

TV TECHNOLOGY™

International Edition

Why Should the World Adopt the American Way?

by Mario Orazio

You might not have noticed that it is unnecessary to slit your throat just because someone suggests it. You might think you've noticed it, but, after this year's International Television Symposium at Montreux, I'm not any too sure.

"Thirteen Women" kept popping through my Montreux head this year. It's a pretty bad U.S. movie from the 1930s in which Myrna Loy exacts revenge on people by suggesting they kill themselves or have accidents, and they do. Well, pals, some folks were suggesting pretty awful stuff at Montreux, too, and, at least as far as I could tell, the suggestees were taking the suggesters up on their suggestions as if they, too, were in a bad 1930s U.S. flick.

I don't know. Maybe it was the rain. It isn't my idea of fun to fly off to Switzerland to be either indoors or rained upon, but I think this year's problems were precipitated before the precipitation.

So what is it?

Look: The shindig is called the International Television Symposium, right? Only the way I see it, it isn't really international, it isn't about television and it isn't much of a symposium. Fear not; I shall now elaborate.

Montreux is located in a country with four official languages: French, German, Italian and Romansch. So what language is the official one at the "Symposium"? Right, English. This only stands to reason. Representatives of one English-speaking country were called upon to address delegates far more frequently than those of any other. The country? The good ol' U.S. of A., with more than 50 percent more speakers than the runner-up, another English-speaking country, the U.K.

Hey, I know where the American connection came from, but the late, great Joe Roizen was a Romanian who'd worked in Europe before he started his California company, he could tell raunchy (but funny) jokes in a dozen languages, and I'm pretty darned sure his record for visiting more TV stations in more countries than anyone

(continued on page 11)

Diamond Shines in Europe

by Chris Dickinson

PARIS Following successful demonstrations of the Diamond digital terrestrial transmission system at the Montreux ITS exhibition in June, backers of the system say further field tests will be aimed at fine-tuning the system for use in Europe's crowded broadcast market.

At Montreux, the system successfully carried four conventional television channels and one high definition television channel in a conventional 8 MHz bandwidth. The demonstration, which followed field trials in the U.K. and France, sent the five signals from an outside future technology tent into the main Montreux exhibition hall.

French backing

Diamond is being developed in France by the central research labs of the giant state-owned Thomson LER (Laboratories Electroniques de Rennes), Thomson's transmission arm, in conjunction with Thomson CSF, the BBC and, to a lesser extent, French broadcaster TDF.

The system is part of the work going on in a number of European countries under the dTTb (Digital Terrestrial Television Broadcasting) banner, which is developing a new generation of digital terrestrial television transmission systems.

Thomson officials say work on digital modulation started about five years ago in an effort to develop a technique that would allow a high quality TV program compressed at 34 Mbps to be broadcast to fixed receivers within a standard terrestrial UHF or VHF channel.

The system, like all projects in dTTb, uses Orthogonal Frequency Division Multiplexing (OFDM) technology. In Diamond's case, the digital compression of the signal is achieved with DCT using the ETSI 300174 algorithm, while the compression hardware consists of Thomson's TER 8520 codec for conventional PAL and SECAM signals and the TER 8200 codec for the HDTV signal.

Thomson officials say the first generation of a prototype OFDM modulator was successfully tested at the

(continued on page 4)



TV touring depends on JVC cameras to produce competitive programming for the German market. See this month's Buyers Guide, page 17.

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STAR-TV

Murdoch Buys Majority Stake in STAR-TV

HONG KONG Australian Media mogul Rupert Murdoch's recent purchase of a majority stake in STAR-TV, the growing Asian satellite broadcaster, is the latest move in an attempt to build a worldwide broadcasting empire.

Murdoch, through his media conglomerate News Corp., recently invested US\$525 million for a 63.5 percent share of HutchVision Ltd., parent company of STAR TV, a purchase price that puts the estimated total value of the company at US\$825 million. That turns out to be a rather healthy return for HutchVision's founders, billionaire Li Ka-shing and Hutchison Whampoa Ltd., which together had invested barely US\$110 million in the two-year-old network.

Under the deal, Murdoch will pay part of the cost in common shares in News Corp., giving Li and Hutchison Whampoa a 2.7 percent stake. They will still retain 36.4 percent of HutchVision.

With controlling interest in STAR, Murdoch will control a distribution network that nearly spans the globe. Murdoch already owns the Fox Broadcasting Corp. in North America and controls half of the British Sky Broadcasting (BSkyB) satellite system in Europe.

STAR-TV will give Murdoch another 45 million viewers throughout Asia and the Middle East, a region that is home to

roughly two-thirds of the world population.

Although STAR has been losing money of late, its long term prospects are considered good. It has agreements with five of Hollywood's leading movie companies, as well as international news organizations. It is expected that STAR will use these sources to support a number of pay channels due to be launched this fall.

Also, it is likely that STAR will launch a pay Chinese channel in the near future to capitalize on the growing markets in mainland China, as well as its already sizable base in Taiwan.

STAR currently provides five channels: BBC news, Prime Sports, MTV and entertainment channels in English and Chinese.

NEW TECHNOLOGY

Toshiba & BTS Announce Universal Digital HD Format

TOKYO Toshiba Corporation and BTS Broadcast Television Systems GmbH of Darmstadt, Germany, announced at the Montreux International Television Symposium June 14 that they have developed a new universal digital recording format capable of handling the HDTV standards in use today. The companies will manufacture and sell the recorders under their own names, beginning in January.

At the 1992 NAB HDTV World, both manufacturers had independently demonstrated digital tape recorders, both using a data rate of about 1.2 Gbps, a D-2 cassette housing, and a track length of 150mm. However, there were differences in other recording parameters, and in the recorded HDTV format.

The companies have now initiated the standardization procedure by proposing the new format to the Society of Motion Picture and Television Engineers (SMPTE) as a world standard for high definition television recording.

For more information, contact Makoto Yasuda at Toshiba in Tokyo: +3-3457-2105, and Karl Reichart at BTS in Darmstadt: +49-6151-808539.

MULTICHANNEL VIDEO

Eight Digital Channels Carried on One Transponder

WINCHESTER, U.K. National Transcommunications and Eutelsat have completed tests indicating that a single Eutelsat transponder can carry up to eight broadcast quality digital channels using the NTL System 2000.

The NTL System 2000 is a multichannel video compression system operating with the MPEG standard. The system can transmit four digital TV channels at 8 Mbps in the transponder space normally used by one analog channel.

The recent tests also showed that four digitally compressed channels can be transmitted simultaneously with a single analog FM channel. This will allow operators to more easily migrate from analog to digital.

For further information, contact Bruce Randall in the U.K. at NTL (Telephone: +44-962-822-582).

BROADCAST NEWS

Mexican Government Sells Off Networks

MEXICO CITY In what many observers see as the first step toward ending a monopoly of private television in Mexico, the Mexican government has agreed to sell off its two television networks.

A group of investors led by retailer Ricardo Salinas Pliego bid US\$641 million for the networks, outbidding several wealthy industrial concerns, as well as a group consisting of Paramount Communications and Capital Cities/ABC, the U.S. broadcaster.

The new network will compete head-to-head with Televisa S.A., the giant Mexican broadcaster that draws more than 90 percent of the audience through its four networks.

The sale was part of a government privatization plan that has netted the administration of President Carlos Salinas de Gortari (no relation to Ricardo Salinas Pliego) more than US\$22 billion.

Along with the government networks, Salinas Pliego acquired a production studio and a chain of movie theaters.

IBC

IBC94 to Expand Scope of Technical Program

AMSTERDAM The Technical Program Committee for IBC94 — the International Broadcasting Convention held biennially in Amsterdam — is formulating ambitious plans to expand the scope of the conference's program, based on the needs of the changing industry.

New for the show will be a series of panel sessions, in which a panel of experts will make short presentations on technology issues as a prelude to controversial discussion involving the audience. In addition, the topics of the workshop sessions will be widened to include radio, cable and satellite. The paper sessions will continue to welcome viewpoints from around the world. (A Call for Papers will be published soon in industry journals.)

For more information, contact Technical Program Committee Chairman Ray Hills in the U.K. at +44-71-240-3839; FAX +44-71-497-3633.

BUSINESS

Leitch Europe Awarded £170,000 Order from Reuters Television

LONDON Leitch Europe will supply Reuters Television Ltd. with six ViewGuard Scrambling Systems to be used to encrypt satellite feeds from around the world to customers in North and South America. The order is worth about £170,000.

A ViewGuard system consists of an encoder, a Dolby audio adaptive modulation unit and a PC computer for scheduling daily events and controlling access via the decoders. It uses a digital line shuffling technique to code the video and imbedded audio signals.

For more information, contact Steve Hathaway at Leitch Europe: +44-256-880088; FAX: +44-256-880428.

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Redefining the Diamond System

(continued from page 1)

end of 1990. A second generation modulator, which included a more efficient synchronization mechanism that enabled 70 Mbps to be fitted in a standard 8 MHz channel, was tested by the BBC in October 1992. Further field trials are scheduled this autumn.

Diamond in the rough

BBC members say that while Diamond is being shown as a single system, the aim is to combine the best elements with others in the dTTb project to create one system.

"We intend to make a single system with the other participants in dTTb,

though it will not be until early next year before this happens," said a BBC spokesman.

Other tests on Diamond were undertaken in the summer by French broadcaster TDF, which has also carried out work on spectrum management in France to find ways of accommodating the new technology. Didier Brugel, sales manager at Thomson LER, said the Montreux demonstration compressed four PAL programs at 8 Mbps each and one HDTV program at 34 Mbps.

"Adding the four programs together, you get about 34 Mbps," Brugel said. "Then add the 34 Mbps from the HDTV channel and you have about 70 Mbps."

The optimization of the HDTV codec and its adaptation to the 34 Mbps channel were done by the BBC research department in the U.K.

Brugel added that using an OFDM modulator "makes use of double polarization, and as a result the signal fits in a bandwidth of 8 MHz."

The Diamond OFDM modulator uses 512 separate orthogonal carriers, each digitally modulated with a 64-QAM constellation.

"In the past, you had QAM only," Brugel said. "64-QAM is one single carrier that can take 64 different states, and each state carries a signal. But instead of one carrier, you have 512 carriers that can transmit. By compressing them, they'll fit into an 8 MHz bandwidth."

The HDTV pictures used in the Montreux demonstration were stored on a D-1 component digital VTR using an experimental storage codec to compress the signal. After modulation, the HDTV and four conventional channels were sent using transmitters supplied by Thomson CSF and demodulated at the Thomson CSF stand inside the main exhibition hall.

Brugel says Diamond was initially designed only to be a professional distribution device, relaying signals to cable

head ends or transmitter sites. He said the system's ability to accept any form of signal, such as PAL, NTSC, PALplus or HDTV, makes it ideal for the job. Whether the system is later adapted for incorporation into consumer receivers depends on work in dTTb.

No U.S. interest

Efforts to persuade the U.S. to look at OFDM as the basis for that country's digital standard have so far fallen on deaf ears at the Federal Communications Commission and among participants in the Grand Alliance, a group of leading companies working toward a U.S. digital terrestrial standard. This is despite the fact that Thomson's U.S. subsidiary, Thomson Consumer Electronics Inc., is one of the participants in the Grand Alliance.

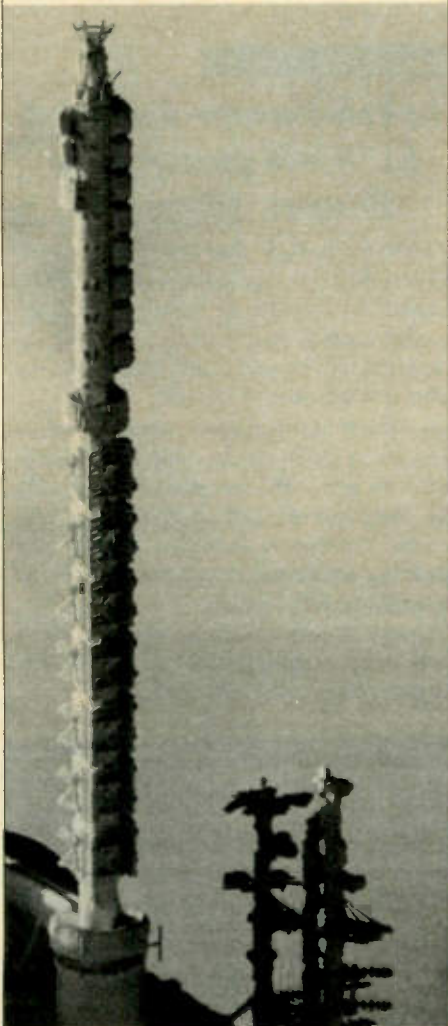
Thomson, for its part, is throwing its support behind both the U.S. and European efforts. While the company maintains that OFDM is "particularly suited to terrestrial broadcasting," it also suggests that the requirements of terrestrial transmission in the U.S. are different from those in Europe.

In the U.S., interference poses less of a problem because of the physical distance between transmission centers, while in Europe, with its high population densities, the chance of interference between channels is much greater. Thomson says one of the main benefits of Diamond is its ability to reduce interference between the digital channels and existing PAL and SECAM services.

One Thomson official, speaking on condition of anonymity, said that while the company's U.S. and European efforts have not yet been officially brought together, it would make economic sense for the company not to have to repeat the same work twice.

Whether this indicates Thomson will pull together its U.S. and European standards in the future is anyone's guess.

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SHOW LISTING

Upcoming conventions,
meetings and exhibitions:

5-7 October 1993—VISION '93

Olympia Exhibit Centre, London, U.K.
A new broadcast, film and video equipment show for the U.K., VISION '93 is the result of a collaboration between the IABM, the BKSTS, Single Market Events and Philbeach Events. For information, contact Orlando Kimer: +44-71-830-8447/8.

18-20 October 1993—European Cable Communications '93

London, England. Following the success of the 1992 show, the Cable Television Association is expanding the size of the 1993 show. To be held at Olympia 2, London. For more information contact Sharon Chapman, Manager ECC '93, The Cable Television Association, 5th Floor Artillery House, Artillery Row, London, SW1P 1RT, England. Telephone: +44-71-222-2900; FAX: +44-71-799-1471.

25-28 October 1993—Broadcasting, Cable & Satellite India '93

Pragati Maidan, New Delhi. India's 1st International Broadcasting, Cable & Satellite India '93 exhibition and conference. One hundred and fifty exhibitors from India, Europe, the U.S., Asia and Australia are expected to exhibit. A three-day technical conference will focus on trends in broadcasting, hardware and software, emerging technologies and non-governmental broadcasting. For information, contact Broadcast Engineering Society (India): Room No. 410, Research Dept., All India Radio and Doordarshan, J.P. Estate., 14-B, Ring Road, New Delhi-110002, or Exhibitions India: telephone +91-4622710; FAX +91-11-4633506.

29-31 October 1993—Broadcast India '93 Exhibition & Symposium

World Trade Center, Bombay, India. The third consecutive yearly broadcast event of India. Eighty companies from 10 nations participated in last year's event, and 10,000 visitors attended the exhibition and symposium. Organized by Saicom and co-sponsored by the Radio and TV Advertising Practitioners Association of India and the Association of Professional Video Equipment Owners, India. For more information, contact Ramesh Meer, Saicom Trade Fairs & Exhibitions P. Ltd., telephone +91-22-215-1396; FAX +91-22-215-1269.

16-18 November 1993—International Broadcast Equipment Exhibition '93 (InterBEE '93)

Chiba City, Chiba Prefecture, Japan. Japan's premiere technology and equipment exhibit, sponsored by the Electronic Industries Association of Japan (EIAJ). To be held at the Nippon Convention Center, Makuhari (Makuhari Messe) 2-1, Nakase, Mihama-ku, Chiba City, Chiba Prefecture, Japan. Admission free; visitors register at entrance. For information, contact Sumi Kato, Manager, Japan Electronics Show Association, FAX: +81-3-3284-0165.

Send announcements to
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or FAX: +1-703-998-2966.

