the market for pre-recorded cassettes to play in these machines. In many countries, the musicassette outsells all other forms of recordings.

It is important for duplicators, record companies and purchasers alike to be continually aware (and where necessary, to be made aware) of the considerable importance of that humble C-0 in cassette duplication. This article will examine individual areas of performance and look at one important new means for the duplicator to assess and compare C-0s.

The interface

In measuring or assessing the performace of a particular tape, loaded into a particular housing — or in the listener's perception of the quality of a recording — there are three separate but interacting factors which affect the result: the tape, the C-0 and the replay tape transport (assuming all is well with the duplicating).

It is one thing to look for low flutter, good HF response and low frictions: another to determine precisely the contribution of each component in the C-0 to the result. Sometimes the perceived performance of two replay machines will change with the tape/housing combination used; likewise the performance of tape/housing combinations may change ranking with the mechanism used for replay.

The domestic user can choose the best tape/cassette combination to record on *his* machine. The problem for the duplicator is to choose a tape that optimises electromagnetic parameters and a housing that performs well with that tapes on *all* replay machines.

For instance, the duplicator will have gone to great lengths to ensure, with the aid of open-reel standard test tapes, that the azimuth of the heads on the duplicator slaves is accurately set and therefore that the recorded azimuth on duplicated pancakes is accurate. But the *effective* azimuth may alter when used in any particular cassette housing, due to the effects of the C-0 itself in conjunction with the multitude of different

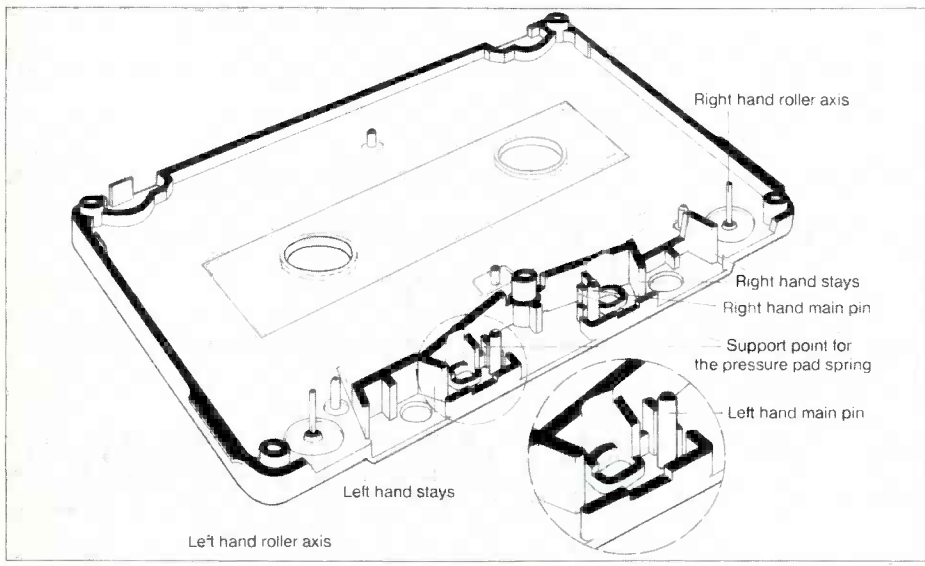

Fig 1: Elements in the lower part of a compact cassette

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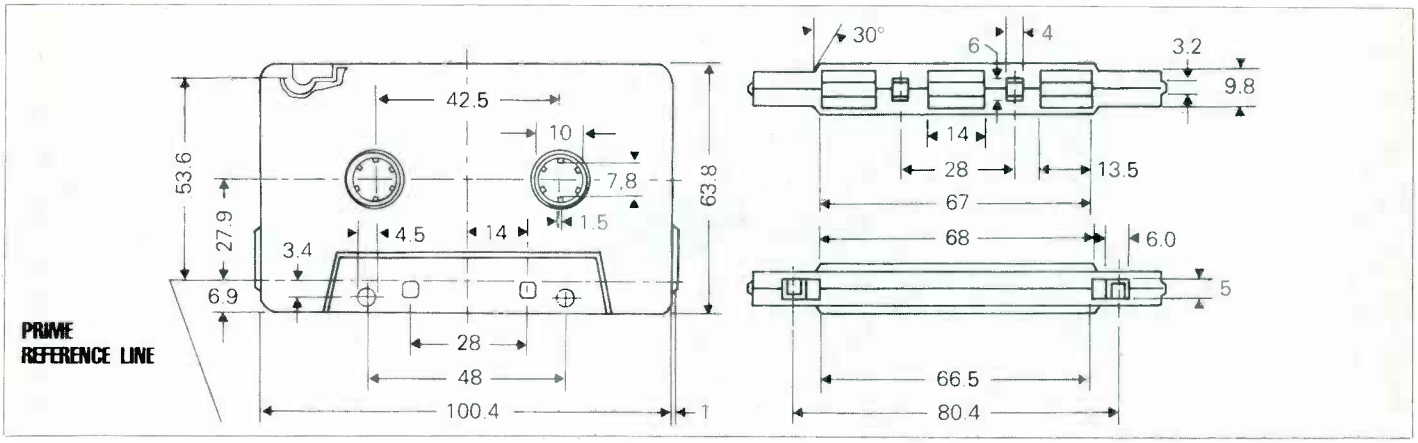

Fig 2: Key measurements for C-0 performance

transports that may be used.

Many of the causes of azimuth errors are also interrelated with causes of other performance errors. So before looking at ways of comparing C-0s in quasi-standardised transports, it is worth looking at the individual problem areas within the cassette housing itself (**Fig 1**).

Components of the C-0

Cassette shell. Most of the important dimensions of the compact cassette are defined in IEC94. Errors in these dimensions (**Fig 2**) can have a significant effect both on the performance of the finished cassette and its reliable handling. It is important therefore that the chosen C-0 conforms to specified dimensions as well as exhibiting other good qualities; this can affect the thickness of the plastics used in certain critical dimensions.

Dimensional errors can cause errors in the positioning of the cassette in the mechanism. They can also affect the ease of loading and unloading. The body of the cassette provides the reference plane for all critical dimensions and component positioning; it must therefore be very flat. There must be adequate stiffness and no localised shrinkage around areas of thicker plastic, such as at the point where fixed guides or other elements at right angles to the shell are joined to the shell.

For consistency in performance, the C-0 shell needs to be rigid and to sit firmly on the support points of the tape transport. Tilting of the cassette caused by dimensional errors at the support point (**Fig 3**) or twisting, will result in errors in the tape's path across the head; the cassette must be accurately dimensional within the specified area (**Fig 39**).

IEC94 allows a significant tolerance over the main support plane of the cassette shell and for the raised section around the head area; to minimise the effects of consequently tilting due to variations in tolerance between these two areas, the tolerance in the separation of these two planes should not exceed 0.1mm and should preferably be half that figure. Although recent recorder designs minimise the effects of such tolerances, cassettes must be capable of playing correctly in older transport designs.

The housing must not be weakened by the window: large, thick windows (or clear shells) may be preferable to small, flimsy ones.

Cassettes may be subject to wide temperature extremes when left in a car parked in the sun or in freezing conditions overnight: therefore the plastic of the housing must be dimensionally very stable over a wide temperature range and for prolonged periods. For example, for its own consumer cassettes BASF specifies tolerance of a temperature of +84°C for 24 hours.

Whether a cassette shell is screwed or welded is less important than whether it is well designed, well made and well assembled. Screwed designs, using five-point fastening, have the advantage that they can be opened in the event of the cassette being damaged or jamming; they can also be very rigid. A well made, sonically-welded shell can be equally rigid if the shell is correctly assembled prior to welding and if the weld is carried out evenly there may be less likelihood of distortion of the C-0.

In choosing between C-0s, it is worth bearing in mind that many blind people use the screw heads (or dummy screw heads, in the case of some welded designs), to identify which side is which — a small but invaluable feature for those so handicapped.

Guide rollers. The guide rollers at the front corners of the C-0 play a very important role in the correct functioning of the cassette, affecting azimuth accuracy and azimuth/phase stability, flutter, winding characteristics and tape damage. Consequently, the guide rollers need to be precision made and accurately positioned.

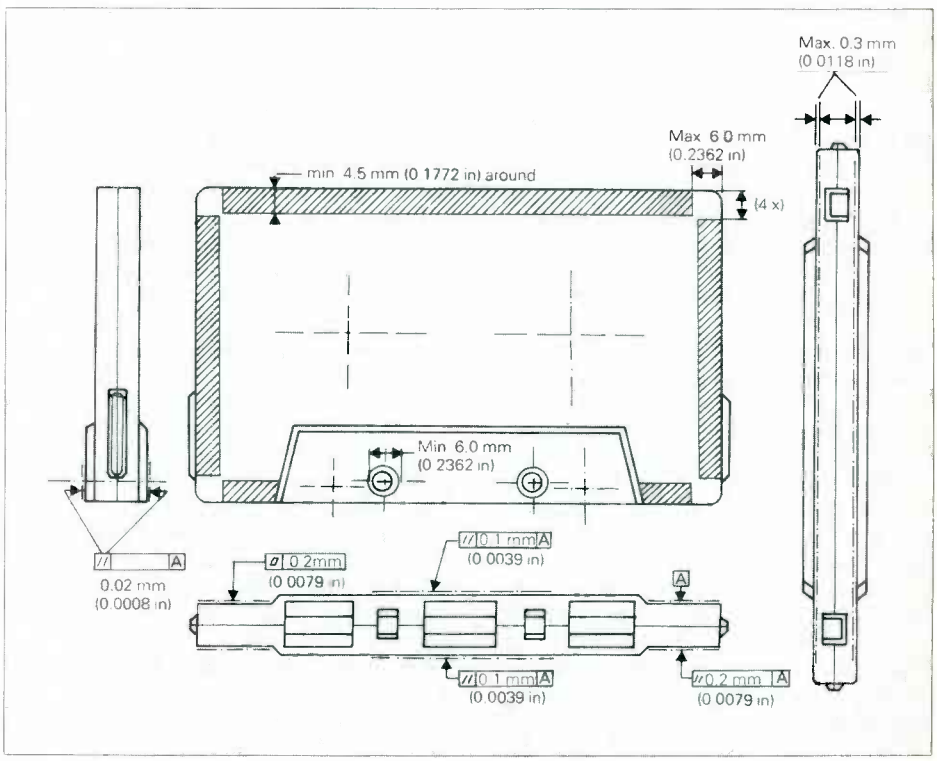

Fig 3: Cassette support planes: the hatched areas must be parallel and provide the reference planes for critical components in the C-0

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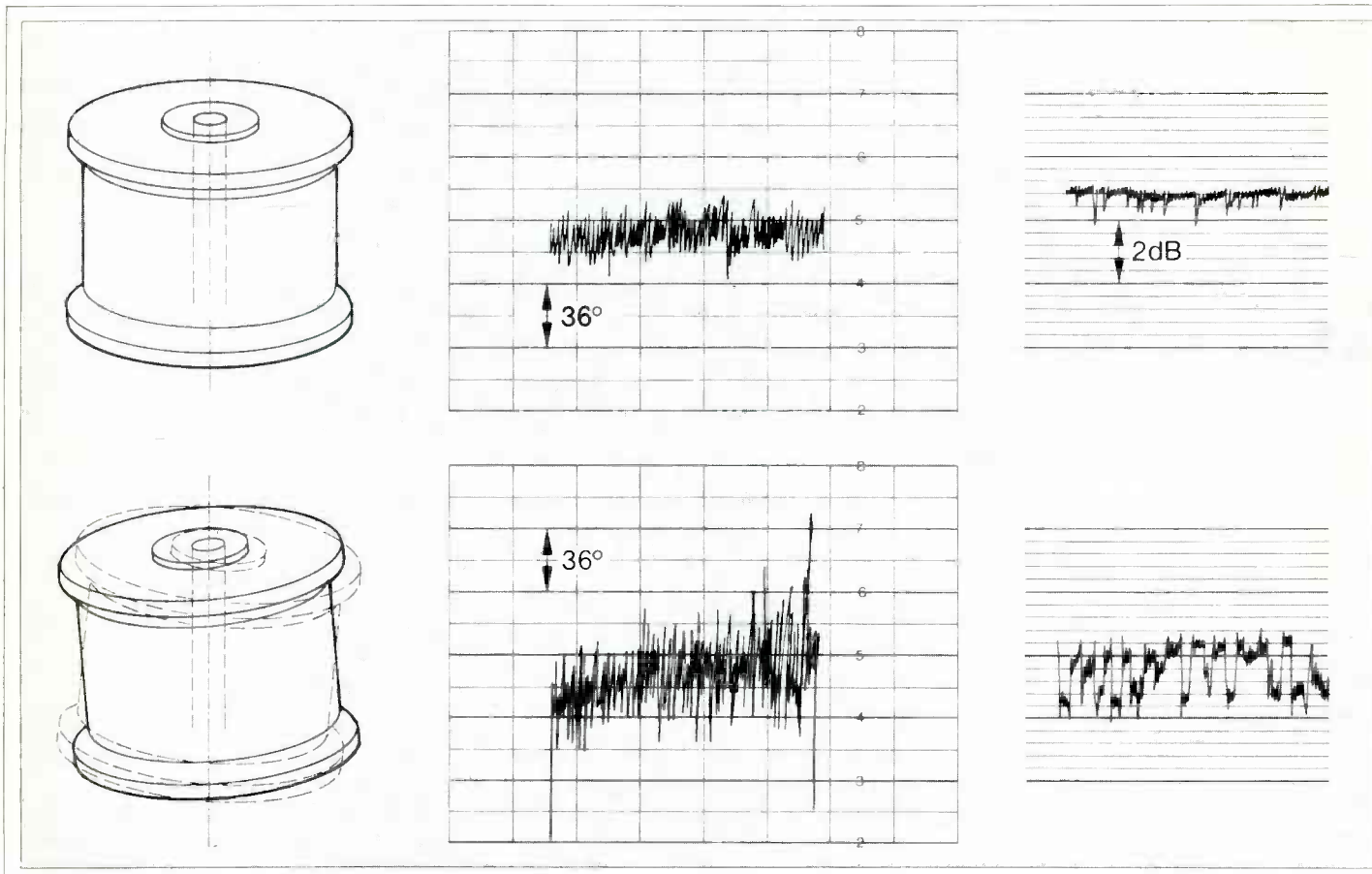

Fig 4: Influence of different rollers on phase and level uniformity — replay 10 kHz

Guide rollers must run true, be round and run concentric with their axles; eccentricity can be significant problem with cheap rollers, causing short-term azimuth fluctuation and in extreme cases contributing to wow. Total eccentricity should be less than 0.04 to 0.05 mm.

To avoid HF loss and phase jitter, the axles and bearings should be accurate to better than .015mm and must remain at right angles to the shell and tape path, regardless of tape tension. True running must be maintained during fast wind at rotational speeds of 100 rps, without wear.

Rollers must be cylindrical across their faces between the flanges, not tapered or barrelled, to avoid distorting the tape, bad running and azimuth problems. Coincity, or difference in diameter between the two ends of the contact surface of the roller, should not exceed about 0.03mm. There must be no moulding seams within the area that contacts the tape, nor moulding 'pips' in the flanges; either can cause tape damage and cyclical speed variations.

Roundness and true running will be affected by the method of construction of the rollers — solid, spoked, symmetrical or asymmetrical — as well as by the plastic material and method of production: how they are made is less important than good, reliable results in practice. While solid rollers are less prone to the distortions introduced by spoked construction, they may suffer from uneven shrinkage of the thicker plastic material and may consequently vary in performance more than spoked types.

The accuracy, profile and spacing of the flanges affects weave and edge damage to the tape, and hence both effective azimuth and head contact. Flanges should be correctly spaced, to guide the tape without intruding into the tape path and distorting it. Wobble, angular play and excessive vertical play of the roller on the axle contribute to bad winding, mechanical noise during wind, tape damage and phase instability **(Fig 4)**. However, some perceptible vertical play of the roller on the axle is necessary in order to allow the roller to move up or down enough to allow correction of the tape path if there is a small error in the seating of the cassette. This allows the tape to run between the flanges without their intruding into the tape path.

The axles on which the roller guides run must be exactly at right angles to the shell, to avoid introducing deflection of the tape path. Rollers with metal axles are frequently regarded as being more accurate than rollers with plastic axles. However recent BASF research suggests that accurately moulded 2 mm diameter plastic axles, in a suitably stable shell material, can give more accurate running than 1 mm steel pins. Because of the greater stability of the plastic axles with regard to the shell, the perpendicularity can be better than with metal pins and the influence of the axle on the tape path is reduced; provided the right materials are used for both the axles and roller, there need be no increase in friction and no stiction.

As with all the plastic elements, temperatures stability of the plastics used must be good to ensure smooth running.

In some cassettes, roller A **(Fig 5)** is replaced by a fixed post or skid guide; because of the long wrap, this may add substantially to the friction and stiction — and therefore flutter — but is a cheap solution to avoiding the errors caused by eccentric or badly moulded rollers, provided the skid itself is very accurately moulded.

Bad rollers (or bad skids) will repeatedly distort the tape, causing damage and inferior performance.

Pin and stay guides. The two moulded plastic pin guides on either side of the replay or record/play head **(Fig 5, H, L)** have been found to have the most influence on replay azimuth. The guide pins, usually moulded plastic but sometimes inserted metal pins, need to be perfectly cylindrical and must not taper or bulge. They must be exactly at right angles to the C-0 housing, as any error in azimuth or zenith of these pins causes an azimuth error **(Fig 6)**; deflection of the pin, measured across the width of the tape path, should be less than 0.015 mm.

There is also some influence on azimuth due to the stay guides B, F, M and N; their zenith have a lesser effect on the accuracy of the tape path and a deflection of up to 0.025 mm across the tape width is acceptable.

In addition, all these guides may introduce ▶

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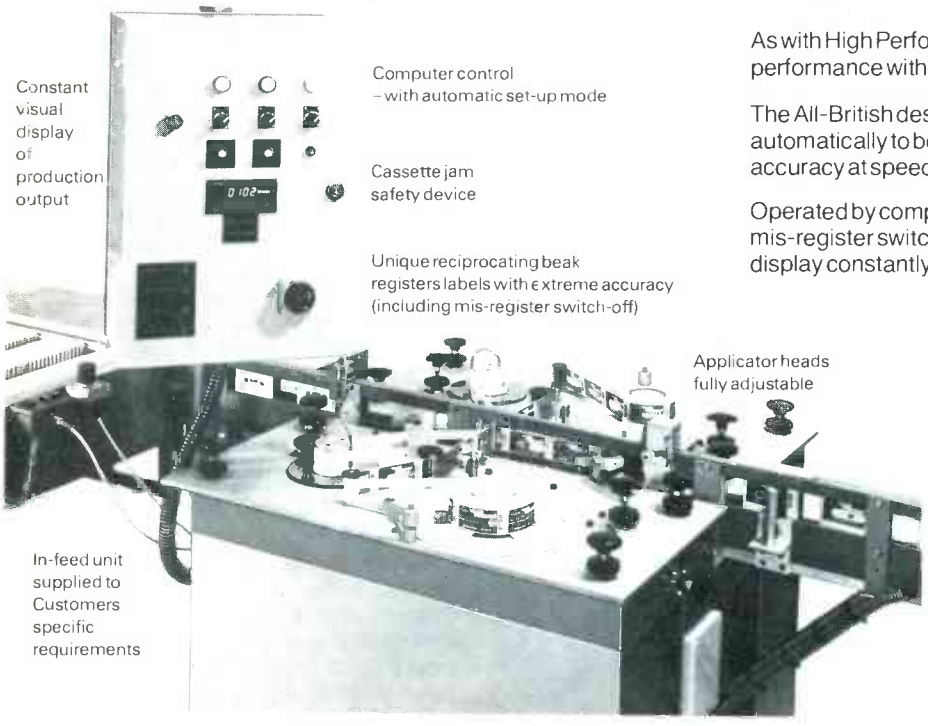

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friction and stiction with the chosen tape, affecting flutter and smooth winding, and their behaviour will depend on the shell material used. Badly moulded guides may damage the surface or edge of the tape and accumulate oxide. Surface damage and the build up of oxide around the tape path may cause dropouts and HF loss; edge damage may cause flutter, dropout on one channel (left) and ultimately jamming due to poor bad winding.

Foils. The thin plastic foils that line the C-0 prevent the tape rubbing on the plastic housing of the cassette shell and can contribute to smooth, jam-free running.

Foil design varies: they may be flat, dished or shaped, or embossed. Generally the flatter foils give lower flutter, while the more strongly shaped foils give enhanced tape guidance during fast loading, but at the expense of flutter. The form of the foil also contributes to runnning noise: flat foils tend to result in a noisy wind, since the hub on which the tape winds is more free to move up and down. The worst case is where the shape of the foil differs in the two halves of the C-0, due either to production tolerances or the effect of temperature fluctuations. This can contribute to bad winding.

Foils may have a lubricated coating to ensure low friction and good winding, and some conductive coatings may help reduce the build-up of static. The worst types of foil may offer none of these qualities, may warp with temperature change and contribute to bad running.

Hubs. The tape is wound on 22 mm diameter hubs and builds up to a diameter of over 50 mm. Hubs should have about 1 mm of play within the housing to allow their correct seating on the winding centres of the take-up and rewind drives. The hubs must be truly round and accurately concentric to minimise wow, offer low friction in contact with the C-0 shell, and provide good anchorage for the tape with no wow-inducing bulge at the anchor point. Over-large apertures at the centre of the hubs may result in sloppy winding; undersize apertures may cause difficulty in insertion and consequent distortion of the cassette.

Hubs generally have little effect on azimuth, but badly moulded hubs can contribute to wow & flutter, and to noise during fast winding.

Other guidance devices. Certain cassettes, notably those from BASF, carry additional guidance mechanisms to those specified in IEC94. In the case of the BASF Security Mechanism (SM), they take the form of moulded plastic devices (tusks) to control the tape wind and guide it from hub to guide-roller and back again (**Fig 5**); the aim is a better wind and tape handling.

