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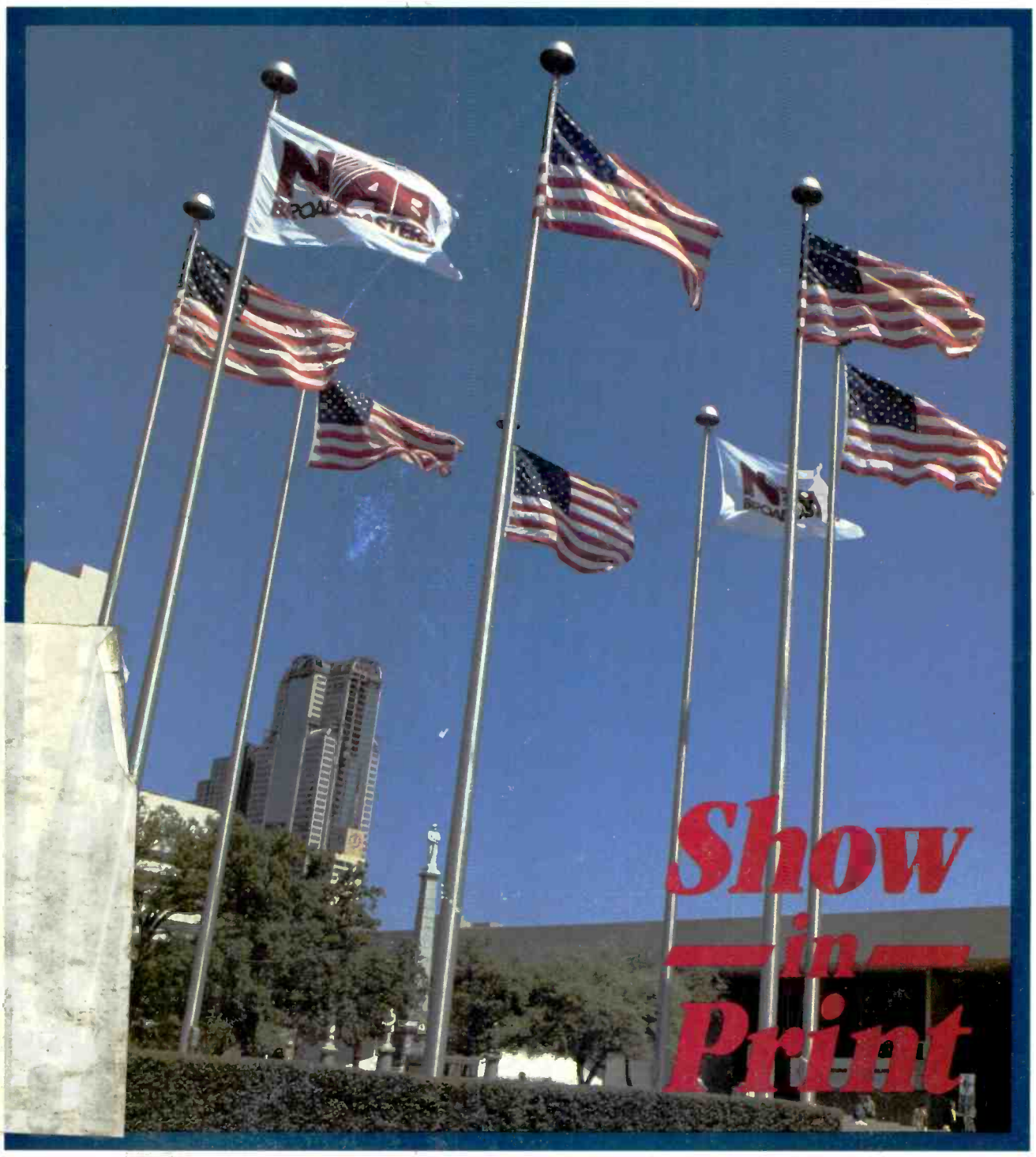

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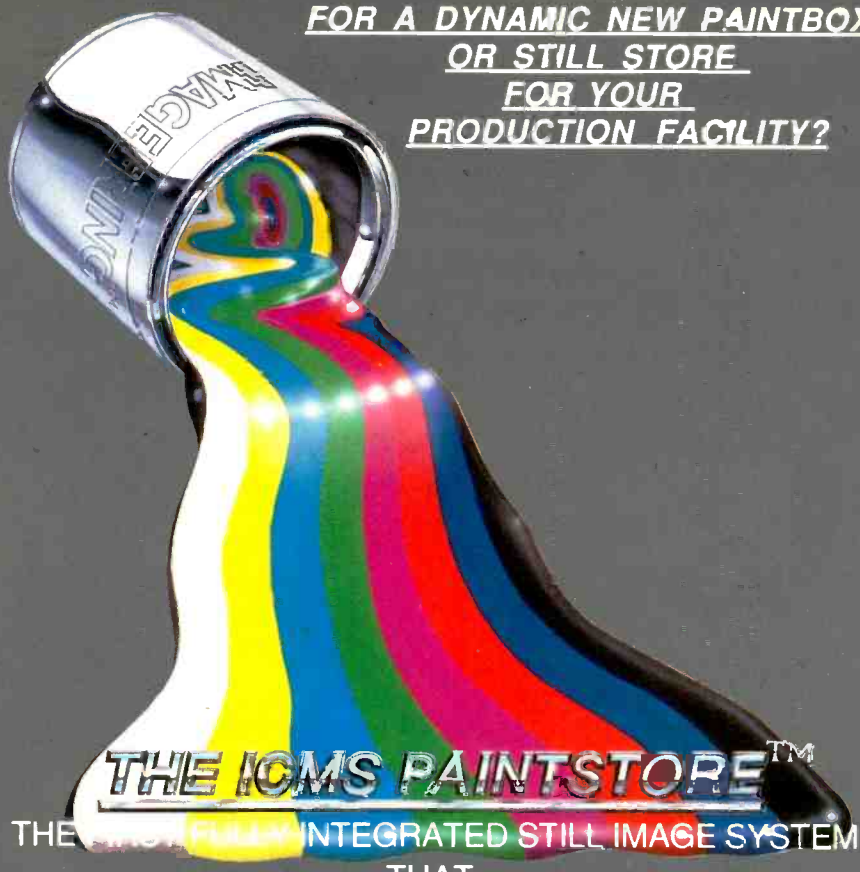

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Also publishers of:
BM/E's **World Broadcast News**
E-ITV Educational-Industrial Television

ABP BPA BM/E BROADCAST MANAGEMENT ENGINEERING (ISSN 0005-3201) is published monthly by Broadband Information Services Inc. BM/E is circulated without charge to those responsible for station operation and for specifying and authorizing the purchase of equipment used in broadcast facilities in the U.S. and Canada. These facilities include AM, FM and TV broadcast stations, CATV systems, ETV stations, networks and studios, audio and video recording studios, telecine facilities, consultants, etc. Subscription prices to others $36.00 one year, $50.00 two years. Foreign $50.00 one year, $75.00 two years. Air Mail rates on request.

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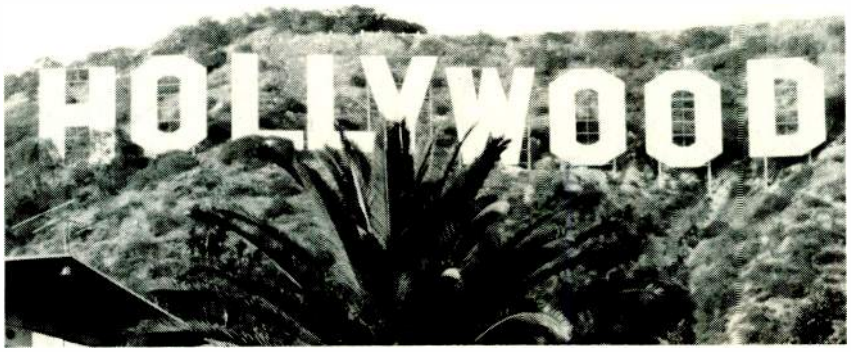

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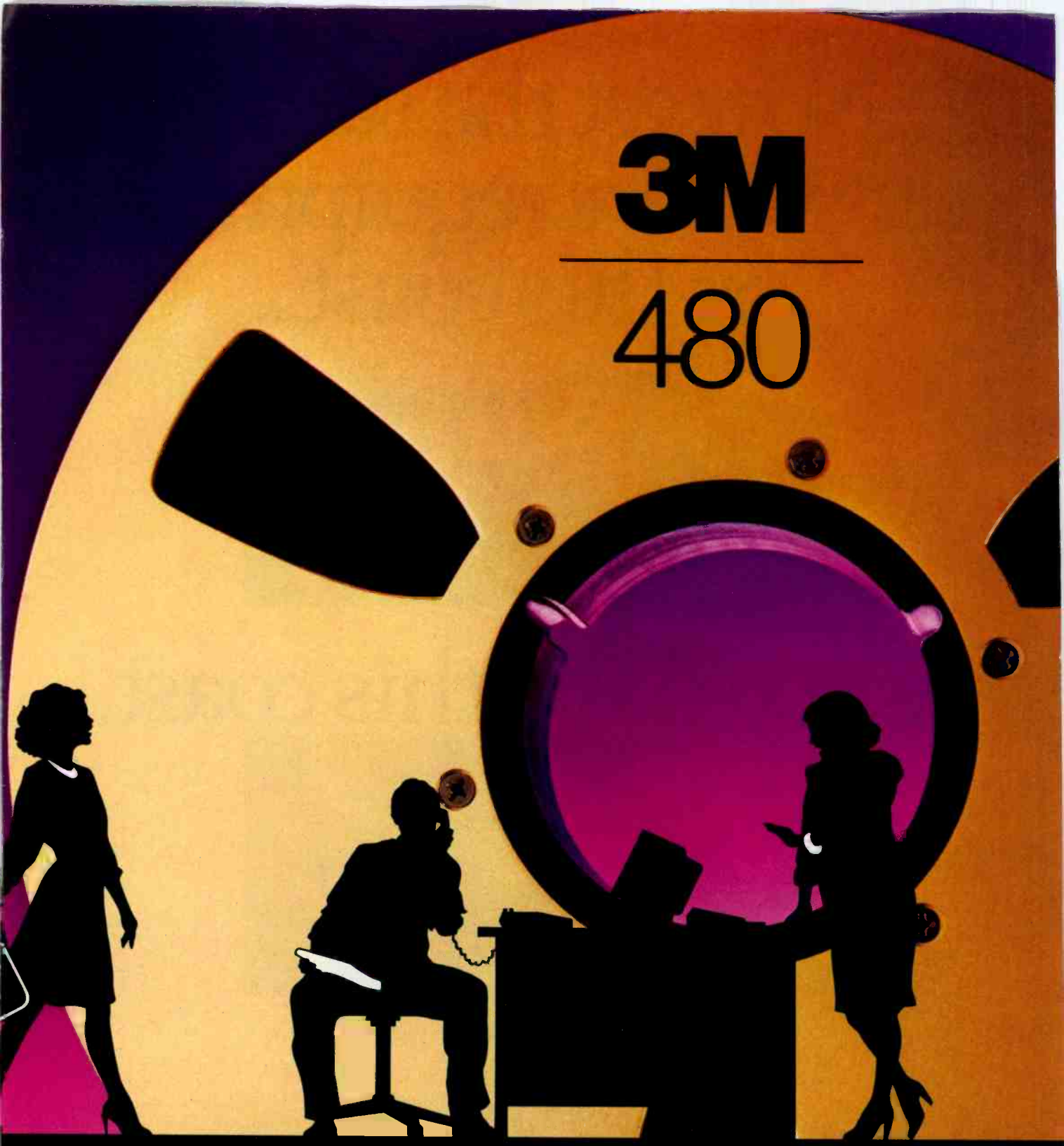

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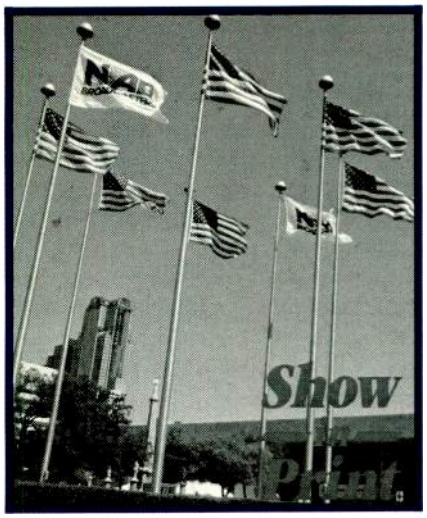

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JUNE 1987 VOLUME 23/NUMBER 6

46

88

Features

Video **23**
NAB '87 opened to record crowds this year, with a great deal of attention focused on the video exhibits. Advances in automation, VTRs, graphics, cameras, and post-production were among the highlights of the show.

Audio **75**
The freak cold spell in Dallas didn't seem to chill the hot action in the audio arena at this year's show. The growing market maturity of stereo TV and impressive showings from digital technology and production equipment manufacturers kept the crowds' attention.

Transmission/Satellites/RF **99**
Inroads by digital and computer technology into RF and sats, more solid-state and high-power equipment, and the exciting development of the external-cavity klystron all contributed to a healthy state of affairs for the transmission field at the Dallas show.

Test & Measurement **113**
Innovative uses of new technologies and intelligent responses to market trends were in evidence at the T&M booths this year, with leading-edge technology and a few new corporate alliances highlighting the show.

Departments

Editorial **10**
The Plague of Censorship

Industry News **12**
Ku-band is used for nationwide AIDS program

Advertisers Index **120**

Cover:

The flags unfurled outside the Dallas Convention Center, site of this year's NAB, as broadcasters enjoyed a banner year inside the facility. Photography by Christina Potowski.

The Plague of Censorship

"Now it's time for those in favor of the First Amendment and deregulation to stand up and be counted."

As any new administration assumes control, it necessarily comes under extra scrutiny, especially the person at the top of that administration. Things are no different with the FCC and its top person, Dennis Patrick, and so much speculation and close examination of his every move has already taken place, some of it undeserved.

Some of it deserved. That which is referred to here is the dangerous tendency that's been shown towards censorship, especially regarding the programming on several radio stations. Of course, it has been referred to as "eliminating obscenity" or "serving the public interest," but hyperbole and euphemism, no matter how deep, don't hide the obvious. The FCC position also appears to contain to great a dose of politicking by embracing the support of select religious/political groups while turning its back on its own hands-off policy. And Congress is trying to let this one slide, because they don't want anyone to get the impression that they are in favor of "dirty words" and are afraid of coming out against free speech—tricky territory.

There has been an idealogical commitment, we were led to believe, stating that the FCC need not interfere with day-to-day operations (such as telling radio stations what type of programming to air) as part of deregulation, as part of "letting the marketplace decide," because these policies are better for the listening/viewing public. This is a philosophy, by the way, I fully endorsed when it was proposed, and still do. But it can't be both ways. I feel such a policy (including program content) does serve the public interest and that, protestations by the FCC to the contrary, the public thinks so too. If listeners didn't like the "Howard Stern-type" programs, they would turn the dial. Yet, they don't because they like the program, the numbers prove it.

So whose interest is being served? Is it now the FCC's responsibility to protect listeners and viewers—and maybe even broadcasters—from themselves? I think not. And I think once program censorship begins it spreads like a plague. Then, where does it stop? With the news? It's interesting that news organizations are now under government scrutiny.

This is not the way a free democratic society is supposed to work, nor is it in tune with the deregulation song conducted by the FCC. Let's face it, broadcasters are not perfect, but, along with the various print media, they are all we've got. They are part of our system of checks and balances. Sure they make mistakes. Sure they do things solely for money, and that is just what doesn't make sense about the FCC position. If the communities served by the radio broadcasts in question truly objected, they would do something about it. It happens all the time. If the listeners objected, they too could do something about it, quite easily. And if they did, the broadcasters would be forced to take notice and make the appropriate changes. But the fact is, none of this has happened.

Why? Because nobody but special religious/political interests and those catering to them is offended. So now it's time for all those who are really loyal supporters of First Amendment rights, and who are in favor of an equitable and intelligent deregulation policy, to stand up and be counted.

Here.

Tim Wetmore

Tim Wetmore
Editor

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Industry News

Ku-band Combats AIDS

Conus Communications plans to muster the full capabilities of its Ku-band satellite newsgathering cooperative for a special live, five-hour television special, *The AIDS Connection, An All-Night Dialogue* on Friday, July 24, from 11:30 p.m. to 4:30 a.m. (EDT).

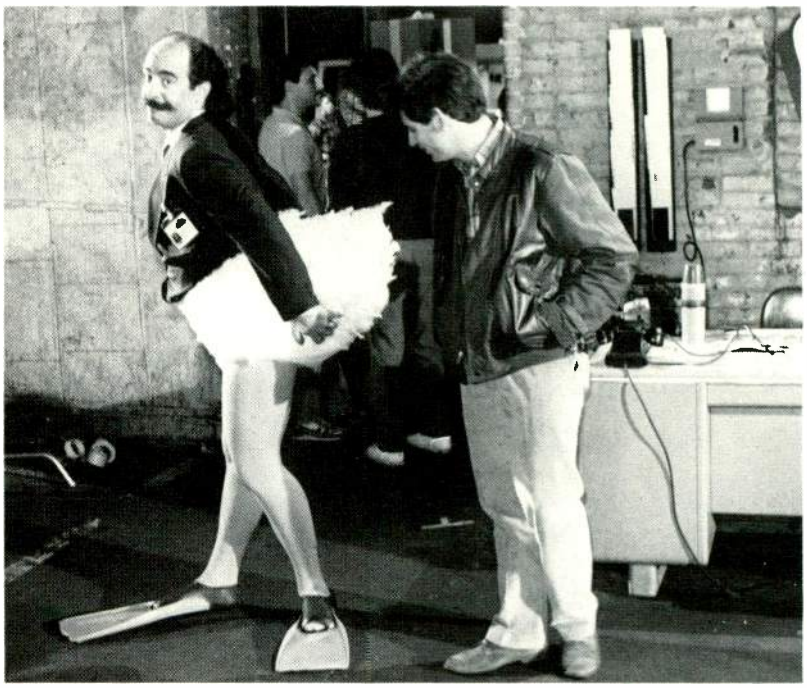
"The unprecedented public threat posed by AIDS requires extraordinary, responsible action by the television news industry," explains Charles H. Dutcher III, vice president and general manager of Conus. "*The AIDS Connection* may be the largest cooperative production ever undertaken by local television stations."

The program, aimed at students and young adults, will be a non-network news special for both Conus and non-Conus stations, and will consist of an uncensored question-and-answer marathon between young people and a wide spectrum of experts, including doctors, marriage counselors, clergymen, and politicians.

Ku-band remotes from more than a dozen locations will be linked with studio audiences in four cities for live interacts. The program's central studio location will be at KSTP-TV, in Minneapolis. Local stations will be able to join the program on the half hour to allow for differences in time zones.

"This kind of undertaking is ideally suited . . . to the cooperative nature of the Conus news organization," observes Anita Klever, Conus vice president of news services.

The AIDS Connection, An All-Night Dialogue will be coordinated by an award-winning production team, and will involve a total of 125 stations nationwide. USTV will handle distribution of the program via its own Ku-band satellite communication system.



Vy a duck. . . ? It is no secret that TV can be an effective marketing tool for radio. In addition to the potential of reaching a large crossover audience, television ads also provide listeners with a visual reference of their favorite DJs.

According to Steve Kingston, operations manager at New York's Z100-FM, television advertising is an essential part of the station's promotional campaigns and has proven extremely valuable in attracting new listeners. In fact, he points out that TV ads for Z100's recent Birthday Contest, which featured the station's popular morning zoo host, Scott Shannon, were so successful that the contest format is now being syndicated to other stations by the Nashville-based Film House, Inc.

As for visual references, we offer the above photo of John DeBella, morning zookeeper on Philadelphia's WMMR-FM, caught in the act of ruffling his feathers during the filming of a 30-second spot for WMMR's Loyal Listener contest. The campaign celebrates the station's 19th anniversary. Let's hope the commercial doesn't lay an egg.

Local Teletext Service Debuts

Two related events on May first could lead to accelerated growth of broadcast teletext services in the U.S. in coming years.

At a special breakfast attended by Utah Governor Norman Bangerter, KSL-TV in Salt Lake City inaugurated its TeleText-5 service, described as the first fully operating, publicly available local teletext system in the United States.

Coincident with the KSL-TV event was an announcement by Samsung Electronics America that it would begin a national introduction of teletext decoders, with initial distribution slated for KSL's viewing area. The decoders are priced at approximately $300.

The decoder connects to any standard TV set, and enables the viewer to dial up 175 TeleText-5 pages of constantly updated text and graphics of news, sports, weather, and financial data. TeleText-5's local news and information is supplemented by national and world news from the CBS Extravision teletext service.

KSL-TV, a division of the Bonneville International Corporation, made history in 1978 when it transmitted the first teletext signal in the United States. A CBS affiliate, KSL-TV worked closely with that network to de-

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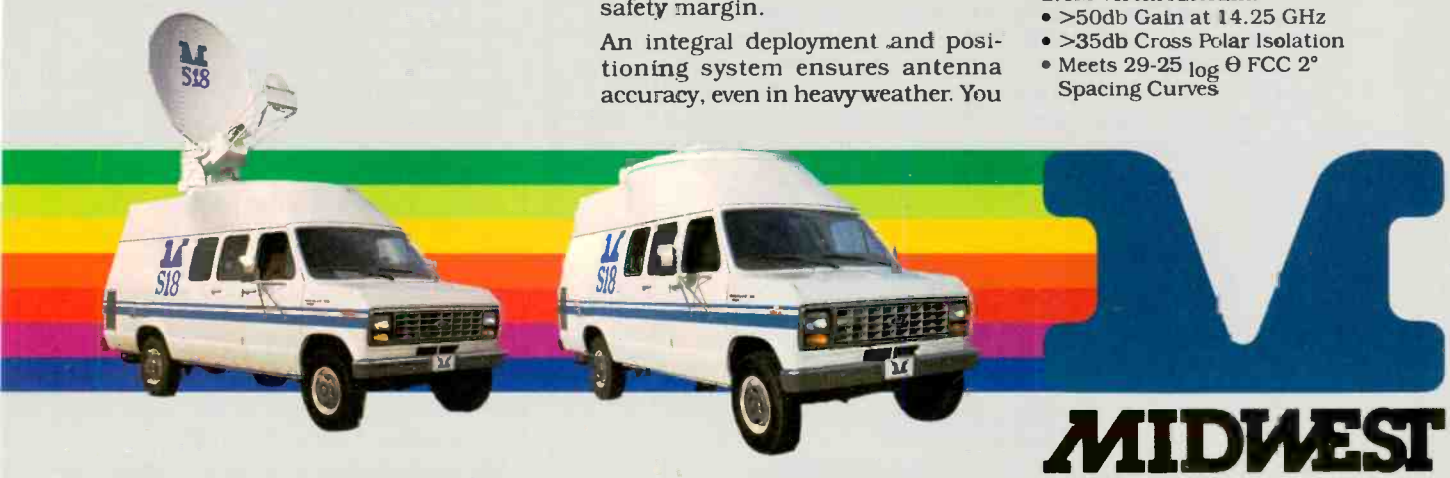

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velop TeleText-5, which will also carry advertising. Both Extravision and TeleText-5 use the NABTS system standard, developed by the Norpak Corporation. The system encodes the teletext information in vertical blanking intervals of broadcast TV signals.