Quantel Backs Its Design Approach

by Dominic Lunney
Marketing Communications Manager
Quantel

There are bizarre tales currently circulating in our industry. My favorite begins: "General purpose computers are versatile post production tools with a long and profitable life." I can understand why some people feel the need to say these kinds of things. I am staggered that the rest of us are expected to believe them.

This article was written on a computer that became obsolete seven months after its launch. It will not run half my software because I need a new operating system for the other half, and when next year's new hardware comes along, I will have a choice: stagnate, or junk the lot and start again. "Upgrading" means I get to keep my (equally obsolete) printer while throwing the rest away — so much for a long and profitable life.

Nonspecific duties

This is part and parcel of the computer experience. The standard computer platform is a machine designed to do nothing in particular. It should come as no surprise that computer manufacturers regularly come up with a way of doing nothing in particular a little bit better. Nevertheless, having invested heavily and planned a future around this hardware, business users can find it depressing when 'their' manufacturer regularly pulls the rug from under them with a cheaper/slightly better machine.

So why are we all getting excited about computers in television? Because of "Open Architecture." This, so the theory goes, lets you upgrade (hah!) your system

or add different software with new capabilities. Right. If a capability is important enough, chances are it is running on its own platform already (when was the last time you tried to balance the company's accounts on your 3-D machine?) If it is trivial (ever run a QuickTime movie in a word processing document?), why load it in the first place?

Software bugs

Agreed, there are a few functions that you might want to use interactively within one system — such as keying, compositing and painting; but if you try to implement them in software, consider the potential problems first.

Item one: If they are highly specialized individual software packages, then they were not designed to be used together. So if they do not work together, who is going to sort the bugs and incompatibilities out? If one or all will not run properly on a particular platform, where does the responsibility lie? What kind of support will your costly maintenance and licensing agreements get you?

Item two: All software and upgrades have to be written around a tight specification, namely the operating system, which itself has to accommodate a multitude of potential uses. Performance and flexibility inevitably suffer and, as usual in computer conversations, attention turns rapidly toward the hypothetical future — "it will be faster/better/whatever in the next upgrade" — and away from the ugly reality of current problems.

All of the above assumes that your hardware (and bank balance) is up to the job at hand. No computer is designed specifically for image processing and forcing it to do that job requires the expense and complication of hardware modification and add-ons. The result can often seem just as clunky, messy and, ultimately, inflexible as a traditional black box suite.

At what cost resolution?

"But I am resolution independent" counters the computer manufacturer. Of course you are. If your basic system is not even capable of handling video in real-time on its own, why not go for broke and talk about doing film work as well? Upping the ante to a higher resolution presents two alternatives on a computer. Option one: the system slows even further to a painful crawl and becomes operationally impractical. Option two: the user throws money and horsepower at it in a bid to increase its speed and overcome the basic inefficiency of its general purpose platform — in which case it becomes financially impractical to fill it out at anything below film rates even if you only want to do video resolution work.

The most useful application for resolution independence seems to be dropping the system below 525 lines in order to produce acceptable speeds during trade show demos.

In resolution, as in application, the computer represents compromise, and compromise rarely works in a service industry. Clients do not care about a system's wider, and usually hypothetical, poten-

tial. They want their individual job done the best way possible. If I go to the laundry, I expect to see washing machines, not a sink full of warm water "because you can wash dishes in it, too." Clients

may well be frustrated by the inadequacies of the traditional black box approach, but have you ever heard of one specifically asking for their job to be done on a computer? Me neither.

Another alternative

There is a third alternative — solution specific technology; machines dedicated to getting a clearly defined job done the best

way possible. No compromise, no unrealistically wide collection of hypothetical possibilities, no computers, no traditional black boxes each performing a single function, no massed VTRs. Instead, we find systems that offer genuine power, flexibility and creative control because they use state-of-the-art, dedicated hardware, because they also have sophisticated and refined software, and because both of these elements have been designed together to work together as efficiently as possible.

The performance advantage of this approach is illustrated by Quantel's Hal. It offers multichannel keying and DVE. It integrates stereo audio, Paintbox, color correction and Quantel's unique true random access storage. It will happily multilayer up to 99 live foregrounds simultaneously at CCIR 601 quality. In short, it is the complete, self-contained digital graphics and

integrated and coordinated development of dedicated hardware and software by a single manufacturer maintains the performance gap. It also makes for longevity, reliability and profitability. Typically, Quantel's solution specific platforms have lives of seven years (rather than seven months), and a steady program of relevant upgrades ensures that the purchase can remain state of the art at all times.

Lengthy service

A glance at the large number of Harrys (introduced in 1985), still in very active service around the world, clearly demonstrates this; an audit of the hundreds of Classic Paintboxes (introduced in 1982) in profitable facilities amply confirms it. This

GUEST COMMENTARY

appeal extends to clients as well as broadcasters and facility owners. These are the kinds of systems that get asked for by name.

Despite the noise and hype that currently surrounds the computer, it is not as if this situation is ever going to change. There is no technological Holy Grail, no "let's do video properly" chip that, in some remote future, we could plug into any computer and bridge the gap. The difference is one of philosophies; it is the way technology is applied, not the technology itself.

After decades of disk development, no standalone computer can record and replay

non data-reduced video in real time. Black boxes can, but not even they can offer true random access to video. The only systems that give this level of performance are designed and built by Quantel. Control and management of this picture storage is handled by enormously sophisticated, dedicated hardware and software, but the storage medium itself is the same kind of standard SCSI drives found in any Apple Macintosh.

No doubt this last fact will inspire some computer zealot to utter that other great computing cliché "with focused development, we will have the power to do that in five years." Maybe they will (though I have my doubts), but by then Quantel users will already have made their adverts, titles,

graphics, programs and profits, Quantel itself will have moved on to bigger and better challenges, and the developers will have discovered that what they are laboring to create is not a computer anymore, it is a dedicated system.

Dominic Lunney is Marketing Communications Manager for Quantel, based in the U.K.



Dominic Lunney



Hal is a self-contained digital graphics and compositing suite.

compositing suite. Yet it still costs considerably less than this year's "state of the art" general purpose platform/software combination, which cannot even process a single layer and review the result in real time.

There are other stark contrasts, too. The dedicated system will always be orders of magnitude faster, no matter how many parallel processors, engines or accelerators are thrown into the computer; the

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International Editor: Marlene Lane

TV Technology Editor: Richard Farrell

News Editor: Arthur Cole

Assistant Editor: MaryAnn Dorsie

Technical Consultant: Lynn Heiges

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Italy: Dario Calabrese

New York: Frank Beacham, Mary Gruszka;

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LA BIENAL: ENCUENTRO EXITOSO

Por Lucía Cobo

BUENOS AIRES, Argentina La Segunda Bienal de Radiodifusión, principal reunión de medios de comunicación del año 1993, tuvo lugar en el Centro Municipal de Exhibiciones de Buenos Aires. Hubo notable interés en los temas de televisión abierta, televisión por cable, televisión codificada (UHF o MMDS), televisión por satélite, productoras y proveedores de programación y radios AM/FM.

La reunión convocó a más de 5.000 visitantes, número que dobló la participación del primer encuentro en el año 1991. Broadcasting, publicación mensual que organizó la Bienal, ha recibido suficientes pedidos de información para la tercera Bienal, para hacer creer que el tamaño del encuentro podrá duplicarse nuevamente en 1995.

Constitucionalistas, tributaristas y empresarios de medios abordaron una veintena de temas en las Jornadas Académicas y las Jornadas de Actualización Profesional. Hubo 120 empresas expositoras de Argentina, Estados Unidos, México, España e Italia en 124 puestos comerciales ofreciendo una variedad de

equipamiento para televisión, radio y cable.

La Bienal se celebró al poco tiempo de haber el gobierno argentino eliminado un impuesto que gravaba el equipo industrial importado con una tarifa del 25 por ciento. Con este cambio, las compañías extranjeras tienen la oportunidad de servir a un nuevo mercado de estaciones de mediana y baja potencia.

Mercado del Mercosur

La importancia que tiene el mercado Mercosur y el de Chile ha despertado

notable interés en las compañías europeas y americanas. Por ejemplo, las compañías AEQ, Itame, Rymisa y Mier (fabricantes de equipamiento de estudio, transmisores, sistemas radiantes y transmisores, respectivamente) han formado un consorcio que

incluye a su distribuidora en Argentina, VEC, para atender al mercado Mercosur y Chile. El consorcio aún no tiene nombre, pero en efecto, brindará un frente único para prestar cualquier servicio a las estaciones.

AEQ también aprovechó la Bienal para introducir al mercado su nueva unidad

portátil de retransmisión con extensor de frecuencia e híbrido digital: el AEQ TLE-02. Introdujo, igualmente, su nuevo sistema modular de procesamiento de señales de audio: el Norma Europa.

El tráfico de visitantes resultó muy beneficioso para las empresas exposito-

de CRL, Lincoln Arteaga, considera al mercado uno de gran importancia para CRL. Ha indicado Arteaga: "Pasar aduanas ha sido una aventura pero esperamos entender mejor el sistema en el futuro".

CRL consideró la presentación de la Bienal como una de las "mas respetables fuera de la NAB de los E.E.U.U."

Otras empresas norteamericanas que participaron en la exhibición incluyen a AKG Acoustics (con Orban y dbx), Jam-

El tráfico de visitantes resultó muy beneficioso para las empresas expositoras.



Badar fue una de 120 empresas presentes en la Bienal

ras, ya que la mayoría reportó interés y ventas de sus productos constantes. La compañía Solidyne, por ejemplo, que ofrece equipo de audio digital y de automatización, observó que la industria va avanzando por etapas. En Argentina, la compañía ha ubicado más de cien sistemas de automatización.

El primer día de la Bienal la empresa ADEMA S.A. alcanzó el mismo monto de ventas alcanzado durante toda la exhibición de 1991.

Representaciones extranjeras

Muchas de las empresas distribuidoras argentinas mostraron interés en conseguir la representación nacional de líneas de productos norteamericanos y europeos. Igualmente, empresas norteamericanas como RCS y Computer Concepts Corp. fueron a la Bienal con el intento de encontrar representantes para sus líneas respectivas.

Las empresas de productoras de cable como Badar y Dulah, igualmente que las de iluminación, como Obarrio & Cia. y Dicrolamp, reportaron gran mucha actividad e interés en sus líneas de productos.

De la misma manera, la Segunda Bienal incluyó la presencia de casi la totalidad de proveedores de programación de televisión: NBC (noticias); Cablevisión Noticias; Todo Noticias; Telefé Noticias; HBO Olé; ESPN (deportes); General Video; I-SAT; Space y JUpiter, entre otros.

Las empresas norteamericanas también han mostrado gran interés en el mercado de América del Sur. La empresa Pensa, distribuidora exclusiva de equipamiento Harris Allied, tiene gran interés en el mercado de radiodifusión en Argentina, dado el reciente cambio de leyes de importación. La compañía ha indicado que el 65 por ciento de la difusión de radio en Argentina se hace a través de equipamiento de Harris Allied.

Circuit Research Labs (CRL) consideró a la Bienal como "una de las exhibiciones más importantes del hemisferio". El nuevo gerente de ventas internacionales

pro Antenas, LBA Group y Broadcast Electronics.

Lucía Cobo es directora de Radio World, publicación compañera de TV Technology.

Plans Made For IBTS Show

MILAN, Italy Preparations are being made for the eighth annual International Audio, Video, Broadcasting and Telecommunications Show (IBTS) and the International Market for Audio, Video and Multimedia Programs and services (MeM) show, to be held 14-18 October in the South Pavilion of the Milan Trade Fair in Lacchiarella.

The show will be divided into three distinct parts: IBTS for systems and hardware; MeM for programs and services; and MEDIAT- ECH for conferences, seminars and reviews. Participants include international organizations such as RAI, FININVEST, NAB, IBA, AES, SMPTE, ANIPA and Imagina-INA, many of which will hold conferences.

IBTS '93 will cover 20,000 square meters of exhibition and demonstration space. Exhibitors will display hardware and software products, TV transmission equipment, professional video and audio equipment, and computer graphics and animation.

MeM will showcase audio and video production houses, services, studios and computer graphics producers, who will demonstrate their skills.

For more information, contact Roberto Pinna Berchet in Milan at telephone +39-2-481-15541; FAX: +39-2-498-0330.



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Vision '93 Show Aims To Fill U.K. Need

LONDON The first Vision '93 show, to be held 5-7 October here at the Olympia Exhibition Centre, is already off to a good start, with high profile support coming from such companies as Panasonic, Quantel, Dynatech, Abekas, Snell & Wilcox and a host of others.

The show, which is to be held in the off-years for IBC, is produced in association with IABM and BKSTS, and is targeted toward not only broadcasters and post houses in the U.K., but business and multimedia professionals as well.

Special show features will focus on future technologies, including HDTV and virtual reality.

The show organizers perceived a need for a U.K. show after it was determined that, in 1990, when IBC was in Brighton, attendees from the U.K. numbered about 9,000, but when the event moved to Amsterdam, in 1992, the show saw only about 5,000 U.K. attendees.

Vision '93, the organizers believe, will fill the gap.

For more show information, contact Orlando Kimber: +44-71-830-8447/8.

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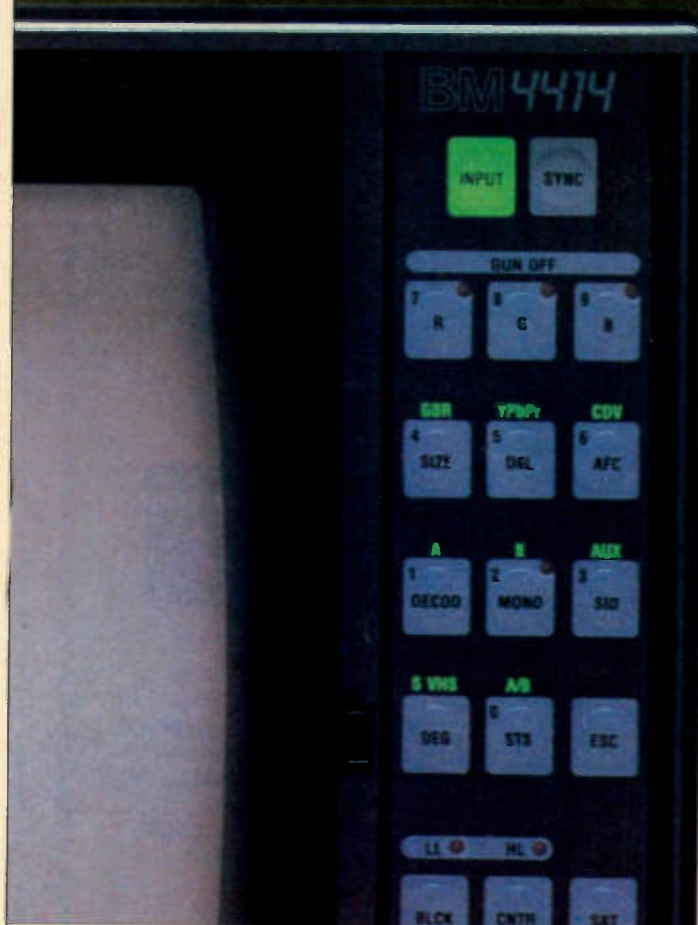
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Companies Up in Arms Over Flame

by Chris Dickinson

QUEBEC Legal action between Canadian software houses Discreet Logic and Softimage has cast a shadow over one of the most exciting products of the year: the Flame software-based special effects system.

The two companies are disputing the ownership to Flame in that both claim they purchased the original product from an Australian developer.

Flame was a hit when it was shown at the Las Vegas NAB show in April, causing a wave of consternation among both

software and dedicated system rivals. The system provides advanced digital editing, compositing, paint, and 2-D and 3-D effects. In addition, the so-called resolution independence of the system has been designed to appeal to film, HDTV and conventional video users.

Seeds of discontent

The causes of the dispute between Discreet Logic and Softimage appear to go back to the original development of Flame in the early 1980s. Its designer, DA Technology of Australia, was a small software company consisting of

two principals who split up in May 1992.

Discreet Logic claims it purchased all the rights to Flame in August 1992.

"In May 1992, Flame's creator, programmer, and sole author and co-owner of DA Technology left DA Technology with a written assignment from DA Technology for all the rights to Flame, and with what he thought were all existing copies of it," Discreet Logic said in a written statement.