Some additional slight friction is induced by SM, but the effect is generally negligible (except possibly with very low power battery equipment) and it is claimed that the benefits outweigh this slight disadvantage. Such devices have not been widely used in C-0s for bulk-duplicated cassettes, presumably on cost grounds.

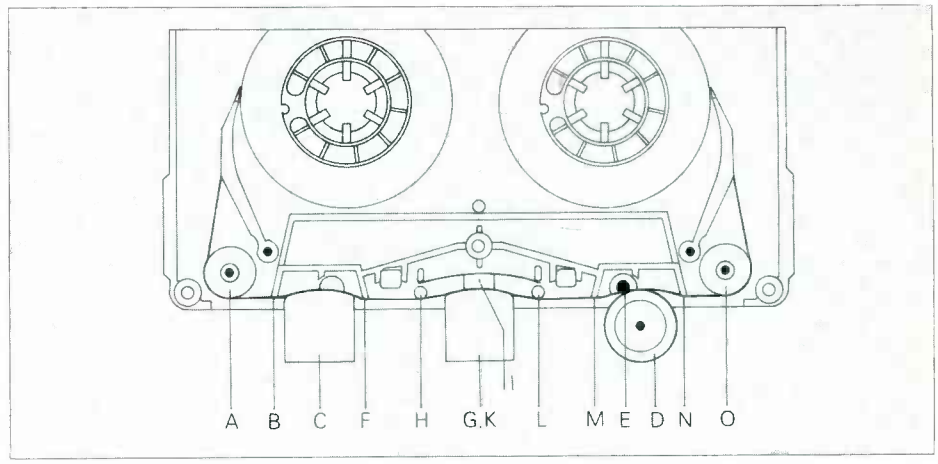

Fig 5: Tape path and C-0 components. A = left roller and axle; B/F = left stay guides; C = erase head; D = pinch wheel; E = capstan; G/K = record/play head(s); H/L = pin guides; I = pressure pad and spring; M/N = right stay guides; O = right roller and axle.

Pressure pads. The pressure pad must extend across the full width of the tape and overlap on both sides, to ensure even pressure and reliable head contact. The pad must be long enough to press on both gaps of a dual record-and-play head; older-style 3 mm pads are inadequate for modern high quality machines.

The pad is usually of special close-textured felt, about 5×6 mm, mounted on a berryllium bronze spring. Sometimes the pad is of foam plastic and the spring of plastic: neither are generally very satisfactory except on grounds of price. Felt pads must be free from projecting fibres, foam pads must not exhibit a tendency to stiction. The spring should be non-magnetic, wide enough to provide a stable mounting for the pressure pad.

Excessive pressure from the spring will cause excessive friction/striction and poor flutter performance. Too little pressure results in unreliable head contact. With the pad in contact with the head, a force of 0.5 to 1.5 g/mm^2 is specified.

Though the effect of the pad and spring on azimuth is less than that of the guide pins on either side of the head, it does influence the tape path as well as head contact, and needs to be accurately positioned. Incidentally, the effects of bad pads on azimuth and head contact are less apparent on double-capstan replay machines than on single capstan types — a point to remember with regard to quality check machines.

Screen. Behind the pressure pad is a screen to protect the replay head from magnetic radiation and provide some electrostatic screening. A good screen will provide 15 to 20 dB of mains hum reduction, a poor screen is only cosmetic.

Part two will examine the C-0 and azimuth, with details of the new BASF azimuth *Template Cassette.*

Author's acknowledgement: I am indebted to BASF for assistance in the preparation of this article and the accompanying illustrations.

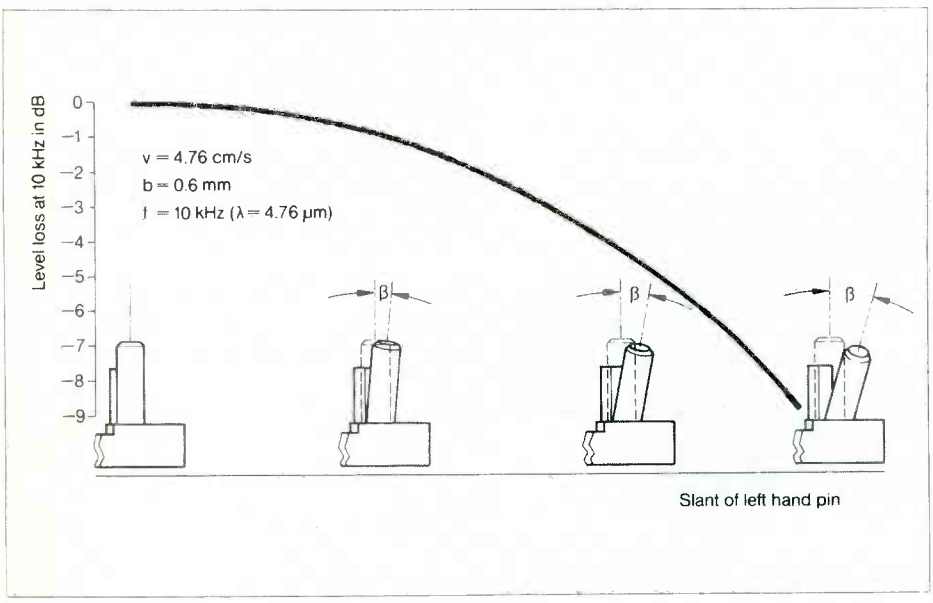

Fig 6: Relationship between the deviation of the lefthand pin from the vertical position (angle of error β enlarged approx 10 times) and the loss in level at 10 kHz in dB.

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Nimbus US expansion

Nimbus Records has opened a CD manufacturing facility in the USA. Nimbus' Mark Galloway discusses the new operation with Ken Kessler.

Though originally earning admiration for superb LPs, Nimbus quickly established itself as one of the world leaders in CD production. The company set up the UK's first CD plant, beating the Japanese and other Europeans, and was the first company outside of the Philips/Sony axis to develop its own CD laser mastering system. The company's self-reliance has resulted in the ability to adapt quickly to new trends in digital storage, and has made Nimbus a prime choice in the UK for record labels lacking their own CD production capability.

To meet the demands of outside clients, Nimbus opened a second plant in the UK in 1986. In October 1987, the company set up a plant in Charlottesville, Virginia, again showing that British firms can — when inspired — match the efforts of the Japanese and European giants.

Mark Galloway, vice-president of manufacturing for Nimbus in the US, recounts that, "We first broke ground for the Virginia facility and started putting concrete in around the first week of March 1987. Less than six months later — by September 13th — we had our plant running and in full production. The plant is new from the ground up. We completely designed, built, and outfitted the entire facility in six months, and we believe that to be something unique.

"The plant is a 65,000ft^2 facility, situated in 265 acres of farmland. We purchased an estate in Green County, Virginia, which is just northwest of Charlottesville, and we re-zoned 25 acres of that land into an industrial setting. The rest of the area is an active and working farm, it overlooks the Blue Ridge Mountains, and it's a gorgeous setting. This gives us possibilities for unlimited expansion. Mastering is currently a part of the existing facility, but we have plans for a 10,000ft^2 mastering facility that has just finished the design stage, and a recording studio which will be used for our own label. This will also cover around 10,000ft^2 set back into the woods overlooking the lake. As you can see, we have a lot of plans for that site.

"Right now our world headquarters are in the UK. We have the two CD plants in Wales, one in Monmouth and one in Cwmbran; however the emphasis of the company is being directed towards the United States. This will, I think, in a short period of time, become the world headquarters for Nimbus Records.

"We'll service the US and Canadian markets, and any South American markets that may have developed, but basically we'll concentrate on the North American continent. The European operation will concentrate in the European sector."

Divided Markets

As for the division of the markets between the UK and US facilities, Galloway explained that Charlottesville would send positives of US-generated material to the UK plant, which would then grow their own stampers and generate custom pressings. It's therefore unlikely that Nimbus would be exporting complete, shop-ready, CDs in either direction across the Atlantic. This would also enable simultaneous releasing of Nimbus' own recordings in the two key markets without shipping CDs back an forth.

Galloway doesn't expect the current price differential between the US and the UK to cause customers to prefer one Nimbus operation over another. "Right now the two markets are different, so there is a difference in the pricing structure between the two continents. However, I believe that will probably narrow in the very near future as the Europeans become as aggressive as we are in the States, the Europeans being slightly behind from a price standpoint."

As for matching the price-slashing which is prevalent in the Far East, Galloway asserts that Nimbus isn't affected. "We've never been one to compete against what we consider to be the low-priced, potentially lesser quality products. We believe that we have a high quality product, we offer the best service, we have 100% quality inspection on all our products — each disc is inspected, not batch QC only. We think that someone should go to a company who's going to give them that quality. So we may be a few cents higher but, yes, we'll be competitive."

Nimbus' quality control starts with batches pulled at every stage, including mastering, pressing, metallising, lacquering, and printing. Before packaging, every disc goes through an automatic testing/inspection machine, then on to hand-packing. Nimbus' packers have all gone through extensive QC training and are responsible for final visual inspection for cosmetic problems or pinholes. The testing/inspection machines were co-designed with other suppliers.

Nimbus was also involved in the design of other equipment at their facilities, but prefer to keep the designs in-house rather than market the technology. Familiar equipment used by Nimbus include Nestal presses and Nigon moulds.

As for the speed and capacity of the Nimbus operation, Galloway believes that the company is one of the fastest, due to a unique moulding system and the use of robotics. Nimbus has bettered the 8 second cycle time 'significantly'. Galloway puts Nimbus' primary strength down to the fact that the company understands every aspect of production, all the way back to the recording and mastering stages. This is enhanced by Nimbus' involvement in the design of the proprietary equipment each step of the way. "Other manufacturers have gone out and bought

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'package systems', a Sony or a Philips mastering lathe and any other components that go with a CD manufacturing system. If something goes wrong, they have less of an understanding of how to correct it and how to react to it because they haven't built the process. We have literally, from 1984, built the process in-house, from the laser mastering all the way through to the end-product. We've been through the entire process. We understand what's involved in every single part of the process. When something happens, when something goes wrong or a parameter changes, we know how to address it immediately. We have technicians and design engineers in-house that have experienced that problem as part of the design criteria. It puts us in a position to be fairly reactive to the market from the standpoint where we're already doing CD-ROM, CDV, CDI, and all of the other CD formats — we can react to those very easily because our lathes were designed in such a way that we have a lot of flexibility in our system.

Capacity

"As far as capacity is concerned, the Virginia plant is set up in two phases. Phase One will have six presses running, which is what's in operation now. Phase Two is another six presses. We have a capacity in Phase One to put out 16 million discs a year, with a worldwide capacity from the three plants of 50 million per year. In Phase Two, our capacity will more than double because of technological advances.

"The target date for Phase Two is either this fall or possibly sooner, depending on our market penetration. Nimbus is just restaging itself in the US market. We had a large customer base back in 1984-5 when we went into the CD business originally, but as manufacturers opened up here in the United States they were able to draw on the home clientele.

"So far, at the Virginia plant we've pressed for Virgin Records US, but we concentrate our business on the smaller labels, people that want to do 1000 to 5000, those people that are mostly ignored by the other majors. Book-Of-The-Month Club, Musical Heritage Society, and so on. We'll do a minimum of 500, and can supply shop-ready product in as little as two weeks.

"We have the capability to do everything from pressing the discs to warehousing and drop-shipping and everything in between. We have affiliations with local print companies in Charlottesville; a customer can come in with the artwork, and we can generate a shelf-ready product.

"The time can go up depending on the artwork or if we do print. Print takes longer to make than the CDs. But our normal turnaround is two weeks, and by the end of '87, we hope to make that one week. Re-orders we can usually do in three days."

As for Nimbus' future plans, the company intends to concentrate on developing its

Precision graphics with laser etching

potential in the US market. In addition to CD manufacture, Nimbus Records has been establishing itself Stateside as a serious contender with its own classical label, and will be expanding the Nimbus catalogue with recordings generated in the US. Galloway stresses that the company is in the communications business and that CDs are just one method of communicating the arts.

New markets

In looking for new avenues within the industry, Nimbus is involved in research in artificial intelligence as well as solid-state technology. As for the immediate future, the company is already able to quote for CDV manufacture and expects to take initial orders and initiate production in January 1988, depending on the state of the format's market readiness.

As for DAT, Galloway admits that, "Things are in a very premature state right now, but Nimbus is pursuing a series of partnership-type arrangements with other record companies. We're positioning ourselves to be able to duplicate DAT both in Virginia and the UK for release in both America and Europe, not just our own label but other labels. We are currently working out pricing structures, but when all of this will take place really depends on the industry. Our opinion is that DAT won't be where CDs are until 1990 or 1992."

Because of the controversy surrounding DAT, Nimbus is quite naturally showing caution. Galloway feels that the announcement of this new format has caused confusion among consumers, but believes that the public is quite capable of deciding whether or not it wants DAT. Nimbus does not feel that DAT will have the same impact on the market as CD.

Regarding the other 'new' format, the three-inch CD single, Galloway feels that the current five-inch CD sporting Nimbus' newly developed laser graphics is 'a much neater, unique way to put forward a promotional or CD single. However, we are tooling for three-inch should there be a viable market. We will have the capability for pressing three-inch CDs because our equipment is so flexible, and with minor re-tooling we can produce three-inch discs. Right now, we're waiting to see what the market will accept.'

Laser graphics

The new laser graphics, already appearing on CD singles in the UK, are limited only by the encoded part of the disc. In practice, with a CD single averaging 20 minutes of music, this enables a customer to specify a laser-etched border 32mm wide. Additionally, a printed label can still be added over the remaining space on the non-playing surface but this does add complexity because of aligning the laser graphics with the conventional artwork. As the laser etching is part of the mastering process, there is no extra charge. Nimbus can also offer their own unique five-colour label printing process at extra cost, which will provide high resolution graphics for luxury or promotional titles.

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Volatile Virgin

"The sales department would like to place a hundred-thousand order on everything, but my job is to make sure we're not over-stocked or under-stocked". Peter Herring talks to Rick Carter at Virgin Records.

"You just react; you take pride in being able to forecast, in being a bit smart here and there. 'I'm really glad I pressed that extra thirty thousand,' you think. But that's what your paid to do — big deal!"

Head of production at Virgin Records for the past five years, Rick Carter needs to be, "a bit smart here and there" (as he modestly puts it) every working day, especially in the decidedly unpredictable area of the seven-inch and twelve-inch single.

Carter started in the Chrysalis Records' post room nine years ago before moving into production. Arriving at Virgin in 1982, he assumed responsibility for all product sourcing and print buying for Virgin and its associated labels. When compact disc came, his role was extended to encompass CD manufacture for Virgin worldwide (as opposed to the UK with vinyl and cassette), yet he feels the newer medium still presents less problems than its predecessors: "Up to about six months ago, CDs were still a special product. Now it's just another format, and a relatively simple one. CD is a pleasure to deal with.

"It was a new format and we all had to learn about it, including the manufacturers. So they went to the record companies to see what we needed. We grew up together with CD and it's been done fairly logically. With albums and cassettes, it's a hotchpotch system: demand for seven-inch singles suddenly drops; there's a demand for picture bags instead of black bags — we have to adapt to all this.

"So the system's grown, but without being organised. It's just reacted to the expansion of the industry."

Carter works with a team of five on the 10 labels now under the Virgin 'umbrella': Circa; DEP; Earthworks; Sire; Ten; EG; Venture; and, of course, Virgin itself. Next year, he'll have an eleventh — the new Virgin Classics series headed by ex-EMI/CFP man, Simon Foster.

From the production point of view, Carter considers classical titles to be no different from any other product — apart from the extra emphasis to be placed on quality control: "I've got to make a certain quantity by a certain date, and that's basically it."

As far as Virgin Classics is concerned, February '88 is the date, with a launch in all three formats, although — given the way the classical market is moving — Carter is no doubt right in believing CD will assume the greatest importance.

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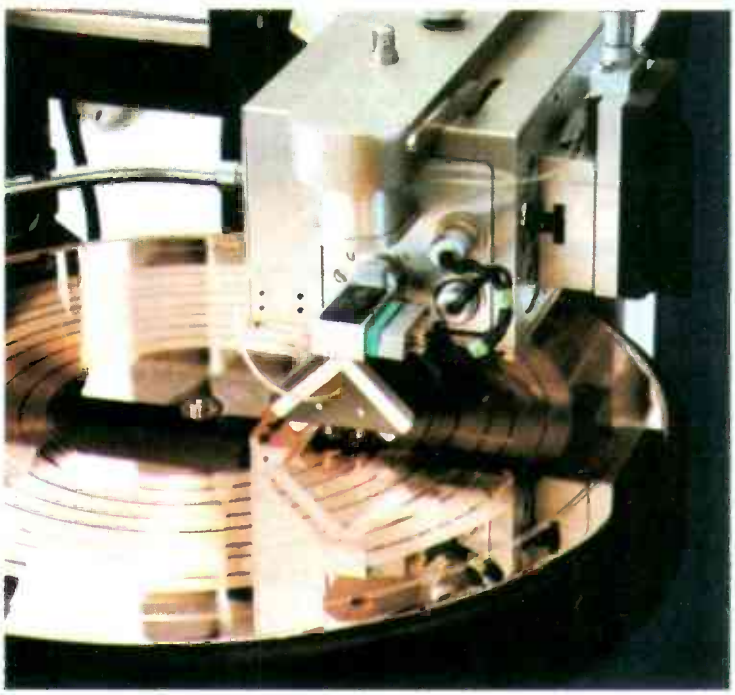

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RECORD COMPANY VIEWPOINT

"That's where EMI are really good. They're able to suddenly switch presses, move product and get it through very quickly."

"Essentially, it's a lot easier than pop product, presumably because you know your market a bit more — or will get to know it."

The classical titles — he doesn't yet know how many will make up the first release — will contribute to the 5 to 7 million CDs Virgin expect to ship during 1988. Virgin's main supplier remains Nimbus, but Carter admits the current price war is "complicating things".

He adds: "Despite this, there seems to have been no really drastic switches of allegiance. We haven't changed manufacturers because of price."

In common with all the Nimbus' clients we've spoken to, Carter is very satisfied with the service he gets from Wyastone Leys and Cwmbran.

"With CD, Nimbus have been able to start from the very beginning understanding the record companies' problems, whereas other manufacturers have tended to go along with the flow and try and adapt all the time.

If only," he adds, "we could run the vinyl and cassette side of the business as efficiently as the CD side."

A comment, he emphasises, in no way intended to reflect adversely on EMI, with whom Virgin have a 100% manufacturing and distribution deal on vinyl and cassettes.

Vinyl & cassettes

"It's a different business — more volatile than CDs."

Did that mean there were problems getting what he wanted , when he wanted it?

"Yes, but there are always going to be hiccups with vinyl and cassettes. Half the stock problems are a result of our own miscalculations, but EMI seem able to get us out of them quicker than anyone else. They tend to be more flexible than other pressing plants."

Constantly monitoring pre-orders, Carter does sometimes find himself having to up pressing quantities only a few days before call-off:

"That's where EMI are really good. They're able to suddenly switch presses, move product and get it through very quickly. They react very well. But I've had some bad experiences elsewhere. I don't understand why certain systems are set up within manufacturing companies. If they want to be competitive, they've got to give what the customer wants, and by nature it's a volatile industry.

"There's no point in telling him, 'Give us a warning of what you want a week before and, if you go under, okay. If you're above it, I don't know if we can fit you in.' You just can't do it like that. There are certain manufacturers — and they'll know who they are if they read this! — who used this stupid system. Thankfully, EMI don't operate like that."

To understand the problems faced by Carter and his colleagues also requires an understanding of the unique nature of the pop market. Surprisingly, perhaps, Carter considers the biggest-selling albums to be the easiest product of all:

"All the way down the line — the people on the presses, the people in distribution — they all know it's number one. Everyone *knows* the urgency of these.

"The difficult ones are the singles. There are strict rules governing what gets on to the 'A' list of Radio 1 and what can get on to *Top of the Pops**. If it's out of the 75 but, for some reason or other, sells particularly well and gets into it, people will come and order who wouldn't have ordered it before.

"That's not the time to go out-of-stock! If you do, it will affect the chart position, therefore the whole promotion, and the whole 'avalanche effect' will come to a halt. On the other hand, you don't want to have too much stock.

"Sometimes you get something going out the next week and you know in your heart of hearts that if you put twenty thousand on, you'd sell them. The art is not to put that twenty thousand on. In effect, you make yourself work harder, by putting ten thousand on and then looking at it again in the afternoon and saying, 'That was a mistake — put another ten thousand on'.

"It's a waste of time to some extent, but you feel safer. A lot of the problems you create for yourself."

Production & sales

He does believe, however, that the set-up at Virgin, with its close and constant communication between the key departments, was better than others in this respect:

"We obviously work very closely with the sales department (some other record companies not quite so obviously I would have thought!) and work out between us what we think the selling's going to be. Then we place the orders and get the off-the-cuff spare production parts in case we're wrong. As far as volatile product's concerned — the singles just released, the stuff in the charts, the albums that are selling very well — we have a daily meeting, around midday, to go through them all. Orders are placed as a result of that.

"You get a gut feeling: we're more often in agreement than disagreement." But, I suggested there must be occasions when the sales and promotions people "wanted it yesterday", as the saying goes. How did he react then?

"I'll do it for them, but I'll get annoyed with them. From the top of this company down, everyone's very well aware of the problems we have so far as production is concerned. This makes life easier and we can give the manufacturers more time. We have enough scheduling meetings for release dates to be set realistically. If someone wants a rush release, I say, 'Fair enough, but look: we've got so-and-so at No 1, Boy George running in at 26, Peter Gabriel at 16, we've got this at 44 — without any airplay. They're all going up, it's coming up to Christmas. We've got *Now Ten* being pressed at EMI. We've got a No 1 album, a UB40 album tv-advertised at No 3; EMI have got Paul McCartney tv-advertised at No 2 — and you want me to release a single in three days time! If I do that, I can't guarantee I'll get enough presses for something else and that'll go out-of-stock. I *will* be able to do it, but this will be the consequence of me doing it.'