"TeleText-5 is expanding the use of the airwaves in ways that none of us ever believed possible, for it provides the convenience of printed materials with the immediacy of a broadcast," said KSL-TV president Jack Adamson at the breakfast ceremony.

Options to be introduced for the teletext decoder include a page printer and PC interface.

Greater Public Awareness of Radio Sought by NAB, RAB

A New York meeting of the executive committees of the NAB and RAB (Radio Advertising Bureau) on May 13 resulted in the two groups agreeing to join forces in a national marketing campaign to raise the public's awareness of radio's role in daily life.

The NAB/RAB campaign invites all segments of the radio industry to become involved in the effort, which will be directed by a Radio Futures Committee to be named jointly by the two associations.

"By cooperating in this effort we believe we can enhance the combined effect of the individual marketing campaigns each of our organizations was planning," said NAB radio board chairman Bev E. Brown, of KGAS, in Carthage, TX. "But this joint project is in no way an indication that a merger or consolidation [of the NAB and RAB] is even remotely under consideration."

In a separate development tied to public awareness of radio, an NAB survey found that although most people hear static or interference on the AM stations they listen to, they seldom complain to the FCC about it. According to the NAB, this contrasts with the FCC's position that an absence of complaints indicates that interference is not a problem.

"This survey documents that there is a real interference problem, even if the FCC has not recognized it," states the NAB's Brown. "The point is, the Commission must establish standards to prevent interference from occurring, rather than await degradation of broadcasting that is suddenly recognized by emerging complaints."

The survey also found that most AM listeners will stay tuned to stations despite interference. The study was conducted by Market Facts, Inc. of Chicago, using a random sample of 1,000 persons.

Satellites Used in Radio Firsts

Satellites continue to be used in innovative ways for radio, with three stations recently broadcasting live overseas programming.

Early-rising radio listeners in Boston last month were treated to the first live digitally transmitted

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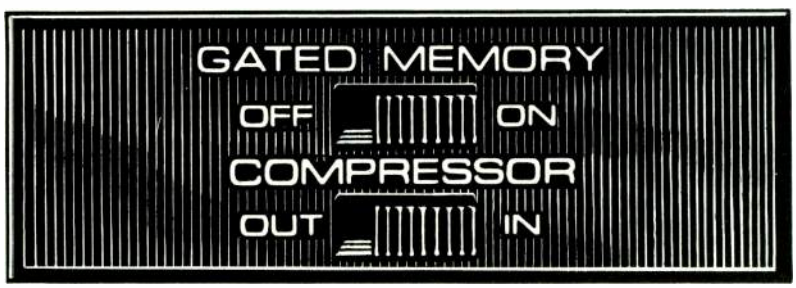

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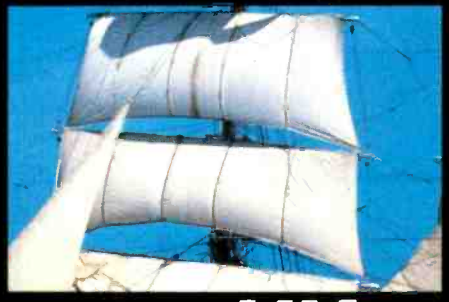

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concert from Japan, thanks to the efforts of WGBH-FM and Konica U.S.A., sponsor of the event.

The May 14 performance by the New Japan Philharmonic was broadcast live by FM Tokyo, uplinked in the Sony PCM-F1 format by Japan's KDD, downlinked by Western Union in California, and uplinked again on Westar IV.

The concert was received, decoded, and broadcast live in analog on WGBH-FM from 5:30 to 8:30 a.m., and uplinked in analog on Westar IV at noon and 8 p.m. (EDT) for broadcast by over 100 public radio stations nationwide.

Elsewhere in Massachusetts, Plymouth's WPLM radio made history from May 26 to 29, and on June 1 with a sustained satellite simulcast that linked WPLM with a leading local independent commercial radio station in Britain, Plymouth Sound.

Plymouth Sound radio personalities Ian Calvert and Louise Churchill journeyed to America to join the WPLM staff to originate four hours of daily programming heard simultaneously on both stations. Music, news, sports, and listener call-ins from both countries were included in the presentation. WPLM used its own uplink, and British Telecom handled reception on their side of the Atlantic.

A third satellite radio event scheduled as of this writing features live-from-London broadcasts by New York classical station WQXR. From 1 to 5 p.m. (EDT) on June 8 to 12 the station will originate from the Tower Records store in London's Piccadilly Circus. The broadcasts will be relayed using the fiberoptic facilities of Teleport Communications and uplinked digitally by the IDB Communications Group.

New NAB System for Assigning Exhibit Space

The NAB exhibit advisory committee has recently endorsed a new point system for assigning exhibit space, and plans to use the system for the 1988 NAB.

The system has been proposed by Rick Dobson, the NAB's new director of exhibits. It is based on: the number of years an exhibitor has participated in NAB conventions, up to 25 years maximum; and the number of square feet of space used each year, over the past ten years. In the case of smaller exhibitors, priority will be given to the years of participation over the history of space.

The exhibit space assignment system awards ten points for each year of past participation (250 points maximum). One point will be accrued for each 100 square feet of space occupied in the past ten years, beginning with the 1978 convention. It was in that year that NAB exhibit space first exceeded 100,000 square feet.

Full details of the new system are being mailed to all exhibitors who have participated in at least one NAB in the past decade. The NAB exhibitor advisory committee consists of ten members representing a cross section of convention exhibitors.

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Show in Print

The National Association of Broadcasters' convention, held in Dallas once again this year, continued its record-setting pace of new technological and financial developments. If it wasn't the arrival of actual production models in the half-inch video war, then it was further digital processing techniques in consoles and other audio gear. If it wasn't a dizzying number and variety of software packages for videographics or test-and-measurement instruments, then it was new announcements of corporate alliances to contend more effectively in the U.S. broadcast hardware market.

Typically at these conventions, there are one or two areas that stand out in terms of the significance of new products being introduced. This year, the breadth of change was truly staggering, as advancements were registered in every category from transmitters (Comark's klystrode, Acrodyne's high power, Harris' digital modulation) to computers.

Computers got faster; software, more flexible; and the whole package, more ubiquitous. Almost every product category showed some form of digital processing or computer application whether it was transmitters, 3D, VTRs, or lenses (yes, the microprocessor found its way into a few video lenses).

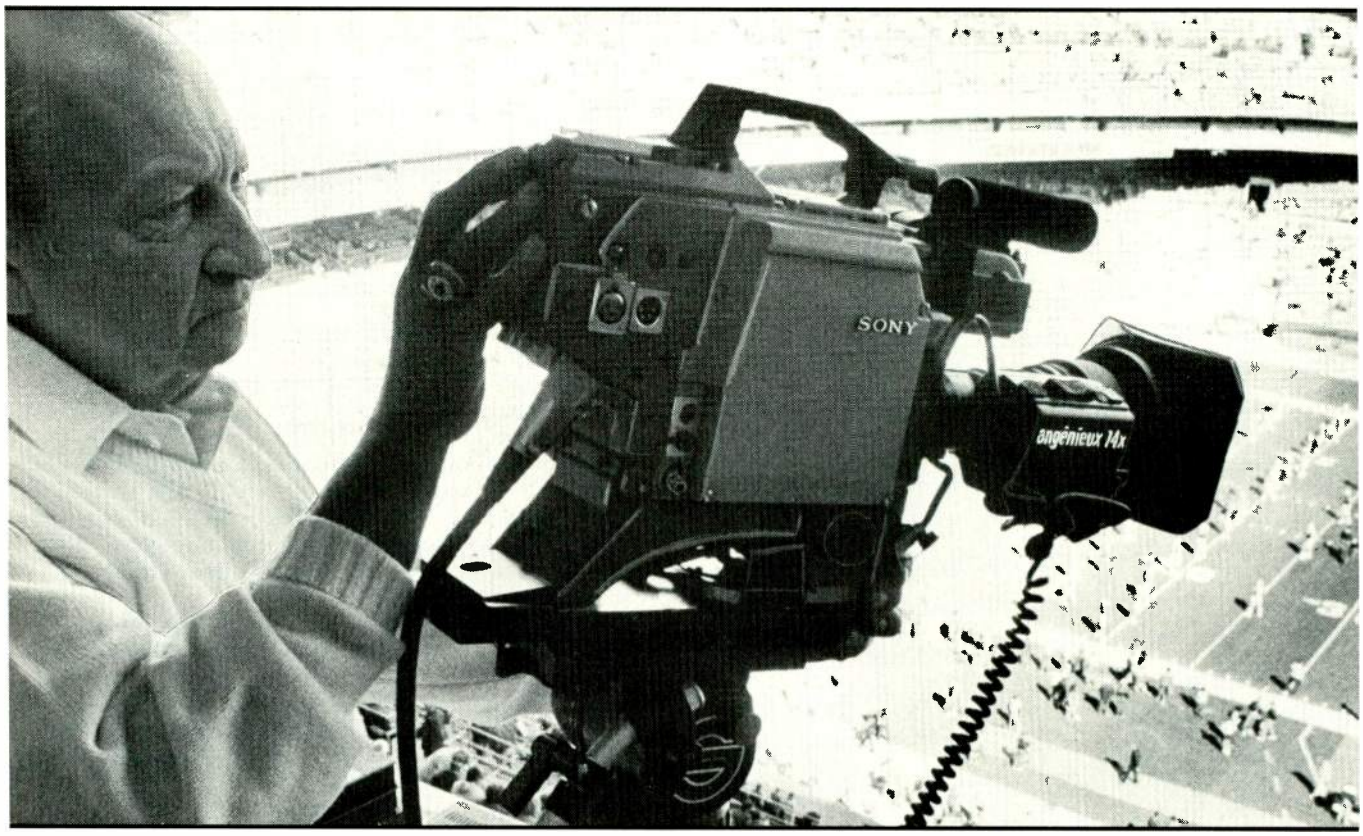
Once the microprocessor is involved and once the hardware base is installed, the software cannot be far behind. Those few manufacturers that did not bring new hardware, showed software updates giving existing products new life and broader capability.

BM/E's show report follows immediately, offering the detail on all areas of technology and business that developed at the NAB. Each section is devoted to relevant hardware/software applications with a unique perspective on not just the products but how they are expected to impact the industry at large.

Video 23
Audio 75
Transmission 99
Test & Measurement 113

"Our videotapes are sharper, crisper—they're the best in the NFL because of our Angenieux lenses."

Nate Fine
Director of Photography, Washington Redskins NFL



Your camera* can now be dramatically better with the new Angenieux 14x ENG/EFP lenses

The Washington Redskins use three Sony BVW-3 Betacams, each equipped with an Angenieux 14x8, to videotape every game. Nate Fine chose the new Angenieux 14x8 because of its very wide angle, 8mm to 112mm zoom, with the industry's fastest f1.6 maximum aperture. The 8mm wide angle is a must for their style of shooting. Nate Fine has been using Angenieux lenses for nearly 20 years with outstanding results.

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Video

Opening a day earlier, on a Saturday instead of Sunday, may have had something to do with it. Or, it may have been part of the industry's recent upswing, but whichever it was, the NAB show opened to record crowds. Much of the action seemed to be centered on the video exhibits.

Automation demonstrated as many advances as most video categories, with robotic MERPS from Odetics, Lake, and Asaca drawing much of the attention. Other automation entries of note included the Ampex ACR 225 and the use of Sony Betacarts in many situations, perhaps most notably with the Dynatech Newstar newsroom computer system. Attracting unprecedented crowds was the Panasonic MERPS system using M-II VCRs, the M.A.R.C. series.

Type-C one-inch stabilized this year with new product both in the hardware and software arenas coming from Sony and Ampex. Clearly, with the half-inch wars heating up, much attention was paid to those formats as product has now become deliverable. Another interesting technology that had impact was the emergence of digital disk recording as a more viable medium with increased record time and greater cost effectiveness. Other digital recording technologies included emphasis on Sony's DVR-1000, and Hitachi showed up with a prototype digital video recorder for high definition television.

Graphics, as usual provided much of the flash as innovations in processing speeds and some amazing software updates and add-ons made buyers' decisions even harder to make. New companies had impact as Pinnacle debuted its new system, and Vertigo and other newcomers showed significant product. The workstation approach for versatility of system configuration increased in popularity this year and the combination of 4:2:2 digital graphics, like that offered by Quantel, with Sony's D-1 machine and Grass Valley's experimental switcher did much for the proliferation of the all-digital studio concept.

CCD cameras almost stole the show because so many manufacturers showed up with new units. Of course, controversy arose at the show over the real value of the CCD in a broadcast application. Nevertheless, there were many models of CCD cameras on the floor and a great number of attendees having a look at them. Quite naturally, the lens people reacted to this, offering an impressive array of glass for specific use. Two other major developments in the lens department included a call for standardization on the part of CCD camera manufacturers in designing the optical blocks and an abundance of studio lenses for use with ⅔-inch cameras. The latter implying one of the important non-announcements at the show: the lack of anything new in one-inch cameras, which seemed to be relegated to a replacement market due to the popularity of the ⅔-inch models for studio work.

Post-production was active if for no other reson than the first NAB showing of the merged Convergence/EECO company. This is not to ignore the contributions of CMX and others, however. In addition, the modular design concept pervaded many of the introductions. As if all of this were not enough, important progress was made in the all-important signal processing category and some of the others that don't possess the sizzle of, say, computer graphics. That notwithstanding, just about everybody had something to offer, and there were many takers.

Cameras 23
Lenses 26
Video Recording 28
Camera Control 33
3D Systems 34
Paint Systems 40
Character Generators 46
Still Stores 48
Weather Systems 50
Switchers 50
Digital EFX 52
Post-Production 56
Telecines 62
Automation 63
Master Control 67
Routing 67
Signal Processing 69

Cameras are Testing Technology

There were very important offerings from many manufacturers of all types of cameras at this year's NAB convention. To be sure, each area, whether it's in the studio or in the field, has its interest in continuing enhancements of existing tube technologies. By the same token, it cannot be denied that the most obvious single thread tying new technological developments to the camera market is the emergence of the charge-coupled device (CCD).

Everywhere on the exhibit floor, one could see introductions of CCD cameras from an increasing number of manufacturers. Still, the ubiquity of models should not overshadow one important consideration in the advent of the CCD camera. Two distinctions exist that the buyer should know about: the different types of CCDs used and the tradeoffs in performance, and the different market positions of the companies involved.

The technically disparate types of CCDs can be fairly summed up as follows (and this is indeed a short summary of the positions of the respective technologies): frame transfer vs. line transfer vs. frame-line techniques. Such a divergence has placed pressure on lens manufacturers who would like to see some standardization so that they could design higher quality, more economical, and efficient optical blocks.

The marketing positions in the new CCD business can be outlined on the models provided by Sony and NEC. Sony claims to produce more CCDs than all other manufacturers, and is thus able to place the technology not only in its new BVW-505 broadcast camera, but also in several new low-priced pro video cameras and myriad home video cameras sold by the company's consumer division. The output of all Sony camera divisions is relevant to the company's ambitions in broadcast because, says Sony's John Rhodes, "We're producing so many chips that we're two to three years ahead of everybody else." If Sony believes its high production volume can lower costs per unit, fund ever-advancing new developments, and allow only the best chips to be used in broadcast cameras, NEC has taken the opposite tack.

"Compared to theirs you could say our chips are hand-made," says NEC industrial division head Dustin Vallaly. His company's strategy has been to produce only a few chips of very high quality, and only for its own cameras. NEC uses the frame-line type of chip, which allows extremely high resolution, relatively no smear, and variable shutter. NEC's new $14,500 SP-3A ENG camera is exemplary; in a relatively high price range it promises top-level performance. Though Sony's top chip cameras promise roughly equal resolution, the SP-3A is meant to compete in a part of the market that Sony prefers to address not with CCDs, but with tube cameras.

Indeed, other manufacturers insisted on CCDs being viewed carefully. The message was that the CCD advantage over tubes was not in overall quality but only in certain applications. "There's some danger of a stampede to CCD cameras," says JVC's Dan Roberts. "They are great for inexperienced camera operators and many other uses. But they do not offer the performance that our tube cameras offer in a controlled setting." JVC offered new three-tube cameras, including the ProCam KY-950BU, featuring improved registration, SSG circuitry, and independent RGB preamp circuits. The KY-950B uses ⅔-inch Plumbicon tubes in conjunction with F 1.4 prism optics providing 700 lines of resolution and S/N ratio of 59 dB. In addition, the KY-20U three-chip camera includes a 13x zoom lens and offers resolution beyond 530 lines. The KY-80U is a three-tube production camera with modular docking capability for ENG/EFP work and outputs both component and composite video for accompanying VCRs.

CCD cameras were the name of the game at this year's convention with new chip cameras from seven manufacturers including BTS, demonstrating here the LDK 90 with Angenieux 14X lens.

The company's strategy seems to be to concentrate on attaining a larger presence in the broadcast market, rather than continuing to expand its industrial market share. At a press conference preceding the NAB show, Roberts seemed to concede that other makers' stronger efforts in the industrial market this year would make it tough for JVC to grow from its already very dominant position there; the way around that problem would seem to be to establish a stronger presence at the high-performance end of the camera spectrum. JVC did introduce low-end CCDs, too, most interestingly including the TK-870 intended for computer graphics.

Ampex also offered the CVC-5 CCD camera in its Betacam line as part of the beginning phase of offering Betacam products. Cameras and camcorders will begin flowing from the company's U.S. facility this year, as will other Betacam products. In addition, Hitachi entered the CCD fray with its FP CC-1 camera in the middle range.

Existing technologies, encompassing tubes, were no less in evidence as changes at the high end of the camera spectrum did not only involve CCDs. Camera-makers in general seem to have conceded that one-inch tubes are now a replacement business, the evidence for which is that there were no new products in the format. Three ⅔-inch tubes constitute the center of most top-end cameras, exemplified by Ampex's and Sony's Betacam SP line, BTS's three new LDK's, KCF 1 and KCF 125, and the HK-323 and HK-323-P field-capable cameras from Ikegami. In fact Canadian Television has ordered at least 60 of these Ikegami models for shooting the 1988 Olympics.

Sharp Electronics was not officially at the show, but introduced its XC-B20P, a diode-gun Plumbicon broadcast camera, and the XC-B10TX triax control for XC-B10 and XC-B20P cameras.

Each of these companies particularly emphasized new ENG or EFP offerings. Both Ikegami and BTS incorporated CCDs in their new products. Ikegami's HL-379 chip camera was debuted at the show through a unique sales promotion in which one could buy the three-tube design HL-95B for $19,000 from any authorized dealer and, within seven months, the owner can apply a $500 rebate certificate to-

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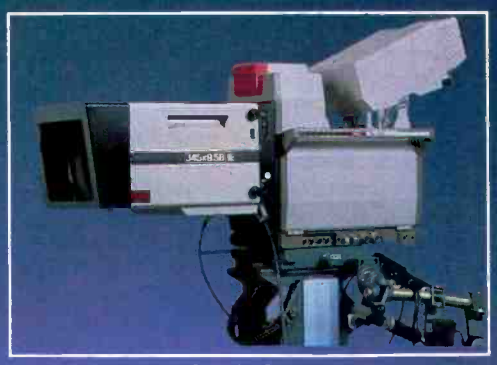

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wards the purchase of the new HL-379 CCD unit, or trade in the HL-95B and pay an additional $1500 to get the new chip camera. Given the high-quality ENG approach Ikegami has taken in designing this camera, it will be interesting to see how the program works out. Of course, the HL-379 can be purchased outright for an expected $13,000.

BTS is charging $16,000 for its new LDK 90 CCD camera, so this is definitely not a model for low-end applications. Demonstrators of the 10 cameras available for play at the BTS booth emphasized that at smaller TV stations, as well as cable head-ends and industrial studios with a need for broadcast quality, rapid employee turnover and the difficulty of finding good engineering talent will make managers turn to low-maintenance CCDs—so long as the CCD cameras offer sufficient imaging. Clearly, BTS's frame transfer technology offers this.

Thomson also offered frame transfer technology in its new CCD ENG camera, the TTV-1640, a Betacam model. Its new TTV-1530 is a studio camera. The company's plans for the U.S. market seemed to remain unclear through the show, though it remains strongly committed to international sales.

Panasonic Broadcast's CCD offering was the AK-400, also aimed at the middle-priced, ENG broadcast market. Panasonic's industrial division showed several CCD models. Highlighted was the WV-D5000 and N3 NiteHawk studio three-Newvicon camera. The WV-D5000 is being touted as "modular," for studio or location work, for attachment to tele- and microscopes; Panasonic Industrial is clearly targeting scientific and health industry uses.

Hitachi added more Computacam auto-setup cameras to its line, including the SK-97D and SK-970D. Added to the Z-31 industrial line was the higher-resolution Z-31A, which uses MS Saticons.

Sony's new field and studio offering, the BVP-360, bucked the trend to CCD, but may start some trends of its own. Available with ⅔-inch mixed field Plumbicons, the camera packs all of the features of Sony's BVP-360 studio line (including F 1.2 prism optics) into the most ergonomically designed product at the show. The 350's graceful curves fit snugly into the operators' arms in all positions, viewfinders are infinitely adjustable, and maintenance access is touted as very simple. The unit weighs less than 13 pounds including viewfinder and adaptor.

Ikegami entered the CCD arena in full force at the NAB, demonstrating its CCD 770 model.

Additional intelligent design is demonstrated by the ability to operate in either triax or standalone configurations. The new BVP-350 was also designed as a fully compatible portable companion to the BVP-360, retaining all of the same PC boards in the camera head as well as all of the auto-setup and digital registration capabilities. All of these design elements were a result of user input. Other manufacturers at the show also boasted of long consultations with camera operators in the design of video cameras, but no other video camera on exhibit came out looking and feeling so much like the generation of lightweight film cameras to appear a decade ago. The BVP-350 may be the Aaton of modern cameras.

An interesting specialty product shown in the PAG America booth was the Nitecam. This is a laser-augmented video camera, designed to look like a conventional unit, that can capture images in total darkness with the assistance of its laser illuminator. *BM/E* reviewers talked to freelance cameramen who have previously used this for unusual video shoots at night and they universally sung its praises for use in rare shoots that take place in semi or total darkness. The black-and-white camera weighs 22 pounds and operates on its battery for three hours.