For its part, Softimage claims it agreed in December 1992 to distribute Flame in Europe "on the basis of Discreet's warranties that it was the sole owner of the Flame source code." Softimage says it

subsequently learned the developer and owner of the code was DA Technology, who maintained that it had not transferred rights to Flame. Softimage then paid \$35,000 for the source code rights.

Richard Szalwinski, Discreet Logic president, said that when his company heard Softimage claimed to have bought the rights to Flame, it terminated the European distribution agreement because "they broke certain clauses." Discreet Logic also obtained a court order allowing it to seize the copy of Flame bought by Softimage from DA Technology.

Counter action

Softimage then initiated legal proceedings against Discreet Logic "to protect its interest and enforce its ownership rights to Flame" and to protect its rights under the distribution agreement.

Meanwhile, Discreet Logic says it is in the process of setting up an alternative distribution source in Europe and that all customers would continue to be fully serviced.

Before the dispute began, Flame was picked up by a number of leading facilities. Disney purchased nine Flame packages for SGI workstations for use on this year's "Super Mario Bros."

The system has also been installed and is working in Virgin-owned commercials facility Rushes, in London. Rushes director of engineering Mark Wildig says the image independence of Flame makes it ideal for in-film special effects work.

"We've had the system here since the fourth of July and we think it's great," Wildig said. "Because it can work at any resolution, we can do effects at film resolution, output in HDTV, or downconvert to 625-line (PAL)."

Wildig added that the Flame, running on Silicon Graphic's powerful four-processor Onyx workstation, is replacing Rushes' CIS film compositing system. In Los Angeles, CIS has also purchased a Flame and Onyx.

The positive reactions of clients to Flame would normally be expected to lead the rapid establishment of the system at the top end of the market. However, the system's future is now questionable because the flurry of legal action has potential customers worried that service and support may be lacking.

Charlie Freemantle at CAL in London says his company wants to buy Flame but is waiting until the legal action is settled.

"The manufacturers and distributors have to sort out their legal battle before anyone can do anything," he said.

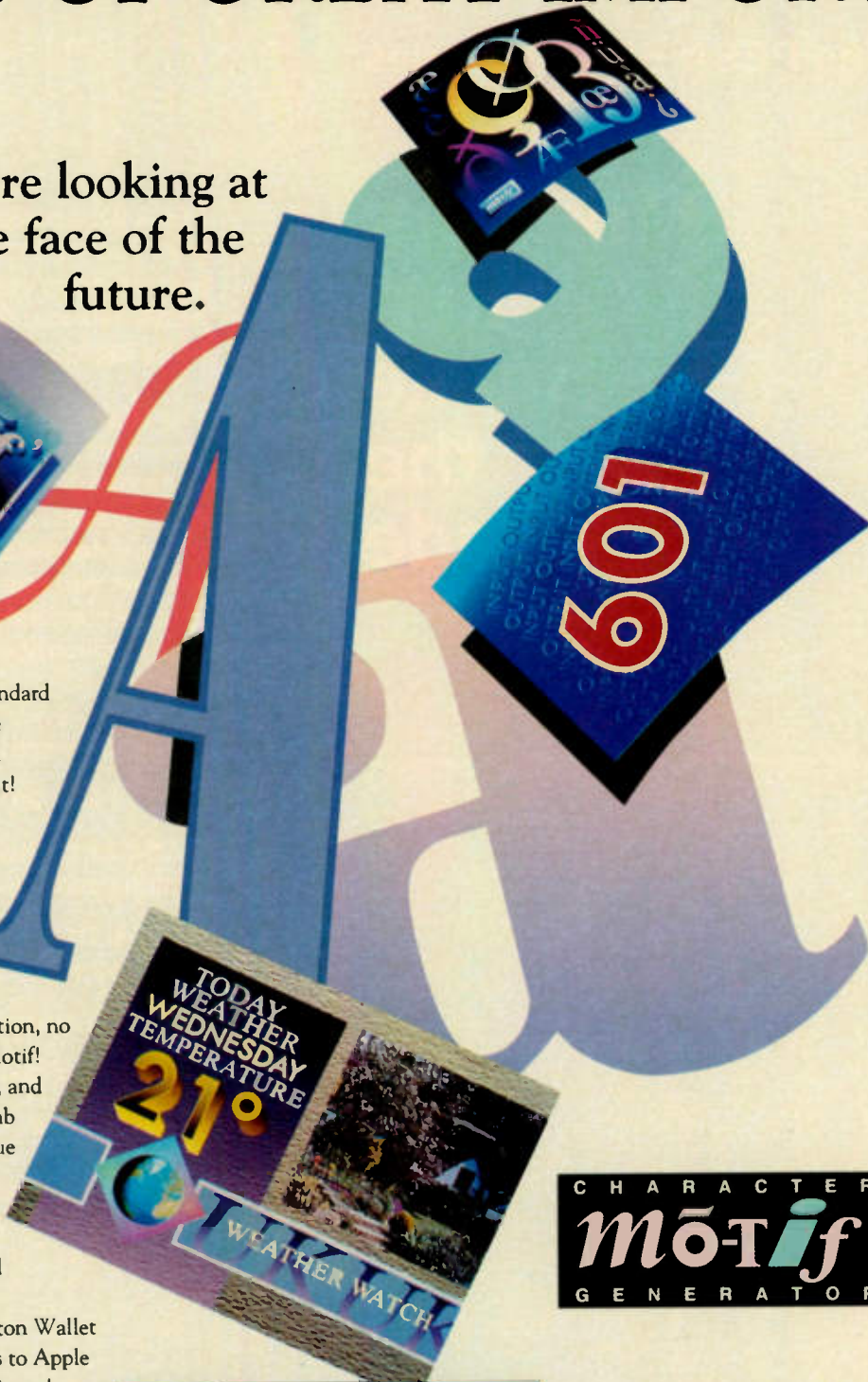
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A Method for Determining Line Pairs

Fourth in a Series

Editor's note: In June's issue (page 12), we began a series of articles using "arm-waving math"—a term used by mathematicians to describe derivations that are not absolutely complete and rigorous—to find such things as the distance to the horizon from the top of a tower and how to get dB figures without a calculator. This month, the author discusses a method of calculating the maximum number of line pairs that can be transmitted.

A TV engineer can easily predict the maximum number of line pairs possible to be transmitted with a television transmitter. The number can be calculated

using numbers related to the video standard, pencil and paper.

A line pair consists of two adjacent vertical lines: one line is white; the other is black. When transmitted, the transition between white and black will not be instantaneous. The rise and fall times of these transitions will be determined by the bandwidth limitation of the video system. The resolution limit will be reached when the spacing of the lines produce a signal equal to the video bandwidth limit for the system. Full white and real black will exist only at the peak values of the resulting sine wave.

We can restate the problem. How many cycles of a signal equal to the video bandwidth will fit on the active video portion of one horizontal line?

To perform the calculation you will need the video bandwidth, in MHz, for the system and the time period of the active video portion of a horizontal line. In the following example, calculations are for the NTSC system. The method is the same for other systems. Just change the numbers and recalculate.

Solution for NTSC System:

The video bandwidth is: 4.2 MHz

The active video period is:
52.66 microseconds

The period of a 4.2 MHz signal is:
0.2381 microseconds

$52.66 \div 0.2381 = 221.17$

Therefore, 221 cycles of a 4.2 MHz signal will occur during a time equal to the active video portion of one horizontal line in the NTSC standard.

This shows that 221 line pairs, 442

TECH TIP

by Larry Albert

total lines, can be transmitted with an NTSC transmitter.

This 442 line transmission capability seems to conflict with the 330 lines that a good NTSC TV engineer knows to be the limit. Both numbers are correct!

The 330 lines are for a horizontal width which is equal to the vertical height and not the full width. Thus, the 330 lines that "everyone knows" are really only 3/4 of the 440 lines we have calculated. The 3:4 aspect ratio is the reason for the 3/4.

Legend tells us that using a width equal to the picture height method was selected so that the horizontal and vertical resolutions produced by a camera would be equal. When everyone used the equal number method to measure resolutions, there was no problem.

Computer users started quoting resolution based on "pixels" instead of lines. For example, VGA has 640 pixels horizontally and 480 pixels vertically. The horizontal and vertical numbers are not equal for computer video. Unequal numbers do not bother computer users.

As video moves into the digital age, it might be helpful to think of the NTSC standard as 440 x 330.

Larry Albert is a television engineer at Murray State University in Murray, Kentucky. He may be reached at +1-502-762-4664. Or write to him at TV Technology.

Economic Boom Expected in India

NEW DEHLI, India Recent and near-radical changes in the attitude and actions of the government of India are poised to take this nation into the 21st century on the wings of an economic boom in the

field of broadcasting, cable and satellite.

Exciting opportunities have come about for both local and overseas investors in the nation. For one, a recently announced unconventional budget surprised the nation by not only holding back a tax increase, but actually slashing customs and excise tariffs. In addition, the Indian rupee became fully convertible on trade account, a long-awaited and welcome step.

For state-owned companies, 1991-92 brought to a close an era of monopoly supply contracts. Policy changes are prompting industry shake-ups, where multiple sourcing from multinational corporations or new multinational-backed joint ventures are becoming the rule rather than the exception.

India's rapidly expanding industry also spells sales opportunities. Technology transfer deals and new manufacturing arrangements promise to change the country's industrial landscape. The broadcasting, cable and satellite indus-

tries will enjoy their share of the benefits of this change.

Price Waterhouse, commissioned by the government of India for evaluating the current investment climate compared to that of other Asian countries, reported that facilities in India are comparable to those in China, Malaysia and Korea.

According to a survey validated by Frank Small & Associates, viewership on STAR TV jumped an impressive 157 percent from about 1.4 million TV households in June 1992 to around 3.5 million in January 1993. There are approximately 27 million urban households in India.

With the recent exciting and liberal changes announced by the government in trade and industrial policies, India commenced the process of restructuring its economy. Less bureaucracy, procedures that are less involved and integration with the global market are hallmarks of the new industrial, trade and fiscal policies.

Broadcast Shows Set for October

To celebrate the promising new economic climate inspired by the Indian government's new vision and further its development, two broadcast shows have been planned for October. The Broadcasting Cable & Satellite India '93 exhibition and conference, jointly organized by Exhibitions India and Broadcast Engineering Society (India) will convene 25-28 October in Pragati Maidan, New Delhi. The Broadcast India '93 exhibition and conference, organized by Saicom Trade Fairs and Exhibitions, will take place 29-31 October at the World Trade Center in Bombay.

Both shows promise to showcase radio and television broadcasting, satellite and cable distribution systems, professional sound, film, video and related services.

Broadcasting Cable & Satellite India '93 is expected to attract exhibitors, conference attendees and visitors from Australia, Austria, Belgium, Canada, People's Republic of China, Finland, France, Malaysia, Netherlands, Norway, Singapore, Sweden, Switzerland, Taiwan, United Kingdom and the U.S. More than 150 exhibitors and 6,000 visitors/buyers are expected.

Broadcast India '93 expects 80 companies from 10 nations to participate, and noted that more than 10,000 visitors attended last year's event.

For information on Broadcasting Cable & Satellite India '93, contact Prem Behl, president, or Prithvi Nijhowne, vice president of Exhibitions India at telephone: +91-11-462-2710/11; FAX: +91-11-463-3506. For information on Broadcast India '93, contact Ramesh Meer of Saicom Trade Fairs & Exhibitions at telephone: +91-22-215-1396; FAX: +91-22-215-1269.

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Doubling the Life of a Satellite

Cable TV is Latin America's latest business boom. The demand for quality programming is growing rapidly. As demand has grown, the supply of available satellite capacity has tightened. Cable broadcasters are looking for new ways to get their signals south to satisfy the growing market. Inclined orbit satellites may be just the solution.

Although long accepted in the Pacific Ocean Region (POR) by a number of prestigious users, the popularity of inclined orbit satellites is only beginning to take hold in the Atlantic Ocean Region (AOR).

So far, International Television (also known as Gems-TV, a newly launched

Hispanic network) and SUR (a multi-national program feed), both originating from Miami, Florida, use an inclined orbit INTELSAT V satellite. Gems currently services 18 Latin American countries with its transponder on INTELSAT V, at 310 degrees, in addition to its Spacenet II feed to the domestic U.S., Mexico and the Caribbean. NBC uses an inclined orbit satellite that is located at 338 degrees, for Canal de Noticias, a Spanish language news service.

Increasing use

The availability of reasonably priced, easy to install and use tracking equipment promises to expand the number of

transponders on inclined orbit satellites.

So why have inclined orbit satellites been so misunderstood and underutilized? Perhaps the years of using geostationary orbit satellites have spoiled us. Why move our antennas around to track the bird when the bird was supposed to be rock solid in the first place? Let us look at some key factors.

Satellites have a designed operational life span, mainly dependent on the fuel capacity used for station-keeping. Station-keeping counters two directional perturbing forces: the east-west forces caused by the earth's gravitational field and pressure from the sun's radiation and the north-south forces caused by gravitational forces of the sun and moon. Over

time, if no countermeasures were taken, the spacecraft would meander into a figure-eight orbit centered over the Earth's equator, making it difficult to provide full time signals to stationary ground antenna.

To keep them stationary, ground-based engineers send command signals to the satellite to keep within a box of ± 0.1 degree of longitude or about ± 40 Km. This small amount of drift is all but negligible except for some very large ground antennas.

This station-keeping does have one drawback. Firing the station-keeping thrusters uses up the limited amount of fuel the satellite is deployed with. The majority of station-keeping fuel is used in countering the north-south gravitational forces of the sun and moon. Depending on the "heightness" of the station-keeping box (± 0.1 degrees or ± 0.05 degrees on newer birds) and proximity of the spacecraft to other spacecraft station-keeping, thrusters may be fired daily.

As the spacecraft gets closer to the end of its design life span, a decision is made to extend the life of the satellite and discontinue the fuel hungry north-south station-keeping maneuvers. The gravitational forces of the sun and the moon then act upon the spacecraft, effecting a figure-eight orbit with the eight's center on the equatorial plane—an inclined orbit. (See Figure 1.)

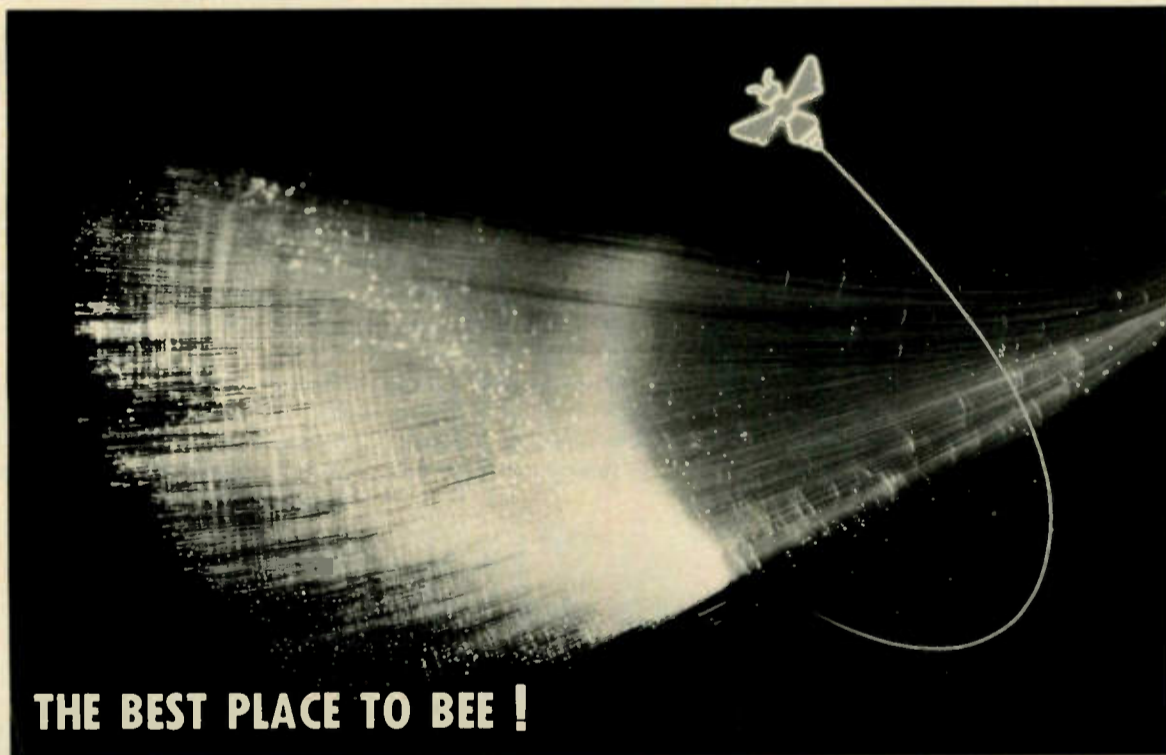
Inclined orbit satellites are permitted no more than ± 5.0 degrees of drift, at which time they are considered difficult to track, and the fuel needed to get them back into the "box" (about once every two weeks) becomes excessive. There is an increase in inclination of slightly less than 1 degree per year. The design operational

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Forums, seminars and symposiums will be held over the three days of the exhibition, in addition to the trend-setting exhibits.