"They're well aware of all this, so they realise that if rush releases are necessary, the risks have to be taken."

*BBC TV nationwide chart show

"From the top of this company down, everyone's very well aware of the problems we have so far as production is concerned."

Production dept

The members of Carter's five strong team do not have individual responsibility for one or two labels. The tasks are divided more broadly, with one handling CDs, one dealing with vinyl, cassette, and new releases, and another controlling singles. The very nature of the business, though, requires flexibility in all these roles on a day-to-day basis. Carter likes to let each of his staff enjoy the satisfaction of seeing a product through from start to finish. He also encourages close friendly contact with his suppliers:

"We ask them up on chart day. They sit in the production office and get to see and understand how we work. And if they understand, maybe they'll go away and work a little harder for us!"

However, he does emphasise his belief in getting the kind of forward planning and organisation which doesn't put suppliers constantly under pressure, adding, "That way, when we do want something in an impossible time, they will do it, because they know we do not 'cry wolf'. That's where we differ from other cmpanies.

I know there have been others who are always giving EMI headaches. I ask for something to be put on press on a Friday because we've got a midweek chart position and they say they can't do it. And I know it's because some other record company hasn't been organised enough and they're pressing and rush-releasing a single on that day."

Release dates

Organisation, Virgin-style, means scheduling — realistic scheduling — six months ahead

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RECORD COMPANY VIEWPOINT

(when I spoke to Rick Carter in mid-November, singles, albums, and follow-up singles releases had all been planned up to May).

"The dates are when we think — all things being equal — everything's going to be ready for manufacture to be done easily. It's all very well-structured and people do take notice. EMI have commented that, generally, our release dates are governed by whether we can get it out on time. At meetings, I say, 'Let's have a realistic release date, so that we can get the video in on time, get the sleeve artwork as we want it and so we can get the pressings done'. I like to give manufacturers at least five working days to fulfil orders. That way, if we do have a rush release it can be fitted in. A lot of companies don't seem to do that: they think production is just some part of the organisation that always gets things out, so they never worry about it. "Here, we're always asked if we can make a release date, rather than being told: 'That's the release date — make it!'."

Surely the ups-and-downs of the singles chart could rapidly make a nonsense of even the best organisation?

"We get lots of indications," Carter explains, "reps' reports, mid-week chart positions, predictions from Gallup. The mid-week chart comes in on a Thursday, so it doesn't reflect the effect of *Top Of The Pops*, which goes out that evening. *Top Of The Pops* can be the final make-or-break for any single. It carries that much clout.

"On tv, that's the one we're really after. If you know a single got *Top Of The Pops*, then you tend to prepare stock levels for that. As to what degree of accuracy is another question, but it doesn't worry me too much. You learn to live with it. You know you're going to be wrong. I don't think I've ever been completely right — I don't think anyone ever is. But you take some degree of pride in being fairly accurate!

"If you go on the basis that you're always going to be wrong, then at least you can't go too far wrong. The sales department never thinks I've got enough stock — and quite often they're correct!

"But I hate scrapping overstocks. Albums you can maybe regenerate as a budget series, and we don't tend to delete twelve-inch singles as rapidly as other companies. But the seven-inch single — once they're dead, they're dead, and you can be left with horrendous problems."

How much did he get involved with 'special promotions' — and how much did he involve his suppliers in them?

"As far as the suppliers are concerned, it's just another manufacturing order. EMI don't have to know why I want that order. All they have to know is the quantity.

"With the *Now* albums, which are always double albums, big quantities, rush-released, I might have to ask for part-shipment, or shipment direct from the factory.

"As for getting white labels to the dance clubs, getting product out for promotions and press departments so that it can be reviewed, yes, of course I get involved in that. They tell me when they want it, and I have to make sure they receive it on time."

"We get complimented by other territories on our specials — the gatefolds, the foil-embossing and so forth."

Print

As mentioned at the start, Rick Carter also has to ensure that the sleeves, labels booklets and inset cards are always ready to be mated with the product. For record labels and cassette inserts, he uses CRS (Cassette and Record Services); for album sleeves, he goes to the Tinsley Robor Group, while splitting the production of CD booklets between the two. Coincidentally, he dealt with both companies while at Chrysalis and has no intention of changing his allegiance:

"We have no plans to release anything on DAT, but I don't see how the industry will be able to resist it."

"They're good. I'm not just saying that because it'll appear in print. If I wasn't happy with them I wouldn't be doing my job properly. "Printing is good — it has to be. Artists put pressure on. They see the proofs and they want to make sure it's correct — as does our art director. Of course, things occasionally go wrong, but it's like getting a warped record — you have to be realistic about it. When you're turning round millions of units, you're going to get the occasional item that isn't great.

"We get complimented by other territories on our specials — the gatefolds, the foil-embossing and so forth. European territories don't like doing them; sometimes they can't do them, so we have to supply them."

But Carter is not about to go soft on his print suppliers:

"They have to be co-operative. I have 100% agreements with my suppliers and I re-negotiate them each year. The only reason they've got the business is because they're good and they're reliable. I've got to know that when I place an order and give a date, I can assume it's delivered.

They do very well. I think they're the best — they've got to be the best to keep my business. With the sort of quantities I put out, I can't experiment, so — as long as they remain competitive — it's difficult to see any new supplier coming in and taking that business from them.

My printers are geared up to turn round what I want quickly — it's part of the contract. But if you give them a lot of volume, you get that priority service."

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But what if EMI or Nimbus failed to give a similar service?

"With EMI, if we want something which they can't manufacture, such as a picture disc or coloured vinyl, we'll go elsewhere. If we get really heavy and they can't manufacture everybody's goods as we want them, then our contract gives them the option to go outside and place our order with someone else. But we never really get into that situation now: it used to be more prevalent three to four years ago. Nowadays, there isn't so much of it, perhaps a reflection of unit sales going down.

Digital quality

"Nimbus give us a very quick turnaround, although I think everyone can offer a good turnround on CD these days. Other companies will deny it, but I think it's a result of over-capacity at most plants. Historically, though, Nimbus were always ahead of the game as far as quick turnround was concerned."

There's no quality control, as such, at Virgin, although naturally individual customer complaints are dealt with. Carter prefers to leave the QC to his suppliers, although he did conduct one analysis of 'faulty' CD returns into EMI:

"I employed someone to go through the two thousand we got back from EMI and listen to them to see if they could hear the fault noted on the sticker. Eighty-five per cent were perfectly okay."

Like others in the software side of the industry, Carter points the finger at certain CD players here: "One Phil Collins album and the Philips *CD104* player gave us a lot of problems, for example."

Mention of the relationship between hardware and software inevitably prompted a request for the production man's view of DAT. As head of production at Virgin, the response was an unequivocal "No comment!", but, Carter continued:

"As a personal opinion, I think it's a lot of fuss over nothing. I think DAT will come, and software will be available. We have no plans to release anything on DAT, but I don't see how the industry will be able to resist it.

"I've shown a DAT cassette to people around the company and they've all said, 'Isn't it cute', but when you start talking about price, it's a different reaction.

"It doesn't look like a high-speed DAT duplicator is going to be available for at least six months or even a year, and then you're talking about a lot of money so I hear. Shop prices are likely to be horrendous.

The hardware companies need the software companies' backing. Basically, we're there to subsidise their hardware campaign and if they need to promote DAT, then we need it at a realistic price.

I can see DAT doing very well in cars and Walkmans and, you've got to face it — although it's an obvious thing to day — you can record on DAT. As a consumer product, people I've shown the DAT cassette to, love

"And then we hear about the mooted prices for CDV — possibly the same price as CD singles. Now, what's going on here?"

it. Same as we loved CDs when they came out: high-tech and they looked great. And if you have something that's visually attractive, that's half the battle." While sympathising with what he describes as the "serious side" to DAT — that of copyright protection — Carter is convinced that, so far "everyone's been looking at it a bit too negatively. It's a fascinating new medium."

Like others, he anticipates DAT paralleling CD, not supplanting it. As CD is to vinyl, so DAT could be to the analogue cassette.

Carter contends: "If record companies were satisfied that copyright protection was taken into account, there's no reason why we shouldn't look at DAT positively — and I'll be shot for that!"

Speculatively, he adds, "And what will happen if Sony buys CBS? Will pre-recorded DATs become instantly available? I can't see other record companies holding back if one of the majors suddenly started releasing DAT."

That situation, of course, would also be of considerable interest to the Copycode lobby although Carter claims Virgin have "no stance" on that contentious topic. Personally, he thinks Copycode "a nonsense", and acknowledges the surge of feeling against it from technical quarters.

He is equally spectical about CD Video, although pre-empted his views on the system by relating what he cites as "one of the most annoying aspects of the record industry".

CDV & CD singles

"In August 1986," he continues, "we launched CD singles as the same price as twelve-inch vinyl singles. Obviously there was a loss involved, but the operation was

"The people who become complacent . . . are the ones that will go bust"

considered a marketing expense — the same as spending x-thousand pounds on an ad in *Smash Hits*. The trouble with ads is you can't tell if it's worked. With CD singles we *did* prove that they benefitted chart positions — very drastically in certain instances.

"We were able to do them because I think our manufacturing price was more competitive than other major record companies were getting, whether from their own pressing plants or elsewhere. Also, thanks to our foresight in CD manufacture, we had the turnround times.

"We'd said 'yes' to CD in 1983; we could get our back catalogue out, and then get closer to simultaneous release then anyone else because we'd exploited our back catalogue. CD singles were not a problem for us, as they might have been to others.

"Then — in their wisdom — the BPI decided to put a moratorium on CD singles from June to November '87, effectively banning them (if they're not eligible for the singles charts, what's the point of doing them?). For what reason — maybe political reasons? Let them answer. Yet we had reports of people without CD players buying CD singles because they knew they'd buy a machine in the future.

"Now CD singles have been re-introduced, with a minimum dealer price. And then we hear about the mooted prices for CDV — possibly the same price as CD singles. Now, what's going on here?"

Pointing out that CDVs will not be eligible for the singles charts, Carter concludes: "At this stage, I can't quite see where CDV fits in. We'll treat it as and when the time is appropriate.

"Personally, I have my doubts: I'm not too sure of it at all, although I'm only talking about the five-inch version here. Speaking as a user, I can't see myself ever being interested in buying a CDV player. I don't know why I'd ever want one. I did want a CD player, and I do own one. If a DAT player was offered, I would want one of those, but for visuals, I want something to record on.

"We're still trying to get *CD* established — it's taken years to get this far. Take that Philips CD campaign a while back: great, glossy advert — didn't tell you a thing about CD! Didn't even tell you that you could plug it into the back of your current system. Just a glossy product. People thought: 'I'm never going to be able to afford one of those'. Stupid."

Yet, Rick Carter feels, whatever the product — be it an existing format, or a future one — the essence of good production is commonsense born out of experience.

He admits: "You learn from your mistakes. Of course, Sod's Law always prevails. You know that something's *bound* to go wrong.

"After the years you've spent perfecting systems and establishing checks, the unexpected happens. So you eliminate it next time."

Were his suppliers doing their best?

"If they weren't, I wouldn't be using them. It's a buyer's market.

"I'd like to pat my suppliers on the back — pat them on the back with one hand, but warn them with the other. There's always a big stick hanging over them and they know that. The people who become complacent in this business are the ones that will go bust."

Where he feels Virgin scores most over the rest is in communication:

"There's constant talking, constant feedback, with people getting involved all along the line. We put up four sales flashes a day all round the building. We don't hide stock levels from anyone. Everyone is encouraged to take an interest — there's no 'closed-door' mentality. It's very 'family-oriented' — and that's going to look terrible in black-and-white, but it's true!"

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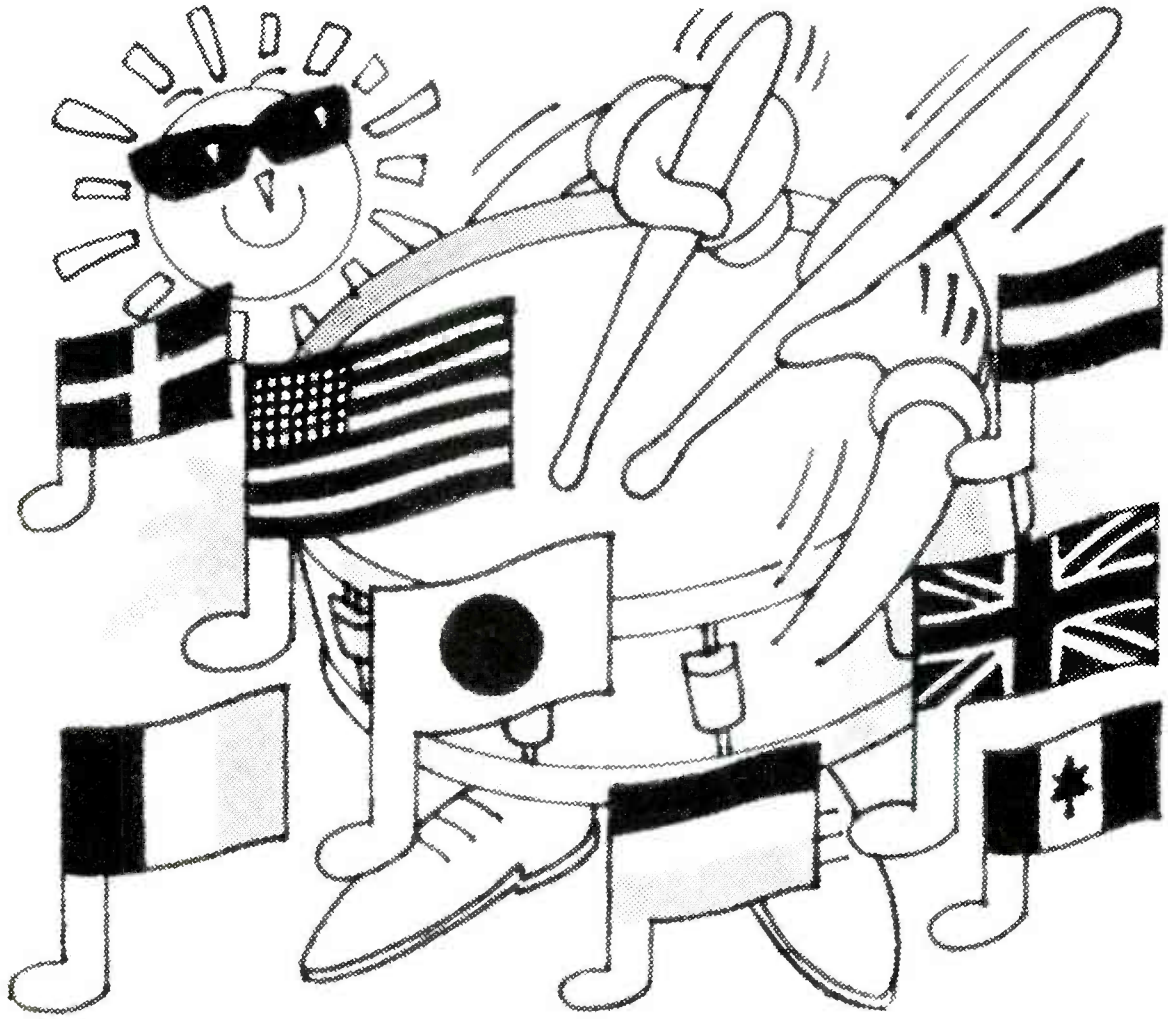

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HRM: New York all-rounder

Susan Nunziata talks to Roger Gouldstone, president of HRM, about the plant, the industry and the future

The six year old HRM Group, located in Happauge, New York, is an example of one of the many duplication facilities that have found diversity the key to survival. The facility began as a record pressing plant and now features capacity for audio and videocassette duplication, with clients such as RCA, Polygram, Arista, and MGM/UA.

Divided into three legally separate companies — Happauge Tape Manufacturing, Happauge Video Manufacturing and Happauge Record Manufacturing — the HRM Group is headed by president Roger Gouldstone. Gouldstone began his career in record making 20 years ago. After running a record manufacturing plant in the Midlands, he started a company making equipment for record and tape manufacturers. It was his simultaneous work as a consultant that brought him to the US in 1974.

The HRM Group was formed as the result of a management buyout fom American Can, which ran the record pressing facility. The audio duplication plant was launched two years after the buyout.

"The sales between the three companies are fairly equally divided," said Gouldstone. "The biggest by a little is the audio cassette plant but frankly we expect that to change and the videocassette plant, in terms of sales dollars, to take over the lead in the next year or so. The value per unit of the videocassette is considerably higher. Basically, that's it, the dynamics of the marketplace."

Video duplication

Happauge Video is a 20,000 square foot facility which utilises five 1 inch Sony *BVH 2180s* and JVC's *BVR 2000* system. The slave recorder is fully equipped with Macrovision, and there are 1,000 VHS machines in the plant. Under operation for approximately 18 months, its capacity is expected to reach 3.5 million units by the year's end.

The company plans to invest in King *2500* winders for its video plant, which will require a 1,000 square foot cleanroom. Gouldstone has also kept tabs on technology such as the *Sprinter* high-speed system.

"We constantly keep in touch with what's available, what's going on, what developments have occurred," said Gouldstone. "We've made the delibrate choice to stay with realtime and we see the situation remaining that way, not for the foreseeable future, but at least the short term future."

Like many multi-service facilities here, the HRM Group has also made a deliberate decision not to invest in a compact disc manufacturing plant. The initial start up cost is prohibitive, according to Goudstone, particularly with the retail price of CDs dropping across the board.

"We were planning until three years ago to build a CD plant," said Gouldstone, adding that the company has watched the technology since its infancy. "We had planned to be one of the first CD manufacturers in the States. And around that time, Philips/Dupont, Sony, Denon, Sanyo, all announced their intent to build CD plants. They were all companies with deep pockets. To manufacture even a small quantity of CDs you have to go out and spend $10 or $15 million before you can even start."

DAT duplication

The potential of DAT was another influence on the company's decision to avoid CD manufacturing. Happauge Video currently has two consumer DAT machines which, with no modification, plug directly into its video plant setup. In addition, the mastering equipment, the control equipment, and the distribution amps are all capable of handling DAT signals.

"DAT is a totally different product, a totally different production process in the sense that the opportunity exists to add DAT equipment incrementally for quite a tiny investment," said Gouldstone. "Literally, we can be producing 10 or 20 DAT cassettes recorded from digital source, the whole bit, tomorrow, at a cost of $2,000. As the business grows we can add incremental units for a few thousand dollars. So you don't have to make this massive, chancy upfront investment. Many CD manufacturers right now are beginning to discover that they took the wrong course."

Record pressing

Although DAT is currently entangled in Congressional red tape, The HRM Group sees itself as being a significant manufacturer of DAT software once the format becomes a viable commercial proposition. However, Gouldstone does not expect the medium to displace audio cassette production in the foreseeable future; rather, DAT should replace the company's work with 12inch vinyl LP's over the years.

DAT's immediate effect will be simply another revolutionary change in the future as the analogue tape format reaches maturity.

Audio duplication

Happauge Tape Manufacturing currently has a capacity of approximately 100,000 cassettes daily. Studer and Sony equipment are used for analogue and digital masters respectively, with U-matic and other digital formats run in the video facility with the Sony *1610* and *1630*. There are 34 Electro Sound *8000* slaves equipped with Dolby *HX Pro* in the plant, and an SQM microprocessor system controls the equipment. Sixteen King *790* winders load tape, which ranges from Sunkyong to Agfa. The cassettes are housed in ICM shells. The facility uses an Apex on-cassette printer and Scandia packaging equipment. The relative humidity in the plant is kept at 50%.

Gouldstone has noted some growing emphasis on audio cassette quality among cients, with more digital source mastering coming into the plant. Yet, in terms of the fundamental equipment technology, he has seen little change since audio duplication has reached its current speed.

"It's like every other product," said Gouldstone. "The development of the technology to manufacture the product tends to develop fairly rapidly in the early stages and then the rate of change of the tech slows down for two reasons: it's already the state-of-the-art in that area, it's not advancing very fast; and of course the incentive to improve the technology is only there if the product shows a lot ot growth potential."

Gouldstone contrasted the rapidly changing CD manufacturing technology with that of the 12 inch record, which basically employed the same technology employed nearly 20 years' ago.