For More Information

Sony	300
NEC	301
JVC	302
Ampex	303
Ikegami	304
BTS	305
Sharp	306
Thomson	307
Panasonic	308
Hitachi	309
PAG	310

Lenses Look Toward Optimum Optics

Much has been said and written on the subject of lenses. When all is said and done, however, there are three critical criteria for judging which lens to use. The first two are, and some may disagree, the demand of the job for which the camera/lens combination is being employed and the preference of the operator. The third important factor is a technolgical one, the one most aptly addressed at an NAB convention.

As with cameras, CCDs have an impact in the lens market as well. Lens manufacturers, particularly Fujinon, began calling for standardization of the optical block to allow for more efficient lens design. The problem here, of course, is that there are essentially three types of CCD technologies in use and, to optimize the effectiveness of each, the manufacturers naturally employ different designs.

This makes it difficult for lens makers to produce a uniform quality piece of glass. The problem may become more accute as CCD cameras increase in number because, rest assured, manufacturers of CCDs are not going to throw out years of R&D to satisfy someone else. This is not to say a move towards standardization is impossible, but, as usual, the stakes are high, and the key companies are pretty far along their own exclusive paths.

Nevertheless, there are many good lenses available from a select few manufacturers. All of the majors, of course, are addressing the CCD market. The obvious stumbling block here lies in the different design considerations. Since CCDs are cemented directly to the beam-splitting prism, there can be no adjustments for each individual color channel, unlike tubes, which must be carefully positioned and which have tracking adjustments to correct for longitudinal chromatic aberration. There are many other important obstacles to leap in solving the ⅔-inch CCD problems.

Some of the steps that Canon has taken include the use of recrystalized nonglass optical elements, multilayer antireflection coatings, special polishing techniques, and more efficient mechanical and electronic designs. Minimizing residual aberrations is a component difficulty of longitudinal chromatic aberration currently being addressed. The solution, as represented by products at the show, is useage of low-dispersion glass or the

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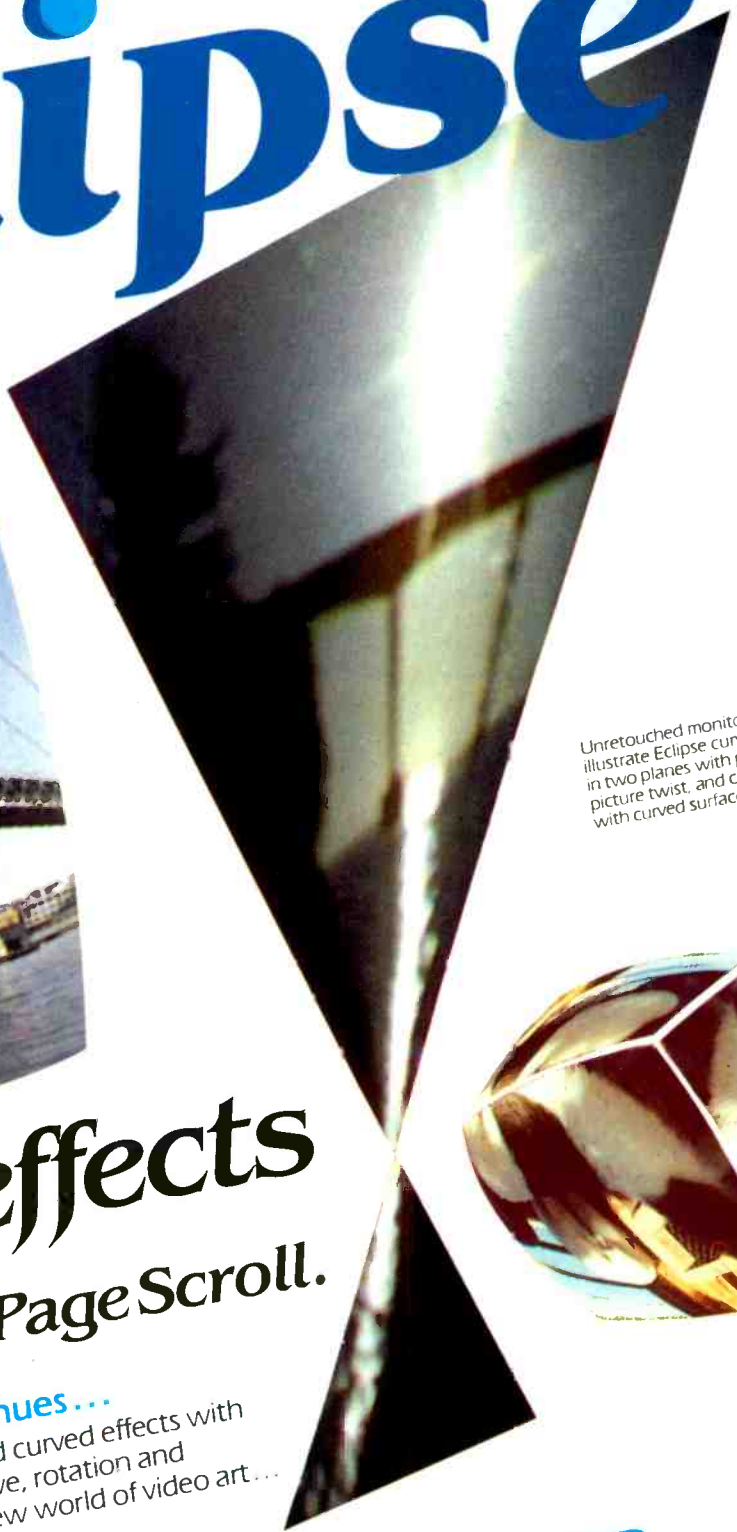

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use of artificial flourite; in all of these Canon has been at the forefront. A lens that corrects for residual chromatic aberration is apochromatic.

Among the many lenses on display, Canon showed the J18x8.5 IRS for ⅔-inch cameras, offering greater reach and lighter weight. The J14x8B high-resolution lens is a 60-degree-wide lens with 14x zoom ration and built-in 2X extender. The ultra-wide model is the J8x6B at 72.5 degrees; all these lenses are for ⅔-inch cameras. The full ENG/EFP and studio lines were also on hand.

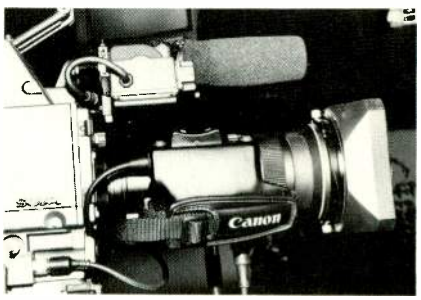
Fujinon, too, has addressed the market demand for ultra-wide-angle lenses and introduced at the show the A8.5x5.5ERM, F1.7 with a built-in 1.7X extender. The company opted for the 1.7 rather than the conventional 2X to deliver a 9.3 mm wide angle, in the extended range, with the flexibility to reach out to 80 mm. At 1X the lens has a maximum wide angle of 5.5 mm for a field of view in excess of 77 degrees.

Another sales note of significance was the announcement of Fujinon's largest single sale in its history: the 65 new cameras to be used for the Olympic Winter Games will be equipped with Fujinon lenses. Other important new product on display included the ⅔-inch studio lens as the camera market accepts the quality of this format for top level studio/EFP shooting.

Though CCDs are capturing the lion's share of attention as they come into their own on the professional level, tube cameras (and therefore the appropriate lenses) still dominate the market for all types of cameras. In fact among the most interesting stories at the convention, beyond the CCD standardization issue, was the advent in the U.S. of the microprocessor-based lens. Both Canon and Fujinon retain their recognized positions in this area as well as in the newer lenses for CCD cameras.

As another major player, Schneider introduced a 35x tele/EFP zoom lens Type TV-85 for ⅔-inch cameras, with one-inch versions to follow. The current unit is available for the BVP-360, HK 323, and the LDK 26. The lens contains a 16-bit microprocessor for control of optical element movement for zoom and focus, as well as a floating element for optimum image formation during focusing. This technology eliminates mechanical cams and followers. Due to the precision control of the microprocessor, the image plane is always kept constant to within .01 mm.

Indeed, it can be argued that much of the most interesting development in lenses today is not occurring in optics but in electronics. Another Schneider impact product at the NAB was the 17X studio/EFP zoom lens, TV-80, which contains new design of servo modules incorporating digital feedback system and automatic alignment of servos when power is supplied. The plug-in servo modules are interchangeable with manual cable drive units for flexible cable control of zoom or focus. Schneider, however, has not ignored the CCD market due



Canon introduced new lens models this year, with some impressive offerings in both the CCD range and general purpose ENG applications.

to its introduction of the TV-80, which has a built-in test pattern and appropriate image diagonal.

Exhibiting its new microprocessor controlled lens with an impressive demonstration, Angenieux introduced its 40x9.5 F1.3 lens for ⅔-inch tube or CCD cameras. The light unit eliminates the limitations of minimum object distance because the microprocessor controls focusing so precisely. The optics are also newly designed and permit wide angle use at 49.75 degress with the 2.1 extender and optional 1.45X. Useful features included the easily accessible electronic back focus adjustment with a lock, a manual back focus and manual overrides for the iris and extender/diascope turret. The other model demonstrated with microprocessor technology was the 40x14 F1.9.

Not ignoring the demands of the ENG market, Angenieux also displayed its popular 14x9 lens for ⅔-inch cameras with its newly designed zoom servo with preset potentiometer for precision control of zoom speed. In addition, the one-inch cameras were offered the 18x12.5 with F 1.5 to F2.4 and two built-in extenders: 1.6 and 2.5X.

Schwem Technology announced a new model of its Gyrozoom lens, the FP-1. It allows the operator to pan faster than was previously possible. The pan rate is 30 degrees per second. Existing Gyrozoom lenses can be retrofitted with this new feature. The lens will fit most ⅔-inch cameras and features 60 mm to 300 mm zoom capabilities of subjects up to 1000 feet away.

In lens accessories, Century Precision Optics featured two-element achromatic diopters that attach to the front of the lens permitting closeups of high contrast quality. Wide-angle adapters and the company's periscope lens, the V16 were also on hand. The V16 works with ⅔-inch and CCD cameras.

For More Information

Canon	712
Fujinon	311
Angenieux	312
Schneider	313
Schwem	314

Video Recording Stabilizes

After a year's hiatus from the NAB battlefront, having been substituted by skirmishes in the half-inch and digital domains, one-inch Type-C made an inspiring return at NAB 1987. New product was introduced by Sony and Ampex rolled out five new features for its one-inch family.

Of the five new Ampex features, the multi-gen setup seems to have drawn the most attention as a software enhancement that optimizes the multiple generation performance of the VPR-3 and the VPR-6. It is intended for use with the Zeus video processor. Also commanding notice was the status-at-a-glance, which is available as a software advance for "all Ampex video machines since day one," according to Peter Zakit, product line manager for the video recording group. The system displays all critical operational status parameters on the video monitor of the VTR. Operational mode changes are made through the software's interactive menu system. The other added features include VITC, serial slow-motion editing and frame-accurate editing capabilities.

As further evidence that development in Type-C is not dead, Sony introduced the BVH-3000 VTR. It also comes as the model 3100 for nonsync applications. Having concentrated its research in recent years on VLSI development, Sony is now seeing it pay off in the form of the 3000, which is an inexpensive, very high-quality one-inch machine on the order of the

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BVH-2000, while being more cost effective. The new machine is also simple due to its menu-driven software package and its several technical features. In reference to the technical features, the multifunction control panel, Dynamic Tracking circuitry, time code generator/reader, color framing displays, and built-in TBC are all offered with the system starting at a base price of $39,000.

One of the technical achievements noticed by the awe-inspiring crowds at the Sony booth was the reduction of circuit boards from 18 to seven and reducing the number of parts by 30 percent by the use of LSIs. The new audio head and transport technology also resulted in extra attention. Sony appears committed, as does Ampex, to the continuation of Type-C one-inch for years to come. How many years remains to be seen.

Rather than focus attention on software, Hitachi has placed its emphasis on mechanical features, returning with the HR-230. New LSI and IC technology has been incorporated as has microprocessor control. Automatic setup and fault diagnosis has been provided along with the popular wide range of slow-motion playback speeds. The foregoing does not indicate, however, Hitachi's efforts in truly advancing video recording technology. Also on display at the show was a digital VTR prototype for High Definition Television. Given that the performance of a digital VTR is largely determined by sampling frequency and number of quantization bits. Hitachi's unit samples the luminance and chrominance signals at 54 and 27 MHz respectively and quantized at the eight-bit level. There was no word when this unit will be in full production, but Hitachi sees HDTV growing in application in the near future and will make the unit available at the appropriate time.

By no means was Hitachi the only company with digital or HDTV product. The current leader in these categories, of course, is Sony whose almost overwhelming display of products included its HDVS recorder, and, in fact, its whole related product line. Also exhibited were the systems in use at the two high-definition production facilities in New York, Rebo and 1125 Productions, and the most recent addition in Dallas, HD Studio.

And digital was in full bloom as well. The all-digital video production and post-production studio systems were on display configured around the DVR-1000, Sony's D-1 machine introduced last year. As part of this component digital demonstration, in keeping the signal fully within the digital domain, a component digital switcher from Grass Valley was incorporated into the system. In the post-production version the DVR-1000 and the GVG switcher were connected to a Rank Cintel Artfile, and a Sony BVE-900 editor controlled three VTRs as well as the BVH-2800 VTR with PCM sound and a BVW-75 Betacam SP recorder/player.

Half-inch Heats Up

Which brings us to half-inch, the sound and fury of last year's convention. This is not to say that the small format was less evident this year. On the contrary, many companies showed up with half-inch product and, since all of it is now available for actual delivery and not just in prototype, the battle is now being waged in earnest. With salvos from both sides of the half-inch war (Betacam vs. M-II) the show floor was fairly buzzing with announcements as to who was buying what from whom.

While urging CCD camera manufacturers to standardize the optical block, Fujinon nonetheless unveiled new lenses, an example of which was the 8.5X shown in this photo.

Arguably taking the broadest approach to application of its half-inch technology, Panasonic Broadcast Systems, with its company fully organized and its executives solidly in place for the Dallas convention, had an impressive booth with a broad display of M-II hardware. The main source of contention between the companies representing the two types of half-inch formats is breadth of application. Panasonic claims the M-II is a total broadcast format, with applications in full studio production (while others maintain this is the domain of one-inch or digital video) as well as in ENG/EFP. In line with this approach Panasonic introduced the AU-620 studio player, which is intended as an editing or broadcast source machine and has further possibilities as a video cart deck.

Additionally, Panasonic makes full one-inch performance claims for its AU-650 studio M-II VTR. Based on analog component and chrominance time-compression multiplexing, the unit provides more than 90 minutes of program material on conventional-size cassette and more than 20 minutes on a pocket-size cassette. Confidence heads are standard equipment for video and audio, allowing real-time monitoring of the recorded signal. Of course portable players have not been neglected since Panasonic has positioned the M-II format as a universally acceptable technology for both studio and field use. The company introduced the AU-505 for corporate/industrial use and the AU-500 with confidence heads and provision for color playback through a monitor or VHF receiver. The 500 can record two FM audio tracks in addition to two audio signals on the longitudinal tracks and has selectable Dolby C noise reduction. The AU-400 is a camera recorder that records on a compact cassette that can be used in any M-II VTR or player without an adaptor, providing 20 minutes of recording time.

The long-awaited announcement by JVC took place at the convention with its demonstration of its new M-II line. Accommodating the field needs of broadcasters, the company demonstrated the KR-X200U docking recorder. Other remote use is possible with the KR-X400U portable VCR, which weighs less than 14 pounds and

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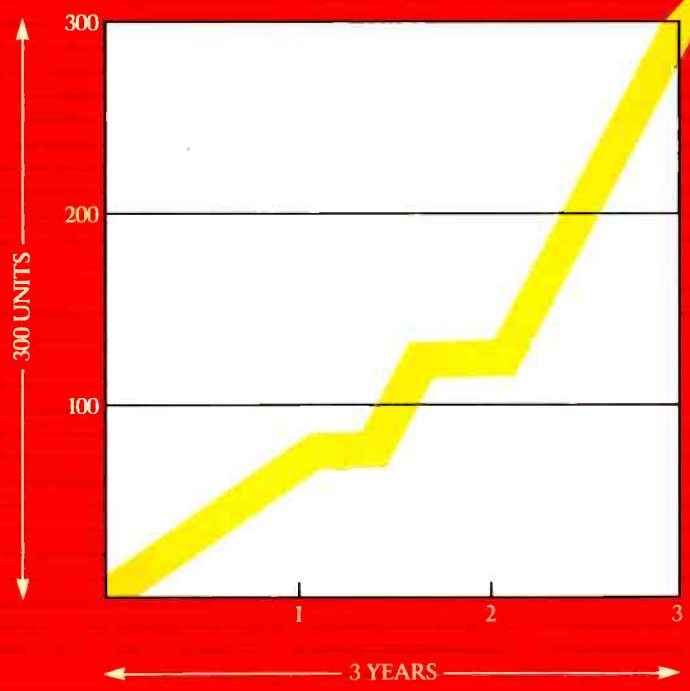

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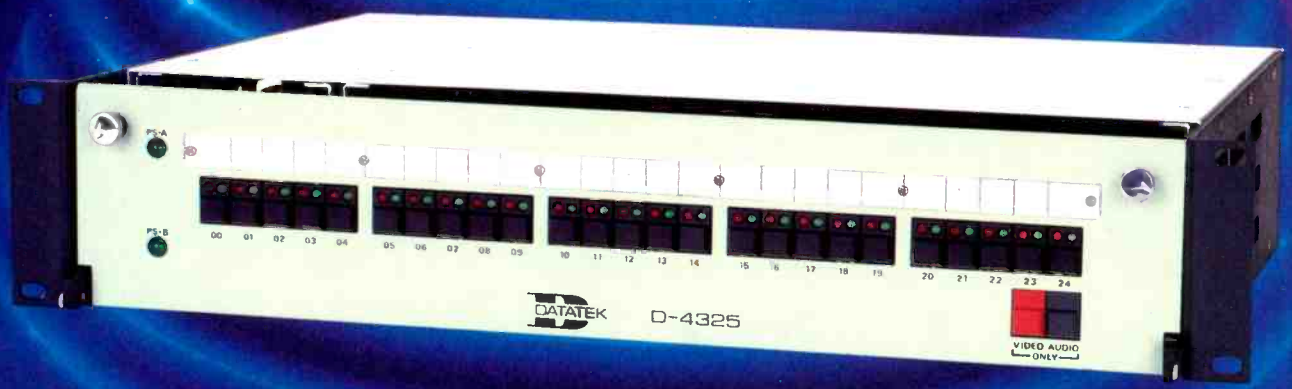

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Type-C one-inch made a comeback in popularity and the half-inch wars continued as Sony offered an impressive array of digital video recorders, part of its 4:2:2 digital studio.

can be used with cameras supplying either component or composite video. Addressing the comprehensive plan for M-II use in all applications, JVC offered the KR-800U with SMPTE time code generator/reader, time base corrector, noiseless slow motion and still mode, and other features included in the KR-Z800U. The latter is an editing VCR.

An important side note to JVC offerings is the KA-3 component adapter for the KY-950BU and 320B cameras allowing their use with analog component recorders. The adapter attaches easily to the rear of the camera head.

On the other side of the half-inch civil war, the Betacam camp has been just as busy. Sony will deliver its first products in July when it ships SP equipment to WNEV-TV in Boston. Along with stressing the high quality of its four audio channels and the 30- and 90-minute cassette sizes, Sony strives to make its point that the Betacam SP line is fully compatible with the 30,000 existing Betacam units currently in use worldwide. This means either metal particle or standard oxide tape is permissable on these decks. Actual products include the BVV-5 portable SP recorder for camcorder configurations. Unlike the BVV-1, the new unit offers Y and CTDM playback through the viewfinder display. The BVW-505 CCD unit and the BVW-503 tube unit are the two camcorder models that incorporate the BVV-5.

As far as ENG/EFP applications the BVW-35 is the Betacam SP recorder/reproducer for portable applications and has use as a feeder machine for field editing. Although Sony has steadfastly claimed that one-inch is the true medium for studio recording, it introduced the BVW-75 as a studio recorder/player in the Betacam format. It offers fast shuttle speed up to 32 times normal in black and white and up to five times in color. The unit also includes built-in diagnostics and dynamic tracking as well as individual B and C component outputs.

A significant announcement occurred after the show that bears mention here. ABC television revealed its commitment to the Betacam format, with suppliers reportedly being both Sony and Ampex. The score is now one apiece.

In its three-phase approach to offering the Betacam SP technology, Ampex continued its course at the NAB. Three new recorders were introduced spanning both studio and field use. The company's purported phasing-in process includes selling the Betacam line under license in an OEM-type arrangement, with phase two being the manufacture of the product in its Colorado plant, and phase three coming in 1988 when it begins developing its own technology within the context of the format. Phase two is in the process at this time.

The three machines on view at the NAB were the CVR-75 studio VTR, the CVR-35 field portable VTR and the CVR-5 camcorder VCR. Obviously, with substantial markets to protect, neither Sony nor Ampex is claiming full studio quality for the Betacam SP, both offering advanced one-inch Type-C machines for that purpose. However, if multiple generations are not necessary, half-inch performs admirably, and the CVR-75 provides AST tracking, built-in time base corrector and dynamic motion control. The portable CVR-35 features RS-422 serial remote control for field editing purposes. The Ampex produced studio recorder/player is the model CVR-40.

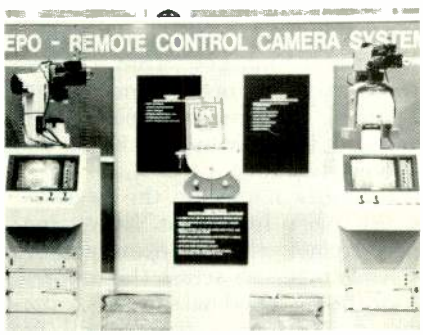
Further supporting the Betacam line in Dallas were several models from BTS. The BCB-35 Betacam SP field recorder/player and the BCB-75 studio unit offer the improved audio and video specifications that are familiar with the Betacam products. The BCB-75 is offered with built-in editing facilities. There are 10 products in the BTS Betacam line ranging from the KCB 1 camcorder to the automatic editing control unit and including the field and studio players and recorders.

Other Formats Advance

There is still a substantial number of users out there for the ¾-inch format, and this fact has not gone unnoticed by either Sony or JVC. The latter this year introduced the CR-600U, a microprocessor-controlled VCR with SMPTE time code capabilities. It is a compatible unit with the CR-850U in an editing situation and offers a diagnostic warning system for troubleshooting.

Nor did Sony ignore this turf as it introduced its SP technology in the ¾-inch U-matic arena. The new models include the VP-9000 player, the VO-9600 recorder/player and the VP-7000 player, all offering computer interface and frame code systems. The VP-9000 player with SP enhancements offers 330 lines of resolution by boosting the luminance channel in the FM carrier by 1.2 MHz. The computer interface is accomplished via the RS-232C control port.