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Inter BEE '93

SATELLITE TECHNOLOGY

by Phil Dubs

life span for INTELSAT V series satellites was seven years. Inclined orbit operation has nearly doubled that life span.

There are only minor variations in an inclined orbit satellite's parameters. Overall, you would find it difficult to detect any difference in signal between a geostationary orbit and inclined orbit operation with the proper tracking equipment.

INTELSAT (International Telecommunications Satellite Organization), maintains the following satellites in inclined orbit within the AOR:

Name	Location	Current Inclination
INTELSAT V	310° East	2.1165 °
INTELSAT V	329° East	3.6825 °
INTELSAT V	338° East	4.0510 °

Factoring in availability of transponders and the advances of antenna tracking technologies, inclined orbit satellites are a lot easier to track today and do not require expensive tracking systems. You can gain the advantages of using inclined orbit satellites without experiencing any appreciable loss in signal quality or coverage.

Tracking controllers, such as the Andrew ATC-300, provide very accurate tracking for large and expensive commercial antennas but are cost prohibitive for multi-antenna users. The ASTROGUIDE TRAX IIe, at slightly over US\$2000, is one example of the new low cost trackers. These new trackers can control just about any antenna which has both azimuth and elevation motors.

Polar mount antennas are the most common type found in the field. They offer easy access and repeatability to the satel-

(continued on page 13)

Taking the American Way Too Seriously

(continued from page 1)

else on earth has yet to be broken. If Joe, all by his lonesome, held forth on a soapbox in Washington, D.C., it would have been an international television symposium; if I want to hear a bunch of Americans whose experience of international television is limited to turning on a TV set in a Swiss hotel, I think I'd rather do it in the Nevada desert.

So much for international. Now let me tackle television. If television, to you, is what you get to see on that Swiss hotel TV or any other hotel TV in the world or almost any other TV set in the world (fed via broadcast, cable, satellite, VCR, videodisc — I don't care), then the "Symposium" wasn't about television. If, conversely (or should I say *perversely*), you're one of those people who simply cannot get enough of the acronym HDTV, Montreux was a good enough place to be. Here's my personal rough count (by sessions):

About HDTV - 14

About EDTV - 2

Featuring HDTV - 2

Other - 2

It wasn't just the sessions. BTS had lots of strange things to show and tell at Montreux (like support of both Digital Betacam and D-5), but the strangest of all had to be its support of an 1125/60 HDTV format from Toshiba — about as strange as Toshiba supporting a 1250/50 format from BTS.

In terms of hot new technology, I was kind of interested in Thomson's longitudinal 8mm digital video recorder; I sure wasn't interested in the NHK HDTV plasma panel that keeps showing up over and over again with what looks to me like the same defects in it. But who am I (and don't we all want to know)? A bunch of people I talked to seemed more excited about the latter than the former.

Trading places

And that brings me to the "Symposium" part. To use one of them there official Swiss languages (as expressed by one of them there international Americans), it's *deja vu* all over again.

The annual SMPTE convention started out as a symposium and then became a trade show with papers attached. Too bad for SMPTE it became just one of many trade shows — too many, according to the major exhibitors. Well — wouldn't you know it? — the same thing is happening to Montreux. Lo and behold (would someone please tell me how to lo?), the major manufacturers are getting tired of the Montreux show; they want to concentrate on NAB and IBC.

The fact that exhibitors could be determining the fate of a supposed symposium indicates, to me, anyway, that the symposium may simply be posing — umm — and HDTV is a tried-and-true way to fill time and technical digests with bumph. I could be wrong, of course. It could be that HDTV is the most pressing issue on everyone's minds these days. It could also be that there's an undiscovered economical way to turn lead into gold.

I don't know. Maybe it has something to do with Swiss restaurants. You go out to eat with someone in Montreux, and you both order soup, and the waiter hauls a huge tureen to the table. And then he hauls another huge tureen over for your dinner companion. Perish the thought that

you might finish your soup and be caught wanting more. It would violate Swiss neutrality or something. Polish off your main course, and the waiter replaces everything that used to be on your plate. Swiss waiters cram food down your throat better than most mothers.

U.S. force feeding

So I guess it's in keeping with Helvetian tradition that Americans come to Montreux to force-feed their myopic view of the world down foreign throats. It doesn't surprise me in the least that Americans feel no shame in telling the rest of the world that it should adopt our winning ways.

What's the ideal field rate for HDTV? Why, 59.94, of course! After all, there is not a single member of the U.S. Grand Alliance that has selected any other rate, and what is good for the U.S. Grand Alliance must be good for the rest of the world, right?

So far, I'm still in *deja vu*-land. No one is going to buy a thriller the plot of which is that Americans tell the world how to run their affairs. It isn't any surprise, either, that FCC Commissioner Duggan would use such friendly language in Switzerland as calling for "a kind of Supreme Allied Commander of Advanced Television." Yessirree! You people better watch out! We're maybe

has nothing to do with the fact that they're 625/50 and we're 525/59.94. Chile's 525/59.94, too.

It isn't the distance, either. They don't watch a heck of a lot of German TV in France or Greek TV in Italy, even though everyone's 625/50. Heck, even though Europeans use the same standard paper sizes and Americans don't, you'll find Britons reading a lot more U.S. magazines than Dutch. Professor Higgins sang, "One common language I'm afraid we'll never get," so why can't we drop the con-

the analog European HDTV transmission standard HD-MAC, and I'll happily append my pseudonym to the list. The pictures at all the HD-MAC demos I've ever attended were — how shall I put this delicately? — less than unimpaired. But I'm not crazy about analog MUSE pictures, either, and I've even seen some garbage in the demos of the U.S. digital proponents (I don't know why, but I really *do* like all the PALplus demos I've seen).

HD-MAC was a flawed system, but so

... I guess it's in keeping with Helvetian tradition that Americans come to Montreux to force-feed their myopic view of the world ...

tortions required for one common HDTV standard? Heck, there used to be a global AM radio standard; there isn't anymore. Has it ruined your life yet?

Who's doing what

Forget the incredible dumbness of the world adopting 59.94 as the rate of the future of TV. Let me just take a brief look at the recent past. Prior to General Instrument's proposal, U.S. HDTV was going to be a choice between analog and hybrid analog-digital systems, right? Then GI says digital and, suddenly, the U.S. is supposedly ahead of Europe and

what? NTSC is a flawed system. PAL is a flawed system. SECAM, though I may never be allowed to eat a snail again for saying such a crude thing about a matter of Gallic pride, is a flawed system. The biggest problem with HD-MAC wasn't technical; it was political. Foolishly, European politicians allowed HD-MAC to become synonymous with advanced European television technology. It isn't, and it never was.

Look: I'm not going to cry if the exhibitors close down the Montreux Symposium in favor of an annual IBC in Amsterdam. *C'est la vie*, as they say in Belgium, France, Luxembourg, Monaco, Switzerland and a bunch of non-European Francophone countries or portions thereof. But if the world at large starts taking us Americans too seriously, I think it's time we called off the joke.

Mario Orazio is the pseudonym of a well-known television engineer who wishes to remain anonymous. Send your questions or comments to him by writing to TV Technology. Or drop him a note via electronic mail in MCI Mail (accessible through Compuserve) at 581-6729@MCIEmail.com.



by Mario Orazio

Masked Engineer

going to disinter Ike and get his corpse to wipe 1250/50 off the face of the earth! HD-Day is coming!

But the novel plot starts to get interesting when the foreign audience, like most of the women in "Thirteen Women," seems to start taking us monoglot Americans up on our chauvinistic suggestions. Duggan called for a "tres Grand Alliance comprising all interested nations," but he didn't take out a copyright on prefixing Grand Alliance with the French word for "very;" he lifted the phrase from Michel Pelchat of the French government. Whuz-zuh? Why should the rest of the world (not counting TV set manufacturers who want to sell in the U.S.) give a hoot about our Grand Alliance?

Overlooking the obvious

It has already been pretty conclusively proven that HDTV can be standards converted, if necessary, between 1250/50, 1125/60 and just about any other cockamamie format anyone has come up with. That covers such issues as the Olympics in HDTV or the Comedy Channel's live feed of the next Royal Wedding. For basic programming, has it ever dawned on anyone that there are worse impediments to universality than the lack of a single technical standard? I don't mean to get radical here, but the reason we don't watch much Argentinian TV in the U.S.

Japan in HDTV transmission.

I'm not surprised that Americans, who can't tell the difference between the Balkans and the Baltic, would buy that argument, but what shocked me most about Montreux this year was that non-Americans seemed to be buying it, too. I don't get it. Europeans have been working on digital TV transmission for years! In fact, unless I am very much mistaken, the first experiment in digital TV transmission in the United States was conducted as part of a European test.

Last year, when HD-Divine showed off a born-and-bred-in-Europe digital HDTV transmission system at IBC, it shocked the heck out of some Americans. But why should it have shocked any Europeans? GI, if I'm not mistaken, proposed its digital HDTV scheme in 1990, after European research into digital TV began. Heck, the COFDM modulation scheme used in HD-Divine is the same one that the U.S. NAB was touting in Las Vegas a few years ago for digital audio broadcasting. Why should HD-Divine have been shocking to anyone? Why was it considered miraculous that at this year's Montreux Symposium the HD-Divine folks added satellite and fiber transmission to terrestrial?

Hey — I don't plan to engage in America-bashing for the heck of it. There have been a lot of bad things said lately about

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Scenarios for Cable Compression

Digital Video Compression, DVC, is the hottest technical subject in television. It has left HDTV behind in the dust. This is because it offers more, sooner.

Compression is motivated by the desire to get more information through limited channels and to be more efficient about it. Another motivation is to require less storage space. Some of the earliest motivations were from the desire to put limited pictures through twisted pairs. PicturePhone was a technology to put images through somewhat extended audio links. To accomplish this, the images had to be compressed. A modern day version of this is teleconferencing.

Military and space communications also deal with images through challenging channels. The most recent motivation for compression is HDTV. An analog HDTV television camera puts out 30+ MHz each of red, blue and green signals. Along with the other signals involved in producing the picture, there is a raw bandwidth of around 100 MHz. However, the U.S. Federal Communications Commission allows only 6 MHz. To squeeze all of that information into 6 MHz requires the elimination of most of the redundancies. A practical question arises. If it is possible to force 100 MHz of HDTV into 6 MHz, wouldn't it be possible to put many NTSC signals into the same 6 MHz? The answer is in the affirmative.

DVC is based on the principal of removing redundancies from images.

There are three kinds of redundancies:

- 1) Redundancies in each picture
- 2) Redundancies between pictures
- 3) Information we do not see

A picture can be considered to be made up of a tremendous number of points of light called picture elements, or pixels. When compared with each other, many of the adjacent pixels are found to be identical. In ordinary television, these pixels are transmitted one at a time without any regard for their redundancies. This wastes a huge amount of spectrum, but makes possible simple, inexpensive hardware. DVC minimizes pixel redundancy and saves transmission capacity at the expense of increased hardware complexity.

Redundant information

Motion pictures are made up of a succession of still pictures. Movies have 24 pictures per second and video has 30. There are large redundancies from picture to picture because objects cannot move very quickly. DVC attempts to remove most of this redundancy.

The final form of redundancy is the information which the human visual system does not use. The human visual system has evolved over time to be very sensitive to horizontal motion and horizontal detail. It is much less sensitive to motion and detail in the vertical direction, and even less sensitive in the diagonal direction. This is probably because prey and predators most often move hor-

izontally, rarely vertically, and even less rarely diagonally. Those of our predecessors who had high sensitivity to horizontal motion probably ate well. Those who did not have this sensitivity probably were eaten. As descendants of the survivors, we have this high sensitivity to horizontal motion and detail.

The camera versus the eye

Photographic and television cameras do not differentiate between these directions. They respond essentially equally in all directions. As a result, there is a lot of information in electronic and photographic images which we do not appreciate.

Yet one more technique can sometimes be used to advantage. It is called "statistical

CABLE TECHNOLOGY

by Walt Ciciora

multiplexing" or "stat mux." In this scheme, the compression of all of the programs to be placed in a 6 MHz shot is done in one location at the same time under the control of a processor. The processor analyzes the video in each program to be compressed to determine the level of difficulty involved. Data capacity is reallocated from programs which are relatively unchallenging to those which are challenging. Better results can be expected. If enough programs are involved, it may be possible to add another program on average. There are some circumstances where stat mux can break down and cause trouble. Stat mux must be used carefully.

Defining types of DVC

There are several methods of DVC under investigation:

- Discrete Cosine Transform, DCT
- Vector Quantization, VQ
- Fractals
- Wavelets
- Magic

In the case of the last category, calls are received at least every other month insisting that there has been some great advance. Computer simulations, loaded with defects, are proudly shown. All the defects are explained away. Dramatic claims are made. Usually there is a request for several millions of dollars to bring the promise to fruition.

The DCT is a technique that divides the image into blocks eight lines high and eight pixels wide. The information inside the block is converted into a spectrum. Once in the spectrum format, it can be processed more easily. For example, removing detail involves low pass filtering. This is computationally much more convenient in the frequency domain. Approximations are made. Blocks from succeeding pictures are compared and redundancies minimized. Models of the human visual response are applied to minimize information we do not respond to.

The VQ approach also breaks the image up into eight by eight blocks. It compares the block to a look-up table with approximate representations of what the block looks like. It chooses the closest match and transmits the location in the look-up table of that representation. In the receiver, an identical look-up table exists. When the location of the approxi-

mating image is received, the image is moved to memory to approximate the picture. The original promise of VQ was greater simplification and lower cost. Originally, the compression was to be done only on a picture-by-picture basis. It was found that when this was done, the compression amount was not adequate. Too much redundancy was left in because of the similarities picture to picture. When redundancies between pictures were removed, the complexity approached DCT but the video quality did not. A persistent shimmering remained which was very annoying.

Wavelets and fractals have not yet received the same degree of attention as DCT and VQ and are therefore in an earlier stage of development. Their advocates make high claims for these approaches. Time will tell if the promises are fulfilled.

Hanging on a cliff

DVC has the promise of significantly better pictures. Transmission noise, costs, micro-reflections, beats between carriers, all are not evident in the picture. Either they are below a threshold which has no impact on the final result or they destroy the signal entirely. There is a sharp cliff between near perfect reception and total disaster. It is possible to avoid the NTSC artifacts of dot crawl and cross color. By using the same S-connector intended for Super VHS, color artifact-free images can be presented. For the older TV or VCR, the usual channel 3 signal will be provided.

This does not mean that there are no problems. DVC brings a new set of artifacts which are minimal when DVC is properly done. If implemented poorly or too aggressively in the pursuit of high levels of compression, DVC can cause some very bothersome artifacts.

When the processing between the eight by eight blocks is not coordinated, the boundaries can become evident. Naturally, this is called "blocking." Some images appear to be as if seen through a dirty window. In some implementations, there are ripples around sharp edges as if little crystals of salt have grown there. In one version of DCT, slow pans yield the appearance of a picture painted on a sheet of rubber. Some parts of the image move before others and then they catch up. A mountain scene appears to be having an earthquake. All of these artifacts occur when the implementation is poor or overly aggressive in the pursuit of high compression rates.