'Obviously, audio cassette is a mature ▶

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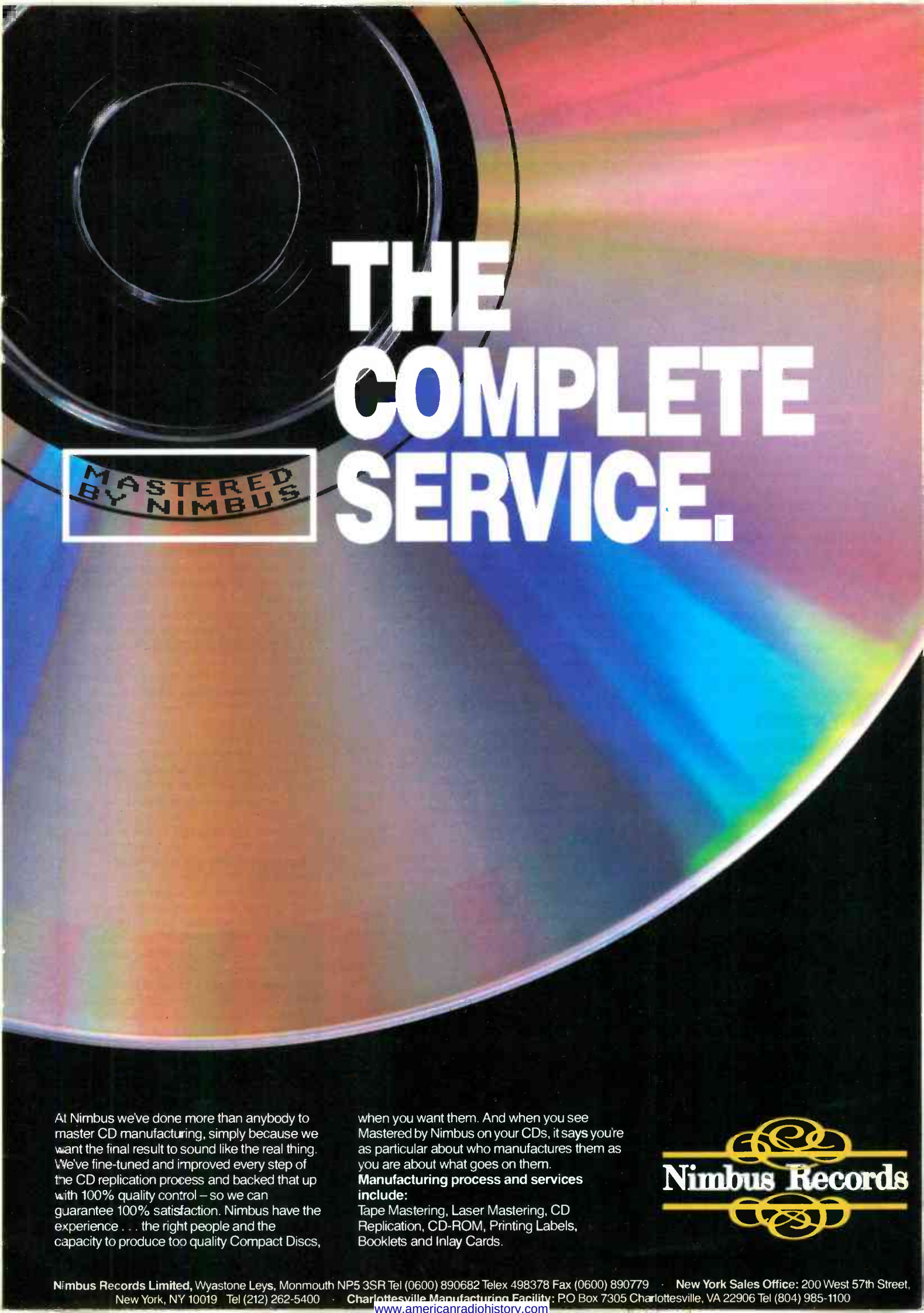

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Tape duplication

product," he said. "We still see growth, but nobody's expecting it to do what CD is going to do for us. There are process improvements and so forth but there are small rather than major changes."

Improvements in labelling, shells and tape quality have continued, helping to make the audio cassette a better, more consistently performing product over the last four years.

"The next logical change would be a higher duplication speed 128," said Gouldstone, but as it stands at the moment, the technology at 128:1 is not adequate for high quality music."

The company is also closely watching the development of disk-based duplication systems, but sees it having little impact on the immediate future.

Quality products

"The biggest single improvement over the years has been tape performance and, to a lesser extent, improvements in consistency of shell performance. What was considered a fairly good standard five years ago is now considered a fairly mediocre standard from the point of view of performance," said Gouldstone.

While clients have supported incremental improvements in quality, including more of a demand for chrome tape, the industry still remains highly price driven.

"The industry has evolved for large volume customers to a point where the conflicting requirements of producing a consistently good product and to be able to manufacture at a low price are constantly at a tug of war between the two," said Gouldstone. "Within the industry there's always a lot of talk about how can we do this better and how can we do that better between technical people and very seldom is price even mentioned. But there's no question that the biggest single issue in the production of audio cassettes is the trade-off between what it costs you to produce, what you can sell them at, and the amount of quality and care you can afford to put into them."

The art of surviving

Of the 400 employees in the facility, approximately 17% are employed full-time in quality control. The HRM Group, like other facilities, finds itself absorbing additional costs to keep up with the price cutting that is an integral part of the industry.

"As a record plant, cassette plant and video cassette plant basically under one roof the concept is simple: we have three products, all of which contribute to earnings, and yet only one set of overhead," said Gouldstone. "There's only one president, there's only one CEO, only one personnel department, only one accounts department. If it weren't for that, were we trying to operate any of our businesses as discrete units, our particular way of manufacturing, with the amount of care and so forth, none of the businesses could survive alone."

In terms of survival, it is Happauge Record Manufacturing that has proved itself surprisingly fit. Regardless of the consensus that the vinyl LP is on its last spin, HRM has seen substantial business in that area. Forty customised Lened record pressing machines from 1965 are utilised in the 200,000 square foot pressing plant.

Because the overall need for 12 inch records has declined by approximately 60% since the late 1970s, more than half of the record plants operating here have closed. Coupled with a decline in pricing, only a few manufacturers remain. HRM's expected capacity for records is 20-24 million this year.

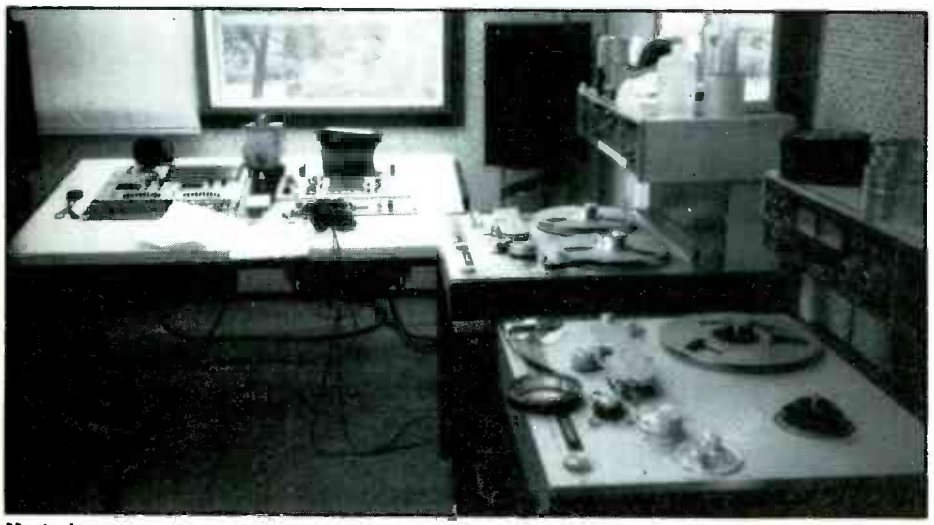
"In our case we will be manufacturing more records than we've done in the past because we've taken advantage of other manufacturers closing to pick up their load," said Gouldstone. ' And although the overall load is declining, our share of it has increased dramatically and in fact we'll make a lot more records this year than we did last year."

Despite his 15 years experience with the 12 inch record, Gouldstone declined to predict the format's life span.

"We've seen a certain degree of resilience in record demand overall, which I assume is driven by the fact that there are still millions and million of LP decks out there," he said. "If you look at some of the examples there are around, the fact that 7 inch records are still sold today, is quite incredible, and yet they're sold in quite large numbers."

It is the quirks and diversities of these entertainment media, which has helped keep the industry flourishing for facilities such as the HRM Group. "The most revolutionary change is from state-of-the-art being regarded as a 12 inch record, which, when you get right down to it, is a modulated wiggling groove on a mechanically moulded piece of plastic, to the top end of the scale, which is now DAT, an electromagnetic tape coded with 1.4 billion bits of information per second," observed Gouldstone. "Rotary head technology in 20 years has gone from the Wright brothers to rocket travel in terms of technology. And of course the thing that drove it really was one thing only — two guys in a laboratory inventing the transistor. We are using technology today in DAT that would have been regarded as impossible 10 years ago."

No two days are ever the same in the constantly evolving duplication industry." If it were not for all the dynamism of the industry, we wouldn't be making records, tapes and video cassettes here today," said Gouldstone, "they'd all be made in Korea or Taiwan or Singapore. It's all because of the dynamics, the fact that what we're producing is needed in the marketplace tomorrow or the day after."



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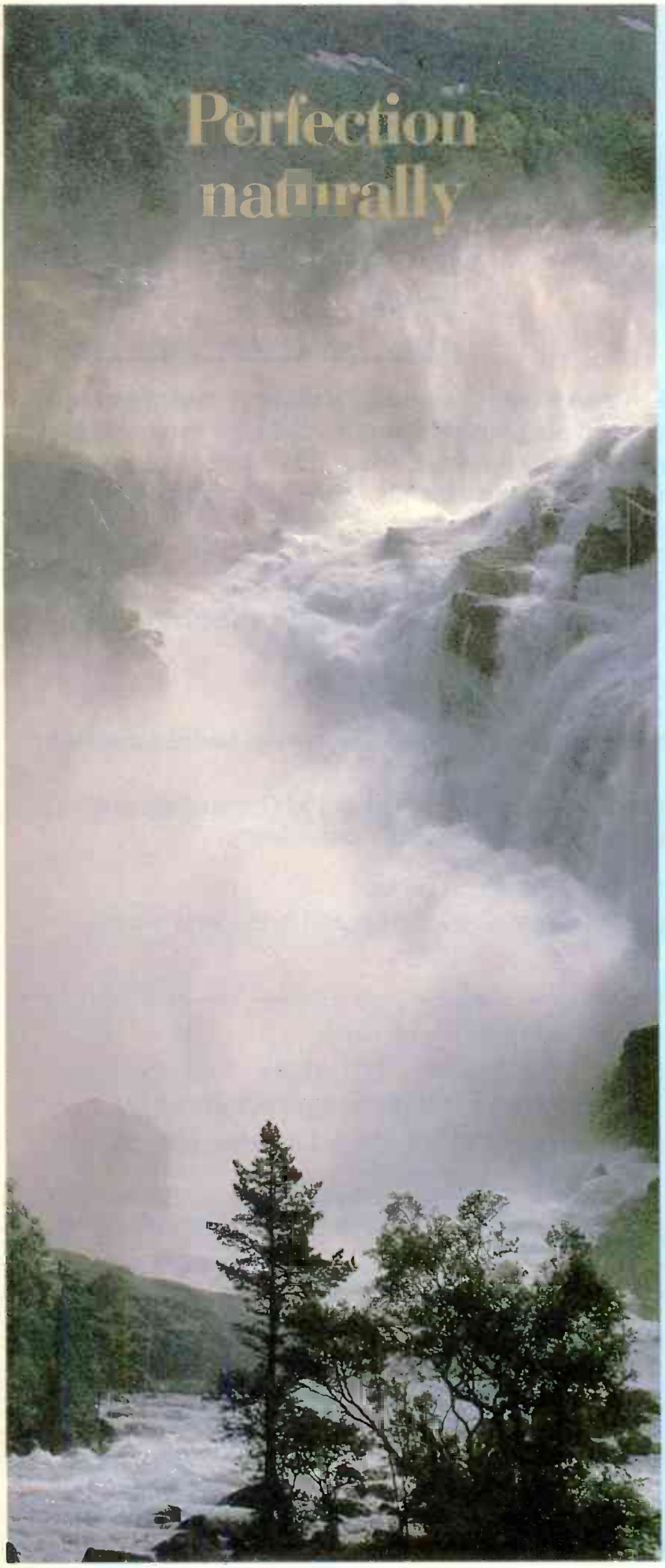

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Mastering for Minimum Transfer Loss

Having just celebrated their first year in Camden Town, John Dent talks to Janet Angus about the unique mastering facilities created at the Exchange.

The Exchange is a new disc cutting facility. If you want to be strictly accurate it is actually a new mastering facility which opened on 1 January 1987 in London's Camden Town. Although they haven't put all their eggs into the vinyl basket they obviously feel there is plenty of life in the old dog yet. And when there isn't, the people at the Exchange are firmly of the belief that whatever the new format, they will be best equipped both literally and skills-wise for the job of mastering it.

John Dent set up the Exchange with partner Graeme Durham, the duo being recently joined by ex-Trident cutting engineer Ray Staff. Durham and Dent had worked together previously for a number of years at Island Records' cutting facility the Sound Clinic. It was in fact Staff who trained Dent in the skills and mysteries of disc cutting in the first place when he started his career at Trident in 1973. A common background means shared values and philosophies and it is only natural that the three should end up together.

To set up and equip a mastering facility during the late 1980s is a pretty expensive exercise. Not only do you need cutting lathes but you also need all the various machinery involved in mastering — ¼in, ½in, Betamax/701, in addition to Sony 1610 or 1630 (or even possibly JVC and Mitsubishi too) for compact disc pre-mastering.

"You need so much hardware available simply in order to play the customers' tapes. Disc cutting was originally a factory process. It is much more complicated today. You have to be careful when you take bookings that you have all the machines you need available for the session; you often need three or more formats per session.

"Our transfer consoles are built to accept up to four inputs from different sources — very unusual for a cutting console. You can't stop the lathe once you start cutting so you are forced to put everything in on the fly. It makes it more interesting for us but it also illustrates the fact that the range of skills required now is far greater than before. It is no longer a factory type transfer, it has become more specialised. Of the work that comes in here 40% is CD mastering. Eventually the cutting room will become a post production room with any number of uses."

Philosophy

The Exchange philosophy is very much concerned with quality of sound — the accurate unadulterated transfer of sound from one medium to another. It is an ethic which they have individually been practising for many years. This philosophy is carried throughout the facility from the cables incorporated in the installation, through every piece of equipment, to the engineer's ears.

Facilities at the Exchange comprise two disc cutting suites, a CD pre-mastering room and a digital copying room. Cutting lathes are Neumann *VMS70*s with Ortofon cutter heads, analogue tape machines are Studer *A80*s, and digital editing is done with the Sony *1630* and *DMR2000*. The disc cutting system is by Esoteric Audio Research.

Much of the equipment would appear to be fairly standard until you get down to the nuts, bolts and circuitry inside. One thing which does however stand out immediately is the monitoring. Nothing standard here. Designed by Graham Holliman they approach the problem of studio monitoring from a psycho-acoustic angle.

Dent: "We required a design which was more specifically catering for studio requirements than Holliman's previous speaker designs. That is, they were required to be more rugged and to be used by an engineer who was working with a console between him and the speakers. These monitors provide reproduction of very, very low frequency bass signals; they are flat down to three cycles. This has been achieved through small cabinet design. This feature is very important because we have phase accuracy across the whole audio spectrum.

"They also eliminate the room acoustics from the given listening area; eliminating the perception of the walls. They work by emitting a control signal which eliminates the need for acoustical treatment to the room itself. Whenever you hear a sound your brain automatically locates it. When an engineer is sitting in front of a sound coming out of two boxes, his brain will be locating those boxes in the room. Graham Holliman speaker design eliminates that function. This has two results: 1) there is no listening fatigue and 2) on a stereo tape you only hear true stereo if it has actually been recorded with stereo microphone techniques. It becomes really clear on these monitors which is processed and which is true stereo.

"They have really redefined monitoring. We are able to produce very good quality cuts because we are working in a way which is more receptive to recorded information. We have been able to use Holliman's designs very successfully."

Since the monitoring is so radicaly different to the norm it begs the question: how does the client relate to something which sounds totally different to what he has been hearing in the studio?

"Yes, some customers have been very thrown by the monitors but most of them are now critical of other studio monitors. Some people really don't believe what they are hearing. If you listen to an acoustic guitar which has been recorded with a crossed pair, ▶

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it sounds stunning. With a multitrack recording on the other hand, which has been sieved and strained through the multitrack machinery with overdubs, you will hear everything for exactly what it is. It is mainly the method of recording which is shown up. Our monitoring has changed the way people are working with the result that they are producing much better recordings."

As far as the cutting room is concerned Dent feels that because of the loudspeaker's very low distortion figures the cutting engineer produces cleaner, clearer cuts. Do they use a more traditional monitor for reference if only to give the customer something with which to identify?

"No we don't have any other monitors in the room because some of them sound so completely different and bandwidth limited it would just confuse the good reference we have. We produce test cuts which the customer can take away if they want to hear it on something else." This confidence in Exchange's equipment and work methods is borne out by the fact that practically all business is repeat business.

None of the Exchange equipment has come into the facility off the shelf. Dent regrets the English tendency to accept whatever is put before them without really questioning what is in it and why. "In America, for example at the Mastering Lab, Doug Sax uses all his own amplification. They have questioned everything which came in the door and modified it if necessary. It is good to be different.

"We get people in here who go to a lot of trouble to record, for example, a piano, using specialist amps etc and they are seeking a minimum loss transfer. A signal can be changed in the tape machine, in the console, on the cut. Any transfer losses can be heard, if only as tonal subtleties, so you have to take a lot of care over the process. You need to be able to rely on the system for a clean transfer."

John Dent in the CD pre-mastering room

Modifications

Dent began to be interested in modifying the equipment in the cutting chain whilst at the Sound Clinic, clearing the signal paths by removing unnecessary elements. When it came to setting up the Exchange he called upon designer Tim Paravicini to take the philosophy a stage beyond his own design knowledge. Paravicini was commissioned to supply a lot of the company's in-line signal amplification — from tape recorder, line amps to equaliser, compressors, monitor amplification and disc cutting amps.

"Paravicini has a very musical approach to design; we have very musical equipment. If you have a tape with a lot of warmth, brightness and energy it will not be degraded in the signal path by his equipment. We have had endless off-the-shelf equipment in here, none of which comes up to standard. He developed a disc cutting system without cutting a record and without a cutting lathe. He knows his mathematics; he knows his theory, and is competent to undertake projects like us."

The digital components in the mastering chain have not escaped the screwdriver. As certain other users have been finding, especially those working in the field of classical music, the analogue circuitry in current digital equipment did not meet requirements. "When we bought our Sony *1630* we had the task of transferring over 100 CDs, but before we started we found that the analogue recording sounded far superior to the *1630*. It sounded dreadful. We replaced the analogue circuitry and now it is an acceptable piece of equipment. The digitising process is not as bad on those machines as the in/out analogue amplification."

The Studer machines also incorporate Paravicini's output amplification. "We have removed from the circuitry all redundant components, all the heavy filtering which has an effect on the sound. It speeds up the transient response of the tape recorder to what it should be. In a lot of cases the transient information is on the tape but because of the tape recorder electronics it doesn't come out. The same applies to the *1630*: the sound will stay intact in all our equipment."

Cutting system

Compared to a stock cutting system the cutting amps provide separate preamp (RIAA, phase compensation) and power amp stages. The power amp can also be adjusted separately from the preamp. "A certain amount of 'out of control' movement is generated in a speaker and the same thing can happen at the cutting head. Paravicini has avoided that and it produces a tidy sound. You can put a 1kHz square wave through the system, cut and send it back through the system exactly as it went in. It doesn't get time smeared."

Choosing to use an Ortofon cutting head is down to the same philosophy: "Because of

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One of the Neumann VMS70 cutting lathes

linearity, especially over the high frequency range. Also the stereo separation on Ortofon is excellent compared with Neumann and Westrex heads. In all our experimentation we haven't managed to blow up a single Ortofon cutting head."

The minimalist theme has been carried through to the cutting console with nothing superfluous left in the circuitry. Otherwise it contains all the usual EQ, reverb, compression facilities as well as high frequency limiters.

"The cutting system handles out of phase information very well; in most cases there is no need to mono master tapes here. It has a lot to do with the cutting amplifier design. With a properly constructed cutting system the depth element is not out of control."

There are five different types of metering on the console: PPM, VU, M+S (sum and difference), spectrum analyser and Tapetalk (sound stage meter). It is configured with four pairs of channels into two. All signal processing is on total bypass insertion — you have to physically switch it in if you want it.

Cable has also come under scrutiny both in and outside the equipment. "We imported low loss computer cable (at the time we couldn't get oxgen-free). It is linear capacitance, low capacitance cable. We have used one type inside and another outside the desk to provide flexibility.

"Computer cable has been designed for very high resolution transfer. We have also found that the quality control over the whole length is very good; a lot of the cable sold for audio use can vary."

We are now getting very much into audiophile territory — a fact which Dent acknowledges but is quick to illustrate certain differences. "We are hearing the same things that people in the hi fi world can hear but we don't make the same erratic decisions that some of them make. We combine what we hear with sound physics. As far as cable is concerned we look at what the cable is made of and also what the shielding and sheathing of the cable is made of. We also look at the capacitance which will affect loss through a cable and the way an amplifier sends and feeds the cable. It may well be the amplifier which is affecting it as well. Our amplifier outputs are minimally sensitive to cable type. The first designs we tried we found very cable sensitive so we asked Paravicini to have another think about it."

He went on to add that even some of Paravicini's designs have been modified for their own use. "We like his designs because they are fairly neutral. It is very easy for manufacturers to incorporate plug-in op amps in their equipment. When you put the signal through just one amp you can perceive a change. When you have 20 of them in a mixing console the signal goes through them once when recording and again when mixing. There are some very standard op amps which we wouldn't put signals through: SSL, the Sony *1630* — and yet everybody uses them. Their sonic performance is very bad.

"We are basically aiming at reproducing a very natural clean sound which is capable of coming off a tape; if we don't hear it we question it. If I was let loose in a recording studio it would be horrendous the amount of equipment I'd throw out. We are hi-fi/audiophile in our approach to what we will tolerate. Our choice of equipment results in audiophile quality although the quality of the product is ultimately governed by the quality of the tape coming in."

Dent does not see the setting up of a cutting facility during vinyl's last few years as a gamble. "We have not geared up simply as cutting rooms and we don't treat the facility as such. Disc cutting systems cut better with clean sounding equipment and a by-product of that is clean sounding compact discs.

"If you asked a recording engineer to make a CD it wouldn't come out the same as if we did it. We are trained and experienced in professional preparation and presentation."

Advice and experience

The role of the cutting engineer has widened over the year. Today's engineer will frequently be required to edit masters, drawing on their experience and knowledge of the market and what will sound best on radio. "Our skills involve the general sound quality. Working with a lot of tape means that we can enhance rather than degrade or destroy a tape which is what a lot of engineers fear might happen. It is common for a recording engineer to come in to the cutting room and say they are very happy with their tape the way it is and they want it cut flat. We can tell very quickly whether to do it that way would make the best record."

By way of example Dent cites *Video Killed the Radio Star* on which, on first arrival at the cutting room, the 'radio' vocal was distorting badly.