Another technology that is affecting video recording is the proliferation of digital disk systems. Due to the short duration of the typical record time and the standard useage of these



In the A.F. Associates booth, EPO exhibited its range of automated remote camera control systems including full software and hardware packages.

products in post-production type situations, NAB reviews on this technology can be found in this issue's post-production section.

For More Information

Sony 315
Ampex 316
Panasonic 317
Hitachi 318
JVC 319
BTS 320

Camera Control Adds Spice to Show

As the broadcast business continues its inexorable evolution towards the

Another leader in automated camera control was TSM, demonstrating advanced software innovations for its heavy-duty camera heads. Also introduced was the Sports Focuser.

automated plant it brings one technology after another into the area of prime interest. This holds true with camera control automation, a market that is now developing, and at a rather rapid pace. As witnessed at the NAB show, there are four major companies vying for a substantial share of the growth market: TSM, Vinten (who also announced a contract for supplying its camera support equipment to the Olympics), EPO, and Telemetrics.

Currently, it appears, the hardware is the most important issue since there are not yet a significant number of systems in use across the country. After the installed base grows to sizeable proportions, software will become the dominant question and these companies will have to then concentrate on programming developments. This is not to say, however, that software should be ignored. Still, the hardware comes first, and in a system that must handle fairly heavy loads (like a studio camera and a big lens), its capabilities should be closely examined. TSM demonstrated the use of its HS-110P, a studio camera pan/tilt head with no limitation on camera/lens combinations due to its load-handling characteristics. Two important elements in this kind of gear are the stiffness and the time during movement in the arc. TSM boasts a 90 degree per second arc time and impressive performance on repeatability as well.

In the hardware, perhaps the single most important component is the servo motor that drives the system. With the TSM system the IC boards for pan and zoom are identical and interchangeable and all breakers are external with no fuses in the system. Not forgetting the software question, TSM allows changes in the control parameters and permits operator's interjected control to be stored into the memory of a programmed camera move. TSM also introduced the Sports Focuser, which will find its main use now in assisting manually operated cameras, but in the future will be for remotely controlled systems. The capability is there now in terms of the hardware/software performance. The Sports Focuser works by calculating infinity and then the closest point of focus so that all points within those boundaries can be calibrated and the system allows the camera to stay in focus anywhere within that range.

Vinten, too displayed an impressive combination of hardware and software in its Microswift, an expandable digital remote control system that operates as a command center not only for positioning and operating cameras, but can control switchers, VTRs, character generators, and routing switchers. The system, which can also control pedestal height, can be configured into a multicamera function using Swiftnet local area network (LAN) to coordinate useage of cameras and other equipment in remote studios. Control processing has been an area of emphasis for Vinten, and its resultant digital system controlling high-quality servos and pneumatically counterbalanced pedestal makes an appealing package. Due to the software involved, the system is easily upgradeable, right up to the level of using it as a LAN center. Control is offered for pan, tilt, zoom, focus, and pedestal height.

Large studio camera/lens combinations are also possible with this system. Extensive control of this combination is possible, even storage of the control parameters including camera and lens functioning (black level, iris, lens settings, etc.) in addition to camera positioning. Shot replay is possible in sequence or at random with a manual override capability included. The shot directory is stored in pages, each of which has a 99-shot capacity, with the system topping out at 1500 shots.

At the A.F. Associates booth, EPO demonstrated its System 90, offering microprocessor control for remote operations. The system supplies 16-bit processing for pan and tilt, 500 shot storage capacity, 14 controllable functions per camera, and storage of fade time. Serial data links are also provided for those situations where long distances are unavoidable. Also available are eight on/off selections and fade time, while stored data is protected against unauthorized revision by a key switch. Power failure is not a problem due to an internal 30-day battery support system. There is also a provision for transfer to disk.

For remote operations, the system will operate over 3000 feet of serial data cable and can function over RF connections or triax camera cable. An operational speed of 9600 baud is standard.

Also offering triax, RF, or cable connection on its systems is Telemetrics. Servo control, 360 degree rotation, and automatic preset sequencer are all standard. Load bearing capacity is limited to 50 pounds on the head, which has 360 degree rotation speed of 10 seconds and 15 degree tilt in two seconds. A joystick control unit allows operation of pan/tilt and zoom/focus, while the automatic sequence unit is a panel with preprogrammed shot selection in groups from one to 99.

For More Information

TSM 321
Vinten 322
EPO (AFA) 323
Telemetrics 324

3D Systems Continue to Dominate Interest

Wherever you looked at NAB, there were crowds gathered around booths exhibiting 3D modeling and anima-

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era be animated in a uniform manner? Can the user select the speed at which to view a motion test? Can pressure sensitivity be used as a tool in the paint mode? Is there a uniform format for all image applications in the system? Of course, the Symbolics graphics system has a "yes" answer in each column of the checklist; nonetheless, it's a very useful point-by-point comparison guide.

Developed originally as a proprietary software product for producing video animation, Vertigo's V-2000 has rapidly become one of the "hot" 3D modeling and animation systems on the market. Now the system has expanded again with the addition of an offline modeling workstation that connects to the main V-2000 unit through networking; the idea is to take the time-consuming process of mathematical modeling away from the main unit and place it in a more cost-effective environment. Vertigo has also been working on output interfaces to other pieces of equipment in the digitial domain. One interface connects the system to a Sony DVR-1000 ditial VTR. Such a system is already in place at Limelight Video in Miami. A second interface allows the V-2000 to be coupled directly to an Abekas A62.

New Deals, New Dealers

Yet another significant development at NAB was the last-minute announcement that 3M has acquired the exclusive worldwide rights to the Neo-Visuals Vishad 3D animation software for the broadcast and teleproduction markets. 3M will sell the product as the Specter 3D animation workstation.

That 3M has been looking for a graphics product to replace the Artronics line, which it briefly marketed and then dropped by mutual consent, was well known. The acquisition of the Neo-Visuals product, however, met with some surprise. The Specter is based on a Silicon Graphics IRIS 3130 workstation—not the average broadcaster's cup of tea (yet). And the Neo-Visuals demo artist spoke of B-splines and surface patches in his demonstration, leaving most attendees in the dark. "We just signed the deal days before the show," explained Jim Mazzone, head of 3M's Broadcast Products Group, "so we didn't have time to tailor the presentation. Over the next couple of weeks, however, our sales force is going to sit down for some intensive training sessions with Neo-Visuals, so we can learn what this system is about, and how to market it to this industry."

Furthermore, NAB also saw the introduction of efx, a brand-new high-end 3D workstation from a brand-new company, Transformations, which was making its first NAB appearance. Claiming to cut rendering time by as much as 90 percent, this $250,000 product represents the current state-of-the-art in 3D. First of all, it is based on the MicroVAX, DEC's latest hardware platform, with extremely fast processing speed. In the software department, it comes with everything that could be desired: surface patch modeling, eliminating the "polygon" look when objects are viewed close up; bump mapping, image mapping, transparency, Phong and Gouraud shading (but no ray tracing yet); multiple colored light sources, dynamic motion control; hierarchical motion; and many other features.

Most important of all, the efx system has been designed specifically for the video post-production environment, and features an excellent operator interface in which almost all commands are issued through the digitizing tablet rather than a keyboard, and in which multiple hierarchical menus are kept to a minimum and replaced by logical flow paths through the system.

And That's Not All

As if all the above weren't enough, there were a number of other companies exhibiting 3D graphics products which, although not new, are all well respected.

Integrated Technologies (ITI) showed Image-maker, based on a 24-bit processor, and priced at $59,500. New features now available include metamorphoses, texture mapping, vector fonts, movable light sources, movable camera, multiple workstations, and a 32-bit paint system with RGB frame-grab. The system includes a menu-dirven artist interface, implemented from the digitizing tablet.

Digital Arts made its NAB debut with the DGS 1.0 digital graphics system, an IBM AT-based 3D modeling, animation and rendering system starting at $35,000. Despite its low price, the system has a number of advanced features, such as a well-conceived motion scripting routine, texture, bump and reflection mapping, and shadows.

Three-dimensional capabilities are also being incorporated into systems primarily made for paint. More information appears in our accompanying section on paint systems. These companies include: Aurora, which showed 3D modeling and animation capabilities for its AU/280 workstation, based around a Sun 3 minicomputer with proprietary Aurora hardware; Artronics showed its Artron 2D/3D workstation, primarily a paint product but with good 3D modeling and animation capabilities; Shima Seiki, now being marketed in the U.S. by Chyron, also showed 3D capabilities for its graphics system. Quanta briefly described the 3D capabilities it will soon offer on its Dimension 32 product, although 3D was not demonstrated this year at NAB.

For More Information

Ampex 325
Cubicomp 326
Colorgraphics 327
Pinnacle Systems 328
Dubner 329
BTS 330
Wavefront 331
Alias 332
Symbolics 333
Vertigo 334
3M 335
Transformations 336
ITI 337
Digital Arts 338
Aurora 339
Artonics 340
Cyron 341
Quanta 342

New Waves in Paint

Paint systems were a major part of the continuing explosion in computer graphics seen at this year's NAB. An increasing number of television stations are using paint to upgrade the look of their graphics, and many broadcasters feel the systems are now a necessary part of staying competitive. This growing interest in paint was clearly reflected at NAB '87, which saw more companies diving in to what is now a veritable sea of paint, creating some definite new waves.

Three Approaches

The biggest new wave, or trend, in paint was the emphasis on its role as part of an overall digital video graphics system, as opposed to the idea of paint being a standalone, single-purpose unit. Manufacturers vary in their approach to this idea, especially if their history is tied to a specific type of product, but everyone is aiming in this direction. As an outgrowth of this trend, more broadcasters are becoming familiar with paint, and are thinking about the option to upgrade to 3D animation. The hardware for

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both is essentially similar; the difference is software. As a result, several manufacturers are including other graphics capabilities—such as 3D—in their paint systems.

A second class of paint consists of those products in which paint is included as a software function in a system specifically made to do other graphics tasks, such as 3D animation. Several major companies have taken this approach, and they include Alias, BTS (Broadcast Television Systems), Digital Arts, Integrated Technologies, Symbolics, Vertigo, and Wavefront.

At NAB '87 BTS introduced the FGS-4500 3D Illustrator paint system, a software package for their powerful FGS-4500 3D graphics system, which was also introduced at the show. Objects in 3D rendered on the FGS-4500 can be transferred to the Illustrator for a full range of paint treatments. This interactive relationship allows artists to bring the full advantages of 3D to the creation of their painted images.

Categorizing any computer graphics product is not always possible, but a third type of system offering paint has emerged, and captured a hefty share of attention at the show. As described with 3D systems in the previous section, this new design—also based on the integrated graphics trend—is called the computer graphics workstation. It's a multiple-function digital graphics studio in a single box.

The Video WorkStation from Pinnacle Systems is such a product, with a unique architecture that provides for multiple, simultaneous software-based functions to be co-resident in a single system. NAB '87 saw many new capabilities introduced for Pinnacle's Video WorkStation, which is available in several models as a building-block approach to computer graphics, including paint.

In the Booths

Software add-ons provide the functions for the Pinnacle Video WorkStation, starting with the model 2010 for digital effects. It becomes the 2020 with the addition of a still store via hardware and software upgrades. One board, a floppy disk, a tablet, and stylus turns the 2020 into the 2030, with 32-bit full-color paint system. The model 3000 debuted at NAB, featuring 32-bit paint and 3D modeling. It, in turn, can be upgraded for full 3D animation. Video WorkStation's software-based, modular design is the key to future upgrades and system expansion.

Quantel introduced several new software updates for its Paintbox, such as a restore brush to selectively reveal a previous picture under one being worked on. But equally important was their emphasis that al-

Automatic News: The Future

Actually, it's the present state of affairs in the newsroom where computers are a prominent factor. This is considered to be one of the largest growth areas in broadcast equipment in the late 1980s since many news departments are so important to their stations and since only a small percentage of facilities now have complete systems. Addressing this rather impressive growth market at the NAB were offerings from a few companies, including the two major system suppliers and a newcomer. Once again, software announcements were as important as were hardware advancements.

Dynatech Newstar created excitement on both fronts, showing a Newstar system hooked to a Sony Betacart. On the Betacart were located the various videocassettes containing the shots scheduled for the news broadcast. The Newstar system, using the company's new APS (Advanced Performance Software) program arranges, schedules, and keeps track of the status of each segment. APS is now ready for delivery after two years of development and provides the following capabilities: allows for exact duplication of a user's already established story rundown forms; provides real-time control of show development, manipulation and overall fine tuning from assignment to rundown to show execution; provides an easy method for monitoring and reporting story status prior to air time; permits all involved departments and individuals to keep current on any changes made to the show rundown before and during air time; provides full control of actual show production including real-time teleprompter; allows management to limit staff access to critical or confidential information including show rundown.

Basys, too, made an impact with its software developments announced at the convention. Of note was the Newsdesk, System-I, a microcomputer-based system running Xenix to support up to 66 devices. As a unit, System-I comes packaged in an actual desk that can be installed easily and used as a system operator station or as a working area for reporters or editors. It can be configured for several users and expanded as necessary.

Interfacing the computer to the overall station operation has been a priority at Basys and the use of newsroom computers in an ENG truck was discussed. Connecting the operating systems to production equipment is underway as automated carts and character generators come into more prominent use in the newsroom system.

Shaking up the fairly settled market for newsroom computers at the show was Twentier Systems (TSI), founded by Carl Twentier, formerly a marketing executive at Basys. The TSI system is powered by a Data General computer that drives the software-oriented product to integrate news coverage, production, wire service capture and sorting,and electronic mail. Daily management features include job costing, personnel productivity tracking, and equipment and inventory control. TSI pitched its new system, in a suite off the show floor, as a management tool for gaining fiscal control over the newsroom.

Editor's note: For those requiring further information on newsroom computers, see our upcoming July issue with dedicated coverage.

though Paintbox is a single unit it uses the same operating system as Harry, and is 4:2:2 compatible with Harry, Encore, and Mirage. New software updates for Paintbox give it an interactive role in such a digital studio setup, which was demonstrated both at Quantel's booth, and at the 4:2:2 digital post-production center at the Sony booth.

Digital video was again a major trend at NAB, as equipment employing digital standards continues to proliferate. Paint, being a function of computer graphics, directly relates to the move toward the all-digital studio. Ampex showed a digital interface between their AVA-3 paint system and their ADO and ESS-3 still store. In addition to emphasizing how its separate products integrate into an overall system, Ampex has also continued to update its paint software. Recent AVA-3 updates include SpeedTrace, which automatically digitizes logos and fonts, eliminating the need for time-consuming tracing by hand.

Product updates are constant with all manufacturers in the competitive world of paint, and this applies not only to software. ColorGraphics Systems is now incorporating the new Motorola 68020 processor in its popular ArtStar II system, which triples the speed of the system's paint and stencil functions. Other updates are new text capabilities for multicolored fonts, and real-time animation zoom and scroll. ColorGraphics also introduced the ArtStar Workstation, an Ethernet local area network allowing multiple ArtStar systems to simultaneously transfer data and graphics.

Dubner Computer Systems has taken the new Motorola 68020 microprocessor and has incorporated it into their new TBS-20 Turbo paint system, introduced at NAB '87. The TBS-20 has all the features of Dubner's popular DPS-1 paint system, but with extra animation and up to four times the processing speed. Turbo paint has also now been included in Dubner's Texta character generation and animation system to create the new Texta-500, which can also store 20,000 pages of text. The DPS-1, meanwhile, was also updated with an expanded font list, and new optional animation software for rotating stencils. Both the DPS-1 and TBS-20 are now also available from Imageering, which has modified the systems under the name PaintStore, for use with their optical disk-based StillStore product.

Quanta is also devising a systems approach to paint, offering it as add-on software to their new Dimension 32 graphics computer, which also performs 3D modeling and animation. This computer has been designed from scratch to do graphics, and the system's fast disk controller allows a full 2Mb picture to be recalled from disk in .35 of a second. The Dimension 32 was still in development at the show, but its paint software was demonstrated, and shown to be full-featured. Quanta divides the 32's paint functions into six areas: draw, tricks, brushes, color, animate, and file. Quantapaint was also on hand, an eight-bit unit with basic features such as antialiasing, varied brush styles, and color cycling.

Chyron, another proponent of the systems approach to paint (it's offered via a multimode graphics module for their model 4200 character generator), took one more big step in this direction with a major NAB announcement that they have agreed to market Shima Seiki graphic products in North America. The Shimatronic graphic image system starts as a powerful paint system and can grow—with hardware and software options—into a full-featured graphics workstation with 3D animation, storage of 3,500 images, and live video effects. Also new at Chyron is the Text Grab feature for the Chameleon paint system and VP-2 character generator, making possible easy interfacing of text and paint. And new video circuitry enhancements for Chameleon were also introduced, enabling it to output video in RGB component or in full broadcast-quality composite.

A recent entry into the paint field, but one that is coming on strong is Rank Cintel. Rank also takes a systems approach, combining their new Art File paint unit with their proven Slide File still-storage system. The user can select any of Slide File's 400 images per hard disk, and perform a multitude of paint functions on the image with the Art File. Art File is a 24-bit, full-featured system that includes internal linear keying for insertion of character-generated text on any frame in the Slide File library. Art File also integrates into a full-blown 4:2:2 Presentation File system, which includes Slide File and Logica's Gallery 2000 optical still storage and management system.

A workstation approach to paint—and other computer graphics functions—is also being taken by 3M. The new 3M Silver video production workstation combines seven dedicated graphics co-processors in one unit to provide font generation, 2D animation, special effects, still storage, and a VCR controller. Its open architecture accepts additional applications-oriented modules to multiply the capabilities of the system and to provide a means of updating system software in the future. Also being shown at the 3M booth was the D-6000 Panther graphics generator, which was introduced at last year's show. The Panther combines the features of an advanced character generator with those of a paint system.

Aurora showed its line of three videographics systems—the 75, 220, and 280—each of which offers paint in increasing levels of sophistication along with additional speed and graphics capabilities, such as a 3D modeling and animation package. Both the Aurora 75 and 220 are IBM AT-based; the eight-bit 75 can be upgraded into a 32-bit 220. The 280 uses a Sun Microsystems CPU with the Motorola 68020 processor. New at NAB was an interface to link the 220 or 280 with the Abekas A62 digital disk recorder for unlimited layering of Aurora images. Also introduced were expanded capabilites for the 3D modeling and animation options of the 220 and 280.

Artronics introduced a new 24-bitplane paint system, Paint24, which is compatible with the company's other major software packages—3D Model Shop, 3D Animator, Paint 8 with AniMagic, and chART—which run on Artronics's Presentation Graphics Producer/PGP and Video Graphics System/VGS.

From Lyon Lamb comes their new Gravitizer, or what the company describes as an uplink from the video world to the high-resolution RGB world. Gravitizer is a painting and grabbing station that uses a Targa board to read images grabbed from video, and send them over an Ethernet as files for larger workstations such as the Sun 3, which don't currently have their own paint programs.

Clearly, new waves in paint have resulted in a multitude of new products and new capabilites for existing products. The upshot of all this activity is that stations and postproduction houses now have greater choice than ever before where electronic video paint systems are concerned. Buyers are getting—as the saying goes—lots more "bang for the buck."

For More Information

BTS 343
Pinnacle 344
Quantel 345
Ampex 346
ColorGraphics 347
Dubner 348
Imageering 349

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Quanta 350
Chyron 351
Rank Cintel 352
3M 353
Aurora 354
Artronics 355
Lyon Lamb 356

Character Generators for Every Need

New, additional features and increased interfaceability with other video graphics tools aren't new trends where character generators (CGs) are concerned. But NAB '87 saw a continuation of these trends, and an occasional blurring of the line where a CG ends and a paint or 3D system begins.

This year marked the first NAB at which Thomson-CSF's Vidifont and Viditext product line were shown by BTS, Broadcast Television Systems, which now markets those products in the U.S. New products included full-frame font/logo compose for Vidifont Viditext II, giving the user the ability to modify fonts, graphics, and logos. A new built-in disk drive for Vidifont Viditext II reduces rack size to just 31.5 inches. New font and message intersystem capability links the Vidifont Graphics V and Vidifont Viditext II, which also now have full-definition, antialiased foundry fonts, and a new downstream keyer for 16-level interplane keying between internal text and backgrounds. Also new: a third channel RS-232 interface to link the Vidifont Graphics V with six remote keyboards; a Vidifex 3D feature for the GraphicStore paint and library system; and new background graphics for the Graphics V.

Quantel demonstrated their new Total Dynamics Graphics Package for their versatile Cypher CG. The package includes an optional background picture library for real-time creation of captioned graphics presentations. Cypher's ability to accept and manipulate 3D picture cutouts from Paintbox, via C-Link, makes possible a full-function, multi-channel effects system for keying words and pictures over internally stored and displayed backgrounds. Another new feature is an internal digital keyer with I/O capabilities to key Cypher effects over an external component digital source, making the product a fully integrated member of any 4:2:2 studio setup.

Chyron's commitment to product upgrades continued at NAB '87. Software upgrades for the Scribe vector-based text generator enable the product to take any letter, word, or logo and treat it as a separate 3D object for manipulation. Software options include texture mapping, smooth shading, variable light sources, and 10 new dynamic effects with 10 speeds each. Hardware options were also introduced: logo compose with digitizing tablet to create antialiased fonts and logos; large-scale disk storage with streaming tape backup for both fonts and messages; and a high-speed networking link for multiple Scribe systems. Digital effects with motion—introduced last year for the Chyron 4200—was introduced this year for the RGU-2 system. Enhanced software for the Chyron IV line, meanwhile, gives it 100 more fonts, and new hardware enables the line to interface with a variety of powerful election reporting systems. The VP-2's new multifont option allows it to access a total of 36 on-line fonts.

Grass Valley introduced new switchers (Model 200 is shown here) and effects devices, and had one of the busiest and most dazzling booths on the show floor.

Quantel's line of CGs grew by three with the introduction of their new QCG-34, QCG-38, and Microgen Plus. The first two offer four and eight face styles respectively, with a horizontal resolution of 18ns at 16 scanlines. Both incorporate instant sizing, 512 available colors, easy editing commands, and RS-170 synch generator with genlock and NTSC (or PAL-1) encoder. The new Microgen Plus features resolution of 50ns, four resident fonts, 512 available background and character colors, real-time automatic page sequencing, dual channel option, and roll and crawl at nine different speeds.

At the 3M booth the D-6000 Panther graphic generator, introduced last year, was again highlighted. The Panther blurs the line between paint systems and CGs, offering capabilities of both. Camera grab, logo animation, 35ns resolution, and 15 standard fonts (with more optional) are among its features. A two-channel version of the D-3600 CG was also introduced, with 35ns resolution, five built-in fonts, and twin floppy drives with 1,000 page storage per disk. Also new at 3M for NAB '87 was the D-2200, a two-channel unit for the industrial/educational market. Resolution is 70ns, and it offers a 512-color palette, eight fonts on-line and additional fonts downloadable from the 3M Font Library disk. Features include 2,000 pages of disk-based extended memory playback for unattended applications.