These artifacts are very unpleasant because they do not look natural. In contrast, analog picture artifacts appear much more like what we might see in nature.

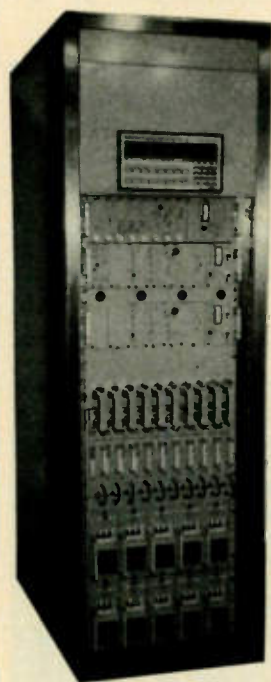
Since video has 30 pictures per second and movies have 24, there is a 25 percent capacity penalty for transmission of video when compared to movies in the same resolution.

Next: What Can DVC Do? And When?

Walt Ciciora is vice president of technology for Time Warner Cable, based in Stamford, Connecticut. Prior, he was vice president of research and development at American Television and Communications. He currently serves on the Executive Committee of the Montreux International Television Symposium and is a member of the Society of Cable Television Engineers. The above and subsequent articles were presented as a paper at the 1993 Montreux International Television Symposium.

PRECISION AND RELIABILITY

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Extending the Life Of an Old Satellite

(continued from page 10)

lite belt. Polar mount antennas can be equipped economically with tracking motors and location detectors for azimuth and elevation, making them compatible with the lower cost trackers.

Tracking systems rely on the micro-processor's ability not only to store parameters to point to a desired satellite, but to anticipate where the satellite is during its figure-eight movement. When the tracker is first put into operation, the first 24 hours are used to build a map of the figure-eight, representative of a satellite's inclined orbit.

By using the signal strength fed to the tracker from the receiver, or built in "beacon" receiver, east-west/north-south movements confirm the strongest signal. This signal is then stored with the exact location. The process continues until more than 200 points are stored (231 in the case of the ASTROGUIDE TRAX II), building the map to exacting detail.

Once the map has been stored, the operator has the option of tracking from the stored map only, or continuously updating. The continuous update mode offers seamless operation with minimum human intervention. This allows the tracker to be located at a cable head-end or equipment shelter where there is limited access. Battery backup provides backup of the stored quality points, as well as all stored satellite positions, in the case of power failure.

LCD readouts are helpful by providing the status of the tracker. Details include SAT (satellite) currently being tracked, Signal Level, Azimuth, Elevation, Map #, Quality Points Stored and which map refresh mode is selected. In addition, a full software dialog is provided from the front panel to assist in the initial settings and operation. The display will alert you if the antenna should wander outside a preset box, or a loss of signal.

Keeping track

As a fail-safe, one satellite, usually geostationary, can be set as a reference SAT and stored in memory as "0-0." The "0-0," or reference, satellite is recalled, and the tracker will attempt to "find" the missing inclined orbit satellite based on the stored maps.

If one inclined orbit satellite does not satisfy you, there is enough memory to store four inclined orbit types, and an additional 32 geostationary birds. Keeping track of all these birds meandering about the sky is easier if you use the RS-232 interface and control. A full software dialog provides a simple connection with your PC-DOS computer. If your antennas are miles away, control and operation is possible for remote locations using the RS-232 and suitable modems.

If you are curious about inclined orbit satellites, and would like to see one using conventional non-tracking antennas, do not worry. It takes four to six hours for the satellite to move outside the "window" of a standard five meter TVRO type antenna. The window depends on the inclination of the bird and where within the figure-eight you view it. The INTELSAT satellites are east of the U.S. domestic arc. For example, INTELSAT V 310 degrees West or 50 degrees East (360 - 310 = 50) is East of Spacenet II at

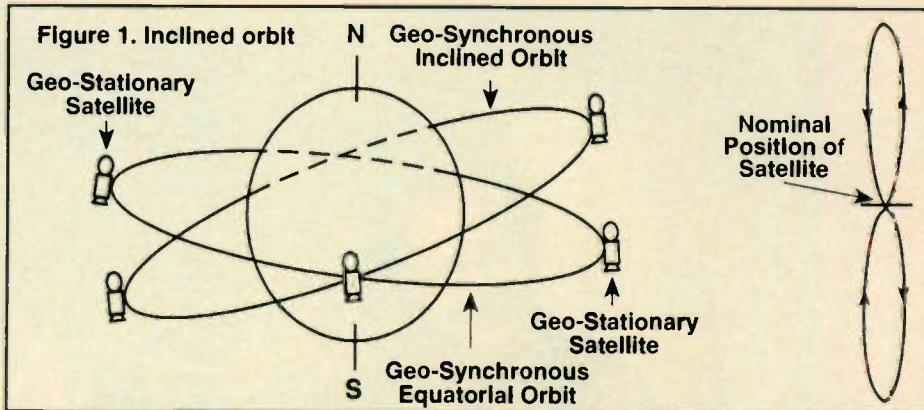
69 degrees East and is very easy to find.

The use of trackers on inclined orbit satellites has opened up a whole new part of the sky. Extending the life of satellites is our part of the recycling effort.

Credits: World Satellite Almanac, Published by Mark Long Enterprises, Inc., November 1991.

Inclined Orbit Satellite Operation In The INTELSAT System, July 1991.

Figure 1 from Inclined Orbit Satellite Operation in the INTELSAT System, July 1991, published by International



Telecommunications Satellite Organization.

Philip M. Dubs is Director of Operations and Engineering for Gems Television. Gems TV, a programming service of International Television, Inc. of Miami, Florida, provides two network

feeds, serving 18 Latin American countries, Mexico, the Caribbean and the U.S.

The opinions expressed above are the author's. For more information, contact Philip Dubs at International Television, Inc., Gems Television, 10360 USA Today Way, Miramar, Florida 33025 USA.

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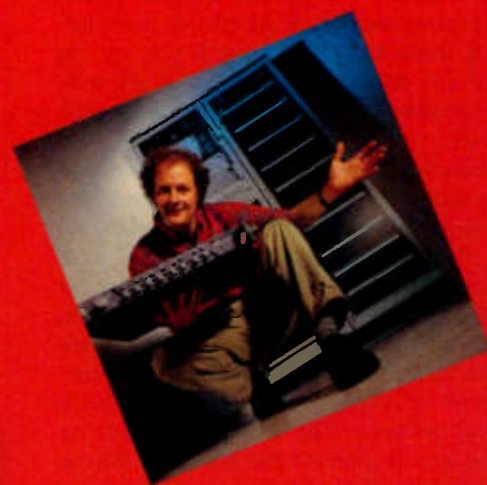
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Barry Flannaghan, designer of the one rack unit CVR45, compares it with the 120 rack unit ACE.

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Toshiba Hi8 Proves to Be Rugged Camera

by Dennis Foster
Owner
Foster Communications

CINCINNATI, Ohio When I purchased a Toshiba TSC-200 Hi8 camera in February 1993, I once again realized the joy of shooting video on location.

After almost 20 years, it feels like I have finally freed myself from the VCR ball and chain. The weight and balance of the camera reminds me of the days when I shot television news film with an Arri 16 BL.

Natural images

I purchased the TSC-200 to record images for a production that required numerous scenic shots—sunsets, seascapes, parks, fountains, flowers, animals in the wild, fireworks and the like—and we had to have a truly portable camera that could deliver high quality images.

Ultimately, the raw Hi8 footage will be transferred to one-inch for post production. In the meantime, we have posted a demo on 3/4-inch, and the response has

views and for on-camera narrations.

I also appreciate the amount of information that is provided in the viewfinder. Most of the time I shoot with all of it displayed. It is nice to know what f-stop is being used so that I can switch the ND filter in or out. Knowing how much tape is left has also been a big help.

However, the fact that I wear glasses has presented a problem with the viewfinder. I have to make a special effort to see the tally LED, and this has cost me a couple of shots where I thought I was rolling but had actually stopped the camera. Also, I cannot seem to get the lens of the viewfinder back far enough to get a sharp focus when I am wearing my glasses.

As for power consumption, it seems that the batteries last forever. In the past, I used

AC whenever I could. But now, I almost always use battery power. I can shoot all day with the three batteries I purchased with the camera.

On again, off again

However, the lowest power consumption in the world cannot protect against leaving the camera switched on. There have been times when I have been certain that I switched the camera off, but when I got it out of the case again it was on and the battery was dead. Somehow something appears to be bumping the switch as I put the camera away. A covered or locking switch would be helpful in solving this problem.

We have had occasion to use the high gain settings. And while the signal becomes rather noisy, it still provides a nice picture

that appears brighter than the actual scene.

Our Toshiba TSC-200 has proven itself to be a rugged workhorse of a camera, providing the quality that we need in an ultra-compact, well-balanced package.

If I had to do it again, I would purchase it in a minute.

Editor's note: Dennis Foster began shooting film in 1971 as a news photographer. In 1974 he became the first ENG/EFP videographer in Cincinnati, Ohio, and by 1978 he had started his own video production services company, producing marketing and training videos for such companies as Caterpillar and Exxon Chemical.

The opinions expressed above are the author's alone. For further information, contact your nearest Toshiba representative, or circle Reader Service 3.

Prompting Service Relies on Q-Tv

by Bob Pinson
Owner
Advanced Prompting Systems

MIAMI I began in the television business in 1959 and for many years had wanted to start my own business.

I have been on both sides of the camera and have worked for all the major U.S. networks in one capacity or another.

When I finally decided to launch my own company, I knew that one of the most valuable tools of the trade was the teleprompter, and this was where I decided to focus my energies.

Too large

Although they are reasonable in cost, teleprompters can be very cumbersome and heavy. Many of the earlier models weight up to 75 lbs., mainly due to the large sizes of cameras and prompter support plates, as well as the large, heavy monitors and counterbalance weights. This made them extremely difficult to work with, especially if there were a lot of setups in a day. It was also necessary to carry around an extra tripod and, on

EFP shoots, a generator.

Because these large systems made field prompting rather inconvenient, I delayed starting my business until technology took the turn toward miniaturization.

I first noticed that field prompters were becoming smaller and easier to use when I spotted Q-Tv's FDP-9 flat screen display (electroluminescent) at the NAB show in Dallas, Texas. What most impressed me was that I could read the screen from 20 feet away. The unit weighed only 8 lbs. with the mounting plate, and there were no counterbalance weights.

It was clear that this was the configuration I had been waiting for. It was compact, lightweight, drew AC or DC power and had a bright display and a sleek design.

I purchased three FDP-9 units, as well as the Q-Tv 600LT (Lap Top) program

luminance is orange, it falls quite low on the lumen scale. Using a CRT's white letter (character) as 100 percent, the brightness of a green computer screen equals about 80 percent. However, the orange/brownish color of a computer CRT equals about 60 percent of the

... the FDP-9's flexibility and compact size make it invaluable.

white CRT, which results in an inherent luminance problem in bright sunlight.

Located in Florida, we are about one stop brighter in sunlight than most of the world.

Q-Tv is aware of the problem and has made some significant gains in this area, but it is still necessary to have another "outdoor" CRT portable system. These systems weigh anywhere from 18 to 22 lbs., and it is necessary to have the right beam splitter.

Aside from this problem, however, no other system matches the weight and flexibility of the FDP-9. Camera operators we have worked with have been ecstatic in their praise for the unit. There is no need for an additional tripod or heavy weights.

Camera balancing is always perfect because of the unique sliding counterbalance platform. It also has a quick and easy mount and dismount to aid in those breakneck location changes.

For me, the FDP-9's flexibility and compact size make it invaluable. I do not mind having to bring another outdoor unit when it is necessary.

Editor's note: Bob Pinson has worked as an independent producer, director and engineer. He founded Advanced Prompting Systems in 1988.

The opinions expressed above are the author's alone. For further information on the FDP-9, contact George Andros at Q-Tv (Telephone: +1-212-460-9050; FAX: +1-212-529-9676), or circle Reader Service 40.

USER REPORT

been tremendous. Everyone who has seen it comments on the vividness of the color and the quality of the images.

Last week, I shot a sunset with a very strange hint of green in one of the clouds. Sure enough, when I viewed it on a color monitor the green was plainly visible. The preset white balance has worked remarkably well for shooting sunsets and other situations where I want to catch the unusual colors of natural lighting.

Overall, I have found that the quality of footage shot on the TSC-200 and dubbed to 3/4-inch is comparable to our previous first-generation 3/4-inch footage.

The sound quality from the camera's built-in microphone also exceeded our expectations. We have changed from using our lavalier microphone to using the camera microphone on a fishpole for inter-

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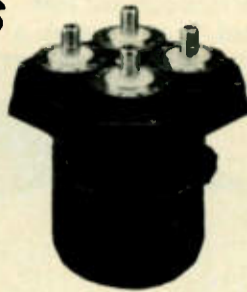
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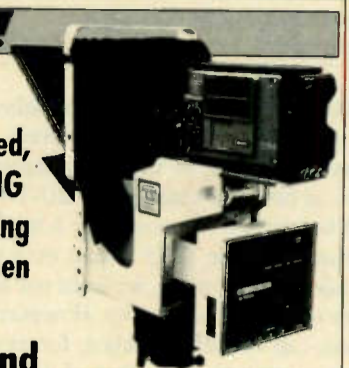
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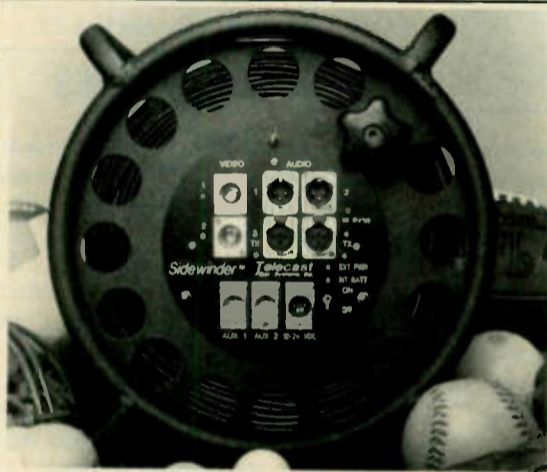
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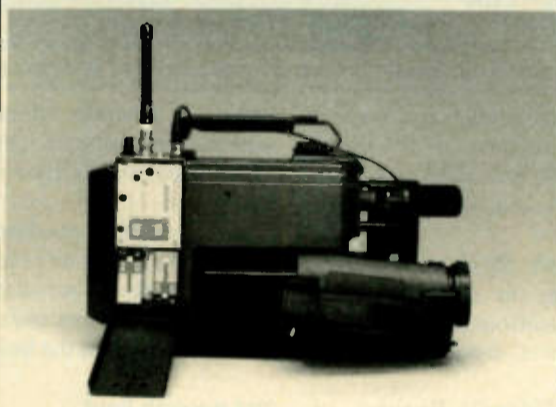
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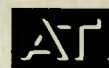
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READER SERVICE NO. 73

Gyrozoom Gets the Story for KPRC

by Ken Cockroft
News Operations Manager
KPRC-TV

HOUSTON, Texas Putting the television viewer in the front row for every news story is the goal of the news department at local broadcast station KPRC-TV.

Whether we are covering a hurricane pummeling the Gulf Coast or a rodeo parade on main street, we want our images to be of the highest quality. However, such a task can be difficult when, for example, we attempt a tracking shot of a marathon runner's face or zoom in on a speeding car attempting to evade police.

Old friends

Since 1985, however, we have relied on the Schwem Gyrozoom 60/300 image stabilizer. This revolutionary lens weighs about 7.5 lbs. and measures only 13 x 9 x 4.5 inches. It has a zoom focal length

USER REPORT

from 60mm to 300mm, a maximum aperture of $f/6.2$ and a pan/tilt speed of 6 degrees per second.

Although the Gyrozoom requires a lot of light and is difficult to use with fast-moving objects, we rely on it to provide steady, broadcast-quality video under what were once considered adverse circumstances.

We initially mated the Gyrozoom to a Sony BVP-30 tube camera equipped with a BVW-1 Betacam recorder. The whole complement measured almost 3 feet from the front of the lens shade to the rear of the recorder.