"It has the wrong ingredients for cutting. Trevor Horn re-recorded it to get the same sound but one which would not crack up on vinyl. He remixed it and when we were able to cut it flat and it become a number one hit. That is a good example of when the cutting room is used in an advisory capacity. It is very expensive to remix and often to add 3 dB treble in the cutting room is easier than going back to the studio, although obviously it is not ideal."

Dent also feels that with the abundance of equipment and various formats being used to record in studios, the whole cutting process has become more complicated.

"I remember being asked to cut an album from a *Ready Steady Go* tape which was put together in 1965. The tape was all different colours — there were ten tracks per side all from different studios and yet all the tracks were compatible. The tape head azimuth was almost identical from track to track. The product was standardised from studio to studio. You can guarantee that if you took tapes recorded at 20 different studios today and did the same thing it would be dreadful. You can't guarantee the quality."

His belief in vinyl is bolstered up by the continued popularity of the chart system.

"The charts are an institution which relies on vinyl. Until that system and the single changes black vinyl will not die out. The charts are prepared weekly; there is nothing else which has such a fast turn round available to the record companies. So until sound is available in a credit card or something I can't see it changing. The break even point for CDs is so high, what with 1630 and factory laser mastering, they involve very high unit cost.

"A facility such as ours should be able to produce a range of interim products. We are therefore not advertising ourselves as a disc cutting facility. Admittedly investing in new disc cutting equipment would be a very difficult decision but we are a very busy studio with the present situation."

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Copyright Reconsidered

Just when it seemed like the UK Government would impose a levy on blank tape the situation has been reversed at the last minute. Barry Fox takes a hard look at the revised proposals.

Divided they fell. As predicted. The record industry has lost its fight for a levy on blank tape. Now the recriminations begin. Even before the government published the Bill designed to rationalise British copyright and intellectual property law (*Copyright, Designs and Patents Bill*, House of Lords, HMSO £10.40) leading figures in the music and record industry were saying privately that they thought the IFPI's campaign for Copycode had muddied the waters and lost them a levy.

Kenneth Clarke, Minister of Trade and Industry, explained why there is no mention of a tax on tape in the Bill. And yes, he even called it a tax, despite 15 years of work by the BPI to label it a levy or royalty.

The BPI began lobbying for a levy five years before a committee under Mr Justice Whitford compared Britain's Copyright Act of 1956 with German law.

In his report Whitford recommended a levy on "all equipment a type suitable for home recording" ie hardware as in Germany. There followed a string of official discussion documents. The first, in July 1981, said 'no' to any levy; another in February 1985 said 'yes' to a levy on both audio and video tape. The last, in April 1986, said there should be 10% on audio tape and nothing on video tape. Now the Bill says 'no' to any levy on audio or video. Because the Bill also deals with patents, trademarks, industrial designs and other areas of copyright it's the longest in the parliamentary session — with 277 clauses and 7 explanatory schedules. It was due to be introduced through the House of Lords in mid November and should be law by next summer.

On the levy, Kenneth Clarke says: "We decided that any financial benefit to copyright owners and performers would be outweighed by the adverse effects the levy would have had on consumers, especially the blind — it would have been totally unfair on the consumer.

The cost of administration would have been disproportionate to the amount of money concerned.

"It would have involved the Government in the collection of a new tax, with a new bureaucracy required to collect and distribute the proceeds. The cost of administration would have been disproportionate to the amount of money concerned. The bulk would have gone to those already doing very well.

"A rebate scheme would have saddled people, especially the blind, with the inconvenience of making claims.

"Those who do illegally record could still do so without paying a levy. They would buy tapes with poor quality music, and tape over the top.

"The levy would also have been marked up in retail chains. They might gain as much as the artists.

"On balance we came down firmly on the side of the consumer.

"As far as the Government is concerned we now regard it as a dead duck."

The BPI says it accepts that the issue is a dead duck, "unless there is a change of minister".

Obviously the BPI is not pleased: "The Bill is a stab in the back for the UK record industry, a triumph for short term expediency over long-term legal objectives, and an insult to a dynamic British industry which is now seen as a public benefactor, a kind of cultural soup kitchen".

When the record industry holds a post mortem it need look no further than two causes.

The tape and electronics industry is even more fragmented than the record industry. Middle management is often appallingly incompetent and there is internecine squabbling, especially between the tape makers. But taking a leaf out of the BPI's book, they agreed long enough to employ professional help in lobbying MP's and the media. It was professional lobbying that had won the BPI government support for a levy in the April 1986 White Paper.

The anti-levy faction lined up as The Home Taping Rights Campaign, under Mari James of the Grayling PR company. The HTRC won backing from consumers, manufacturers and retailers and has lobbied everyone with clout on the views of the blind, teachers and young people. They kept the issues simple. Simply that a levy is unfair on consumers. Even the thickest political or hack journalist can grasp that.

Meanwhile the IFPI went off on the Copycode wild goose chase, campaigning to ban the sale of DAT recorders unless equipped with circuitry which prevents home taping.

"They were easy people to campaign against", says Mari James modestly. "There is now a notch in the bill where the levy would have been".

The Copycode and anti-copy issue is immensely complicated. (See our report in the September 1987 issue, and the response by the IFPI in November). Hacks and MP's get understandably confused when faced with one record industry lobby for a law to tax tape and legitimize home taping, and another lobby from the same industry for laws to make manufacturers build circuitry into their recorders which prevents home taping. The fact the audio industry said the anti-copy system spoilt the sound of the music it was intended to protect only confused things further.

It became a foregone conclusion that the government would ditch the levy. They did and the IFPI is surely discredited in the eyes of those who had eyes to see. The anti-DAT campaign has foundered too. Kenneth Clarke says the question of DAT imports and anti-copy legislation is "a trade matter and something we are leaving to the EEC to discuss".

The baby may well have gone out with the bath water. There is no curb on the low cost rental of compact discs, which customers can easily tape.

The letter of the law remains unchanged on audio taping and video time shifting. It is still a breach of copyright for consumers to copy their own records or time shift TV programmes (unless they contain no music or written words).

When the record industry holds a post mortem it need look no further than two causes.

Says Clarke: "It would have been a nightmare to draft legislation to legalise this without creating loopholes for criminal pirates. It's better to leave home taping as technically a breach of copyright, because record companies don't sue home tapers".

Artists will get tighter control over their work. Musicians will be able to sue 'bootleggers' who issue illicit recordings of a

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live performance. Actors will be able to prevent the release of new films based on rejected clips from previous films. This happened, for example, after Peter Sellers' death when a further film in the Pink Panther series was made from 'out takes' from old Panthers.

Handling infringing copies of any copyright material, like video tapes, discs or computer programs, will carry the risk of an unlimited fine and 2 years in jail.

The new law will also recognise 'moral rights' which let creative artist stop others mangling their work without permission. This will let film directors curb re-editing; composers will be able to prevent pastiche performances; and authors will be able to curb satirists.

Litigation on patents should now become cheaper, quicker and easier. Anyone whose patent is infringed, or who is accused of infringing someone else's patent, will no longer need to fight an expensive action in the High Court. The White Paper proposal, that patent actions should be judged by the Patent Office, has been dropped — following objections that civil servants would effectively have become judges.

Instead inventors will be able to fight their actions in the County Court. Because of the techno-legal complexity of patent cases, specialist judges will be appointed, the first in London.

Trademark law will be tightened, to help protect the public against counterfeit products, eg phoney tapes of poor quality. For the first time ever it will become a criminal offence to steal someone else's trademark. The penalty is an unlimited fine and up to 10 years in jail.

Trademark law will be tightened, to help protect the public against counterfeit products, eg phoney tapes of poor quality.

The protection of industrial copyright has become by far the most muddled area of British intellectual property law. Specialist lawyers argue over whether the manufacturers of mechanical and electronic equipment can use artistic copyright in their design drawings to stop competitors selling spare parts.

A House of Lords court decision in February 1986 created what the critics described as a 'pirates charter'. The Lords said that a manufacturer, eg of a press, could not stop competitors making spare parts needed to keep it running. The electronics industry took fright, fearing a free-for-all on spares.

The 1986 White Paper suggested copyright protection for original designs, like spare parts, but limited to 10 years. And after the first 5 years rival companies would be able to demand a licence and compete. In this way manufacturers would be able to monopolise the market on spares for 5 years, and earn a royalty on rival products for the next 5 years. DIY repair work is not an infringement.

The Government has now watered down this proposal. Manufacturers will not get any monopoly if a spare part must be shaped in a special way to fit or do the job. Drive belts, hydraulic pump seals, video head drums, mould parts etc, must of necessity be a copy of the original, if they are to be of any use at all. So spare part manufacturers will be free to copy them. In the few instances where there is no need to copy a shape, for instance if the part is an accessory, the manufacturer can claim copyright to stop competitors selling. The 10-year rule will then apply, with licences of right after 5 years. Essentially this gives the spare parts industry carte blanche.

Press comment on the Bill has so far been superficial, and is likely to remain so. The document is daunting in its complexity and those attending the press briefing given by Kenneth Clarke and his team of legislators, did not even see it until halfway through. This takes the Government's pananoia over leaks to new and absurd limits. A roomful of journalists can hardly be expected to absorb a thick volume of legal jargon in a matter of minutes, when it has taken full time legislators literally years to write it.

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New Equipment for Mastering

Bill Foster takes a look at the 83rd AES Convention from the mastering point of view.

The recent AES in New York introduced a number of interesting products for the post-production studio. The show itself was massive, covering the exhibition space of two hotels and playing host to around 15,000 attendees, who had a daunting number of stands and demo rooms to visit.

Sharing 'Star Of The Show' status with SSL's re-styled '6' Series console must surely be the *Soundstation II* from Digital Audio Research — a hard-disk editing system which comes with a built-in pedigree in the form of its three principle designers, who have between them over ten years experience with this type of equipment.

Jeffrey Bloom and Nick Rose have previously developed a device known as *WordFit*, which uses hard-disk technology and allows film dubbing engineers to synchronise studio dialogue with the 'wild' track, even if the actor didn't quite for it on the take. Guy McNally joined DAR from BBC Research where he worked on *RIO*, their disk editing system. Although principally an in-house project, the system was demonstrated at IBC back in 1985.

I covered disk-based editing quite extensively in the last issue of *One To One*, pointing out that one of the dilemmas facing a designer is how to represent the edit on a VDU screen. DAR have chosen a different concept from, for example, the *Audiofile* (by price probably its closest competitor) and developed what McNally terms a "logical path". Using a touch screen, it is possible to select a number of options at each stage, thereby removing a lot of the screen clutter which, DAR claim, is a failing of many of its competitors.

It's a little early to say yet whether their concept will work but, judging from the crowds around their stand, a lot of studios will be trying out a *Soundstation II* in the near future.

Also on the disk-editing front, Lexicon were demonstrating their now almost complete *Opus Workstation* and there was another interesting device from Dyaxis. Based on a Macintosh computer, Dyaxis is more limited — but at a considerably lower price. It will be available in the UK during 1988.

AMS' *Audiofile* continued to generate interest and, now that its 'reel rocking' facility is fully working, it becomes a very useful tool for the audio post-production house.

Disappointment of the show for me was the continuing non-appearance of Sony's new editing system. In fairness, Sony never said it would be there, but for those of us still battling with *DAE 1100s* it would have been a welcome sight. Pride of place on the Sony stand went to their new limiter/compressor, which can be connected directly into the *1610/1630* signal chain.

Sony salesmen were dutifully demonstrating DASH 2-channel machines, but with the compatibility problems currently being experienced in the US, there was not much enthusiasm. I fear that by the time the DASH people get it right, something will have taken its place.

Teldec effectively relaunched their DMM-CD system this year. It was announced with much trumpeting (and the Mayor of Los Angeles) at last year's AES, but this time there were actual CD's for the lucky few. The system most certainly works — as witnessed by this magazine earlier in the year — now we only await details of delivery. Teldec estimate mid-1988. After years of waiting for digital-based equipment, I have my own theory about that.

All-digital mixers are finally beginning to appear. In addition to Neve, Sony and JVC, a company called Analog Digital Synergy have produced a prototype modular console which can be configured from 8 up to 64 channels. The 'desk' on show had only one module — which was not processing audio — so it's definitely early days yet. However, the designer has produced digital equipment before which means that Analog Digital Synergy could be one to watch.

DAT machines were everywhere. In addition to Sony's two 'pro' models, Fostex were showing an interesting prototype. They claim it is capable of synchronising to SMPTE timecode using a technique which they were not prepared to discuss in detail. To illustrate this there was a video being shown with audio coming from the DAT player which appeared to be in sync.

Fostex are hoping to get their method adopted by the DAT Committee, but are not very optimistic of getting the Sony/AIWA vote. Production machines by the summer, the salesman said confidently!

Apogee are a company making a name for

Digital Audio Research Soundstation II

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themselves selling retro-fit filters for digital recorders. Having successfully introduced a replacement for the *PCM-3324*, they have now turned their attention to the *1630s*. The curves given in the literature show a dramatic difference, and engineers who are using the Apogee filters say this is borne out by the improvement in sound quality.

Finally, Yamaha's *DMP-7*. The arguments continue to rage over this little digital desk. Is it a toy — or a bargain priced chance to enter the digital domain? I'll keep my own opinions quiet for the moment and concentrate on some new add-ons for this extraordinary device.

Those who have seen the *DMP-7* will know that it is MIDI compatible. At the AES in Japan, Yamaha introduced a MIDI controller for the desk, allowing control of all main functions. They have now added an equaliser. Offering full bandwidth response with 44.1kHz sampling, the EQ unit connects to the *DMP-7* via Yamaha's own digital I/O (not AES/EBU or domestic interface compatible).

Even with four days at the show, I barely managed to see everything, such was the size of this year's AES. With record companies continually cutting their production budgets, and record, cassette (and now CD) plants offering free mastering services, one wonders how the post-production industry can continue to support this rapidly increasing flow of new hardware.

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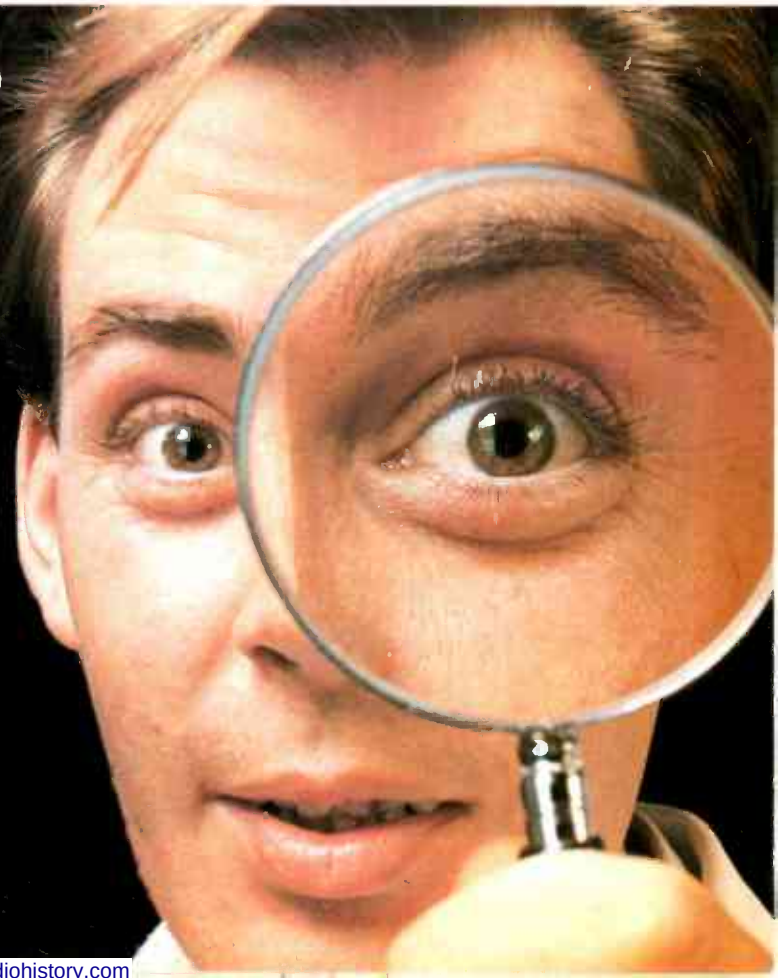

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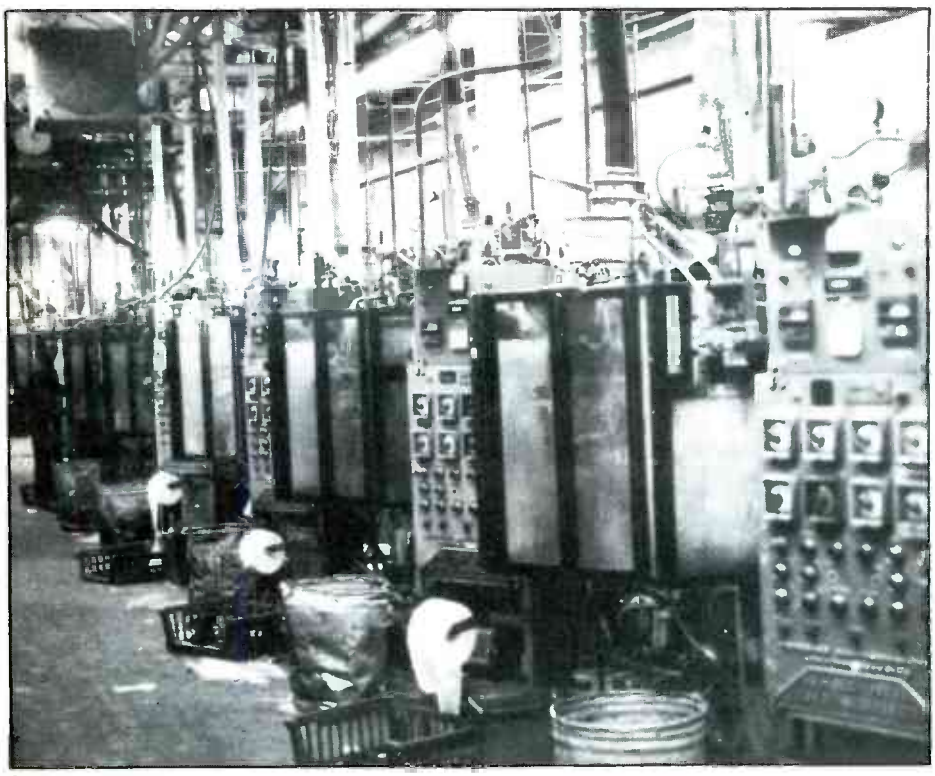
Damont Audio The Flexible Approach

Tim Leigh Smith visits Damont Audio, the largest independent record and cassette manufacturer in the UK, and finds that the company has seen some major changes in the past year.

Based in Hayes, Middlesex, Damont Audio celebrated its first birthday in early November 1987. In fact Damont has been around since 1974 when both the original company and its name were formed by Dave Miller (da) and Monty Presky (mont). They set up a record plant to press the Stereo Gold Award budget label which was created by Woolworths.

Over the years the Damont plant had several different owners, and it grew. Seven additional presses came from the PRT plant in Mitcham when it stopped production a few years ago, doubling Damont's disc capacity. A small audio cassette duplication facility was also added on a mezzanine floor at one end of the factory.



Main press shop

In 1986 the company had severe financial problems and eventually ceased trading. Ray Richards, whose Meekland Group owns the PRT group of companies, acquired Damont and it was relaunched as Damont Audio in late October 1986. On the board are Nick Flower (managing director), Frank Pearce (commercial director), Colin Rye (production director), Ray Richards (chairman) and his daughter Kim Richards who is also managing director of PRT Records.

"We were very fortunate with the loyalty of the staff and customers," says Nick Flower. "It was tremendous, everyone stood by us, and it is much appreciated." The birthday party was a jolly occasion, well attended by customers and suppliers, celebrating a 'fairly hectic' successful year with increased staff, an increased customer base, and a licence to process and press DMM; and officially launching an expanded audio cassette facility in its own premises. In addition Damont Audio in June 1987 acquired as a wholly-owned subsidiary Lyntone Audio, a custom pressing plant based at Holloway in North London which is also Britain's oldest manufacturer of flexidiscs.

Someone suggested that the birthday party was also to celebrate 50 years in the record industry for Damont Audio's commercial director, Frank Pearce. He started at the HMV shop in Oxford Street as a messenger boy in the days before telex, FAX and radio-controlled bikers proliferated. After war service he got into sales with EMI and in 1966 he set up Record Merchandisers to promote the home-grown product, beginning with EMI and then expanding to include the other companies. Just over ten years ago he joined Damont.

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Pressing plant

The Hayes factory has its own galvanic plating department handling the whole process with an Europa Film silverer, two Europa Film pre-plating tanks, ten plating tanks by Europa Film and four by Musitech. Supplies for this department are from various sources: some items such as sulphamic acid and silver nitrate come from Woburn Chemicals; others including nickel sulphamate come from Harshaw Chemicals; the actual nickel is from Fairclough Alloy Steels (a company which originally bought scrap nickel to make nickel-chrome-steel and then discovered there was a demand for the nickel itself).

Many customers are major companies which provide either metalwork or lacquers for processing. A vital 30% of the business comes from small independent customers some of whom look to Damont Audio for assistance at an earlier stage in the operation. PRT Studios may be called upon for disc cutting or even multitrack recording and mixdown. Contacts with sleeve and label printers allow the company to offer a full service from performance to packaged product.

Stampers are centred using a P & J Sibert centre press and cut to size on a Europa Film edge trimmer before going off to meet the press and turn out an average of 1,000 discs each. The 15 fully automatic Lened presses have an automatic material handling system to keep the presses supplied with vinyl from bulk storage (two 55 tons silos for virgin vinyl). Five are twin presses producing a pair of 7 in discs on each cycle, and the other ten presses produce one 12 in disc per cycle. Thus the capacity is similar for 7 in and 12 in. The original plant had a bias 6:4 towards 12 in but the former PRT presses balanced this up, being 6:4 in favour of 7 in.