Dubner debuted its 5K CG, an economical unit with antialiased fonts as a standard feature. Also new is presentation graphics software for the 5K, 10K, and 20K, and software for interfacing the 20K with the DPS-1 paint system.

JVC introduced the Mindset M-3000 advanced titling and animation system at NAB '87, which integrates a CG, logo creation, paint, and animation in one unit. The M-3000 can I/O either composite or component, offers five resident font styles, can animate characters and logos quickly, and has an optional image capture module.

Aston Electronics unveiled several enhancements for the Aston 4, including hard disk storage, a color-ramp shaded background feature, and soft masking. The company also announced a new three-year warranty policy for the Aston 4.

Pesa America introduced a new CG, the model CG-4722, which features eight resident fonts held in RAM, and a choice of keyboard layouts for international users.

Laird Telemedia introduced several new add-on features for their model 1500 CG, including a paint system option, 20 Mb hard disk memory, and an expanded keyboard that also streamlines numerous commands. The new, low-cost 1450 Cee Gee was also shown, with six resident fonts and 100 pages of storage.

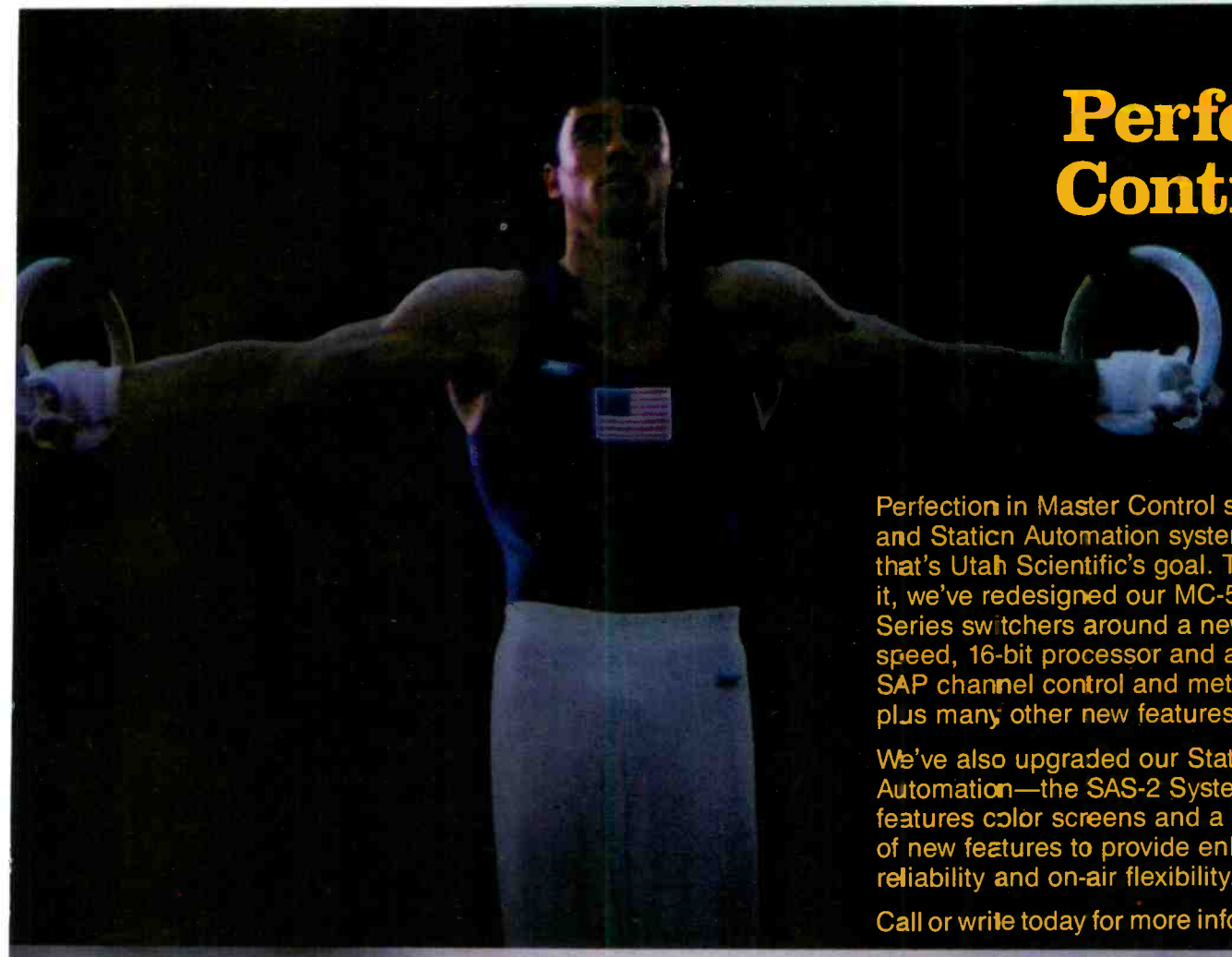
Other Types of Video Typing

The growing CATV, education, and industrial markets are increasingly being addressed by CG manufacturers, with numerous CG products for these areas shown at NAB '87.

ICM Video introduced enhancements for their CG7000, including: the optional ES-200 word-processing software IC; the MM-1400 80-page plug-in memory module; the CV-1053 character highlighter; and ten new font modules in a variety of languages.

Knox Video added new features to their K40 Microfont compact color titler in the form of an optional four-font upgrade, and 64 more pages of memory. New for Knox at NAB '87

Perfect Control



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was the K200 Chromafont II, offering eight fonts and greater speed than its predecessor, the K100, which was also shown.

Mycro-Tek showed the new 740K dual-drive versions of its Supra Star One and Two CGs, which now come with the Supra Edit text and graphics editing keyboard. They also showed their popular Ernie and Max CGs.

Compu-Cable Systems presented the Spectra View II information display system, which uses a special cartridge to turn an Atari PC into an information display system.

For More Information

BTS 357
Quantel 358
Chyron 359
Quanta 360
3M 361
Dubner 362
JVC 363
Aston 364
Pesa America 365
Laird Telemedia 366
ICM 367
Knox 368
Mycro-Tek 369
Compu-Cable 370

Still Stores Refuse to Stand Still

The explosion in video computer graphics has only made the already-vital role of the still store even more important. Both established and new still-store products attracted considerable attention. All products in this area included some form of library management and rapid access features.

Abekas showed their proven A42 digital still store with advanced library system, capable of storing 1,050 frames on-line and an unlimited number of frames off-line in tape cartridges. Ampex's booth included the popular ESS-3, and a new introduction, the ESS-5, aimed at middle-market broadcasters and industrial users. The ESS-5G version offers a "compose mode," for cut/paste and character generation. Harris brought their IRIS II, IRIS-C, and ESP-II digital still stores, and introduced a networking feature for IRIS that allows simultaneous access for up to 36 users and on-line management of 86,000 stills. A price reduction for the ESP-II was also announced.

A sure sign of a hot product area is more companies entering that area. Leitch Video introduced a new digital still file, the DSF-3100N. It stores 650 fields—expandable to 10,000—and includes a library management database. The Alta Group, famous for their economical but full-featured Pyxis and Cygnus special effects products, unveiled the Centaurus still store, which holds up to 2,500 images, and also offers special effects, A/B roll video editing with dual picture freeze, and stereo audio mixing.

Optical Inroads

Not only were there new companies becoming associated with still stores, but new technology as well. A move toward optical-disk-based still storage was seen in several booths, with vendors stressing the greater long-term image stability of optical systems. Quantel introduced a laser optical disk archive storage interface for its Digital Library System (DLS). The randomly accessed disks hold 1500 frames per side, and are controlled by DLS's management system. A new fiberoptic link to connect the Central Lending Library (CLL) with satellite DLSes was announced, as was the new ability of the CLL to store DLS keys for creation of floating cut-out images.

Rank Cintel introduced their full Presentation File 4:2:2 system, which integrates: the hard-disk based Slide File, with tracker ball-controlled production effects and a nine-mode image cleanup function; the Art File paint system; and—to tie it all together—Logica's Gallery 2000 for storage of 500,000 frames on optical disks, and simultaneous management and networking of 16 Slide and Art files.

From Sony Information Systems comes the CSS-100 optical disk Color Still System. Thirty-two disks can be integrated into the system; each disk holds 8,000 images. The CSS-100 will accept any video or computer output, and its host computer can access any image in three seconds or less. Sony also introduced the ProMavica industrial still video recorder and player, using two-inch floppys.

Imageering has incorporated Sony's optical disk technology into their ICMS (Image Composition and Management System) StillStore. Sony disk drives, controllers, and frame buffers are used in the ICMS StillStore, which can be configured with a 50-disk changer for storage of 2 million on-line images. StillStore disks are guaranteed for 30 years, and an accompanying paint system, the PaintStore, was introduced at the convention.

Panasonic also showed optical disk still storage products. The TQ-2026F recorder/player and TQ-2027F employ standard NTSC signals and an eight-inch disks that hold 24,000 pictures each.

At a hands-on session, Central Dynamics personnel schooled attendees in the use of new features offered by the Strata-7 switcher.

For More Information

Abekas 371
Ampex 372
Harris 373
Leitch Video 374
Alta Group 375
Quantel 376
Rank Cintel 377
Sony 378
Imageering 379
Panasonic 380

The new LDK 90 CCD camera takes the fear out of even the most difficult situations

Lags, burn-in, smears – everyday horrors a cameraman had to face. Until now. The new BTS LDK 90 camera with high resolution frame transfer CCD's sets new standards for ENG cameras. With not just superior picture quality, but the best obtainable. Negligible registration error, perfect geometry, corner-to-corner sharpness, no comet-tailing, no microphonics.

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Doing Something About the Weather

Like the ever-changing weather itself, weather graphics vendors were on the move at NAB with new products and services for better TV forecasting. WSI Corporation added to its extensive weather data services by unveiling SUPERseer, which uses highly sophisticated government and WSI computer modeling to produce graphics of nationwide cloud cover up to 48 hours in advance. WSI makes SUPERseer images available twice daily.

Advanced Designs showed new display enhancements for the Doprad II Doppler radar system. Enhancements include: dual display of range height indicator and azimuth returns, for monitoring specific sections of storms; improved resolution and color; a map builder for display of geographical features and landmarks; optional paint tablet; and a new 36-key touch membrane radar control panel for one-touch control.

ColorGraphics, which had its genesis in weather systems, unveiled its new LiveLine V weather graphics system, based on ArtStar technology. A sophisticated 32-bit system, LiveLine V features include automatic base-map generation for anywhere on earth, animation of up to 24 satellite images over that map, color cycling, and compatibility with all services of all major data vendors. Weather Central, a division of ColorGraphics, offers extensive ready-to-air weather graphics, including an eight-bit, ultra-high resolution service transmitted at a timesaving rate of 9600 baud. LiveLine IVA was also shown, and LiveLine PC—an economical IBM AT-compatible system—was introduced.

Kavouras is also marrying the advantages of paint and weather systems with its new Triton X Art/Paint system, which offers a wide range of paint and animation features, vector type faces, automatic input of weather data, and full compatibility with current Kavouras technology. The company also introduced its new Radac 2000 unit, which receives precipitation data from both Kavouras and FAA radar, and then animates it over its library of high-resolution base maps. New also is RAMFAX, an animated graphics feature of Kavouras's RAM database service.

Accu-Weather debuted the new Weather Show, a self-contained, constantly updated weather package that includes meteorologist voice-overs, satellite and radar graphics, and local forecast information. Show length is user-chosen, as is the sequence and mix of graphics. Also introduced was NewRad, which combines its own radar with that of government stations to produce comprehensive national precipitation maps, and the Front Door data receiver/storage unit for interfacing with all weather and video graphic systems. Front Door 750, a new system for the satellite reception, storage, and archiving of weather graphics, was also demonstrated.

The DSC Illusion is a multichannel digital video effects system exhibited with its 2000 Event bubble memory storage.

ITI (Integrated Technologies, Inc.) had their Weather-Maker and Weather-Maker RO on display. The Weather-Maker brings eight-bit paint functions to weather graphics, includes a base map library, and is compatible with major data services. The RO—receive only—version lacks paint functions.

Alden Electronics's new software update for its C2000 weather system is called radar composite; it can overlay multiple weather data for the same site, anywhere in the U.S.

BTS now offers dial-up compatibility with Weather Central graphics for the Vidicast feature of the Vidifont Graphics V system. Interfaces to WSI, Accu-Weather, and ESD are also provided.

For More Information

WSI 381
Advanced Designs 382
ColorGraphics 383
Weather Central 384
Kavouras 385
Accu-Weather 386
ITI 387
Alden 388
BTS 389

Production and Post-Production Switchers Enter the Age of Reality

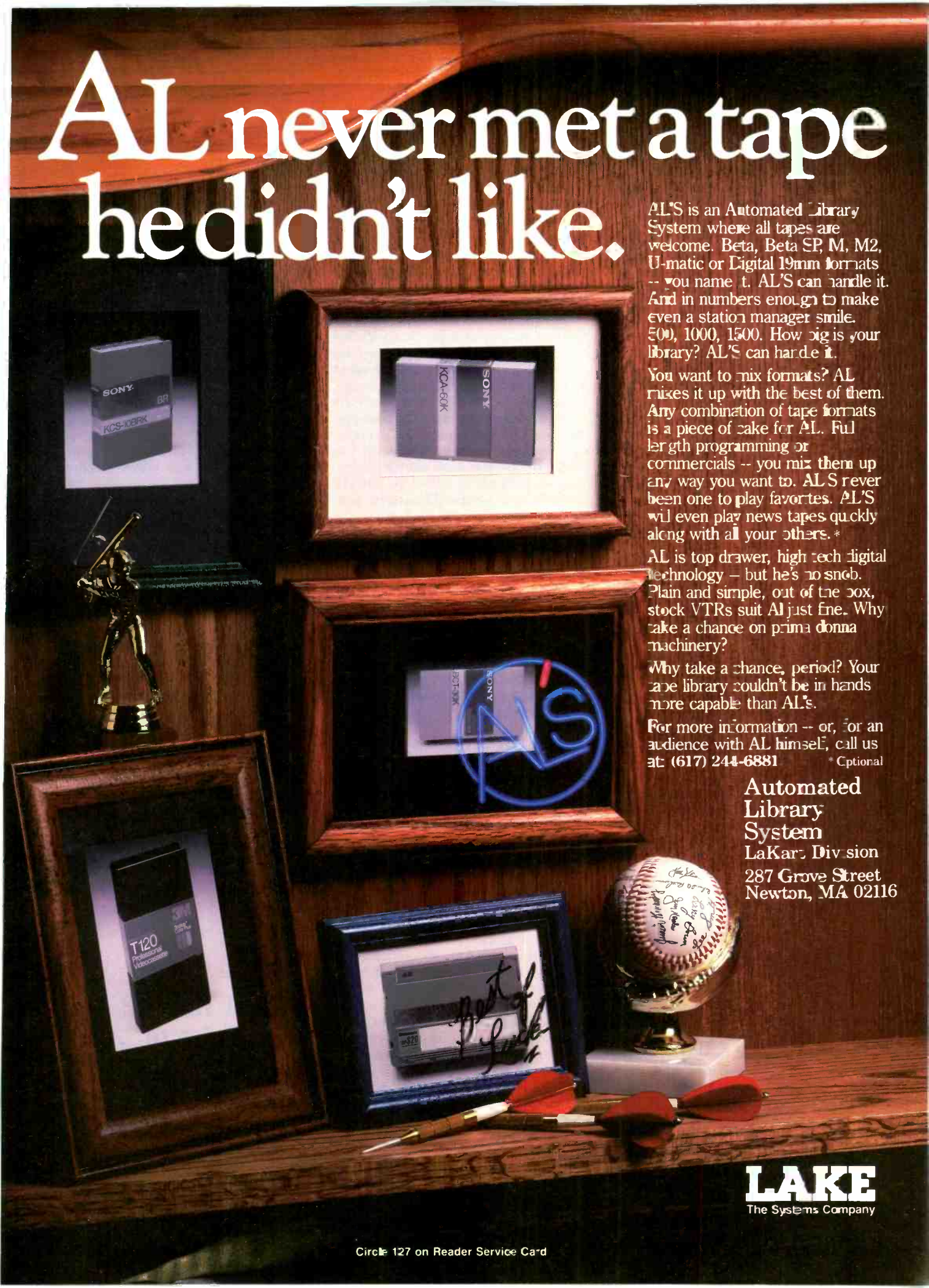
"You can't just design switchers for large post-production facilities and expect everyone else in the industry to accept what they're given," one manufacturer noted wisely. "Broadcasters need their own systems, and smaller facilities need switching power too, without having to spend hundreds of thousands of dollars and devoting an entire studio just to house the switcher."

This was the thinking behind the introduction at NAB '87 of several new switchers that are downscaled versions of larger units designed for top-level station and facility installations, but in some cases just as powerful.

Smaller and Better

The new Vista switcher from Ampex typifies the smaller-but- still-powerful trend in switchers. The Vista is a compact, cost-effective version of the AVC line, with a 10-input, 19- by 12.25-inch rackmount version priced in the $30,000 range. Designed for installation in smaller broadcast facilities, off-line editing suites, corporate/industrial and smaller broadcast facilities, it is available in 10- and 18-input versions, and incorporates two linear keyers with independent key switching buses, each ca-

AL never met a tape he didn't like.



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pable of luminance, ISO, chroma, and RGB keying. A downstream mixer/keyer provides two more buses, plus two additional keyers and a master fade-to-black. Full interface with the ADO is also offered.

Exciting, too, is the Vista's graphics-oriented display screen on which the system status, diagnostics, transition timing, and other operator information are shown in easy-to-understand icon form, with the operator making selections by pushing a series of coded buttons.

Ampex, of course, is still active in the large switcher arena, and showed the AVC Century series of switchers for the first time at NAB. Introduced at SMPTE, the high-end switchers, with two or three M/Es, feature extensive keying, key masking and memory capabilities.

The other smaller switcher causing excitement at the show was Grass Valley Group's new Model 200, actually an upscaled version of the Model 100 in terms of architecture, and priced to begin at $40,000. One of the main features of the 20 input, two M/E system is its powerful new keying capabilities: a downstream keyer, linear keyer, luminance, and chromakeyer are provided for each M/E, with six external key inputs and four external fill inputs per M/E. An expanded wipe set and wipe modifiers for each M/E is also standard.

Options for the switcher include a Quad Chroma Key, which generates a chromakey from any of four types of component sources; a new linear borderline key-edge generator with transparency control; and expansion of the basic wipe set to include dual matrix and enhanced analog wipes.

Central Dynamics, too, had a new flexible, affordable 16-input, four-bus production switcher. The CD-400LE has three fully independent key levels, one of which is a downstream keyer with independent key and fill inputs plus two other inputs. The switcher incorporates CDL's sequential effects generator, permitting up to seven combinations of mix, wipe, and cut transitions to be performed independently, in any order. Options include encoded chromakeyer, single or dual RGB keyers, and an externally triggered auto transition on the master fade-to-black.

Also with a new switcher is Intergroup, whose 9600 is a two M/E, 24-input version is priced around $50,000. A key feature on the switcher is its REFEX effects memory system, allowing an unlimited number of control panel setups or transitions to be stored and recalled, especially useful when creating news shows or other types of programs that call for the same effects day after day. Keying capability on the switcher are quite flexible, allowing the eight external key and three optional chromakey inputs to be assigned to any of the five keyers; a maximum of seven key elements or key functions can be used simultaneously on any or all of the five keying systems.

Intergroup also has an answer to the enormously popular Grass Valley Group model 100: the Intergroup model 9300 switcher, base priced at $11,000. In this switcher price range, Crosspoint Latch also introduced the 6129, priced at $10,999. The post-production switcher is available in eight- and 16-input versions, both with two M/Es. In the standard configuration, the two M/Es share a 32-wipe pattern generator; a second 32-pattern generator is available as an option. The switcher features three colorizers, four keying levels, a four-input downstream keyer, and an RGB chromakeyer (a second chromakeyer is optional).

According to company president George Pires, one of the switcher's principal advantages is the ease with which it interfaces with editors; it requires only a single plug-in board per interface, rather than an extensive interface box.

And Still More Switchers

A surprising new entrant into the production/post-production field is Abekas, which this year unveiled the T8, a composite or component unit with 10 inputs (including color background and black). The M/E system has program, preview, and key buses, together with downstream keyer and master fade-to-black. Over 80 wipe patterns, including rotary and clock wipes, are accessed through dual pattern generators.

New this year from Ross Video was the model 210A 10-input production switcher with the Ross MLE multilevel effects system, analog borders, memory, serial interface, chromakeyer, and transition preview; base price $10,950 plus options. Also on display was the RVS-216A 16-input MLE switcher with encoded chromakeyer, analog borders, extended wipe patterns, memory, and serial interface; base price $15,450 plus options.

A compact production switcher, in versions up to 24 inputs, is also available from BTS, Broadcast Television Systems. The RME switcher series features separate preview and key buses, RGB chromakeyer, border key, flip/flop program/preset buses, and NTSC pulse processing. There is a large range of wipe patterns, including 19 rotary wipes and a pattern modifier.

For-A Corporation, too, had a new production switcher, the 12-input plus black and color background PVM-600. Dual program, preview, and M/E outputs facilitate system connection to other pieces of equipment in the production/post-production environment, while a built-in genlock sync generator with three black burst outputs allows locking of switcher inputs. Other features include 24 wipe patterns with hard and soft borders; downstream keyer; and four auto-transitions. Options include a chromakeyer and effects memory system.

Not all developments, of course, were in small switchers. Vital Industries showed its new 3000 (production) and 3000+ (post-production) series, which feature two, three, or even four M/Es in a full-featured package. Again, keying is what makes this switcher worth the investment. The switchers can be configured with up to four keyers plus a chromakeyer for each M/E. And since each M/E has its own key and fill inputs, up to 16 self-filled keys can be produced simultaneously with the largest model.