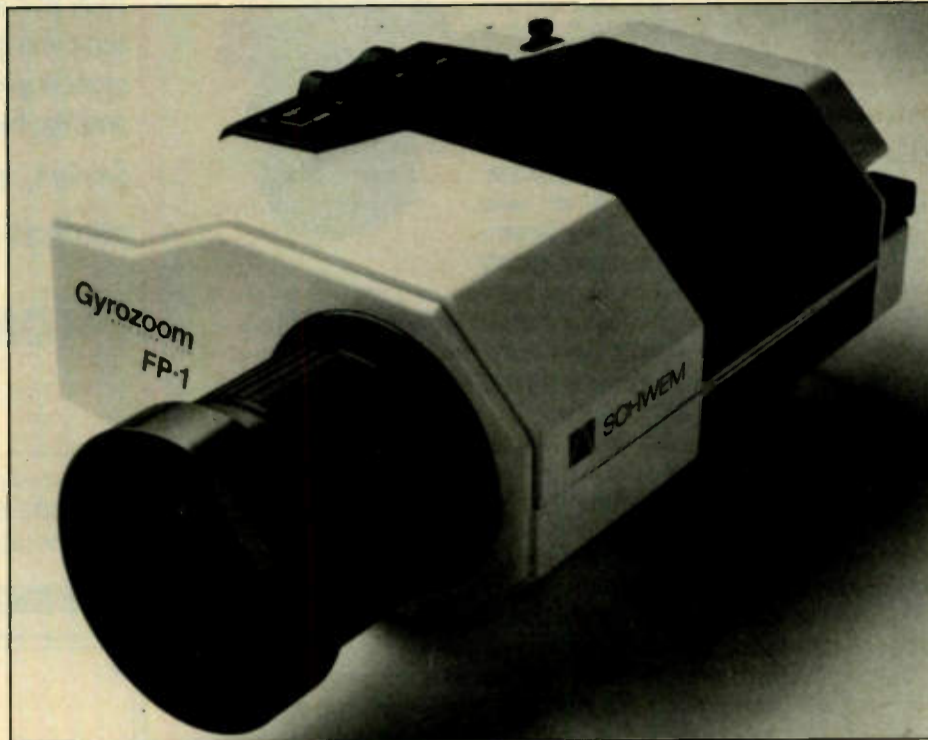
Several years ago I sent the Gyrozoom back to the factory for an upgrade. It was cleaned, readjusted and the pan/tilt speed was increased from 6 degrees per second to 30 degrees per second. It was almost like getting a new lens.

We used the Gyrozoom lens extensive-

ly earlier this year in Waco, Texas, during the infamous standoff between the Branch Davidian cult and the U.S. government. The story began with an unsuccessful raid in search of illegal weapons in which several cult members and federal agents were killed. It ended when a

Gyrozoom lens on a tripod on the roof of our satellite truck, elevating it approximately 17 feet above the ground.

At 300mm, the best our cameraman could get was a very steady wide shot of the compound. To improve this advantage, we purchased a Century



The Gyrozoom can give viewers a front row seat at news events.

second raid reportedly touched off a fire that quickly spread through the compound. A number of cult members were believed to have taken their own lives during the blaze.

During the standoff, the Gyrozoom was praised by not only our crew but many other news organizations as one of the most important pieces of equipment used to cover the story.

The U.S. Federal Bureau of Investigation kept the news media more than a mile-and-a-half away from the Branch Davidian compound. To get adequate pictures, we mounted the

Optics 2x extender which was equipped with bayonet mounts for quick and easy setup between the lens and the camera face.

This gave us a maximum focal length of 600mm, giving us excellent tight shots of the rambling Davidian headquarters, the FBI staging area and armored vehicle movement around the buildings.

Not enough light

When the second raid on the compound began in the pre-dawn hours of 19 April, the big lens served as little more than a spotter scope due to the lack of available

light needed to provide broadcast quality pictures.

With sunrise came the much needed light, and the crew started feeding live pictures back to Houston. As the Davidian compound started to burn, video from the Gyrozoom-equipped camera was fed to our network, the National Broadcasting Corp. (NBC), as well as to non-NBC stations across the U.S.

The camera and lens was powered with 110-volt AC for the duration of the Waco coverage. We power our camera/recorders using a Perrott PE-90a, 4 AH, 12-volt battery. It has been our experience that even with a brand new, fully charged battery, the camera and Gyrozoom lens will deplete the charge in about 20 minutes.

The Gyrozoom 60/300 that we own is now sold as the Gyrozoom FP-1. It has been an important tool from day one and has indeed given our viewers a front row seat at many news events.

Editor's note: Ken Cockroft has worked in broadcast television since 1963. He joined KPRC-TV in 1974.

The opinions expressed above are the author's alone. For further information on the Gyrozoom lens, contact Clay Sylvester at Tinsley/Schwem (Telephone: +1-510-222-8110; FAX: +1-510-223-4534), or circle Reader Service 51.

BUYERS BRIEFS

Nikon's S15X8.5 II TV-Nikkor lens for 2/3-inch ENG/EFP cameras offers a 15x zoom ratio with a built-in 2x extender.

The lens has a focal length of 8.5-127.5mm (17-255mm with extender) and a maximum relative aperture of 1:1.7 to 2.2 ($f=127.5mm$). The minimum object distance is 0.8m.

Other features include a sloping grip for a more comfortable hold and separate servo and extender sections.

For further information, circle **Reader Service 24**.

Canon Broadcast's J20aX8B IRS internal focus (IF) zoom lens is one of the longest handheld lenses available, with a focal length range of 8 to 160mm and a 20:1 zoom ratio.

The IF system involves mounting the focusing group separately from the front lens to provide a stationary front element and barrel. Because the optical accessories are also stable, the lens provides improved focusing speed and response time.

Also, Canon's MB 200 Matte Box can be used more easily because the box and filter are stationary on the barrel while focus and zoom are conducted internally.

For further information, circle **Reader Service 52**.

The Vision 5LF and 10LF pan-and-tilt heads from **Vinten Broadcast Ltd.** offer flick on/flick off pan-and-tilt brakes and a standard 100mm leveling ball.

The 5LF features 160-degree tilt (+85 to -75 degrees from horizontal), while the 10LF provides 180-degree tilt (+/-90 degrees).

Both heads weigh under 3 kg and offer optional quick-action mounting plates.

For further information, circle **Reader Service 34**.

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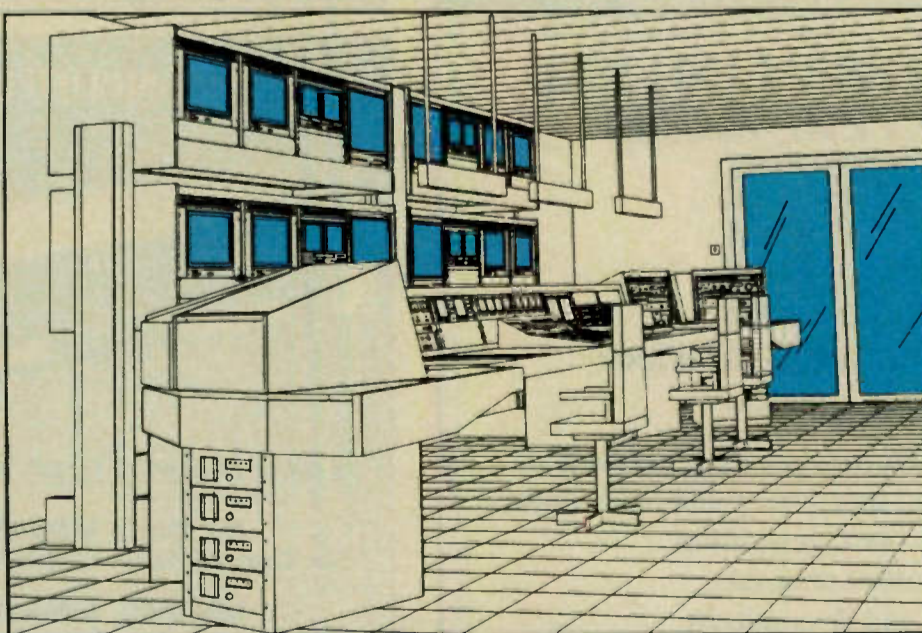
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RAI Looks to Cartoni Tripods

by Luigi Cifani
Cine Division Chief
RAI

ROME As any professional newsgatherer knows, the quality of the shots that can be achieved with a camcorder is totally dependent on the type of support being used.

Although camera suppliers always like to display their latest portable camcorder balanced comfortably atop an operator's shoulder, the reality is that most location footage for commercial production, news and documentaries is shot with the camera locked firmly into a pan/tilt head attached to a quality tripod.

Strong support

From production to post, a tripod makes its presence felt. It certainly reduces film and tape losses by keeping the shooting ratio low.

Producers are seldom satisfied with unstable "off the shoulder" material, except for news gathering where shots cannot be taken any other way.

Most often, the demand is for a smooth and controlled movement, free from jerks or vibrations and achievable only with a professional support.

The cameraman's prime weakness is, in fact, his ability to hold the weight of the equipment for extended periods. The load is basically represented by a combination of camera, controls, lens and viewfinder, and possibly lights, batteries and a recorder as well.

For this reason, all professional pan/tilt

USER REPORT

heads feature an integrated counterbalancing system that neutralizes the effects of the camera's payload through the tilt range. This ability to properly balance the camera also allows the operator to move the camera to a particular position and then hold the shot without putting any pressure on the pan bar.

Another significant human weakness is the inability to support the camera without shaking it. Needless to say, no cameraman has the ability to stop breathing for extended periods of time while shooting. A professional support must allow operators to control the camera without shaking it.

Smooth pan

Also vital for a professional support is a multistep or continuous drag system that provides a wide choice of tension settings to suit different shooting environments. And the best method of achieving this is known as fluid damping. This technique is superior to more conventional hydraulic systems in that it allows quick moves to produce a hydrodynamic effect, enabling whip pans to be achieved.

Trends in the tripod industry are moving toward devices that meet three main criteria: lightness, performance and value. Naturally, camera operators want lighter tripods, because their cameras are getting smaller and lighter each year.

On performance, when the camera operator pans and tilts, the fluid head should move the desired parameters and should stop when it is supposed to. No "backlash" effect should occur at the end of the panning, and the viewer should never "see" the tripod in any shot.

On the value side, reductions in the size and price of CCD cameras have also resulted in customers looking closely at the relative cost of a camera support system.

Major tripod manufacturers, such as Cartoni Srl., continue to bring out lighter pan-and-tilt head/tripod combinations packed with new features and innovations.

Proud history

Located in Italy since 1935, Cartoni originally developed a leading reputation in the demanding field of 16mm and 35mm film camera support. In March 1992, the Academy of Motion Picture Arts and Sciences of the U.S. honored

Cartoni's engineering department with its Scientific and Engineering Award.

Through the years, the enormous changes in the design of video cameras and relevant accessories have resulted in a continuous updating of Cartoni's fluid heads and tripods.

Following the positive response received by the Beta lightweight head designed for newsgathering purposes, two new models will soon be introduced.

One of these is the Alfa, a pan-and-tilt fluid head designed for the new generation of CCD cameras weighing up to 8 kg, which are now very prevalent in broadcast and corporate environments. The other is

the Delta, a new ENG/EFP fluid head for up to 16 kg cameras. The Delta combines a 10-step drag control with a continuously variable fluid damping module and a continuous counterbalance adjustment.

With so many choices on the market, it is my belief that a high quality pan-and-tilt head/tripod combination should represent a major component in every serious camera operator's kit.

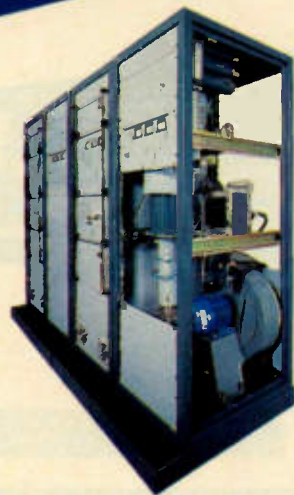
Editor's note: Luigi Cifani has worked at RAI for 30 years and is a member of the AITC, the Italian Society of Movie and TV Engineers.

The opinions expressed above are the author's alone. For further information on the Beta head, contact Guido Soro at Cartoni (Telephone: +39-6-438-2002; FAX: +39-6-438-8293), or circle Reader Service 30.

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TV touring Depends on KY Series

by Norbert Hufgard
Program Director
TV touring

WURZBURG, Germany TV touring, a private television broadcast company, celebrated its fifth anniversary this past summer.

In those five years, the company has grown from three to 70 employees. It now operates three television stations, located in the towns of Wurzburg, Aschaffenburg and Schweinfurt, as well as a post production facility in Wurzburg.

In addition to broadcast operations, TV touring owns a production company called Creativ TV, which is devoted to high end industrial video and commercial production.

Road to success

The success of a private regional television company is determined by the size of its audience. And with the steadily growing audience of "Franken-Journal," a daily hour-long magazine show, TV touring has proved that the German people have a large interest in attractive regional programs.

Lately, TV touring has begun broadcasting live shows from remote sites. Recently, we aired the three-hour final event of the "Challenge Days," a sporting event between Wurzburg and the city of Magdeburg. We also recently broadcast a symphony concert from the

Wurzburg Mozart-Fest.

For these types of operations, we normally use the KY-27 ENG/EPF camera from JVC because of its light weight and low power consumption. It also provides high resolution and a high signal-to-noise ratio.

The KY-27 features "full auto shooting," in which the camera operates in light conditions from 10 lux to 30,000 lux without adjustments to gain, iris or filter wheel. This gives the cameraman the ability to concentrate on the scene rather than the operation of the camera.

USER REPORT

In addition, JVC's LoLux function allows high quality shots to be taken as low as 2 lux, after most cameras have failed.

Another feature is the unit's variable scan, which enables the camera to take pictures from computer monitors without those annoying noise bars.

Universal link

Because we work with various clients, it is necessary to connect to different VTR formats. The KY-27 is dockable to any VTR format, which was one of the reasons we purchased the camera in the first place.

In the studio, we use JVC's KY-35 camera. This unit is equipped with JVC's

AMS (advanced memory system) that enables the operator to store numerous adjustments as scene files. No longer is it necessary to undergo a lengthy setup process; by calling up a particular file, all the adjustments are made automatically.

The memory system consists of a Memory Card that stores up to four complete camera setups. The memory is non-volatile, meaning cards can be removed and replaced to provide additional setups.

In addition, JVC's RM-P300 remote control provides control of gamma, independent flare correction for RGB, contour level, black and white point, etc. The remote has a range of 300 meters and provides component, Y/C, RGB or composite output, as well as

power to the camera.

Both the KY-27 and the KY-35 feature "lens-on-chip" technology, in which a microlens is placed over each pixel on the CCD to improve sensitivity and reduce vertical smear.

With a professional, high-quality system in place, a regional television broadcaster can maintain its hold in the German market by satisfying viewers' lack of regional information.

TV touring is able to meet this demand mainly through the use of equipment such as the JVC KY-27 and KY-35 cameras.

Editor's note: Norbert Hufgard joined TV touring as an editor in December 1989.

The opinions expressed above are the author's alone. For further information on the KY-27 or KY-35 cameras, contact your nearest JVC representative, or circle Reader Service 75.

WV-F700 DE PANASONIC AYUDA A ESTACIÓN LOCAL

Por Rob Abele
Director de Ingeniería
WJAC-TV

JOHNSTON, Pennsylvania Los clientes de WJAC-TV, emisora local de televisión, han logrado un alto nivel de sofisticación en lo relacionado a valores de producción. Ofrecemos a esta clientela servicios de producción comercial completos—desde rodaje fuera del estudio a trabajo de postproducción.

En vista de nuestro deseo de proveer el mejor servicio a nuestros clientes, pero hacerlo efectivamente, compramos la cámara WV-F700 de Panasonic. La cámara tiene tres CCDs y procesamiento digital de señales (DSP).