Much of the virgin vinyl is supplied by Doeflex of Swindon, "probably the only independent manufacturer in the UK," with top up from ATO, CBS or Teldec.

What percentage of regrind vinyl does Damont Audio use? "We use all of it," quips Nick Flower, "We run either neat virgin or neat regrind and we put the regrind mainly on the 7 in, it occasionally goes on the 12 in. If the regrind is good there's no reason why you shouldn't use it. It's bad regrind that gets regrind a bad name.

"We use only our own regrind, that way you can control it. You need to know where it comes from. You could have a tin or a lead based vinyl and there are different stabilisers. If you mix them you get odd concoctions. You don't know what you're mixing if you buy scrap records and grind them. Some people can get away with it, we can't. We press for the majors and we press for the independents, all of whom have demanding quality standards. We don't want to compromise those standards by saving a few bob on material."

Quality control is a continuous operation from raw materials to finished product. Disc reject rate is about 6%. Six Technics direct drive turntables with Sony amps and JBL speakers are used to check pressings and a trusty Garrard *401* turntable with 12 in SME arm is used for checking metalwork. John White of Musitech, an expert troubleshooter known to some as 'Red Adair of the CD world', worked for Damont before he was lured away by the call of the digits and he still comes in two or three days a week as a consultant to the quality control department.

Europa Film plating equipment

As in other pressing plants disc labels are carefully dried before use so that in the press, with 100 tons in^2 pressure at 160°C, the ink does not bubble and stick the label to the stamper. The trick is not drying them so much that the label becomes brittle and breaks up under pressure.

Next to the label drying area is the sleeve storage area which holds about two million sleeves, all accounted for on the computerised stock control system. Regular stock reconciliation on the computer helps security, ensuring that everything is where it should be.

The presses automatically bag records in 7 in sleeves, 12 in disco sleeves, or 12 in inner sleeves as appropriate. Albums usually go into polylined bags supplied by Greenaway Harrison and are then manually put into cusomers' printed sleeves. Nick Flower suggests it is not worth automating this final stage: "It would seem logical that the record is put in a bag and then dropped into the album sleeve. It's not practicable, unless you manufacture your own sleeve, because you can have so many different weights of board and slightly different tolerances from the five or six major sleeve printers. You would be continually resetting the machine."

Special touches such as stickers or inserts have generally been done manually in-house with occasional recourse to finishing companies such as Advance and D & T at busy periods. At the time of writing Damont Audio is looking at automatic machines to deal with special customer stick-on labels, DMM stickers, and Euro-essential bar coding.

Shift work

The Damont pressing plant has operated 24 hours a day, seven days a week for the past three of four years, making more than 10 million 7 in and 11 million 12 in records each year. It has kept busy most of that time with work for nearly all the major companies and many independents. WEA is probably the largest single customer. Hayes neighbour EMI is only an occasional customer although business does come from the UK branch of EMI India which serves the Asian community in Europe.

Having taken over the PRT presses Damont handled about 80% of PRT's pressing. Now the two companies are closely related Damont Audio does even more work for PRT. This increased load is one of the reasons for acquiring Lyntone. The 14,000ft^2 (1,300m^2) at Damont Audio were already fully committed leaving no space for increased capacity but Lyntone has exactly the same type of electroplating equipment and automatic presses, with the facility for 10 in records as well as 7 in and 12 in. Under the new management Lyntone will continue to service its own customers and will also provide extra capacity for Damont Audio says Nick Flower.

"The flexibility makes certain that the additional customers we're going for can be guaranteed a service at the busiest time of the year. There's no point courting people in February and March only to drop them on the scrap heap come the Christmas rush. You've ▶

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got to look after your customers. We need a growing customer base all the time. It is a diminishing market: we're trying to get a larger share of it. I think we will see some pressing plant or plants closing within the next 12 or 24 months."

The Damont Audio plants in Hayes and Holloway will increasingly operate as a single factory on two sites, but they will retain their separate identities. "We'll still keep the Lyntone name. It's a name that's been around for a long time, particularly in the flexi record market, and it's well-known overseas. But we want to get to the stage where, if a record is suddenly leaping up the charts, instead of having to move metal masters or positives over, we could actually send stampers. That just means making certain that we use the same profiles and so on. This will enable us to handle more hits."

Hit singles form an important part of the company's work. Nick Flower regards it as one of the fun parts of the business, juggling production of perhaps five out of the top ten. "We do have a very fast response time. We're one of the fastest, if not the fastest, working seven days a week, 24 hours a day. The other week we had metalwork in on Thursday evening, the labels and bags were delivered in the early hours of Friday morning, and we shipped the product Friday afternoon."

"At most times of the year there is a surplus of capacity. The result is there is a market price for anything. It would be nice for it to be higher, but everyone can say that. Some customers will try to beat us down on the price and some of them are prepared to pay for the service. We are not the cheapest pressers, but there are very few places where you can ring up late on Friday afternoon and, if you've got your production parts with us, you know you'll get product on Monday morning. A lot of people appreciate that and they're prepared to pay a little bit more. If they can have that response time, they can keep their stock holding down; so they've got no obsolescence of stock. So there is a benefit."

Cassette duplication

A modern factory unit just down the road from the pressing plant now houses the Damont Audio cassette facility. In an air-conditioned slave room either of two Electro Sound 64:1 loopbins works into a single set of electronics feeding the original three Electro Sound slaves, three subsequent Tapematic *5000* slaves and three brand new Tapematic *5000* slaves. Electro Sound test gear includes a ⅛in tape deck for checking pancakes and automatically producing bar-graphs which show test tones from 50Hz to 15Hz. A few dB down at 15kHz is regarded as less than desirable. "We try very hard," says Nick Flower.

Ferric tape is from Capitol Magnetic Products and chrome tape is from BASF. Library cases and C-0s mainly come from GTS (Fabrications) in Wales, with top up from CBS Precision Mouldings. C-0s from Italy or Hong Kong are also used on product for certain markets.

Loopbin masters are prepared at The Exchange in Camden or PRT Studios. Some companies like to add a touch of 'artistic pre-emphasis' to compensate for deficiencies in the cassette system. The Damont Audio approach is to master flat, unless specifically requested to alter the sound: "We follow the original tape as closely as we can. Unless the customers give us instructions to the contrary, we assume that what they supply is what they want to hear. We would like to supply what the customer wants."

Three Tapematic automatic winders, one *2002* and two upgraded *2000*, have replaced earlier King semi-automatic winders. Nick Flower has been planning to buy a Tapematic winder. When Ray Richards became chairman he agreed that this was essential if Damont was serious about tape. The first one arrived in January 1987 and everyone gathered round to admire it handling three times the output of the previous machines. Watching it at work Ray Richards decided that Damont should have more Tapematic winders.

Most cassettes go to the automatic Apex for on-cassette printing: "Any colour you like, as long as it's black," jokes Nick Flower. Other colours are possible but it takes some time to make all the necessary changes, so black is preferred. The duplicating and winding sections are set up to operate at the same rate, but the Apex can cope with 24 hours of present cassette output in about 14 hours operation, leaving capacity for expansion.

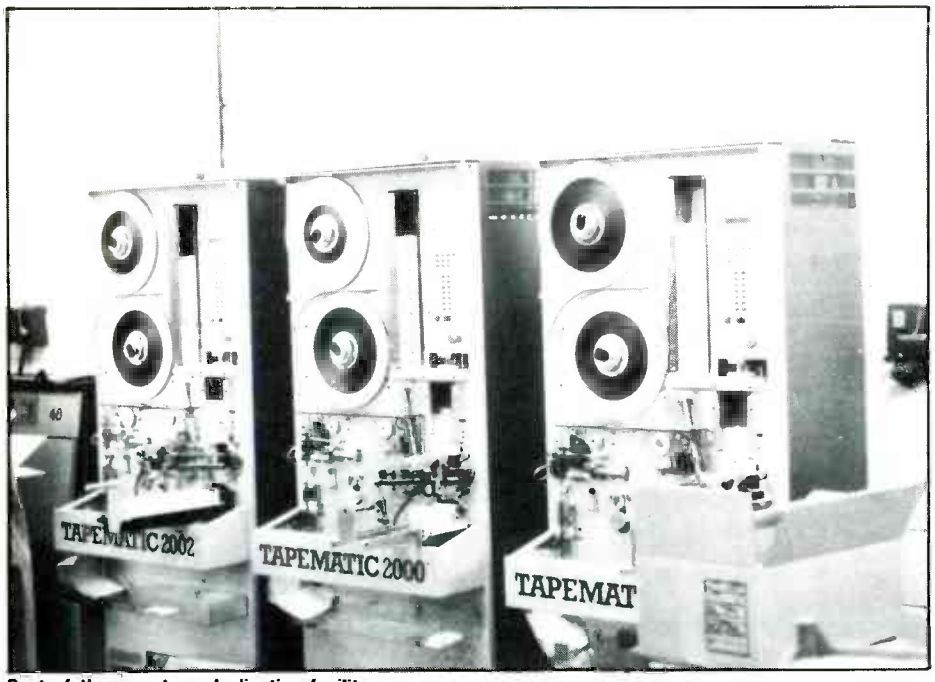
Less than 10% of customers ask for paper labels. "Our philosophy is: if the customer wants it, we will provide it." Hence the recent purchase of a second hand Tapematic *1000* labelling machine. Finished cassettes, inlay card and boxes go into a Tapematic *670* boxing machine which puts it all together.

Quality control includes Teac cassette machines, Sony amps and JBL speakers, but there are also various home computers to check the data duplication of games for Amstrad, Commodore and the like. Occasional cassettes go to the mastering studios to be checked against a copy master. Nick Flower notes that cassette reject rates have actually reduced: "Since we put the Tapematics in the reject on tapes is down to around 1% and previously we were running at just over 2%."

The future

For the future Damont Audio is watching the progress of compact disc following the take over of two British CD plants. Will Damont Audio go into CD? "It is not out of the question," says Nick Flower, "but at the moment the time's not right. We're keeping our options open. I think the CD market will settle down, but I think it's got another tough year ahead of it." The company is keeping it's options open on DAT too.

There's no doubt that Nick Flower and his team get a lot of fun from their contribution to the music industry. "Although we're deadly serious about providing a service, I think you've got to be able to poke fun at yourself and have a good laugh. There are times when you have total disaster and devastation around you. If you can't laugh then, forget it; because if you can break the tension you usually get it right quicker. Sometimes I've thought, 'I'll go and get myself a proper job,' but I enjoy it. Every day you've got a different set of problems. It's nice to be able to do the impossible occasionally."



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Tape Control

The Master Art of Lyrec

With a history stretching back over 40 years, Lyrec Manufacturing A/S have had first hand experience of the on-going development of tape duplication equipment. Carl A Snape reports on the company today and how they view the current scene.

The headquarters of Lyrec are based in Lyngby, just a short drive to the north of Copenhagen. The company occupy a relatively new three-storey building that backs on to the residential area of the town.

The ground floor contains the main parts store (150 different PCBs in stock and around 20 to 30 new ones a year), machine shop plus the stock and packaging store. On the floor above are the general offices, final test and the research and development departments. The third floor is used for production and assembly.

Talking to Henning Beck, the production manager, it seems that all the employees take a keen interest in the company's activities and are quite happy to spend time over lunch (almost everyone uses the staff canteen) discussing a particular problem or new project. This concern and interest seems fundamental to the Lyrec philosophy and part of this can be illustrated in the company's attitude to new and existing product lines. The company, for example, make a great effort to ensure that earlier products are not automatically outdated when new developments are introduced.

Spare parts for machines up to 10 years old are generally held in stock. New components (were possible) are designed to fit existing models and if you break or lose a mechanical part from a very early machine, no problem, the machine shop would be quite capable of producing a 'one off' replacement part.

Given the fact that the equipment is built to last, this level of service must be quite reassuring to many customers, especially those in overseas territories.

Early products

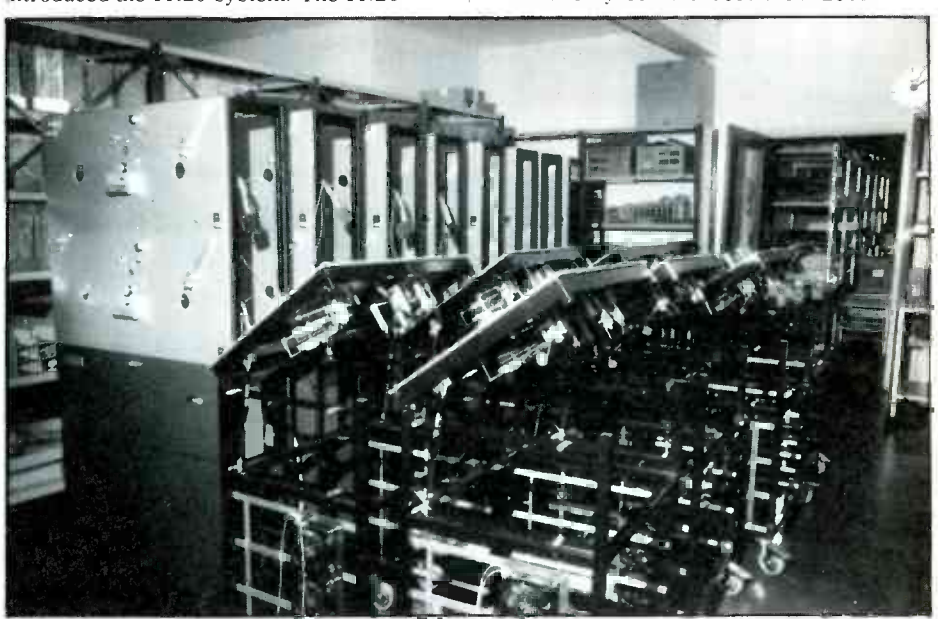
Founded in 1945, the earliest days of Lyrec actually pre-date the commercial introduction of magnetic recording tape. The first products Lyrec ever made were moving coil pickups and turntables. Quite an interesting combination of products as it turned out, for in 1947 Lyrec set their sights very much on the professional market with the introduction of their *Instantaneous Recording Equipment* — a portable, 78 rpm disc cutting system.

In 1950 they marketed their first tape recorder (appropriately the *TR1*) and in 1959 introduced the *TR20* system. The *TR20* system was a four times, open reel duplicating system using 3¾ and 7¼ ips masters with duplicating speeds of 15 and 30 ips. Either one or two masters could be used with up to 10 slaves.

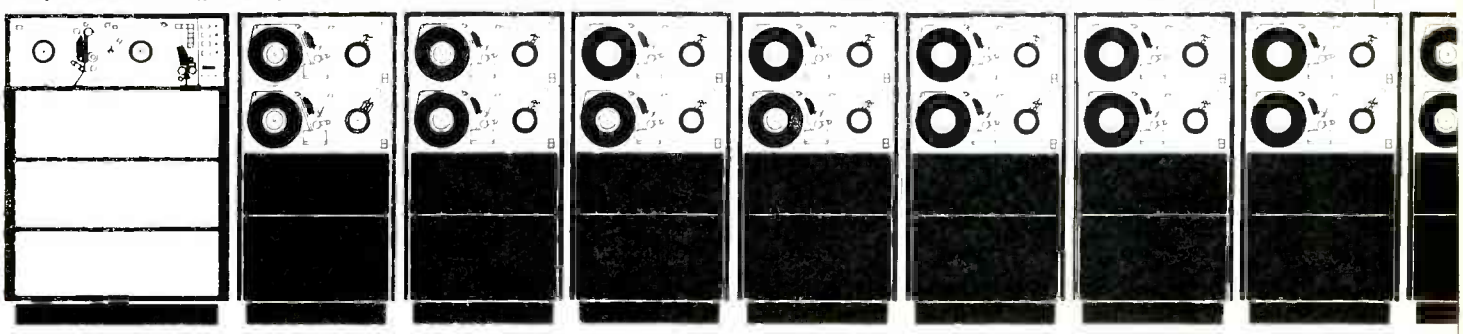
At the beginning of the '70s (after waiting to see which format would win greater acceptance — compact cassette or 8-track) Lyrec produced their first cassette duplicating system. Based on the open reel system two versions were available: one featured five slaves, the other 10. These early in-cassette systems ran at ×8 duplicating speed and all the individual cassette units were driven with a common capstan motor.

In 1976 the first twin slave system was introduced — the *P-2000*. Duplication speed was 8×7½ ips. Interestingly the slaves used 10½ in NAB pancakes but the masters were still on 7½ in cine spools. This was followed by the *49PLM* loop master running at a 16:1 ratio.

In 1978 Lyrec introduced the *P-2000*



Frames awaiting further assembly and electronics



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loopbin system — the forerunner of the current *P-2500* system. Running parallel with the development of the duplicating systems were Lyrec's broadcast and ¼, ½ and 2 in studio recorders.

Markets and philosophy

Lunch provided the opportunity to talk at length with Orjan Svedberg, managing director of Lyrec. As he was about to leave for Switzerland it seemed obvious to ask him about Lyrec's overseas markets — particularly the unusual ones like Russia and China.

"We started exporting to Russia 7 or 8 years ago and now the three cassette duplication plants which are in Russia are working with our equipment. They are run by Melodia, which is the state-owned record company and have a capacity of 20 million cassettes a year."

"What," I asked, "had impressed them about Lyrec equipment?

"Well, we have design philosophy of not complicating the design unless it is necessary and therefore we try, as far as possible, to use components that are generally available so that spares, — if needed — can easily be found locally, anywhere in the world. That was one part of it.

"Apart from the quality of sound another important point is that the cassette factory is really a 'transport' company. In the factory you transport a lot of tape, a lot of plastics, a lot of the packing material and so on so that means you need a lot of floor space for bulk handling. The way our machinery is designed makes it possible to provide the maximum floor space for just that purpose. You can put four of our slaves in the area of one of our competitors."

And what was the situation in other markets?

"At the moment we have five large installations in China, our last shipment was in July. To my knowledge there are roughly 12 big installations in China but I think sales will now slow down because the Chinese have now expanded to their planned capacity.

"Important markets for the next few years will be Western Europe and the US where there has been a tremendous cassette boom and a lot of effort has been made to increase the quality of the cassette. Everything looks like this will continue which makes new investment more and more likely."

Given the fact that quality is on the increase should the record companies be doing more to encourage higher standards?

"We discussed this a couple of years ago and we could not find an easy way of communication on this issue. This is why we concentrated on our customers and the way they wanted cassettes to sound. We took a look at the total cassette manufacturing process and literally listened our way to new designs to make sure that we were capable of producing high quality cassettes.

"The quality race has obviously been helped by the CD coming to the marketplace so today the need to tell people about the need for quality is not necessary. It is accepted and the industry is trying to increase the quality. Obviously they have to think of their return on investment all the time and that's a fact of life for everybody. I'm not sure either that the people to pressure for higher quality are in fact the record companies. I think it should be the end user who encourages quality by what he is buying and those are the signs the industry has been waiting for.

"You have a lot of new young people coming into the market every year, a lot of customers coming in with different views on quality based on their own experience and their interest in audio. Customer awareness of quality increases every day and obviously the industry should take note and act accordingly.

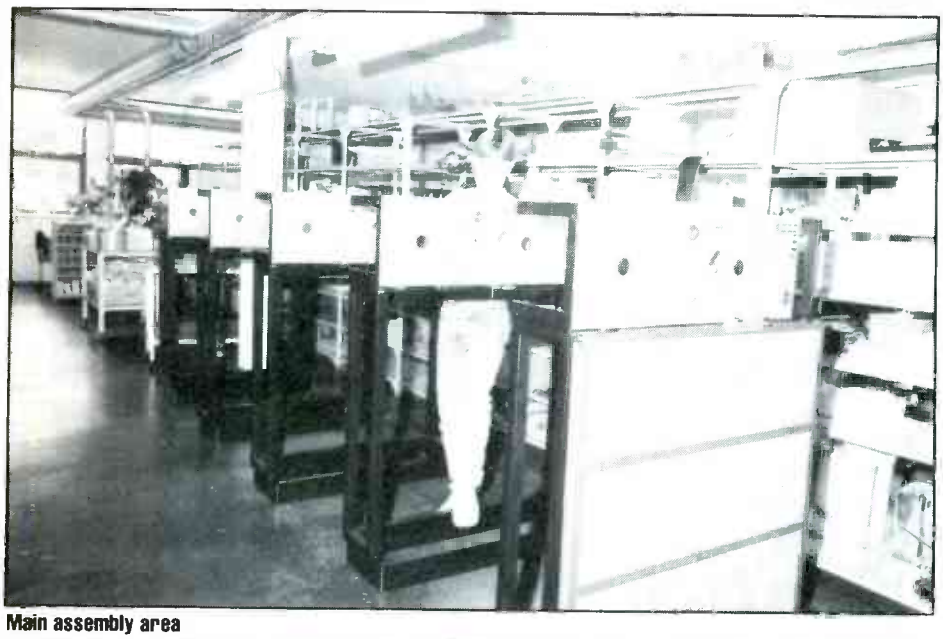
"Tape manufacturers, duplicators, CD manufacturers, everybody wants to make their contribution and the customer has been responding which means the whole industry now turns to quality. Costs, well that is a situation between the record company and the duplication company. Obviously the price is dependent on a lot of different factors but what we hear from our customers is, in this business situation, plays a bigger role every day. It is not necessary to spend any more money to get better quality it's just that techniques have advanced and tapes are now much better."

Given the interest in higher quality, what kind of future did Orjan Svedberg see for the duplicating industry?