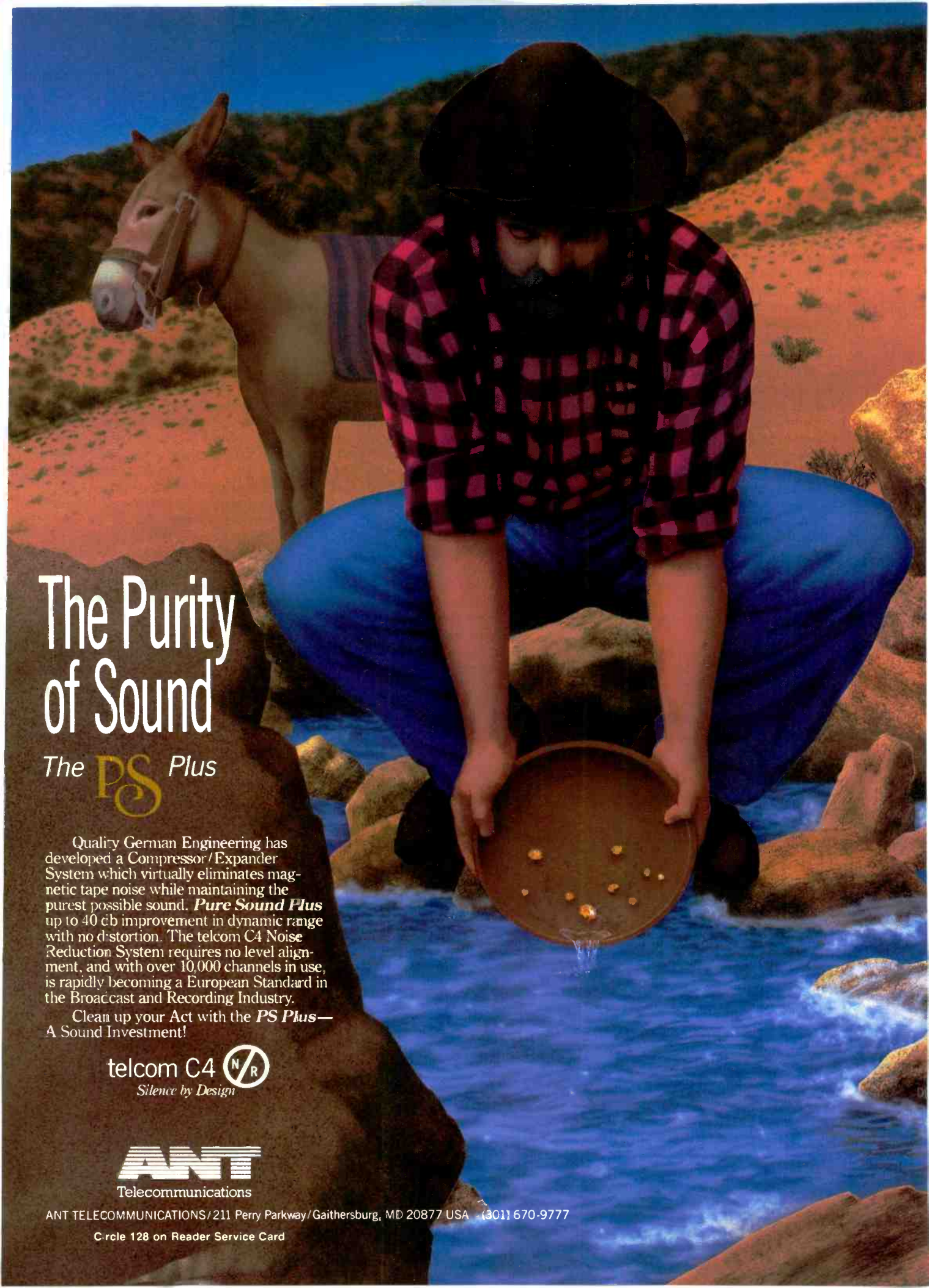
The 3000+, occupying only 27 x 18 inches of console space, offers the same keying capabilities as the basic 3000, yet is ergonomically designed for the post-production suite and can be triggered by an editing system.

For More Information

Ampex 390
Grass Valley Group 391
Central Dynamics 392
Intergroup 393
Abekas 394
Ross Video 395
BTS 396
For-A Corp 397
Vital Industries 398

Digital Effects: New Twist to an Old Theme

Bending, warping, twisting, curving—these words describe what is happening in digital effects today. Whereas a few years ago three-dimensional effects with infinity projection were all the rage, producers are beginning to demand a slightly more organic feel to the effects, achieved through curving the raster rather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than simply reorienting it along the *x*, *y*, and *z* axes.

A prime example is the brand-new Abekas A53-D effects processor, the first effects system offered by Abekas that conforms to the CCIR 601 4:2:2/13.5 MHz digital sampling standard. The A53-D—which also incorporates analog component outputs—offers the possibility of staying completely within the digital domain by interfacing directly with other 601-compatible pieces of equipment such as the Sony D-1000 DVTR and the new Abekas A64 digital disk recorder. Otherwise, the basic effects capabilities of the dual-channel system match those of the A52, previously introduced.

The special feature on the new A53-D, however, is a package of bending and curving effects that can be combined with other three-dimensional effects through an advanced effects editor and then stored for later recall. The unit also contains 24 preprogrammed and protected effects patterns for production applications, while the other memory registers, triggered through an editor, can also be used for more sophisticated post-production situations.

Besides the warping and twisting, other effects include true 3D perspective and rotation with variable axis control, global 3D manipulation, extremely smooth picture movement, a cube maker, inside and outside borders, picture cropping, and full manipulation of frozen pictures.

NEC, too, added a transition effects package to its System 10, and also the brand-new System 10C component video effects system (Y, R-Y, B-Y or RGB input and output). The transition package is actually a new hardware module to provide increased processing power, accessed by Version 3.0 software that provides for effects such as curl, roll, fold, and wave. The new effects, made avaiable through the DVE's soft function keys, can be combined with existing capabilities such as rotation and perspective. A new chromakeyer option is also available.

Curving the raster was also a major theme at the Quantel booth where visitors were amazed by a new "corner pinning" capability on the Encore effects system. In description and operation the concept is simple: the operator pins each corner of a compressed image onto a corner of a two-dimensional shape. Then, as the shape is manipulated in three-dimensional space, the image is carried along with it. The system really gets creative

Showing the merged Convergence and EECO lines for the first time, the Convergence booth demonstrated the EMME line in one section of its display.

when the beginning and end points of the shape's corners are programmed separately, so that as the corner positions move from one point to the next and the image is carried along, the form appears to ooze from one form into another.

The Encore also has the new capability to accept Quantel's Starlight feature, previously available only on the Mirage 3D manipulator. Providing two lighting sources for illuminating the 3D perspective rasters, it can provide highlight sparkles as well as overall illumination direction.

DSC is another effects system manufacturer that introduced twists and curved effects this year, along with a new page turn for its Eclipse effects processor. Menu-driven, the system includes a high-resolution CRT display and an easy-access control panel, together with effects such as an automatic cube builder, picture cropping, smooth picture movement on all continuous parameters, a shape manipulation option, and both linear and curved picture twist with the curved effects option.

DSC also demonstrated its single- and dual-channel Illusion effects system, with both shape manipulation and perspective options. The illusion can also be integrated into DSC's SX-2000D, in which the effects are integrated with a production switcher's M/E and keying amps.

New Features, and the Future

Not all the new effects on view at NAB were curved and twisted, of course. New in the Ampex ADO line this year was the introduction of Digitrail, an optional hardware and software upgrade kit for ADO 1000 and 2000 systems (also shown this year with an optional digital Combiner unit). The effects package makes some of the more popular effects found in the Infinity system available in the lower-cost units, including trails and sparkles behind moving images and smear effects within live video. A composite mode allows ADO images to be internally keyed over stored backgrounds, allowing multilevel graphics to be built using the positioning controls.

The other new ADO feature this year is a digital interface, allowing any ADO system to be connected with another piece of CCIR 601 equipment, such as a DVTR or graphics production equipment. It is thus possible to use the ADO in a digital component production environment, and to do extensive keying and special effects work while still maintaining digital signal quality.

This theme was also echoed by Grass Valley Group in an engineering demonstration of what might one day become a product: a multilayer effects compositing system, based on the technology already found in the Kaleidoscope effects system, in which units can be cascaded in the digital domain, using the output of one effects processor as a key input into the next system. The signal processing in the Kaleidoscope—and in the potential new system—is CCIR 601; but the engineering demonstration was shown with the ability to both input and output 601, RGB, YUV, or NTSC component, and the new product might thus find applications in production and post-production facilities that are not yet ready to completely convert to digital component but want an effects system that can grow from partial to full-scale implementation of the 601 standard.

From Microtime this year comes the RP-1, a SMPTE-introduced 3D effects system featuring a complete range of rotation and perspective effects with a self-contained matte generator. The RP-1 is modular in design, enabling cost-conscious facilities to start out with a 2D effects system then expand to 3D capabilities later. The basic configuration, with a dual-channel combiner analog component inputs, and a CCIR 601 adapter, produces effects such as posterization, mosaics, trails, continuous expansion and compression, linear or curvilinear trajectory, cropping, and bordering.

Microtime also announced at the show that is is lowering the price of its Genesis 1/ACT 1 effects system to $19,995. Composite and component inputs and outputs, linear and curvilinear movement, drop shadows, mosaic, and posterization effects are

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Maximum Mounting Weight: 330 lbs.
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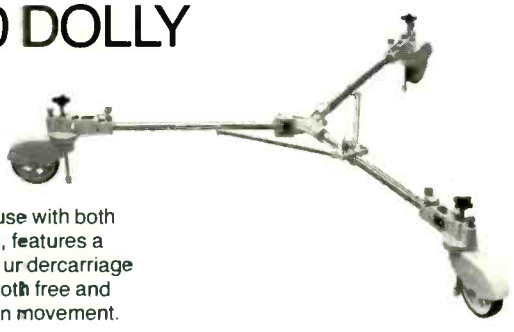

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all part of the basic package.

Digital Economy

In addition to the full-fledged effects systems, there are a number of low-cost effects processors on the market based on digital TBC technology. New from the Alta Group is the Centaurus. Priced at $14,200, Centaurus is a combination digital still store (50 images internally, with up to 2,500 on external disks), A/B video switcher, stereo audio editor, infinite-window TBC, and digital effects processor with downstream keyer, all plainly designed for the post-production suite. It was also announced that Alta is manufacturing the CDS-2000 special effects switcher incorporated with several Convergence editing products (see the section on post-production).

A similar approach has been taken by Crosspoint Latch with its model 8200, priced at $9,795. A production switcher with two 16-line TBCs, it features 12 wipe patterns, joystick positioner, two keying levels, and bordered, soft or hard edge patterns. Effects include pushes, pulls, posterization, and mosaics.

Prime Image showed the TBC-Sync+, a low-cost effects system featuring posterization, sepia-tone, mosaic, freeze (field or frame) and variable strobe (field or frame); list price is $8,888. A version with limited effects—freeze and strobe—is available for $6,666.

GML America introduced the X-Calibre, a dual-channel digital effects processor with dual TBCs, dual frame synchronizers, and dual color correcting processors; it offers A/B transitions, and effects such as zoom, flip, spin, tumble, trajectory, posterization, mosaics, strobe, freeze (frame or field), background color, etc.

In a slightly different vein, JVC introduced a new animation and effects option for the M-1500 (Mindset) titling system (a low-cost 2D character and graphics generator designed for the industrial video market priced at $4995). The new M-4210 option, at $995, provides real-time animation effects such as zooming, flipping and x-y animation movement through the use of special graphics chips and video frame bufferes. The resulting images are completely NTSC compatible, and can be keyed over a video source.

Finally, not to be overlooked as a digital effects system is the Pinnacle 2000 series workstations, which can be configured to include effects combined with still storage, graphics composition, paint, and/or 3D modeling. For more information on the Pinnacle Systems workstations see the 3D and paint sections of this issue.

For More Information

Abekas 399
NEC 400
Quantel 401
DSC 402
Ampex 403
Grass Valley Group 404
Microtime 405
Alta 406
Crosspoint Latch 407
Prime Image 408
GML America 409
JVC 410
Pinnacle 411

Among other advances, CMX showed its Model 100, one of the handiest items at the convention.

Expanded Capabilities, Increased Control Options Characterize Post-Production Developments

Having gone through a development spurt several years ago as microprocessor controllers became both more available and lower in cost, editing systems have remained relatively stable recently. That is, until this show. Not only did NAB mark the first public viewing of the merged EECO and Convergence lines, but virtually every editing system manufacturer had new products on display, some of them substantial departures from former technologies.

Ampex was one, introducing the brand-new ACE 200 system. The original ACE, of course, has been around for several years, and the new system incorporates some of the changes and improvements suggested by current ACE owners. Most notable about the system is that it is modular in design, and can be configured to suit user needs from an A/B editor to a full-fledged, high-end system.

Among the 200's major features are a 6,000-line EDL capability stored on a 20 megabyte disk drive integral to the system whose hardware also includes an LSI 11/73 central controller. Up to 16 pieces of equipment can be interfaced, directly, including all Ampex VTRs, Zeus image processors, AVC switchers, ADO effects as well as other manufacturers' units. Control of other peripherals is offered through 20 GPIs.

Another important feature is the use of internal time line control (TLC) processors separate from the main CPU to control all attached devices. Rather than needing to sequentially poll the devices to determine their status, then issuing control commands, TLC logic allows the devices to be preprogrammed—a far more efficient approach.

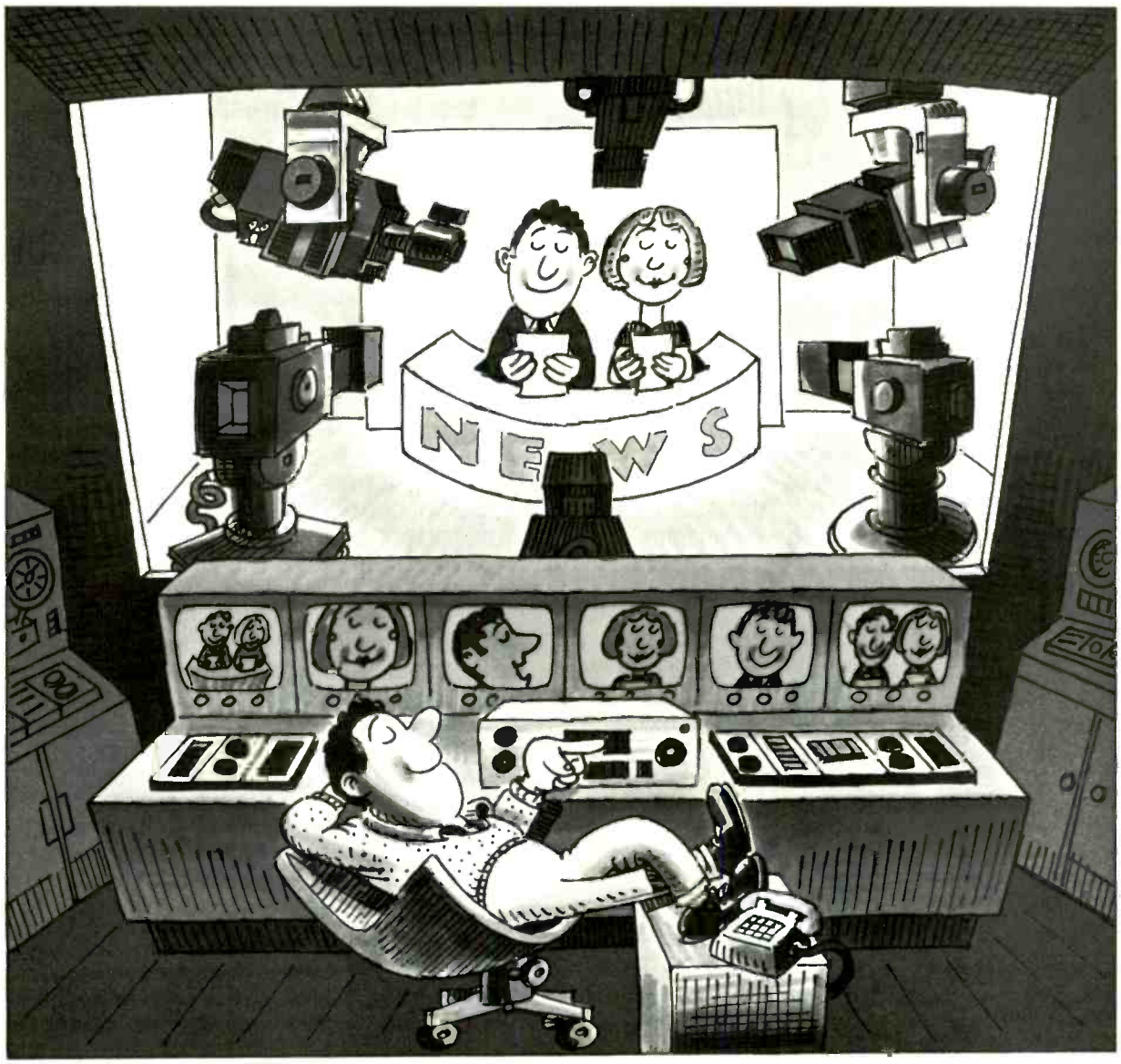
Switcher control is also quite impressive, with the ability to access up to three M/Es on the AVC switchers (including the new Vista model). A set of "learn keys" can be programmed to carry out commonly used and repetitive switcher functions.

Sony, too, had a brand-new editor this year, the BVE-9000, an expanded version of the 900 and designed to replace the 5000 (first introduced seven years ago). Like the ACE 200, one of the 9000's main claims to fame is its modular approach that can be customized for different applications from mid-range to high-end work, both broadcast and post-production.

In its basic mode, it controls up to 14 VTRs and related devices, using a newly designed keyboard to interface with a menu-driven display monitor. Features include assignable recording, four audio channels (permitting two stereo tracks to be recorded simultaneously), full lookahead auto assembly, dynamic motion control, color framing, and control of wide range of video switchers with access to crosspoint, main fader, keyer, dissolve and wipe pattern settings.

For high-end applications, the 9000 can be equipped with up to 28 intelligent device controllers (IDCs) to control 27 VTRs of any format, a switcher, an audio mixer, and 32 GPIs. Using IDC, the system can read longitudinal or vertical time code or control track information from any VTR in any combination. The IDC also offers full learn capabilty to control dynamic motion, and video switcher control is extended to include all switcher panel setups.

CMX this year surprised the industry with the introduction of the CMX-100, a compact A/B roll editor, priced at $19,750 as a complete package, that can be bundled into two shipping



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cases and transported to a remote location. The system also includes a small video switcher for effects, and a small audio mixer.

Other CMX product developments this year are primarily upgrades to existing lines. The 330, for example, priced at $17,750, now features a 3.5-inch floppy disk drive, and incorpo-

The Power and The Glory

Batteries constitute a true paradox in the world of video equipment. This is due, in part, to the essentially unchanging nature of battery technology over nearly the last century. On top of this, there is not a modern television station able to compete in this technologically advanced age without that antique technology. In other words, cameras need batteries, without them—no video. Let it not be said, however, that the battery companies are sitting still.

On the contrary, some of these companies are pushing the "technology envelope" in important areas. This is where the ubiquitous microprocessor comes in. Specifically, such technology is not contained within the battery but within the units that service the needs of a station, i.e. chargers and analyzers.

In this vein, Anton/Bauer introduced at the NAB its MP-8, the latest addition to its Lifesaver series of chargers. It is an eight-channel microprocessor-controlled charger accepting any combination of 12 to 14 volt batteries and automatically identifies the size and voltage of the battery and selects the optimum charge routine and rate for each position. There is a set of LEDs for instant charge status and a 24-character two-line LCD provides detailed charge information for each battery including amount of charge delivered. This display can also read out diagnostics providing information on battery problems an specific cell deficiencies.

Also introduced at the show were the new Gold Standard battery-mounting system and the Mobile fast charger that offers power from almost any vehicle that has its own +12 volt negative ground dc power source. It can function with or without the vehicle running providing a one-hour charging system incorporating logic-controlled charge monitor circuitry and battery-coupled all-cell sensing system.

True to form, Perrott offered impact products in the new technology arena represented most accurately by the Quad 441 charge/discharge unit and the new Micromini charger, model 383. The unit provides available charging for 12, 13, 14, 15 V batteries and works from 115 or 230 volt power for operation anywhere in the world. In another response to customer needs, Perrott introduced the 309S sidemount silver zinc on-board battery. It was designed for almost any camcorder combination and mounts under the end of the camera, giving room for the recorder and better balance to the unit overall. It runs the average two-piece for 2.5 hours and weighs 2.5 pounds.

Of course, Frezzolini has one of the broadest product lines in the business and brought the whole package to the NAB. Among the most interesting items on display was the UPS (Uninterruptable Power Source) interface. This unit fits all standard mounting brackets and fits between the camera and battery. When a battery needs to be replaced, it can be removed and the camera will still operate for 10 to 15 minutes until a fresh battery is put on. The UPS interface automatically recharges itself from camera battery and weighs less than 1.5 pounds. This system was installed on several cameras and on an Ikegami microwave link. In addition, the full line of batteries, chargers, lights, and accessories was on hand.

Alexander, too, brought its set of chargers based on new technology. The Smart Charger handles up to three packs in the 12 to 14.4 volt range while detecting when batteries are fully charged. The Tri-Analyzer determines remaining capacity in VTR batteries with an LED display showing capacity in MAH. The analyzing procedure also dememorizes and recharges the cells. The complete range of versatile batteries was also demonstrated.

Several interesting items appeared in the Cine 60 booth. The Hitch-hiker master overnight charger dememorizes and reconditions and is designed for any 4 AH 6 to 30 V NiCad. The Power Miser battery belt is an economic solution for shoulder-weary camera persons and, according to the company, provides three times the power of a typical battery.

PAG is a rapidly growing force in the power field and one of its important products is the PAG-lok system. It is an improved mechanical and electrical camera-to-battery interface system allowing a variety of batteries and battery holders to be attached. In addition, the PAG Micro Master charger is outfitted with the system. The range of BP 90 type replacements were on hand as was the horizontal mount system for camcorders, incorporating the PAG-lok system. It was also announced at the show that CBS is adopting the mounting system for its crews.

Dememorizers and chargers and analyzers carried the day for new entries at the show. Paco, a new Japanese firm, showed a four-channel dememorizer system with built-in discharger that operates, without switching, on ac 100V to 240V 50/60 Hz. Its companion charger, the KD240, was displayed with its ability to charge four batteries consecutively. Other products, including NiCad battery packs and replacements, were also on display.

"WITH THE ODETICS CART MACHINE I DON'T WORRY ABOUT MAKEGOODS!"

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Chief Engineer
KWHY
Los Angeles

Until they installed the Odetics Cart Machine, errors, both human and mechanical, were a costly problem for KWHY.

According to Dave:

"We're a very busy operation. Although much of our programming is live, we air over 200 carts in a nine hour period -- that's programming, promos and station IDs as well as spots. Therefore, we need a cart machine that will consistantly air the right tape. With the Odetics Cart Machine, discrepancies and makegoods are extremely rare. Now we're airing a high quality product every day."

The Odetics Cart Machine can automatically manage, record and play-to-air all forms of spots and programs -- including events as short as one second.

The Cart Machine has improved efficiency at KWHY in another way.

"I like the fact that The Cart Machine is quiet and contained because we're in extremely cramped quarters. Our old equipment was cumbersome and noisy, creating a hectic atmosphere," says Dave.

Daily program schedules are smoothly transferred from the traffic department because the Cart Machine interfaces with the traffic computer and automatically downloads the schedules. Armed with a 65,000 cart database and 1,600 event look-ahead feature, The Cart Machine can automatically preplan spot play lists hours, or even days, in advance of airing.

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rates three machine interfaces on a single plug-in card.

The 3600, an upgrade of the 3400A, now sports dual eight-inch floppy disk ports and a 3.5-inch port, and is considerably faster in operation, especially in EDL management. It also now features EDL rippling. The price is $47,000—the same price as the 3400A used to be. Meanwhile the 3400A's price has been reduced to $35,000.