Decidimos comprar la cámara (nues-

solamente ajustes mínimos para rendir funcionamiento óptimo. Los potenciómetros de ajuste de una cámara suelen desalinearse con el movimiento y la vibración que ocurren fuera del estudio. No hemos tenido ese problema con la WV-F700.

La circuitería CCD de la Panasonic nos ha impresionado muchísimo. La cámara maneja la borrosidad vertical de la imagen con maestría. Los técnicos aprecian la calidad duradera del diseño de la cámara y su ergonomía total.

Hay ocasiones en que usamos a la WV-F700 como componente de sistema, especialmente en situaciones fuera del estudio. En estas ocasiones, se le conecta a una grabadora portátil Panasonic AU-55H M-II. El resultado es de mejor calidad que la de una pulgada, y hemos recibido muchos comentarios a nuestro favor de los clientes.

Cuando hice la evaluación de la WV-F700, también examiné su rendimiento en situaciones de nivel de iluminación bajo. La ocasión fue una presentación anual que hace la emisora de un partido de béisbol local. El partido es importante por ser organizado por un club de deportes de la comunidad, pero el estadio no tiene suficiente iluminación para cámaras de televisión. Colocamos a nuestra WV-F700 en media cancha y rodamos cinta. El resultado fue un éxito.

En conclusión, WJAC-TV utiliza su WV-F700 cuando desea obtener los mejores resultados posibles. Yo anticipo que la próxima compra de cámara será de otra cámara con tecnología DSP.

Nota del director: Rob Abele empezó su carrera con WJAC como técnico/operador cuando aún cursaba estudios secundarios. Lleva cinco años como director de ingeniería.

Para más información, comuníquese con su representante de Panasonic más cercano, or marque el Reader Service 95.



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Scenes Shine with LTM Sungun

by Thomas F. Denove
Freelancer

AGOURA HILLS, California As someone who has been shooting film and video for more than 20 years, I am always interested in trying new equipment, preferably items that will save me and my producers time and money.

Most often, however, the new equipment I purchase does not live up to its name or the manufacturer's claims.

Low expectations

The light output from my first 250 watt sungun was anything but awe inspiring. The beam field was extremely spotty, and the few footcandles it produced diminished to next to nothing when the dichroic filter was flipped in front of the bulb.

However, that all changed when LTM Corporation of America introduced the Sungun 200 S/E earlier this year. LTM is best known for its HMI lights that offer bright daylight balanced (5600K) output but also have bulky heads and heavy ballasts, meaning they are not very portable.

My fears regarding the unit's portability soon vanished, however, because it is actually an extremely small HMI lighting instrument. The head width, including the yoke, is 6 3/4 inches. The depth is 7 inches, and the height, including the handle, is 10 inches. At 2.6 lbs. for the light plus 2 lbs. for the flicker-free DC electronic ballast, the total weight is less than 5 lbs. The small ballast (4 x 6 x 2 inches) easily clips onto the battery belt.

Throughout my career, I believed that heavy, mechanical ballasts consistently work the best for HMIs. But the light-weight LTM 200W electronic ballast has changed my way of thinking. I have never had a problem with the electronics.

Light control

The ballast has a dimmer knob, which allows the videographer to decrease the intensity of the light up to one stop. Dimming the Sungun slightly increases the Kelvin temperature.

The focusable 200 watt S/E MSR hot restrike globe can be powered by AC (120V/220V 50 to 60 Hz) or DC with a 30 volt battery belt. It is also color-balanced for daylight. The power consumption is approximately 10 amps from the 30 VDC battery belt, 2.5 amps at 110 V and 1.25 amps at 220 V. I have averaged more than 45 minutes of light operation with LTM's standard 30 volt battery.

Of course, a lighting unit is only as good as the quality of light that it projects. This is where the LTM Sungun 200 S/E shines. Its focusing range of approximately

3:1 delivers a clean, even spread of illumination from spot to flood.

The handy focusing lever on the back of the light allows the operator to hold and focus it with one hand. The light can be hand-held, attached to a camera or stand-mounted.

Borrowing a feature from LTM's famous line of HMI par lights, the Sungun 200 S/E comes with a set of interchangeable lenses, which adds to the flexibility of this unique lighting system.

These lenses allow videographers to manipulate and modify the light source to adapt to any situation. There are four lenses to a set: a medium angle, a wide angle, a super wide angle and a Fresnel.

The medium angle lens increases the spread of the light in the flood position by almost 10 percent, while the wide angle lens increases it by 25 percent.

The super wide lens maintains the Sungun's circular pattern while almost doubling the spread of light. The Fresnel lens increases the spread in the spot position almost 90 percent, and more than 30 percent in the flood position. The Fresnel lens creates a softer light source that can be more cleanly

USER REPORT

Each lens slides securely between the light and the barndoors, and they do not interfere with the Sungun's focusing capabilities.

The medium and wide angle lenses create a rectangular pat-

tern of light, flags and barndoors.

All in all, the new Sungun 200 S/E from LTM perfectly lives up to its name.

Editor's note: Tom Denove has worked as a director of photography in film and video for 23 years. He won a Technical Academy Award for his design work on the Belco/Denove Cinemeter light meter.

The opinions expressed above are the author's alone. For further information on the Sungun 200 S/E, contact Laura Maurel at LTM (Telephone: +1-818-767-1313; FAX: +1-818-767-1442), or circle Reader Service 77.

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Sony RM400 edit controller w/cables, \$150+shpg. G Klrby, Gray Fox Video, 13613 US 36, Marysville OH 43040. 614-261-8871.

EECO IVES II SMPTE time code edit cntrlr w/programmable A/V mixer/fader, frame accurate, expandable to A/B editing, comp w/Ikegami monitor, manual, cables & interface kits for Sony VO-5850/5800 & cable & interface kit for Panasonic NV-8500, \$1100/all. S Briones, BVP Video Recording, 5036 Joe Herrera, El Paso TX 79924. 915-751-2223.

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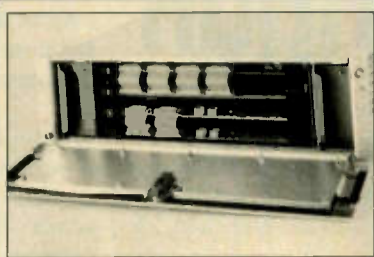
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VIDEO PRODUCTION EQUIP...WTS

Panasonic WJ-4500 special effects gen, BO; Panasonic WJ-1100, BO, both in good working condition. R Conklin, TV4, RR1 Box 1284, Greene ME 04236-9719.

Panasonic UTP-2 video signal transcoder, transcodes virtually any video signal into any other video signal, handles S-VHS, U-matic, RG-C, RGBS, MII & Betacam, 5.5 MHz bandwidth, 60dB S/N ratio, new in box, never used, \$1100. Ron, Video Keepsakes, 516-285-7146.

Panasonic AG-7400 port S-VHS VCR, excellent condition with 2 batts, \$1100; Sony EVO-9100 HI-8 camcorder, very good condition with 2 batts, \$800. PKD, Box 20590, NY NY 10023. 212-988-6929.

Sony VO-5850 3/4" edit deck, like new, \$1900; RM-440 controller, \$400; BK-801 cntrl panel, \$200. R Sumner, CAVU Corp, 3322 Applegate Ct, Annandale VA 22003. 703-968-8894.

Sony BVU 110 port 3/4" rcdr & case, \$500. Craig, 201-377-3753.

Sony VO9600 w/BKU-702 interface SP 3/4", \$2400. P Smaller, Media Assoc, 616 National Ave, Mountain View CA 94043. 415-968-2444.

Sony BVV1-A Beta recorder with Ikegami ITC-730A camera, low hours, good condition, BO. M Russell, LP Group, 2035 E 2200 S Ste 253, Salt Lake City UT 84109. 801-484-2468 evenings.

Sony AV-3650 1/2" open reel VTR; Sony AVC-3400 B/W port camera & VTR, both in gd cond, BO. R Conklin, TV4, RR1 Box 1284, Green ME 04236-9719.

Sony VO-6800 3/4" port U-Matic (2) with P-Brace cases, VG, excellent condition, low hours, \$1250/ea or \$2400/both. WVPL, 19 Bonticou View Dr, New Paltz NY 12561. 914-255-5348.

JVC BR6400U source deck, great shape, just overhauled, \$1475. B Hines, RD #1 Box 413A, Export PA. 412-468-4115.

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Sony VO-8800 3/4" SP rcdr w/tlme code card, Portabracc case, \$2100. F Zakrajsek, Essential Video, 700 W St Clair, Cleveland OH 44113. 216-241-4143.

Sony BVW-10 Betacam player with built in TBC, fair cond, \$5000; Sony BVV1A Betacam dockable recorder, fair cond, \$2500; Ampex CVR-21 Betacam field player with AC supply & NP-1 batt separator, excellent cond, \$4500, package price, \$10500. M Downey, Visual Evidence, 407-655-2855.

NEC 3/4" VCR timelapse recorder, \$300. J Baltar, Maine Reel, 67 Green St, Augusta ME 04330. 207-623-1941.

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How to Upgrade Your PC

(continued from page 16)

some professional uses.

The next step up in video output is a scan converter. Communications Specialties' Scan-Do, an external device with its own software on-board, converts VGA output to composite or S-Video. RGB Dynamics also offers a scan converter, as well as encoders in external, rack mount versions (CDR-150 and 250) or as a PC card (CDR-950).

Such video I/O devices, as well as genlocks, frame-grabbers, and so on, represent the low-end of PC power requirements, bringing their own hardware to the video party.

Memory, inside and out

Graphics work is RAM-hungry. Features like "undo" and spare pages/screens in paint and modeling programs gobble up all the memory they can find. Figure 4MB RAM as a minimum for any PC these days, and 16MB or more if you will be doing much graphics. Most motherboards now have room for 32 megs, and more can be added on an expansion card. Some video applications require fast RAM, so get 70 nanoseconds.

Just as graphics are hungry for RAM, they will quickly eat up external storage, too. A 100MB hard drive should probably be considered a minimum for a PC used for even the least demanding graphics applications.

Beyond the familiar hard drive lies the land of unlimited storage, inhabited by a growing number of high capacity removable media devices offering several advantages over fixed drives.

By using either optical, or a combination of optical and magnetic technologies, these drives give you more than just the ability to insert a new cartridge or disk when the old one is full. They eliminate the need for tape backup. And if you will be transporting your graphics files, remember that some may be too large to fit on a diskette. The price you will pay for the advantages of removable media will be higher cost per meg than hard drives and slower read/writes.

Michael Brown is owner of MBZ Products in Muncie, Indiana. He can be reached at +1-317-288-0009.

For more information:

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Panasonic WV-555 Nighthawk 3-tube camera w/zoom lens, 1 w/battery charger, pwr supply, \$1000; Panasonic NV-9600 3/4" editing deck, \$1500/BO; Panasonic NV-9240 3/4" source deck, needs work, \$250; NV-8500 1/2" editing deck, \$500; NV-A500 edit controller w/one cable, \$500; JVC TM 22U 5" color monitor, \$350; Pioneer LD-V2200 laserdisc player, \$500, will sell package for \$4000. Tape-It! Prod, POB 444, Rogersville TN 37857. 615-272-4827.

JVC CR-4400 port 3/4" rcdr w/AC & new batt, padded carrying case, new belts & rubber inside, \$350. Bill, 405-691-5927.

Sony BVU 200A (2) 3/4" bdcvt quality edit decks & Sony BVE 500A editing cntrlr w/all cables, manuals, schematics, new head, comp working edit system, \$1200/BO. S Briones, BVP Video Recording, 5036 Joe Herrera, El Paso TX 79924. 915-751-2223.

VCR/VTRS/RECORDING MEDIA

Want to Sell

Sony 9800, \$3500; Sony 9850, \$5900; Panasonic AG6040 time lapse VCR, new, \$1695; Panasonic NV8050 time lapse VCR, used, \$650; Sharp VC-WD1 standard converter VCR, \$1595; Panasonic AG-W1 standards converter VCR, \$1950. C Bell, 214-406-9292.

Panasonic AG7400 port S-VHS deck, comes w/case, \$1400. G DiBiase Jr, 617-547-5767.

Sony VO6800 rcdr w/Portabracc case, 6 batts & chrgr, \$1350. K Krohn, 314-298-0053.

Sony VO-5850/VO-5800 3/4" recorders both excellent condition, VO-5850 edit deck, \$2200; VO-5800 edit source deck, \$2000; EECO IVES II SMPTE time code edit controller with programmable A/V mixer/fader, complete with Ikegami monitor, manual, cables & interface kits for Sony VO-5850/5800 NV-8500, \$1100, all items listed \$5100/package. S Briones, BVP Video Recording, 5036 Joe Herrera, El Paso TX 79924. 915-751-2223.

Panasonic AG7400 port rcdr, lw hrs, exc cond, \$1350. Aaron, 516-536-0606. Panasonic AG-450 industrial S-VHS camcorder unit, \$900; Magnovox S-VHS camcorder with built in digital effects, \$800. J McLeod, J-Mac Video, RR4 Box 370, Bangor ME 04401. 207-884-8663.

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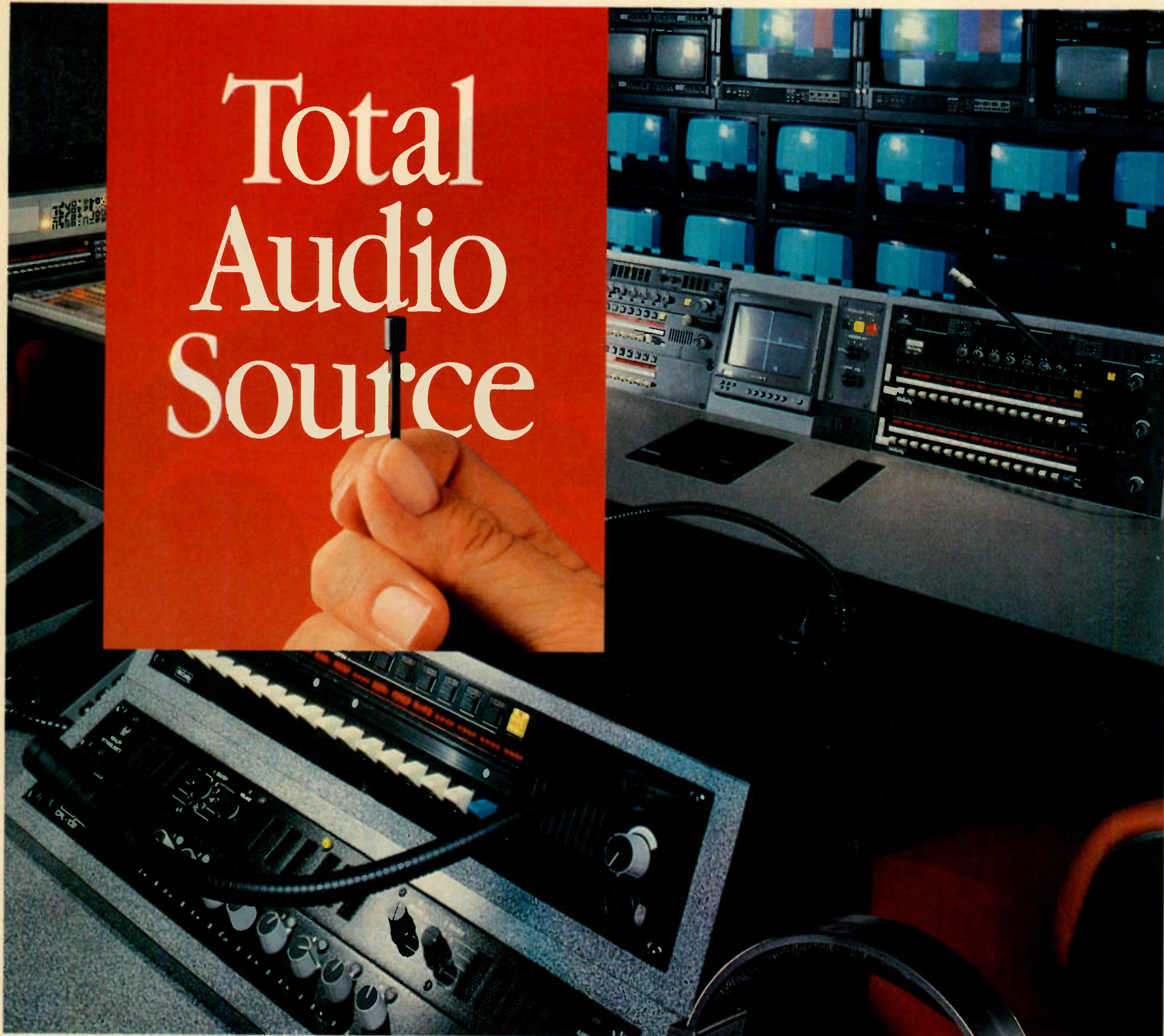
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See Page 11

Murdoch Expands His Media Empire

by Chris Dickinson

LONDON Rupert Murdoch and his News Corporation media empire appear to be in the fast lane in the race to create a worldwide "digital superhighway" supplying television, data and communications.