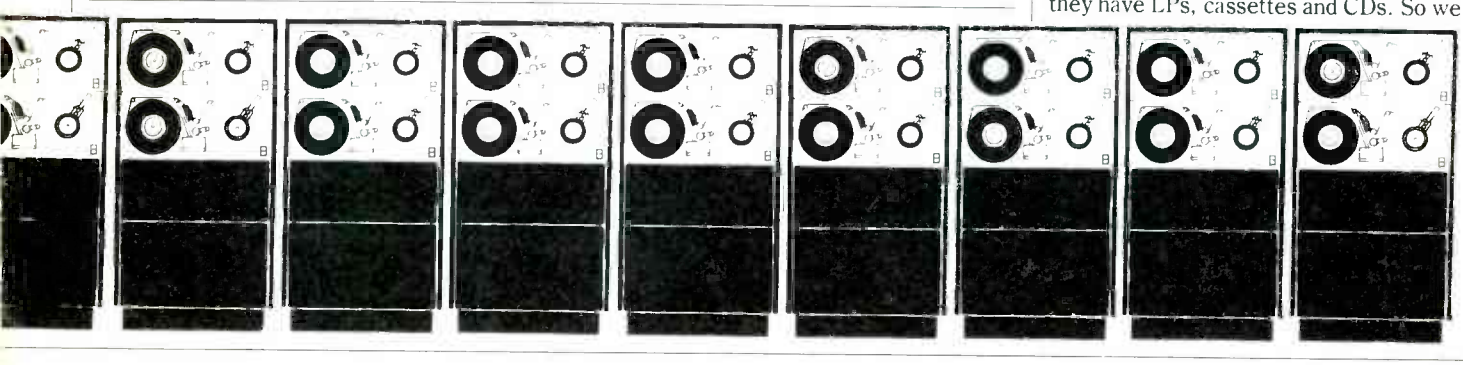
"I think in the short term what will happen is you will see every duplication company becoming more of a full service company, to provide bigger and bigger factories, not only just handling the printing of labels, etc, but also providing the distribution to the sales outlets. This may mean that there may be amalgamations amongst duplicators.

"As far as new media is concerned I think there will always be new alternatives because the media represents a tremendous amount of invested capital to the market. Whether a new media is a success or not is more a question of investment rather than a question of whether the medium itself is good or not.

"Today you can go to a music shop and they have LPs, cassettes and CDs. So we ▶



Main assembly area



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already have three media. Adding a fourth or fifth and the risk of making the wrong stock decision increases tremendously. Also putting pressure on record companies to release several formats only adds to the costs. I think this is against the idea of the music industry where everybody is interested in a cost effective approach."

Technical matters

The current high speed duplicating system (*P-2500*) has been carefully designed to be space saving, flexible and easy to run. The *P-2509* loopbin can run either ½ or 1 in masters and no vacuum or compressed air systems are required. In order to achieve minimum crosstalk between programmes, separate heads are used for Sides A and B.

The *P-2508* is a twin slave design featuring Dolby *HX-Pro* and 64/32:1 duplicating ratios. Special low inductance heads with 8 MHz bias are used to obtain extended high frequency capability at high duplicating ratios. Each record amplifier has four equaliser networks (Bias, Mid-to-High Level, Peak Level and Level); separate adjustments are provided for ferric and chrome and ×64/×32 ratios. These are all preset at the factory according to IEC I and IEC II standards. If customers prefer to use tapes different from the IEC standard, alternative calibration can be provided.

According to Jorgen Michaelson, technical manager, getting a flat frequency response wasn't a particularly difficult problem, far more important was phase stability.

"In conventional recording the high frequency content of the record current will add to the bias current giving the so called 'effective bias'. Changes in the effective bias, due to a 'toppy' programme, change the absolute phase of the recording and so differences in programme material between the two stereo channels can actually change the relative phasing between channels.

"The aim of the Dolby *HX-Pro* is to monitor the effective bias and based upon this information to keep it constant. Since the amount of bias reduction necessary for keeping the sum constant must be the same across the whole tape width and all tracks for identical input signals, it is of vital importance that the stereo channels are matched together in frequency and phase response in the record amplifier where the monitoring takes place in order to get proper relative phasing of stereo tracks.

"*HX-Pro* has a lot of advantages and it can be used anywhere in the recording process. Some people think there is a problem of time constants and a change of frequency response when you alter the bias. The worst thing that could ever happen is mis-tracking — but that is still no worse than not using *HX-Pro*. The only thing it can do is not work, in which case you'd be back to square one."

In order to help customers keep their equipment properly aligned Lyrec have developed a very useful test tape. Jorgen Michaelsen explained. "When we have the master recorded at relatively low speed and reproduced at high speed on two completely different machines then, even if you carefully adjust the machines with standard test tapes you have to match them very precisely to get really high quality. Our test tape is for fast alignment in the field.

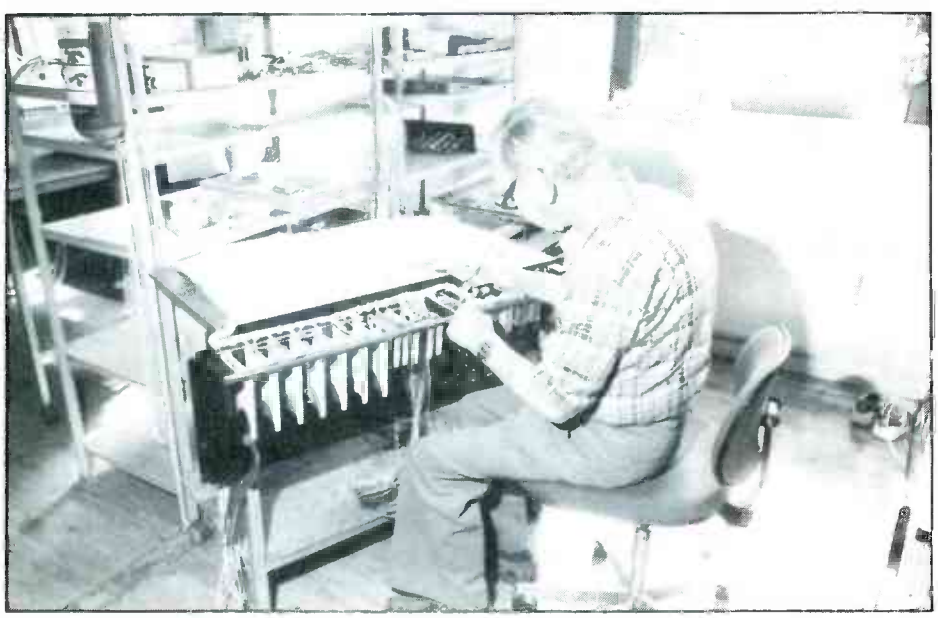
"We supply the test tape so that you can run it on the ¼ in machine and you can prepare a master with the signals. Of course this is done after you have aligned the machine in the ordinary way. Our test tape is used just for the final adjustments. You put the test tape in your master loopbin and fine adjust azimuth, check phase jitter and look at the frequency response. If this is done correctly you can be assured that you are getting the ultimate result from the master. After that you record on the pancake repeating the process. Although it is possible to look at the frequency response in realtime, it is designed to be looked at on an oscilloscope at high speed using our calibration test head.

"You can also use the same test signal coming from the master for stationary adjustment of the slave. We adjust the slaves here at the factory when they are not running by just looking at the head current so you can use this same test signal for easy alignment of the record amplifiers. If you have a new tape and you know that you have to lift your treble 2 dB for instance, you can use the signals for quick alignment just by looking at the record amplifier test points."

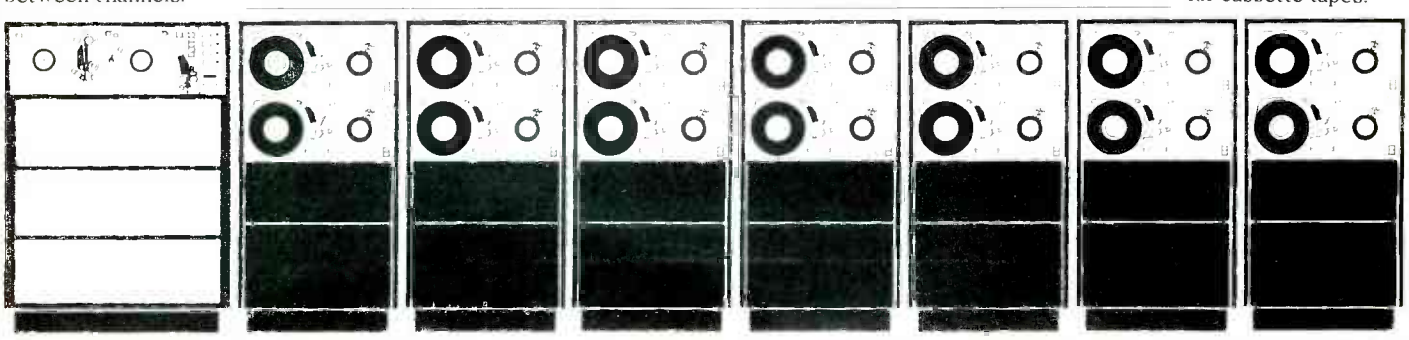
With the equipment running reliably then quality becomes important.

Over the past few years attitudes have changed. Improving quality is now a very real consideration for many duplicators. Compact disc with its wide dynamic range and lack of hiss is raising consumers awareness of higher standards. With the obvious improvements *HX-Pro* brings, what were Jorgen Michaelsen's feelings about Dolby *C* noise reduction.

"I like Dolby *C* very much. Dolby has the same way of doing things as we do. We listen to what we are doing and like Dolby have optimised every circuit for listening quality. But there's a problem with Dolby *C* for cassette tapes. ▶



Wiring of electronics



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"Many people don't have Dolby *C* on their equipment and it's not compatible with non-Dolby equipment. Dolby *B* is partly compatible as you don't have the breathing or pumping effects from the Dolby *B* circuit as you have with Dolby *C*."

"What do you feel is the biggest problem at consumer level: incorrect Dolby *B* alignment or incorrect azimuth?" I asked.

"It's both. In Europe manufacturers use the DIN standards but the replay characteristics are very wide. You can have a cassette player that follows the DIN norm and I think it could be about 5 dB down at 10 kHz and 7.5 dB down at 12.5 kHz. This influences the Dolby tracking to a great extent.

"Duplicators today should have no problem following Dolby's guidelines for level and response. The azimuth response is very dependent on the C-0 but I think duplicators are so aware of it that it is the main parameter in choosing the shells."

Naturally no matter how good the duplicating equipment, there's one essential item of equipment we haven't mentioned so far and that is the pancake QC checker. Lyrec's *TR55-QC* is based on their ¼ in studio recorder and includes some quite interesting features.

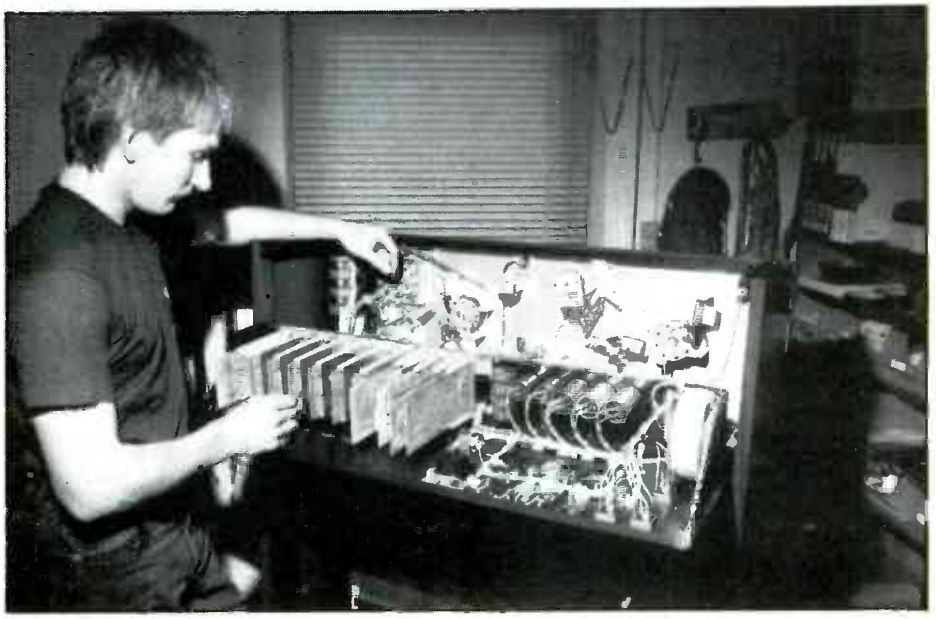
The *TR55-QC* can be used to check programmes either directly on pancakes or open reels. A special packer arm (similar to that on the twin slave) allows the user to rewind the pancake after testing so that it can be returned to the production line without any loss of programme. One major user has already calculated that the machine paid for itself within four months of being installed because of just this one facility.

Another interesting feature is the azimuth adjust. If for any reason the azimuth is not quite spot on and needs slight adjustment, then resetting the slave is simplicity itself as both the slave and the QC machine have identical adjustment screws. All the engineer has to do is match the angle of the screwdriver slot on the slave with that of the QC machine. A removable knob ensures that only qualified staff can alter settings.

The machine has yet another unique feature — its Cue Finder system which automatically helps the operator find the beginning of the first programme recorded on the pancake.

It's down to earth, practical solutions like this that characterise Lyrec's thinking. In a process of continual refinement, standards are improved, output is increased. That is why, rather than rush into any areas of new (and possibly dubious or short-lived) technology, they're quite happy to go on getting the best results from proven technology.

So what are we likely to see next? Well it won't be a DAT duplicator (Jorgen Michaelsen doesn't see a real future for DAT in the duplication field). What is most likely is a 480 ips system using 7½ ips masters but, then you probably already guessed that.



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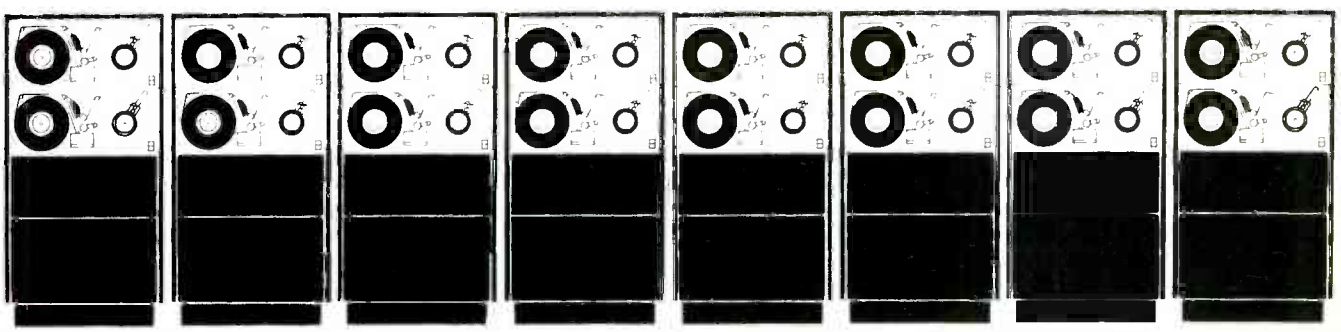

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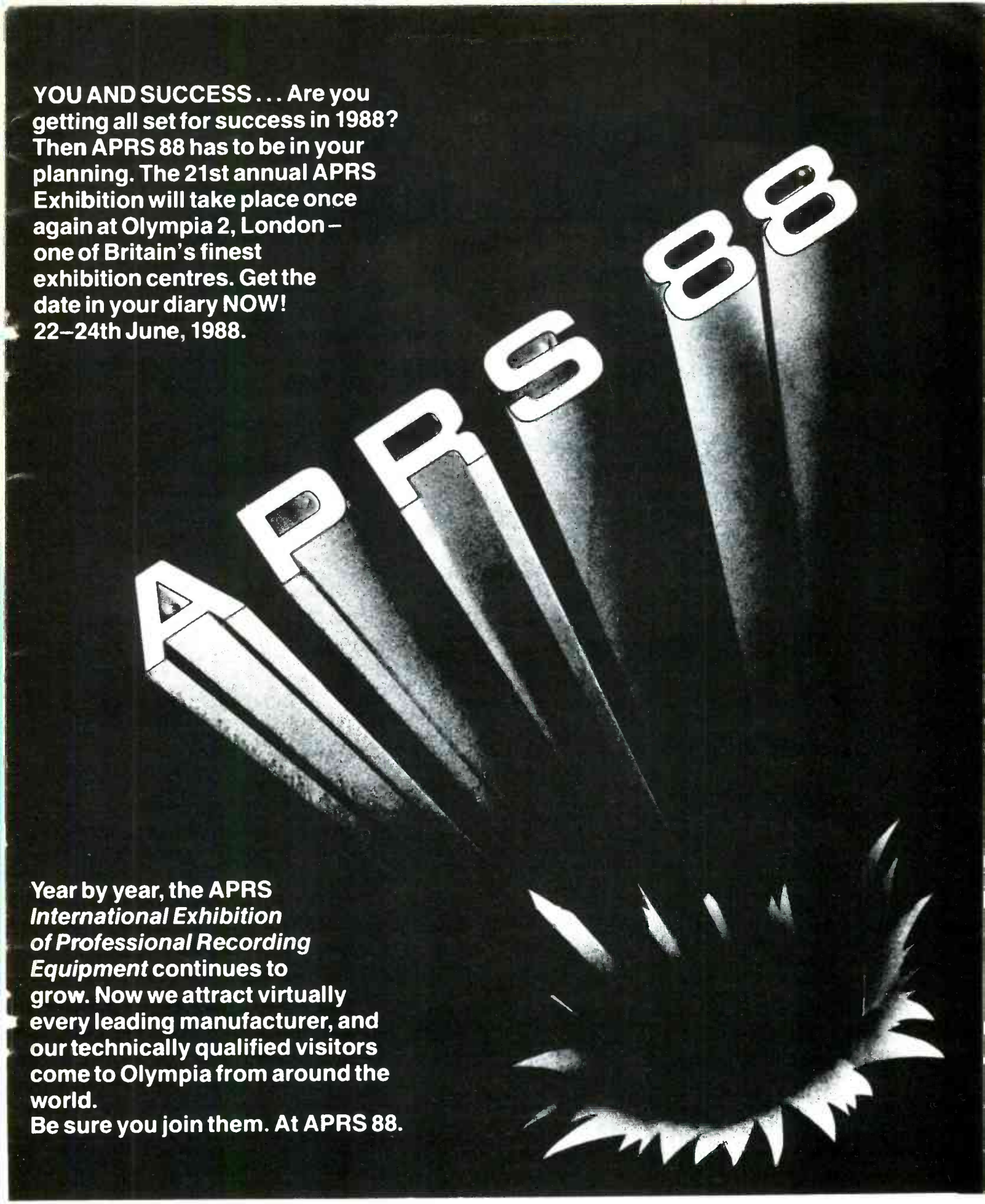

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The Changing Face of CD Production

Barry Fox looks at the broadening interest in optical pressing from the boardroom to the high street.

Today Wales, tomorrow the world. Today Oxford Street, tomorrow who knows . . . Nimbus started pressing LPs of classical music in 1977 and in 1984 built Britain's first CD factory, in the grounds of a Monmouth mansion. In 1986 Nimbus built a second CD factory at Cwmbran, gave up pressing LPs and started ploughing back music CD profits into work on CD-ROM, the data version of CD which can store 600 Megabytes (or several encyclopaedias) on a single standard disc. Now Nimbus has opened a CD factory at Charlottesville, Virginia, giving a total production capacity of around 20 million discs a year.

Long before CD was even launched, Nimbus' technical director Gerald Reynolds made a prophetic comment. Mastering, he said, was both technically and commercially the key to success.

In those far off days, a lot of us were trapped in the mindset that because CD was a digital medium, just ones and zeroes, all you had to do was transfer bits from tape to a master disc, electroplate it to get stampers and start pressing. The technology would be difficult — far more difficult than anything the record industry had ever previously faced — but either the discs would work, or they would not work.

Sooner or later, we all learned that there was much more too it than that. At every stage in the production process more errors are added to the bit stream. Up to a point, the player can correct the errors it detects. Past that point the player has to interpolate, which is a fancy way of saying it must guess on the strength of the last useable information retrieved. Past the guess point the player mutes.

Of course we now know that different players handle errors in different ways. Interpolation sounds nasty. Mis-tracking, caused by a confused servo control, sounds even worse. If the mastering stage introduces errors, then they are there all the way down the line, as a base to which all other errors are added.

Mastering a CD is as challenging as masking the circuit lines for an integrated circuit, with crucial dimensions less than one micron, or one millionth of a metre. The master glass must be cleaned to remove all traces of contamination, and coated with a layer of photo resist material with a depth which exactly — and consistently matches the depth of the pits pressed. When the coated glass is spun under a laser, modulated with digital code, the beam must track in on a perfectly regulated spiral path, changing its focus all the time to keep a pit-sized spot on the inevitably slightly uneven surface. There is no guide spiral on the disc to follow, as in a player. At several hundred rpm the servo-focus optics are tracking warps with microsecond tolerances, and at the limits of feasibility defined by the wavelength of the light used.

In Europe Philips sells mastering suites. Even at a turnkey price of £1.5 million, there is still a year's waiting list. Hence mastering is currently the production bottleneck even though it costs over £500 to master a CD.

In December 1983 Nimbus' research director Dr Jonathan Halliday started to do what seemed absurd — build his own laser mastering system instead of buying from Philips. Halliday had joined Nimbus from the IBA, with experience of Ambisonics surround sound. The lathe cost £150,000; a tenth the cost of the Philips system. In 1987 it won Nimbus the Queen's Award for Technology.

Nimbus now has two mastering lathes up and running, is building two more for its American factory and another three more for use in the UK. There are no plans to build one for anyone else. Nimbus knows the commercial advantage of having plenty of mastering facility on the premises; it means the freedom to guarantee a standard two week turn-round from tape to pressed disc and as little as four days if necessary.

Nimbus is decidedly unenthusiastic about the three inch single. "Yes," agrees Gerald Reynolds "It would be possible to press four 3-inch discs at the same time in a mould. But then you multiply your problems four times. And what happens when one part of the mould wears out ahead of the others?

"The industry's problems on mastering capacity will get worse," says Reynolds, "especially as run lengths get shorter". He cites the example of what will happen with CD video, when the same discs have to be mastered twice over, once for PAL release and once for NTSC; and CD-ROM, where very high value discs are pressed by the hundred.

"Mastering," he said, "was both technically and commercially the key to success."