Grass Valley Group's new editing products this year are memory and software upgrades for its existing systems. In addition to 2 MB of extended internal memory and memory management, the new 51Em upgrade of the 51E uses a unique "BIN" memory register concept to considerably augment list management capabilities. Designed for large editing projects where multiple edit decision lists are built — such as a feature film where there is a director's cut, producer's cut, editor's cut, and so forth. The system maintains eight separate memory register bins in active memory, each containing some 1,000 edit lines. Section's of each bin's EDL can be copied to another bin, of portions plit off and put into separate registers for later recall.

Grass Valley also introduced the System 41m, an expanded version of the System 41. Memory expansion to 256 KB is the key new feature, expanding EDL capability to 1,000 lines.

New for both the 51Em and the 41m is V. 4.0 of the operating system, featuring XEDL, an EDL utility allowing other manufacturers' EDL data to be read into the GVG system and incorporated with its data. V. 4.0 also features expanded diagnostics, and direct preview of program materials from component VTRs.

At the Convergence booth, as noted, visitors were given their first view of the integrated Convergence/EECO editing products line, ranging from the ECS-90, 240X, and 1000 products from Convergence, (now a wholly-owned EECO subsidiary) to the EMME and IVES from EECO. As time goes on, it is anticipated that the products will become more and more integrated into a single line.

Meanwhile, new product development has not stopped. New this year was the CDS-2000, a serially controlled digital effects system programmed from the keyboard of the Convergence ECS-195LM A/B roll editor or triggered by a GPI pulse from the IVES Pro. The system is manufactured specifically for Convergence by The Alta Group and performs dissolves and nine wipe patterns including pushes and pulls. The switcher has five stereo audio inputs; four video inputs include two VTRs, camera, and internal black and sync.

Another new product is a computer-style workstation for the EMME—a color-coded computer-style keyboard, also incorporating a joystick for VTR motion control, in a compact, standalone unit.

From Paltex there was considerable new product development in the "E" Series of editors, which have now been technologically revamped so they form a modular, upgradable system ranging from the Excel and ES/D-P to the Esprit Plus (priced at $50,000 for a six-machine, serial interface system). New member of the family this year is the Elite, a cost-effective ($13,600) entry-level system consisting of an A/B roll editor complete with serial interfaces for VTRs and three RS-422 ports for interfacing audio mixers, digital effects, switchers, etc. This editor, like others in the "E" series, is marketed by the JVC dealer network in addition to Paltex's own dealers.

New in the Esprit Plus is a non-volatile memory for the EDL, plus the three RS-422 ports for interfacing peripheral equipment. All the "E" Series products now also feature time code phase compensation that overcomes code phase synchronization problems when interchanging cassettes. The Paltex system monitors off-tape phase relative to reference black and automatically compensates for errors.

Time code phase problems were also addressed by Calaway, now a subsidiary of Quanta Corp. (a Dynatech company) with its time code phase compensator (TCPC), a standalone unit with a graphic display that compares the phases of the two VCRs' signals. When the two bars are illuminated, they are in phase. If one is moving, time code and sync are not locked to the same reference. If the bar is stationary but not centered, it indicates how much compensation is needed.

Calaway also introduced the CED MK II editor, offering control of six RS-422 protocol VTRs for a price in the $22,500 range. The new editor incorporates as standard all the software features found in the earlier CED machine, now resident in an 80286-based microprocessor housed in a rack-mounted chasis with standalone monitor, keyboard, and motion controller. Edit lists are generated in industry-standard formats.

One of the most exciting new editing products at the show was the Comm-Ette from United Media. One of its claims to fame is that it's the only A/B roll editor (base price is $6,990) that can later be expanded into a full eight-machine editing system. Other sophisticated editing functions built into the low-cost controller include EDL managmeent with ripple, split audio/video edits, match-frame dissolves using "smart" key, 250-event memory, animation editing mode, and programmable GPI-10.

Videomedia, too, showed its low-cost editors: the Mickey 1 (cuts only) and Mickey 2 (A/B roll); and the Eagle and Magnum editing systems.

Keeping It Digital

Perhaps the biggest news in post-production at the show, however, was not about editing system developments but about how signals can be recorded and processed and reprocessed and rerecorded without ever leaving the CCIR 601 component digital domain. Various developments in special effects processors, graphics systems, and production switchers are discussed in separate sections, as are new developments in digital VTRs. The new tools that are being looked at with increasing interest in the post-production community, however, are solid-state and digital disk recorders, and NAB had some surprises.

The most significant new introduction was the long-awaited Abekas A64 digital disk recorder. It shares many of the same features as the already enormously popular A62: 50- ($175,000) or 100-second ($275,000) capacity; simultaneous recording and playback, allowing effects to be layered *in real time*; variable playback speeds; and random access to recorded material, allowing sequences to be built with a transparent checkerboard. But there is one important difference—the A64 is a digital component machine rather than digitial composite, conforming to the CCIR 601 specs and therefore able to be interfaced with other pieces of 601 equipment such as digital effects processors and DVTRs.

Another brand-new feature, not found on the A62, is internal chromakeying in addition to luminance keying, allowing the creation of key masks. The A64 also incorporates two separate video stores, allowing foreground and background to be created independently then combined through the keyers.

Abekas also announced that at

SIGGRAPH it will unveil the A60, a lower-cost version of the disk recorder without internal keying or simultaneous playback/record capability. The A60 is primarily designed for animation recording, and will take an input directly from a graphics workstation.

A real surprise at the show was the announcement that Microtime had picked up exclusive North American sales, manufacturing, and service for the Vision 4 disk recorder/video processor from PVK, a West German manufacturer. The product has been available for a couple of years, but lacked American distribution.

Vision 4 is a full-fledged system, recording 160 seconds of video as standard, with an option to expand to 340 seconds. This system conforms to CCIR 601 specs, and can be accessed by two control panels at once, but does not have simultaneous playback and record. Instead, foreground, background and key are stored in different memory locations then mixed together internally through a mixer/keyer. In its edit mode, the system can assemble and output cuts with up to 64 segments. As in the demonstration of digital production technology offered by Grass Valley, with a Kaleidoscope-like engineering prototype shown capable of inputting and outputting different forms of composite and component signals, Vision 4 accepts and puts out: RGB; Y, R-Y, B-Y; CCIR 601; and NTSC (when outfitted with an encoder and decoder). The price for the 160-second version is set at $225,000.

Still another new digital disk recorder, primarily for recording animation output from its FGS-4000 and 4500, was shown in prototype by BTS. The recorder, which produces CCIR 601-compatible output, stores 25 seconds of material.

The other company with a major committment to digital recording is Quantel, whose Harry forms part of the Quantel Digital Production Center, tying together the Paintbox, Encore, and Mirage. As time goes on, however, Harry becomes more and more powerful as a graphics tool in its own right, and this year was shown with several new software enhancements as well as a package of operating system refinements.

The new software package, Rainbow, is a series of color capabilities resident in Harry itself. The operator now has control over an image's gain, offset, and saturation, permitting both color grading and also color matching, either frame-by-frame or across an entire scene. Harry also now

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offers effects tracking and comet-tail effects, features normally found only in digital effects systems. The software also allows for "dynamic rounding," a patent-applied-for process enabling digitally-generated images to be combined in a scene without annoying interference artifacts.

Improvements in the operating system include nonadditive mixing, an improved clip library management system, and a library for storing keyer setups.

Equally interesting technologically, although not yet developed quite as far as a post-production product, was NEC's SR-10 solid-state recorder. That's right. RAM memory has gotten so compact and so relatively inexpensive that it is now possible to store 34 seconds of NTSC video on the system's 3,000 newly-developed one megabyte chips—a total memory of three gigabytes!

The system uses component, YIQ internal signal processing, and so unfortunately does not conform to CCIR 601. And the initial application demonstrated at NAB is for sports slow-motion; to this end, the memory can be soft-segmented into four discrete channels, allowing the director to isolate four cameras at once. The very next application being explored, however, is for animation production, and the recorder already comes equipped with a mixer/keyer and simultaneous recording/playback capability. The price will be in the $120,000 range.

For More Information

Ampex 412
Sony 413
CMX 414
Grass Valley Group 415
Convergence 416
EMME 417
Paltex 418
Calaway 419
United Media 420
Video Media 421
Abekas 422
Microtime 423
BTS 424
Quantel 425
NEC 426

Telecines: "New" Market in Broadcast

With all the advances in electronic technology and videotape recording, it is easy to neglect the fact that a great deal of program material still originates on film, and that many TV stations today are still doing a lively business transferring film to tape, or airing film directly. Even the manufacturers appeared to have forgotten for a while, and so with stations still using an older generation of telecines from Ikegami and RCA, the more exciting development work was going into developing solid-state telecines for the post-production environment.

All that may be changing now, with both Rank Cintel and Bosch trying to carve out substantial market niches in broadcast as well as post-production facilities. "We already have a dominant share among post houses," confessed Colin Brown, executive VP of Rank's U.S. operation. "Now we need someplace to grow." Gaylord Broadcasting has bought two of the units for its operations in Milwaukee and Cleveland—but that is just the beginning.

That new marketing approach manifested itself in several new developments for Rank's ADS 1 CCD broadcast telecine introduced at the show. Most important is that a newly upgraded version of the ADS Amigo preprogrammer is now available for use by broadcasters. Any of the telecine's vital functions, including variable speed (for time compression and expansion), auto editing and error correction, pan/scan, and x/y zoom can be set up in advance for any program. The operator can also program color balance, gain, gamma, and ped settings. Sections of preprogrammed material can be stored in one of seven memory registers, and portions copied from one register to another, or different sets of decisions compared side-by-side—much like an edit decision list.

Another innovation in the Rank line is a new CCD dual-line delay adaptive comb filter decoder that helps eliminate NTSC artifacts such as chroma crawl and edge boiling and greatly reduces cross-color flaws. The decoder, designed to be used in conjunction with the telecine, senses vertical color transitions and adapts to "simple" decoding to maintain absolute vertical resolution.

BTS (Bosch), which owns the other part of the post-production telecine market, is also becoming extremely broadcast-conscious these days. The FDL-60, also based on CCD line sensor technology together with a digital framestore, offers a special package of features designed for broadcast applications: variable-speed playback from 16 to 30 fps for slow-motion effects and time expansion; programmable freeze and un-freeze on selected frames; selection of different types of film stocks; pan/scan for wide-screen films; manual color correction in conjunction with the playback timer; and automatic 1-2 changeover. A film-grain reducer software package is also available, helping cut down on unwanted film artifacts during transfer or airing.

This year there was also a brand-new telecine on view at NAB, the Copymaster from Dwight Cavendish Co. The company, which manufactures videocassette duplicating equipment, plainly intends the telecine for film-to-tape transfer in duplicating operations. Priced at $35,000 for the

Merlin Engineering's ME-438 Bar Keeper is a library management, identification, and control system for Sony Betacarts. It prints bar code labels and hardcopy lists of all cassettes in the system.

16/35mm model, the unit features interchangable gates for all film formats, with a 35mm wet gate available as an option. The Copymaster uses flying spot scanner technology, with a floating scanning window to eliminate CRT burn and increase tube life. Other features include variable speeds, choice of negative/positive film stocks, and pan/scan.

For More Information

Rank Cintel 427
BTS 428
Dwight Cavendish 429

Automation Abounds

There are hot product categories every year at NAB, and in 1987 automation was definitely one of them. Computerized automatic systems are not new to broadcasters, but each year their popularity increases. The industry is attracted by the savings automation offers in labor costs, and by the unequalled precision they provide in playing—and keeping track of—what is broadcast. Automation is having a direct impact not only on commercial and program playback, but on master control and routing as well. In automation—as in any product area—manufacturers are taking various approaches to the subject.

The age of the MERPS

Automation was at the core of a major announcement at NAB, when it was revealed that NBC agreed to acquire two Odetics TCS2000 Cart Machines for use by the network's first-line news and commentary shows. The deal also calls for joint Odetics/NBC software development to interface the TCS2000 with the NBC automation system. The TCS2000 Cart Machine is one of several products that come under the heading of MERPS (multiple event record and playback systems).

MERPS are computer controlled, multicassette machines (six M-IIs in the case of the NBC application) for playback or recording at preprogrammed times. MERPS range from hand-loaded machine control sequencer systems to those featuring large-capacity cassette-storage carrousels and robotic pluckers for transporting tapes to and from players.

MERPS—especially the robotic versions—virtually eliminate makegoods for spot playback; for news, they allow last-minute changes in video report sequencing. Program playback and timed recording of satellite feeds can also be handled. With the proper software, a MERPS can in-

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terface with any computerized traffic and billing system.

Odetics showed its TCS2000 Cart Machine in both M-II and Betacam versions. It holds 280 cassettes in its library, and can database 65,000 more. Meanwhile, at the Sony booth, other MERPS were on hand. Sony displayed an updated prototype of its Library Management System, outfitted with Betacam SP VCRs. The unit holds 1200 cassettes, and should be ready for delivery in one year. A 4fsc composite digital version is also on the way. Sony's Betacart, meanwhile, was demonstrated with its new News Presentation System, offering full status display of all tapes in the system, and the ability to change tape sequence instantly.

Ampex showed the ACR-225 automatic spot player, employing the composite digital format on standard D-1 cassettes. The system holds 256 cassettes on line, includes playlist management, and will be ready for delivery next year. Panasonic Broadcast Systems demonstrated its M.A.R.C. (M-II automated recording/playback cassette system) I and II models, which accept both sizes of M-II cassettes. The 100-cassette M.A.R.C. I is geared for news; the M.A.R.C. II accommodates a maximum of 1179 tapes, and is suited for long-term unattended play of any length spot or program.

Another entry into the MERPS field at NAB '87 was Lake Systems, which introduced their ALS, or Automatic Library System. Unlike the La-Kart system, ALS features a robot gripper, and will library up to 1,500 cassettes of any format. Asaca demonstrated the ACL-6000C video cart system, which holds 600 carts, expandable to 8,000. Dubner Computer Systems created the unit's software, which this year includes new fault detection codes and a total station automation option.

Among the nonrobotic MERPS were cart sequencer systems from Grumman Broadcast Systems, whose AIS 5000 offers not only computerized control of spot insertions but complete automation for sales, traffic, and billing. Townsend Broadcast Systems, which has acquired Broadcast Systems, Inc., since last year's NAB, showed the popular DC-80 and DC-800 video cart sequencer systems in the Townsend booth. Townsend has designed the DC-80 and DC-800 for spots and programs, respectively.

Videomedia displayed its Q-Star IIA automated playback system, and the VMC-2000 and VMC-3000 control systems for the Q-Star IIA. From Channelmatic comes two new automation products: the Adcart 2+2 fully random access ad insertion unit that can control up to eight VCRs on one channel; and the Broadcast Break Sequencer for noncomputer-controlled sequential playback. Channelmatic also offers the Li'l Moneymaker and Spotmatic Jr. for CATV systems, and the Broadcaster I, a juke-box-style changer holding 15 U-matic cassettes.

Automation Integration

Automation systems designed around a technical, master control/machine control approach have an even broader role in the modern television plant than do MERPS units. Control of VTRs, MERPs, still stores, telecines, earth stations, master control, routing, and distribution either are or can be included in the operation of such systems, which aren't meant to replace the human master control operator, but to make his job easier, more precise, and less tedious.

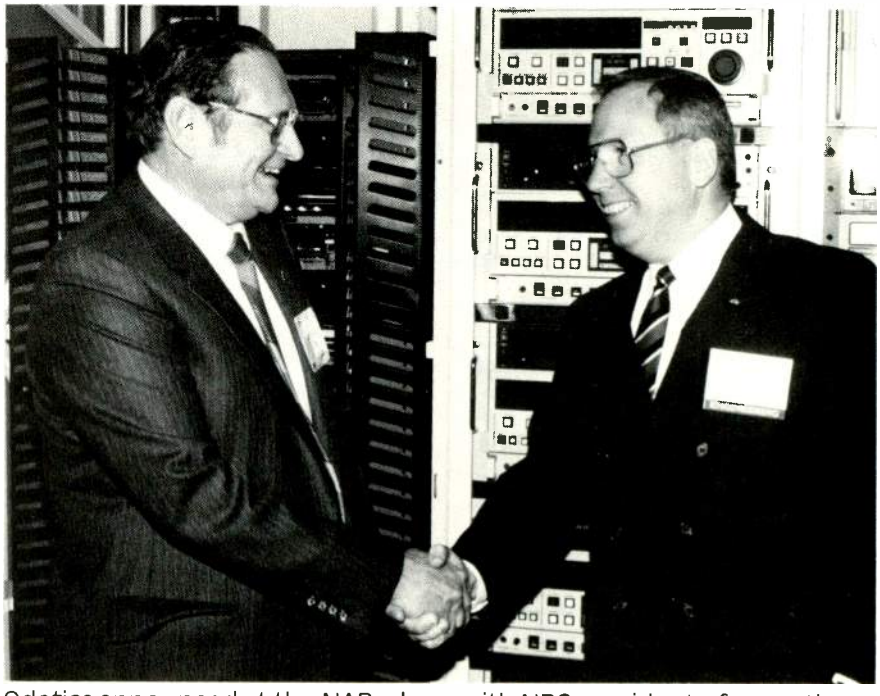
Stated simply, these systems download schedules from a traffic computer; enable operators to instantly access the status of those schedules and make changes up to time of air; execute switching and machine rolling; and upload "as run" logs after schedule execution.

It's all in the system

Grass Valley Group's M200 modular automation system allows the user to choose several ascending levels of automation, from manually actuated single-event preroll, to completely preprogrammed 24-hour automatic operation. The M200 works in conjunction with GVG's 1600-4S master control switcher, more information on which appears in the next section.

BTS introduced a proven European automation system to the U.S. at NAB '87; the BTA-2300 station automation system controls the BTS MCS-2000 master control switcher and the TVS/TAS-2000 distribution switcher, and the TCS-1 machine control system. The BTA-2300 is based on the powerful Hewlett-Packard 9000 series 320 computer, and can include a color terminal with touch screen, and a mouse for total control up to time of air.

Utah Scientific, part of the Dyantech Broadcast Group, has added numerous enhancements to their SAS-1 station automation system, creating an SAS-2 version. Like its predecessor, it takes charge of audio and video switching, plus the automatic control of machine functions necessary for continuity. New enhancements include an all-color CRT display with brilliant red warning notices, 20-megabyte drives for greater storage,



Odetics announced at the NAB, along with NBC president of operations and technical services Mike Sherlock, that the network would use the Odetics cart machines equipped with M-II decks.

and windows to display complete instructions for every function. Utah Scientific (which celebrates its tenth anniversary this year) has announced that it is now offering a ten-year parts and labor warranty on all their products, including those presently in the field.

Alamar Electronics has updated its MC-1050 sequencer system, using smaller disk drives and faster processing to create the new MC-1055 model. Like the original, the MC-1055 uses a distributed intelligence approach to remote machine control, communicating with machine interface controllers over the ESbus. Another new Alamar product is the RCMP-5 remote control panel, which works with the MC-1055 and other Alamar automation products. An assignment panel, users can add from one to ten RCMP-5s, and have full remote control at any location over VTRs, switchers, telecines, character generators, and general purpose closures.

Software is an equal partner with hardware in automation, and Merlin Engineering showed three complimentary software packages for master control of Sony Betacarts. The Q-Driver system allows operation directly from a traffic system of Betacarts alone or with any other Sony protocol machines. The ME-438 Bar Keeper is a library management, identification, and control system for Betacarts; it prints bar code labels and hardcopy lists of all cassettes in the system, and keeps track of their whereabouts. Bar codes are also used with Play Lister software, also for logging and management of system cassettes. Rack-mounted versions of Q-Driver and Bar Keeper were introduced.

Spot reeling is often an important part of station automation, and for this purpose AF Associates showed the Pegasus commercial compilation system. Program schedules are input into Pegasus, which can generate three different types of edit lists, including transfer of spots from master reels, compliation of daily reels, and deletion schedules. A total Pegasus automation system is being developed.

For More Information

Odetics 430
Sony 431
Ampex 432
Panasonic 433
Lake Systems 434
Asaca 435
Grumman 436
Townsend 437

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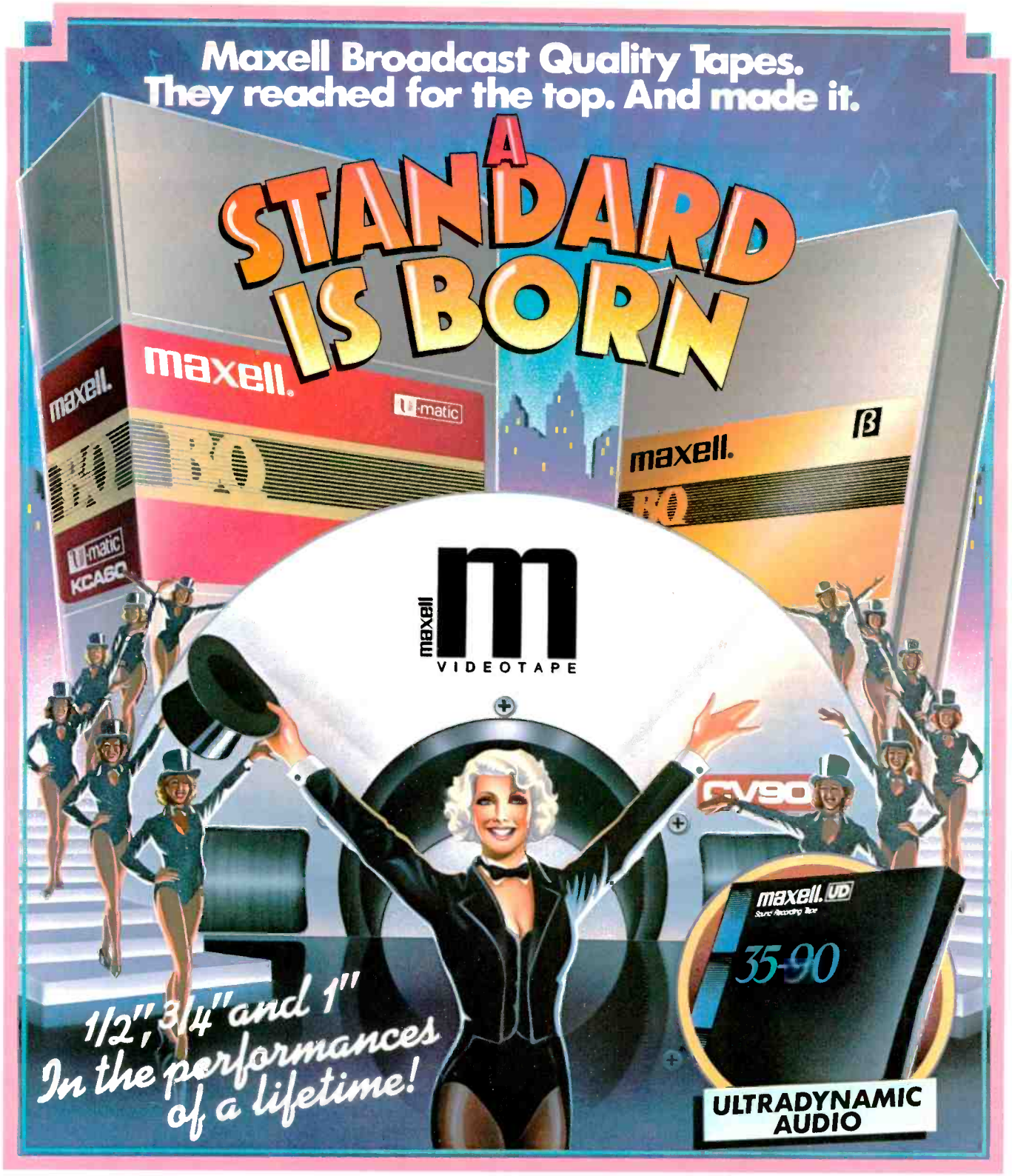

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Videomedia 438
Channelmatic 439
Grass Valley Group 440
BTS 441
Utah Scientific 442
Alamar 443
Merlin 444
AF Associates 445

Masterful Master Control

Where the industry goes, so goes master control, the funnel through which everything must pass before air. Automation continues to have its impact on the design of master control switchers, and this is dramatically evidenced in Utah Scientific's new model MC-502B unit, which was designed from scratch to interface with their SAS-2 automation system. The MC-502B employs a new high-speed 16-bit processor, giving it—among other things—considerable preset capabilities. The trend toward stereo audio in television is also seen in this new switcher, which sports six VU meters for right, left, and SAP for both program and preview. Channels can be reversed with a keystroke to avoid phasing problems.