Unveiling new pay TV packages for U.K. satellite viewers in September, Murdoch said the forthcoming entertainment network would use the latest digital technology and would incorporate elements of News Corp.'s Fox Network in the U.S., BSkyB in Europe and the newly acquired Star TV system in Hong Kong.

He also announced a program-making tie-up between Fox and Televisa of Mexico to produce 500 hours of new drama and special event television, and a pay TV technology deal in Europe between BSkyB and German broadcaster Pro 7, an affiliate of the Kirch Corporation.

Global aspirations

Murdoch's aim for a super highway mirrors a similar project announced by President Bill Clinton in the United States. Murdoch said he wants to combine satellite technology with telephone networks to allow consumers to access communications, TV shows, movies, sporting events and information services as simply as possible.

"The traditional distinctions are breaking down," he said recently. "Five of the world's biggest industries — computing, communications, consumer electronics, publishing and entertainment — are converging into

(continued on page 4)

Television Behind the Great Wall

by Bill Ford

Editor's note: As one of the first American journalists allowed into the studios of a number of Chinese television facilities since the Tiananmen Square uprising of June 4, 1989, Bill Ford was offered a unique opportunity to view the state of Chinese broadcasting today. This account reflects what he witnessed in the Chinese television industry.

BEIJING As China continues its transformation to a market economy, its television industry finds itself caught between the still-dominant central authorities and the need to remain independent enough to take advantage of the latest technologies.

On a recent tour of Chinese television facilities, I had an opportunity to get an inside look at the state of the industry, from top-notch systems of the central television authorities that rival the leading facilities of the West to poorly-equipped local operations that, in some cases, would be hard pressed to obtain operating licenses elsewhere in the world.

Every station in China falls under the auspices of the Beijing-based Ministry of Radio, Film & Television. They are owned, operated and administered by one of three government levels: city, provincial or central (Beijing). The individual Broadcast Company (state-owned) runs day-to-day operations, but funding comes from their respective administrative level.

Beijing TV and China Central Television (CCTV) broadcast nationwide and serve the capital by transmitting four channels each to a 50 kilometer effective radiated area around numerous repeater stations in the country. Stations located in provincial capitals broadcast to the provinces they serve, and city level stations within the provinces broadcast to

their respective cities.

Residents in most large cities receive four or five stations: one local, two provincial and two from Beijing.

Except for China Central Television's new facilities in Beijing, most stations are usually short-funded at their inception; and only after a period of time do they acquire new equipment and upgrade to larger, more automated systems. Smaller stations generally keep more of their revenues, and so are able to upgrade more often.

To buy equipment, a station head must apply to his administrative level for a certain amount of foreign money to be allocated to the station account. The station then invites a government-owned import corporation to

act as negotiator in buying the equipment from the sales agency, which is usually located in Hong Kong. Each Bureau or Ministry has its own import agency.

Purchase orders

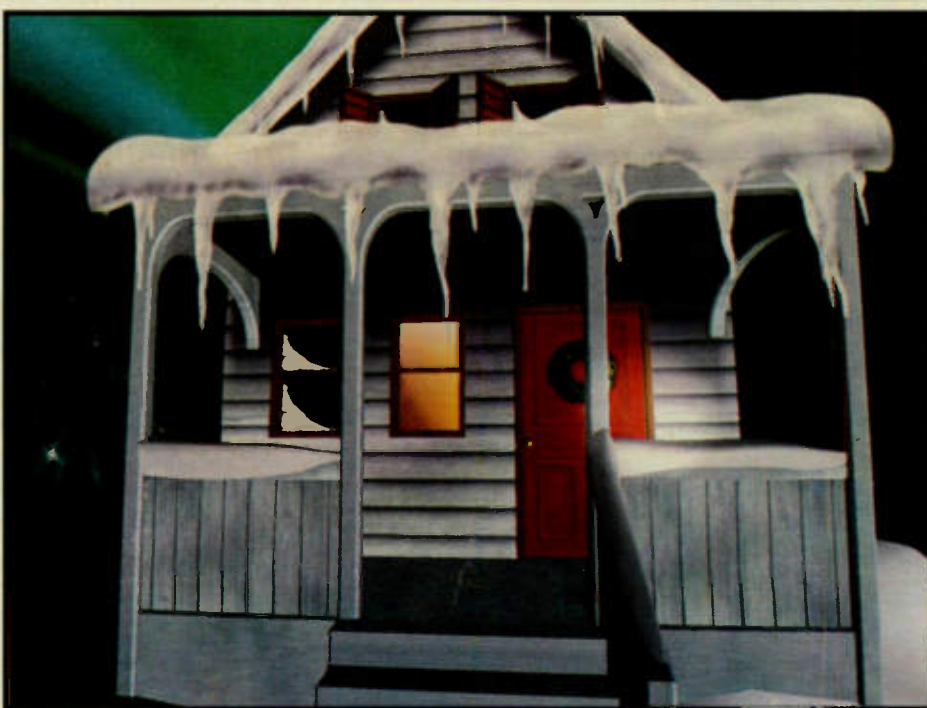
In most purchasing situations, the government orders the broadcast facility to purchase equipment of Chinese origin, if it is available. Chinese towers and transmitters are used in many locations around the country. However, I was told that for most studio, editing and control room equipment, most stations purchase U.S., U.K. or Japanese products and then tell the financing government agency that they "forgot about the directive" or "cannot remember what they bought." Apparently this is a good enough answer for the government, as this is standard practice in China.

In some cases, members of the Chinese-American community in a "Sister City"

(continued on page 6)



Getris Images' Studio Venice paints a winter scene. See this month's Buyers Guide on graphics equipment, p.17.



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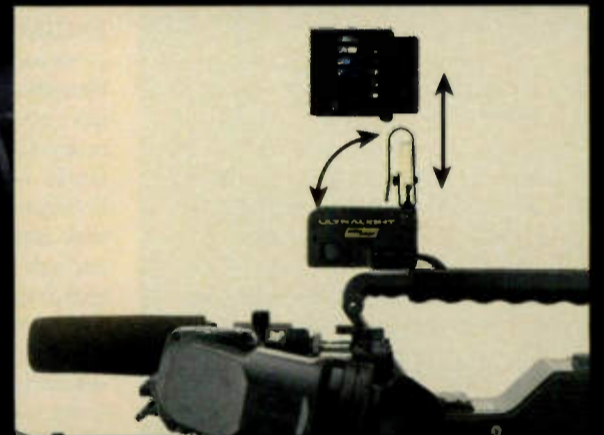
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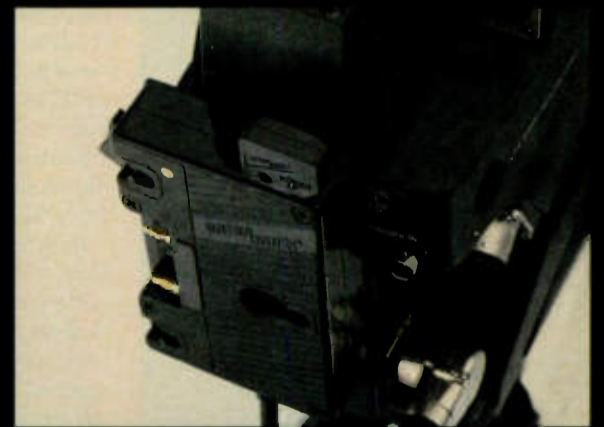
Compact and lightweight, the Ultralight 2 was designed specifically for on-camera use. It virtually becomes part of the camera.

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INTERACTIVE TV

Firms Join to Bring Video Dialtone to Korea

SEOUL, South Korea Interactive television in the Korean marketplace is the goal of a strategic alliance between Broadband Technologies Inc. (BBT), of the U.S.A., and Korea's Taihan Electric Wire Co. Ltd.

Under the two-year agreement reached in early September, the two companies will work together to introduce BBT's Fiber Loop Access (FLX) interactive "video dialtone" platform to the Korean market. Taihan will provide sales, marketing, technical support and customer training.

"The two companies will explore the long-term requirements of the Korean marketplace, as well as the product modifications necessary" to establish FLX at the forefront of the Korean marketplace, according to Salim A.L. Bhatia, BBT's president and CEO.

The FLX system allows fiber optic-based local distribution systems to provide numerous interactive services, such as movies-on-demand, on-line home shopping and information services, education programs and telemedicine.

The system is currently being installed in several locations in the U.S.

NEW TECHNOLOGY

ATM Technology Takes Center Stage at March Conference

RENNES, France Asynchronous Transfer Mode (ATM) technology, touted as the future of broadband cable and fiber distribution, will be the topic of discussion in March 1994, during the ATM Developments '94 conference.

The conference, scheduled for 30-31

March in Rennes, will feature papers from numerous technical experts who are currently active in the field of ATM. Topics to be discussed include: ATM for public broadband, private and virtual networks; ATM compared to other technologies; broadcast applications; ATM test projects and development strategies; and the migration toward ATM technology.

Among some of the international telecommunications firms scheduled to conduct demonstrations at the event are CNET Lannion, CCETT, OST and CERIU.

For further information, telephone +33-1-4707-2929; FAX: +33-1-4707-3129.

BUSINESS

Pesa Provides OB Van to Russian Media

MOSCOW Pesa Electronica of Spain has been chosen to supply a 10-camera OB trailer to Russian State Radio and Television, Vserossijskaja Gosudartvennaja Teleradiokompanija (VGTRK).

The 13.5-meter trailer was to have been outfitted at Pesa's Madrid factory for shipment to Moscow by the end of the year.

The trailer is to feature an expandable side and is to contain Ikegami cameras, a Grass Valley Group Vision mixer, a Soundcraft audio mixer, as well as a range of Pesa monitors, distribution amps, routers, a graphics workstation and an intercom system.

The Moscow sale reflects a growing interest in Eastern Europe by Pesa, following a string of sales to facilities in such countries as Czechoslovakia, Poland and Hungary.

British Company Adopts New Name

WINCHESTER, U.K. National Transcommunications, the British communications organization created from the engineering division of the Independent Broadcasting Authority, has officially changed its name to NTL.

According to the company, the name change coincides with the company's transition from a public service provider to a "customer-oriented commercial company," concentrating on satellite uplinking, digital compression and telecommunications.

"The developments to our corporate image build on the progress we have made in sustaining our established business, moving into new markets and remaining at the leading edge of technology," said Tony Gee, manager of NTL. "We are in the communications business and we think we are now presenting ourselves in a more appropriate light."

MAXINE! Character Generator Now Available From Chyron

MELVILLE, New York Chyron Corp., a member of the Pesa/Chyron Group, has made available the new MAXINE!, a compact, single-channel, single-user character generator and graphics system.

MAXINE! is compatible with the Chyron iNFiniT! and MAX!> and provides a fully anti-aliased, full color output.

Features include advanced font utilities, an intelligent interface, video input and Ethernet and RS-232 communication. A Macintosh link for transfer of fonts and graphics is also available.

For further information, circle Reader Service 53.

SATELLITE

Satellite Service Comes to New Guinea

PAPUA, New Guinea New Guinea has completed the installation of a Scientific-Atlanta INTELSAT Standard "A" satellite earth station established to provide video, voice and data to this island nation of approximately 3 million residents.

The US\$2.4 million facility is part of an overall telecommunications development

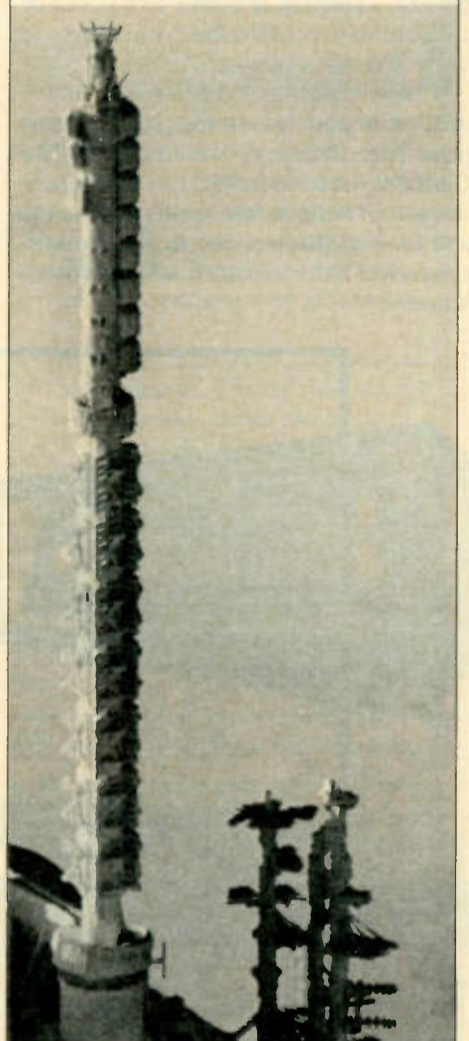
plan initiated by the government in 1991.

The earth station is located at the country's Satellite Communications Centre outside the capital city of Port Moresby. It includes an 18-meter antenna, intermediate data rate equipment, as well as a number of television receivers and excitors.

Scientific-Atlanta provided civil works, design, manufacturing, delivery, installation and testing for the project, and will continue with ongoing operations and maintenance training. The center was officially opened by Martin Thomson, minister of communications and information services.

Satellite service was selected due to the country's varied geographical makeup, particularly rough mountainous areas separating major population centers.

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A View of Vision '93

LONDON The new U.K. national broadcast equipment show in October, Vision '93, produced a few new products not shown at Montreux.

Avid unveiled two new versions of its non-linear Media Composer systems; the Models 100 and 1000. The Model 100 is aimed at "small scale" business and industrial users, while the Model 1000 is targeted at mid-level facilities and independent producers.

Avid's European director, Paul Basson, said the company was also attempting to produce a system working with uncompressed video.

"We hope to have a system showing non-linear uncompressed images in a year or two," he said.

Lightworks Editing Systems had its new Heavyworks system working with six sources running in sync and at full frame rate. Enhancements to the Lightworks systems include faster processors and more storage space for handling large projects.

Alpha Image, part of the Dynatech Video Group, launched a new, even smaller version of its compact digital vision mixer, Alphie, that fits into a 6-RU frame.

Abekas announced a new VideoTools package for its A65 and A66 disk recorders that allows the systems to

interface with MAC and SGI platforms.

Aston Electronic Designs launched a new Accelerator kit for its Motif range of character generators, designed to speed up image processing.

Rhode & Schwarz introduced a new family of general purpose video analyzers, the VTA71, VTA72 and VTA73, with vectorscope functions.

Macrovision announced the formation of a new Information Delivery Services group to market the company's Cine Guard video scrambling and access control system. Alistair Knox, managing director of Macrovision U.K. and newly appointed senior vice president of the new subsidiary, said the system offered the secure distribution of videocassette-based theatrical and special interest programming to specially equipped video theaters.

Sales announced at Vision '93 included a commitment by leading U.K. ITV broadcaster, Granada TV, to Sony's Digital Betacam. Meanwhile, Dutch facility Sonotech and U.K. facility Teddington Studios purchased Panasonic D-5 systems, and Carlton TV, another ITV broadcaster, purchased Ampex DCT VTRs. Ampex also sold its data DST system to Kodak for inclusion in the new London-based Cinesite facility.

DVW-A5000

Barry Flannaghan, designer of the one rack unit CVR45, compares it with the 120 rack unit ACE.

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