Maxwell interest

This is the hidden reason why Robert Maxwell and his communications corporation recently paid £24 million for a controlling share in Nimbus (*And also presumably why he is reported to be interested in a new Bulgarian CD plant — Ed.*). Cap'n Bob isn't interested in music CDs. He's getting into electronic publishing and needs the CD equivalent of a typesetting plant and printing press.

Maxwell has not said what kind of material he will publish on CD-ROM. But Whitaker has now announced a CD-ROM service, called Bookbank, which shows the kind of market which Maxwell will attack. Whitaker already offers booksellers a microfiche service, to help them keep track of the 440,000 books currently in print, from over 12,000 publishers, with 1,000 new titles added each week. From January 1988, Whitaker will keep its book lists on CD-ROM. For a subscription of £980 a year, Whitaker will provide bookshops with an updated CD-ROM every month. They can use these with a desk top PC and CD-ROM player to search for any book, by title, author or subject keyword. Providing a similar service on paper, says Whitaker, would need an index sheet stretching over 50 km.

Whitaker's timetable will be very tight. The monthly Bookbank discs will be mastered and pressed at Hannover in West Germany because Whitaker had already struck a deal with the Philips DuPoint joint venture before Nimbus announced its commitment to CD-ROM. Although PDO has a factory in Blackburn, it is not yet equipped to handle CD-ROM.

Maxwell will find life much easier, with his own personal mastering and pressing facility just down the M4.

Pressing technique

Although no-one gets to see the Nimbus mastering suites, the company is refreshingly open about its pressing facilities, one in America and the other at the original Monmouth plant now pre-masters in a new factory in Cwmbran. The new Welsh factory was leased in May 1986 and was pressing discs by September. There are now six ▶

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presses, made by Netstal of Switzerland, feeding three Leybold vacuum chambers for metallisation. The presses work on injection (as opposed to injection-compression), producing up to 9,000 discs a day or 400 an hour. Each of the four chambers holds a batch of 252 discs with a cycle time of between 20 and 25 minutes. The discs are loaded in, the air pumped out and aluminium flash-evaporated by passing high current through tungsten coils.

The Nimbus Netstal presses at Cwmbran are running on a cycle time of just 9 seconds. But the system is clever in that it sets it own optimum cycle time. You set the parameters, like temperature of the mould, and the Sycap computer does the rest. That way the factory can work out the best parameters for good pressings rather than start with a cycle time and end up with poor pressings because the machinery runs too hot or too cold.

The condition of the raw polycarbonate fed into the press, by a high pressure screw, is all important. If there is any moisture trapped in the plastic particles, it ends up as a bubble in the pressed disc. So the raw plastic granules must be kept at high temperature in dry hoppers, before being fed to the presses.

Nimbus, like Sony in Austria, buy their polycarbonate from Teijin in Japan, rather than Bayer in Europe. Bayer is used as a second source to ensure that shortages of raw material can't hold up production.

Although, routinely, anyone working in the Nimbus factories must wear protective clothing, neither factory has an air shower. Instead there is a clever system of laminar air flow. All the sensitive areas, where the discs are exposed, are underneath hoods which blast class 100 air downwards in an enveloping blanket.

The air flows continually at 0.75m/s so that any dust or particles of skin shed by the workforce never get a chance to get near the disc.

"We prefer to keep the air clean where it needs to be," says Thorne. "With laminar flow round the sensitive areas, and positive air pressure everywhere to keep dirt out, we don't need air showers. We don't use beard masks either, although we take sensible precautions, like asking people not to wear wool clothes under their protective suit."

Samples of discs are tested before metallization, ie while still transparent, by viewing through a polarising screen. Any stress shows up as a coloured pattern. Transparent discs straight from the press are stacked on spindles, spaced apart by washers. After metallisation, protective lacquer must be applied within the hour, or oxidisation progresses fast and spoils the reflective characteristic. Samples of finished discs are checked on equipment made by Jonathan Halliday, a modified Studer *A-725* CD player which prints out a read-out of the block error rate. The Philips specification says anything above 220 is unacceptable. Cwmbran rates were between 10 and 20 when I visited.

The staff are encouraged to bring their own CDs, bought in local record shops to check them for BLER. "It helps the concept of quality which we are trying to encourage," says Thorne.

The Swiss made Teca print machines, which squeeze ink onto the label surface normally work with two colours. But Cwmbran has put two alongside each other, so that they can work either separately on two lines or together to give four-colour printed labels.

Earlier this year Nimbus made news by announcing that the company was making over 100 workers redundant, to make room for increased automation and, thereby reducing pressing costs. Another 140 lost out when the Monmouth plant stopped pressing. Factory manager Martin Thorne explains where savings can be made.

"Other times the line was running, but like something out of a Jacques Tati movie, the robot handling arm was flinging them out of the press and onto the floor."

"Firstly we pack by hand, and that can be automated. The discs are checked visually, but electronic checking is possible. Thirdly, we are loading and unloading the metallising chambers manually and that needs mechanisation. The new metallisation chambers always keep the discs aligned for easy removal after treatment."

Although all the publicity for Nimbus concerns the CD pressing venture, and takeover by Robert Maxwell, it's easy to forget that the company is still making music recordings.

Whereas early Nimbus recordings were mostly of piano, voice or chamber music, many are now large orchestral works recorded on location. The company has just started to release old jazz recordings culled from the collection of a local enthusiast and record dealer. With a staff of over 500, factories in Britain and in America, more CD mastering than any other plant in Britain and a location recording facility it is easy to see why the Nimbus empire gets annoyed when described as a "small record company".

Why, I asked, is Nimbus not following the lead set by Virgin at the Oxford Street Megastore, and using a single automated line, with automatic handling and a conveyor belt running from the press through the metallisation chamber?

Nimbus acknowledges that that the Virgin plant is a fascinating idea, but clearly sees Richard Branson's £0.5 million investment as more of a publicity stunt than a serious rival in the pressing business.

Virgin Megastore

It was on September 29 that Virgin pulled back some screening from the bottom end of the CD shop basement to reveal a fully-fledged CD factory and proved trade rumours correct.

Through a glass wall into the clean room area, CD shoppers can watch what was claimed to be the first 'monoline' in the world. A Netstal press produces discs from Bayer polycarbonate, at a rate of around one every 10 seconds. A robot arm picks the discs from the press mould and loads them on to a carousel.

From there they are pulled up through a bulkhead into a Denton Vacuum vacuum chamber. Inside the chamber the clear discs are sputtered with aluminium; a high voltage strips metal atoms from a block of aluminium and deposits it on the discs.

The metallised discs — now looking silver — fall gently back down onto the carousel. This transfers them to a short conveyor belt moving past a lacquering nozzle. The disc then spins to spread the lacquer evenly while the conveyor moves the wet disc under an ultraviolet curing lamp.

At the last stage of the monoline an inked silicone rubber pad prints a two colour label.

In theory Virgin staff put raw polycarbonate plastic in one end and lift spiked piles of finished discs from the other for checking on Sony error detection equipment.

"If we had an in line machine", says Thorne, "I would like points along the route to divert discs round faulty stages in the line. With existing lines if one part of the machine goes wrong, the whole line stops."

After visiting Nimbus, I called several times at the Virgin Megastore in London. Thorne's reservations were born out. On two occasions the line was stationary, with worried-looking Virgin staff poking it with screwdrivers. Other times the line was running, but like something out of a Jacques Tati movie, the robot handling arm was flinging them out of the press and onto the floor. There they piled up as a sea of unusable rejects.

While all this was going on the puzzled workforce was trying to mend something faulty downstream.

Only time will tell how long it will take the Megastore line to produce useful quantities of saleable discs. One thing is certain. If yield rates remain at an unacceptable level, Branson will strip out the equipment once the novelty and publicity value has worn off.

Already Virgin has put megamillions into the incredibly risky plan to launch a direct broadcasting satellite for Britain. It is hard to find anyone in the electronics industry who thinks the venture stands a chance against competition from its Luxembourg rival Astra, or that Richard Branson fully understands the costly game he is playing. If DBS proves to be the fall for which many believe the Buccaner is riding, a troublesome in-store CD plant may prove an expensive plaything.

Anyone want to buy a used monoline — going cheap with transatlantic speed boat and balloon?

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Thoughts on Re-issues

Guesswork or judgement, creating re-issues on CD can be fraught with hidden problems. Sean Davies explores the problem from the mastering engineer's point of view.

Gather a few engineers around the bar in the local pub and among the subjects guaranteed to give a lively debate would be (i) Whose round is it? (ii) Who is going to buy Studio X? (who have denied they're up for sale) (iii) What is the proper way to deal with older recordings when reissuing on CD? We're going to talk about the last one.

At the two extremes we have: the CD should be exactly as the first issue of the black vinyl; the multitrack should be remixed. As golden rules I don't believe in either but the first one is less frightening. Anyway, what are we trying to achieve?

Yes. Jones Minor: 'Quality', excellent.

The CD buyer should get the best possible sound from the original recording. Now we've answered that we can all go home, or we can stay and ask ourselves if we are really giving Joe Public the best possible result for his hard earned cash.

Technical limitations

Any recording system has inbuilt technical limitations (yes, even CD) although we're not supposed to talk about those as CD is the new wonder product and it's perfect, or so we've been told by the commercial people. Part of being creatively involved with a recording is the ability to work with these limitations, sometimes stretching them but not denying their existence. The problem comes when we have a transition from one medium with its own set of restrictions to another with a different set.

Back in the days of acoustic 78s the system could not cope with the bass drum used in jazz and dance bands and the string bass would simply not be audible. This meant the bass line was provided by a brass instrument, tuba, euphonium or bass sax. Nobody, as far as I know, has been silly enough to suggest that we should now dub a string or electric bass on to reissues of King Oliver or the Original Dixieland Jazz Band. On the other hand, there's every reason to search out the original master plates for a transfer rather than use a shellac pressing just because that was what was in the shops at the time.

OK, at this point we're probably all still in agreement, but it's when the technology gap is less that the decisions get harder. Take, for instance a couple of acknowledged problems with analogue discs: low frequency level and playing time, and high frequency vs playback distortion and/or cutterhead safety. Low frequencies don't bother CD although there is a trade-off between HF and overall level, particularly if pre-emphasis is being used, and certain sounds can turn 'tizzy'.

Suppose the original stereo master was ¼ inch, taken to the cutting room by the producer who, after working on the mixes for some weeks, was hearing the final master with new ears, and right through both sides at one sitting. The cutting engineer might have suggested some changes to improve the overall result on disc and the producer may have decided to make some changes in any case. Sometimes a ¼ inch analogue production copy would be made incorporating all these changes: should this be our master for the CD? (Remember, it's already a generation away from the original mix.) The point is, unless we can talk to the producer and/or the cutting engineer, we can only guess at what changes were made for the convenience of transferring to analogue disc and which changes were made by the producer as an artistic judgement irrespective of the medium.

Guesswork

Our guesses, however, might be a bit closer to the truth if we can compare the original ¼ inch with the first analogue cut, and even better if we can see any notes made by the cutting engineer at the time. If the side were 24 minutes long and of fairly heavy rock, then if there were more bass on the tape than the disc, and the tape sounds good then we are fairly safe in assuming that the bass cut was expedient rather than desirable. If there were a lot of top, especially on the last tracks on each side, and the HF filter had been used, we might just assume that it was to avoid playback distortion, but we're not on such firm ground; maybe the producer said, "Yes, it's better with a bit of rolloff, keep it like that through the side." We can't be certain.

It's even more difficult if we find that overall limiting/compression as used; it might have tightened up a mix just that much and the producer loved it. Or maybe the producer was out of his skull that day and later regretted asking for it (but might not admit that to anybody). It should now be obvious that the ideal situation is to have the producer attend the CD preparation session, having located original tapes. (One of the few examples of this happy state of affairs is the reissue of 'Sergeant Pepper' on CD with George Martin supervising throughout).

If we can't arrange the ideal, then we must trust an intelligent preparation engineer to do his best with the best material available. 'Intelligent' in this case means not only someone who knows what buttons to press but who has an understanding of the kind of music and recording techniques used on the original. 'Best material' does *not* mean the nth generation dub most easily found. (See One to One, February 1987 *Back Catalogue: Who Cares?*).

I have great admiration for the engineer who has the patience to make something out of 40 tracks of regurgitated samples laid over the six tracks containing an average song but he is most emphatically not the person to put in charge of a reissue from a few years back. Nor is the studio junior ("but it's only 2-track to digital, he can handle that, can't he?"), who might decide to 'improve' the sound based upon his vast and deep experience of engineering over the last six months. (I well remember playing a Buddy Holly reissue on LP and being depressed at how old and feeble it sounded until I pulled out my original LP on Coral, cut by Ron Mason with the *FFRR* head at Decca, and *Raining In My Heart* just leapt out of the speaker).

Judgement

At the end of the day it's a matter of judgement but it is up to the record company to either select the right person for the job or go to a studio that has the experience and give them the support they need in finding the right tapes, information, etc, and not gripe about the bill if the engineer took another hour to get a really good job done.

Most of the above relates to rock/pop; the classical work tends to be better supervised and controlled, since the public is allegedly more critical of the recorded sound, but in these days of independent producers/engineers and small classical record labels there is plenty of opportunity for confusion and careless work.

How's this for an idea? All producers who have albums in press and which might get issued on CD should get together (via The Producer's Guild for example) and let the respective record companies know that they (the producers) are available and want to be involved in any preparation sessions. OK, it might cost a few more hours in the studio (the producers would benefit from royalties anyway) but it would mean at least there was some kind of reason for issuing the thing on CD in the first place.

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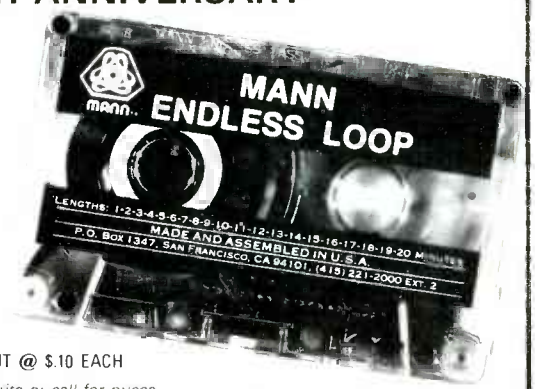

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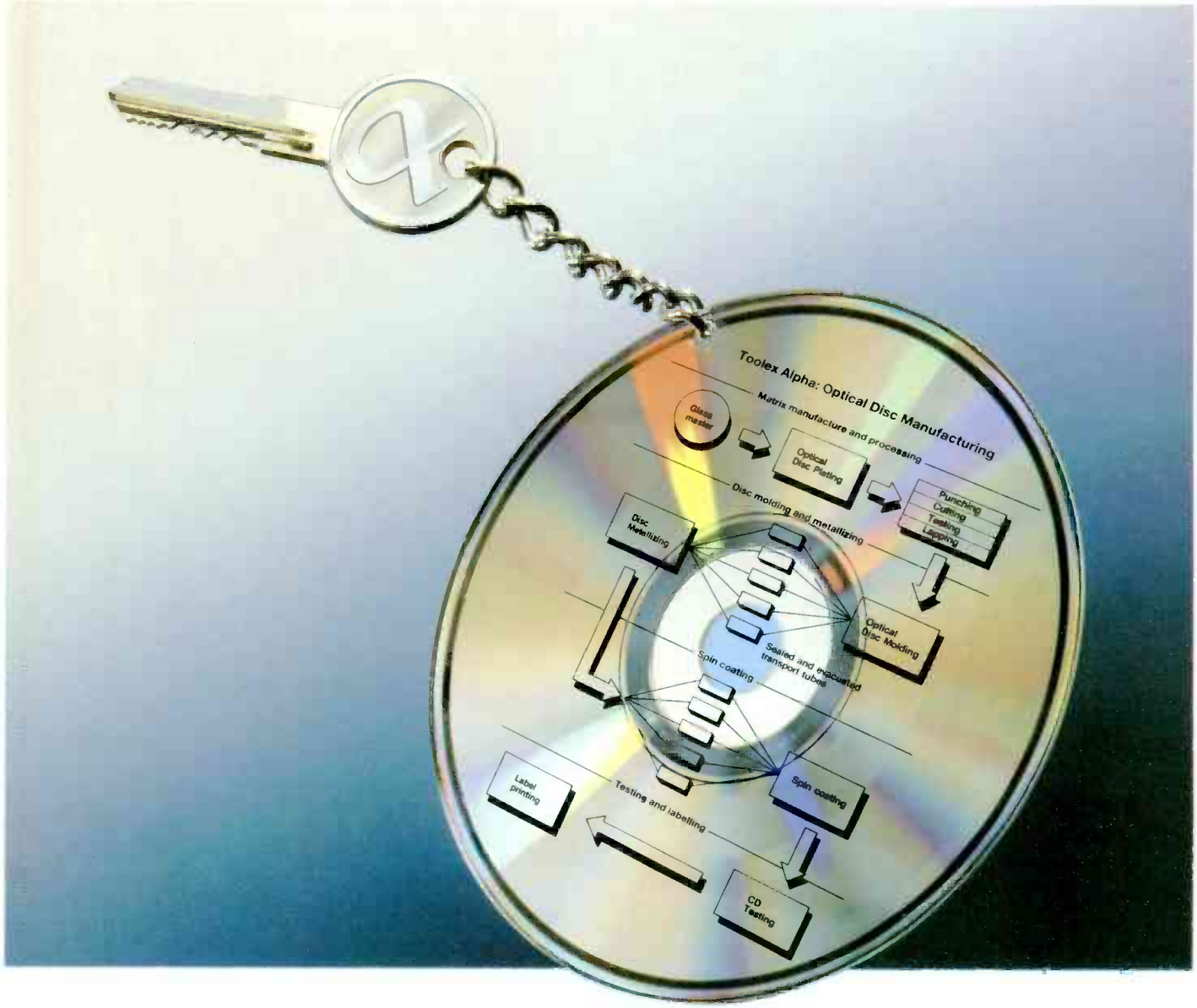
Complete System for Optical Disc Manufacture



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CAN YOU MAKE CDs IN THIS ENVIRONMENT?

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The AVAC system cuts costs – both for investment and operation.
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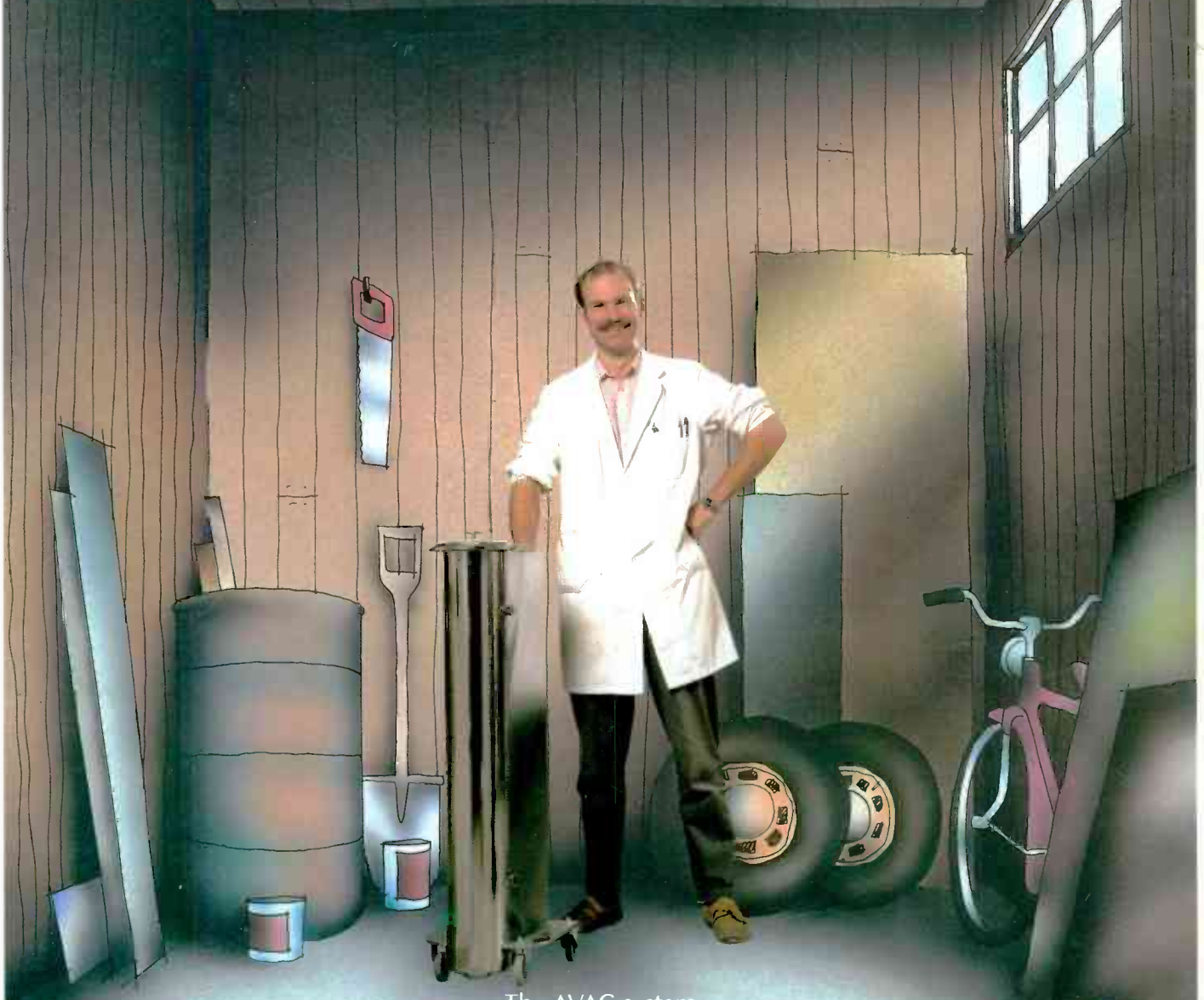

The AVAC system
Continuous batch CD production without a cleanroom

AVAC

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