Grass Valley Group's model 1600-4S master control switcher is also designed for seamless interface with their automation system (the modular M-200 system), and this year it too has been enhanced for MTS. The 1600-4S now has separate right and left program audio controls in addition to a SAP control; LCD VU meters for the three audio channels; and a six-input master control bypass. The bypass allows the user to rehearse with the switcher even while feeding programming to the transmitter. The bypass feature even has its own power supply.

BTS, the joint company of Bosch and Philips, is another industry leader taking the integrated master control/automation approach. Their new BTA-2300 station automation system and their proven MCS-2000 switcher are designed to work together hand in glove, although the MCS-2000 offers some of the features of an automation system all by itself: an output for automatic logging to a printer; an event stack option providing 100 preset buses, and a CRT to display full status on each one. Mix keys, key mixes, bordered video keys, and color bordered matte keys are among the MCS-2000's other features.

At 3M's booth a brand-new master control switcher was introduced, the model 324. It can be integrated with 3M's other switching systems, and it provides 32 audio/video inputs, four assignable inputs with alphanumeric readouts, and full audio over and under capability. Ease of operation with the 324 is stressed by 3M, which points to the unit's ability to perform keys, dissolves and cuts, and transitions to and from programming information. The model 324 offers an event stack processor option that provides 99 preset events accessible with a single keystroke. Automation control is another option.

Image Video displayed their model 8200 master control switcher, which features digital clock timer to indicate real time, elapsed time, and countdown in 12- or 24-hour time modes. Automatic pre-roll allows for adjustment increments of .01 seconds to 10 seconds for each of 30 inputs. The compact 8010 and 8020 models were also shown.

Intergroup's 8000 series master control switchers were at NAB '87; input configurations in the series come in 12 and 20 inputs, with larger designs available by special order. The series offers stereo audio, machine control of VTRs, film islands, and external RS-232/422 control.

From Vital Industries comes the VIX-115 series switchers, available with from 2 to 5 buses. All offer 16, 20, 24, or 30 audio follow video inputs, including color black and color background; all interface with Vital's station automation manager (SAM).

For More Information

Utah Scientific 446
Grass Valley Group 447
BTS 448
3M 449
Image Video 450
Intergroup 451
Vital Industries 452

Dynair unveiled the Dynasty and Dynasty 100 series routers, for every switcher application. They are made for video, audio, and control signals of up to 100 MHz in bandwidth. A direct fiberoptic output is available, too.

Routing to New Destinations

The plethora of new signal standards demand routing and distribution systems with greater bandwidth than has been available in the past, and NAB '87 saw this need addressed, with new products designed to handle the broadband signals of HDTV, component, digital, and high-resolution computer graphics.

Dynair unveiled the Dynasty and Dynasty 100 series that will permit the switching, control, and distribution of video, audio, and control signals of up to 100 MHz. These products are compatible with today's standards, too. Connectors are of the 75 ohm high-density BSM type, allowing quick expansion to 1000 x 1000. Dynasty switchers were also used to route signals from Quantel Paintbox, Ultimatte, and HDTV cameras at the 4:2:2 digital production studio at the Sony booth.

Another significant development was the announcement of a joint agreement between Dynair and Artel Communications to become a source for high-bandwidth fiberoptic distribution networks. The partnership will create turn-key systems for every conceivable type of video user, broadcast to corporate. Dynair demonstrated the Dynasty 100's direct fiber optic output, passing 120 MHz RGB signals from an image generator to Artel Communications's CG203 optical receiver via 1500 feet of fiberoptic cable. Test equipment indicated no signal degradation in the system. In another development, Dynair announced a five-year warranty covering all products manufactured after March 1, 1987.

At Artel's booth the T3065 low-

power laser transmission system was exhibited; it is for sending EIA 250B video and audio signals up to 25 km over single-mode fiber. Artel also supplied a 1,000 ft. fiber optic link to carry HDTV RGB signals for the NAB's HDTV demonstration at the show.

Grass Valley Group offers routing choices to suit every user, and their price/performance policy is the impetus behind their new Ten-20 and 20-Ten video and audio routers, which are full-function, affordable systems requiring only one rack unit per matrix. As the name indicates, 10 inputs-by-20 outputs (and visa versa) are provided for; either may be configured for video only, audio only, or video plus multiple audio. The units are available in component or composite versions. The switchers have four control levels, and communicate with remote control panels via shielded audio cable. Price/performance is also behind the line of 10 x 1 routing systems, each of which offers stereo breakaway, audio, and differential inputs for both video and audio.

Grass Valley Group's Horizon routing systems not only take care of signal distribution chores, they provie reliable parallel machine interfaces to transmit bus commands and report machine status back. Any major PC can run Horizon routers and program control panels. Other new products include an intelligent telephone interface for the control of Horizon routers from any Touch Tone phone. Fiberoptic transmission systems from Grass Valley Group, meanwhile, include the Wavelink model 3290/9/1, and the EZ-Link series 87.

At BTS, a new generation of signal distribution and switching equipment made its debut, under the name of the 350 series product line. It can handle 30 MHz with a full slew rate for wideband signals. The 350 series—designed in a compact, 3.5-inch rack frame—includes a wideband distribution amplifier (DA), audio DA, compact 10 x 10 video switcher, and the compact 20 x 1 stereo audio switcher. The TVS/TAS-2000 video/audio distribution switching systems were also on hand at BTS. TVS/TAS-2000 offers a broad range of user-configurable video-audio switching and control panels, including facilities for adding extra units to expand existing systems.

Utah Scientific's AVS-1B routing system offers video bandwidth of over 60 MHz—subject to size limitations—and features that include 10-year memory retention of reprogrammed data and matrix status, up to eight separately addressable switching levels of up to 320 inputs by unlimited outputs, and BNC video and compression-type audio connectors. A full line of reprogrammable router control panels make any routing scheme possible, providing individual control and statusing of up to four switching levels.

The popular Series H routing switcher systems were shown at the 3M booth. Designed as a space-saving, high-specification system offering versatile controls options, Series H can be expanded to any size, and configured with any combinatin of video and audio program, time code, or other required signals. The company also showed their Routing Switcher Control System for linking control locations with a series H routing switcher matrix. The 3M ESbus machine control system, highlighted at the show, can be linked to the routing control system to handle serial or parallel machines.

NEC also took up the wider bandwidth gauntlet, and entered the routing arena in the USA for the first time. The new series 500 video/audio routing switcher handles bandwidths of 30 Mhz, provides vertical interval switching, and is designed around a building-block approach that can be expanded to a 512 x 512 matrix. The series 500 features decentralized control logic, with continuous and automatic line monitoring to protect against common mode failure, to provide token passing system protection, and to allow node station exchange during system operation.

Image Video has also seen the broadbanded future, and is preparing for it by introducing the model 9400 RGB (Y) routing switcher; it's a fully self-contained high density routing switcher with built-in power supply, all necessary control circuitry, and a frequency response of more than 30 MHz. Also new is the VDA-980 video DA, with a frequency response of 50MHz, and its companion ADA-990 audio DA, designed for handling component, HDTV, and MTS signals.

Di-Tech introduced many new products: Version 2 software, diagnostics, and a redundancy feature for the model 9001 color CRT system controller; several sophisticated new alphanumeric control panels for the 9001, offering extensive status reporting features for both sources and outputs; and the first showing of the model 5860 audio-video vertical interval

The new Harris model 642f frame synchronizer/time base corrector features up to 12 dB of Smart Noise Reduction that is automatically applied to the amount of noise measured in the video.

routing switcher, each frame of which houses a 64x32 matrix with dual power supplies, dual audio, but occupies only 15 rack units of space, including serial control electronics.

Central Dynamics's SDS-2 high density router includes a resident microprocessor programmed to offer a variety of switching choices. The SDS-2 packs 256 hybridized cross points into each rack unit, and it also includes security locks for on-air bus protection, programmable alphanumeric labels, diagnostics, and RS 232 and 422 ports for linkage to machine control and automation systems.

From Datatek comes: the new D-4325 25 x 1 routing switcher, offering local control or serial remote control by an automation system; the new D-2400 routing switcher system designed for stereo and compactness; and the new D 531 stereo audio DA with generous headroom, low noise, and wide dynamic range.

Videotek brought their established line of routing switchers to Dallas, including the 18 x 1 AFV routers, 12 x 1 video only, and 10 x 1 with audio follow video with breakaway features. New for NAB '87 from Lenco is the PVA-352 high quality utility video distribution amplifier, with front-mounted power status LED, and front-mount gain control . . . Leitch showed a new ADA-881 audio distribution amplifier with 100 dB s/n ratio . . . ICM Video introduced three new passive routing switchers for general purpose uses.

For More Information

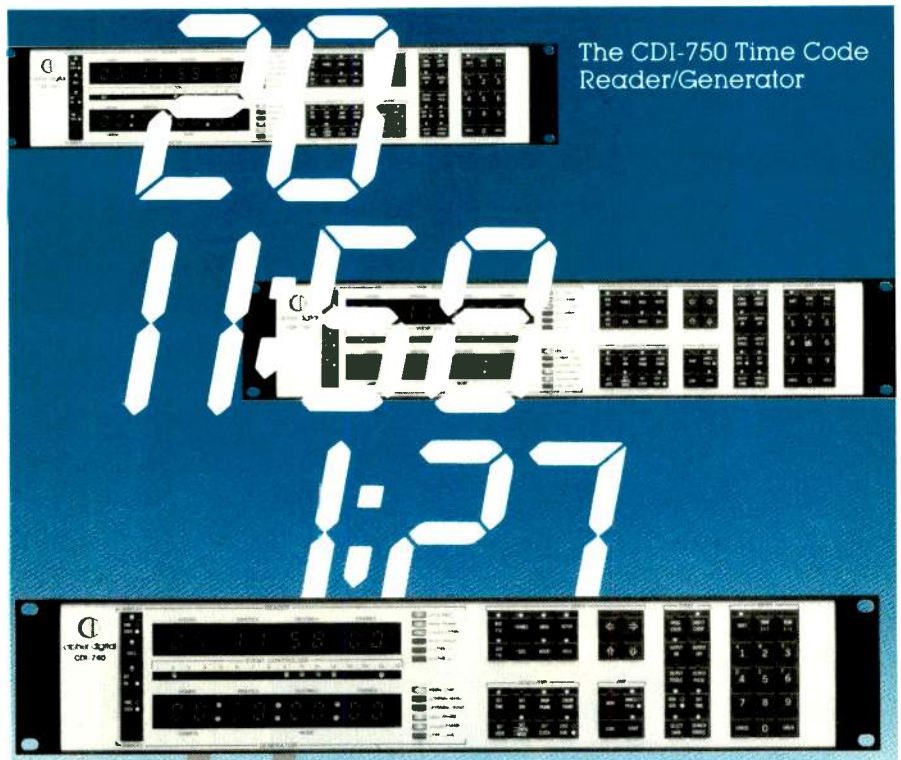
Dynair 453
Artel 454
Grass Valley Group 455
BTS 456
Utah Scientific 457
3M 458
NEC 459
Image Video 460
Di-Tech 461
Central Dynamics 462
Data Tek 463
Videotek 464
Lenco 465
Leitch 466
ICM 467

Signal Processing for Every Need

As the industry changes, so too does the way in which it employs video signals. New signal uses in turn impose new requirements on time base correctors, and manufacturers responded with TBCs designed for high performance and special applications, such as graphics and mobile vans. Truly, it is a dynamic market that is dedicated to the creation of stable pictures.

The new Harris model 642f frame synchronizer/time base corrector features up to 12 dB of Smart Noise Reduction that is automatically applied to the amount of noise measured in the video. The product offers one input each for synchronization and time base correction, and enables users to select the most needed function and provides for clean switching between remote feeds and VTRs. In a special introductory offer, Harris has lowered the price of the 642f until the 26th of this month.

Panasonic introduced its model AU-TB50 advanced TBC as part of its MII ENG/SNG field edit system. The unit features correction capability of 32-line in the baseband component, and is designed to connect to Panasonic's AU-550 field edit recorder to provide noise-free picture playback at speeds of from −1x to −2X normal speed.



More than just a matter of time

The CDI-750 is a full function reader, generator, character inserter and programmable 16-event controller all rolled into one. In addition to simultaneously generating and reading time code, this intelligent microprocessor-based instrument offers a programmable jam sync mode, built-in time of day clock, and an RS-232/422 computer interface. And with front panel controls, the CDI-750 is an easy unit to operate, affording the user greater flexibility.

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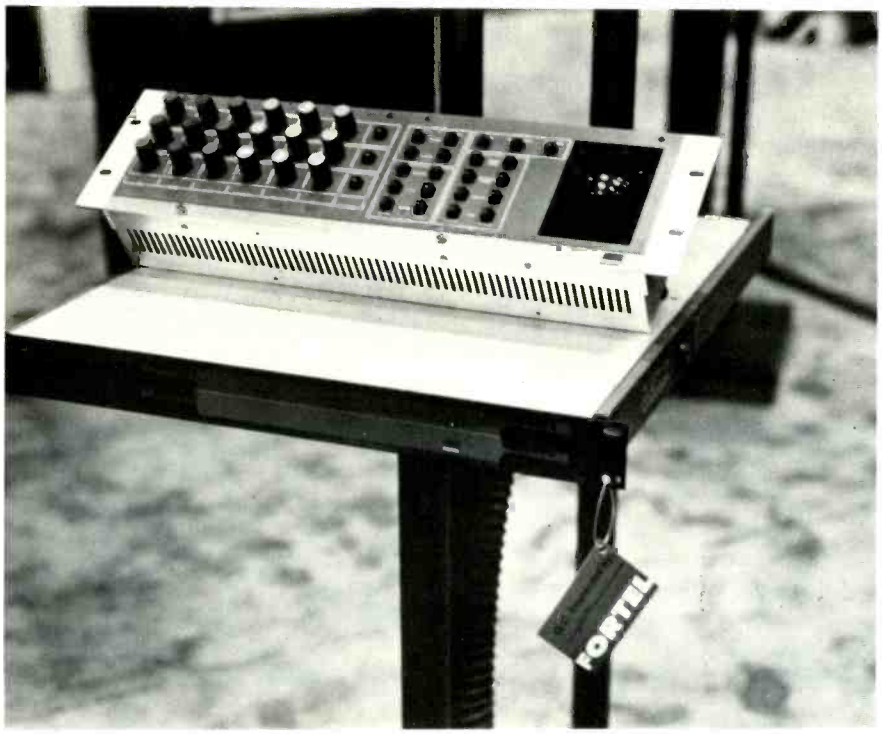

Fortel's new CC2 color corrector is selectable for NTSC, component, or PAL, and it features a Harry-style cursor-location trackball for ease of operation.

From Microtime comes the Tx2, a new TBC for achieving maximum performance from half- and ¾-inch VCRs without their own TBC. The rack-mounted Tx2 measures less than two inches in height in its single TBC version, and is also available with dual TBCs. It features both composite and component output, interpolated field freeze, and has a full frame of memory to operate with or without advanced sync to the VTR.

Fortel inaugurated a new line of international products at NAB '87 with PAL versions of their popular Turbo II TBC and ecomomical DHP 525 (now the DHP 625), and with a new product selectable for NTSC, component, or PAL: the CC2 color corrector. The CC2 corrects and "sweetens" color caused by white balance or other problems, and features a Harry-style trackball for ease of operation, and a modular design to incorporate future enhancements.

For-A Corporation introduced its new FA-740 parallel effects TBC, which can be operated as two independent TBCs when desired. The unit offers full frame correction and an array of effects for professional A/B roll

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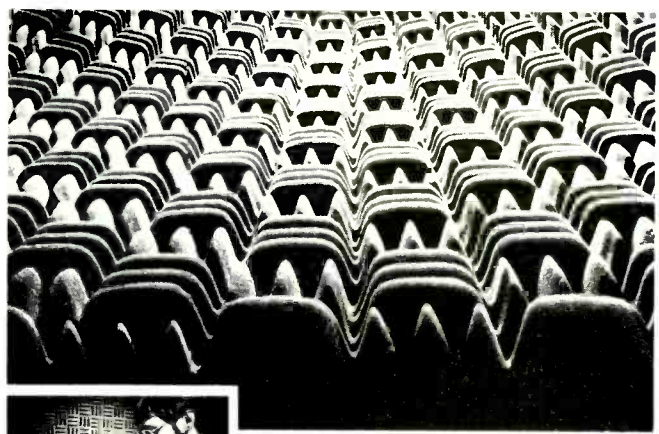

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editing. Mosaic, paint, and strobe-freeze are available on both the A and B channels, and a variety of other effects are available on a separate effects channel. Also from For-A is the CCS-4350 color corrector designed to solve color problems arising in ENG, EFP, and telecines. The corrector has independent R, G, and B color correction controls for black and white levels; R and B for gamma levels.

Nova systems announced the birth of the low cost Nova 700 TBC, with full 32-line digital memory, and an output of eight bit, four times subcarrier processing. Nova's models 700, 620, 511, and 501 were also on hand, all of them backed by the company's longstanding one-day guaranteed service turnaround policy.

Price performance was evident at the Scientific- Atlanta booth, where the company's popular DPS-170 TBC, DPS-175 TBC/framestore, and DPS-165 frame synchronizer were shown . . . From Apert Herzog comes the model H digital TBC/frame synchronizer, specifically designed for VTRs having heterodyne processed output signals. Full frame infinite window correction allows it to also be used as a freeze frame . . . Hotronic's line of TBCs grew with the economical AG 81 digital TBC with still store and variable speed slow mode.

On display at both the Camera Mart and Townsend booths were the five TBCs from Prime Image, a company founded by developers of the industry's first TBCs. Each product is a full RS170A, eight-bit device; all offer dynamic tracking. They include: the TBC + with or without digital effects; the TBC-Sync + with limited or full digital effects; and the new Dub-TBC + for all dub mode VTRs.

Lenco's wide range of processing equipment included their model TBC-450 for NTSC. Its correction range is 16 lines, resolution is eight bits, and it can handle VTR shuttle speeds of up to 10x without loss of H or color lock. The TBC-450 is only one rack unit high, and weighing only 13 pounds, it is ideal for mobile applications.

Encoders/Decoders/Sync

The Lenco booth also included a heavy emphasis on encoding/decoding for computer graphics. Drawing attention was the PCE-466 color encoder for creating an NTSC color signal from RGB and sync.

Grass Valley Group announced the availability of the CV-25N NTSC encoder, the latest addition to the company's CV-20 series of component video products. The CV-25N produces two high-quality NTSC video outputs from composite or noncomposite RGB. An onboard pulse generator derives blanking from input sync, eliminating the need for a separate blanking input. Grass Valley Group also introduced a new sync pulse generator changeover switch, the model 9550.

A longtime newsmaker in signal processing, Faroudja Laboratories and Ikegami announced just prior to the NAB a comprehensive licensing agreement for Faroudja image processing technology to be used by Ikegami to improve the NTSC images of their cameras. Ikegami plans, in particular, to utilize Faroudja's proprietary bidimensional comb filtering techniques to produce NTSC signals that rival the RGB originals in the cameras.

On the convention floor, Faroudja encoders and decoders were widespread, the lab's proprietary hardware licensed in equipment by BTS, Sony, Ultimatte, Ampex, Fortel, Aston, Digital Services Corporation, Aurora, and Symbolics. At the Faroudja booth, new products consisted of three options for the CTE-N RGB in/NTSC out encoder.

Pesa showed their Swat Plus synch watch analyzer and timer for complete analysis of the sync and blanking parameters of a video signal . . . a new family of color sync generators offering improved performance was introduced by Sigma Electronics . . . Omicron Video showed their 400 series NTSC sync pulse generators . . . Leitch introduced the SPG-1300N NTSC sync pulse generator designed around three modules for genlock, pulse outputs, and power supply.

For More Information

Harris 468
Panasonic 469
Microtime 470
Fortel 471
For-A 472
Nova 473
Scientific-Atlanta 474
Hotronic 475
Apert Herzog 476
Prime Image 477
Lenco 478
Grass Valley Group 479
Faroudja Laboratories 480
Pesa 481
Sigma Electronics 482
Omicron 483
Leitch 484

TV STEREO

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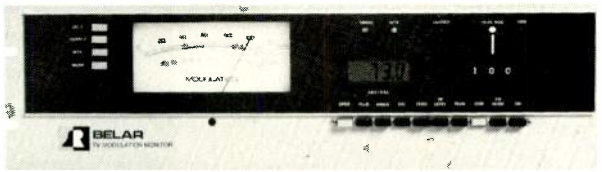

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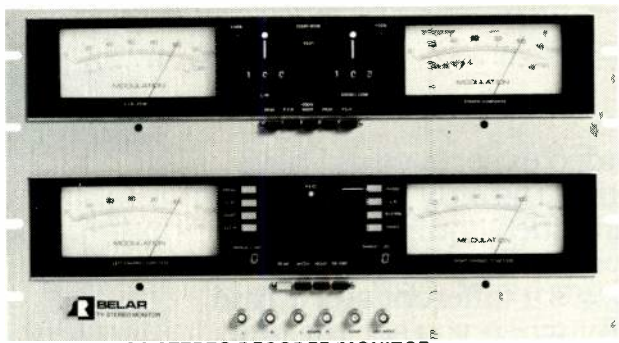

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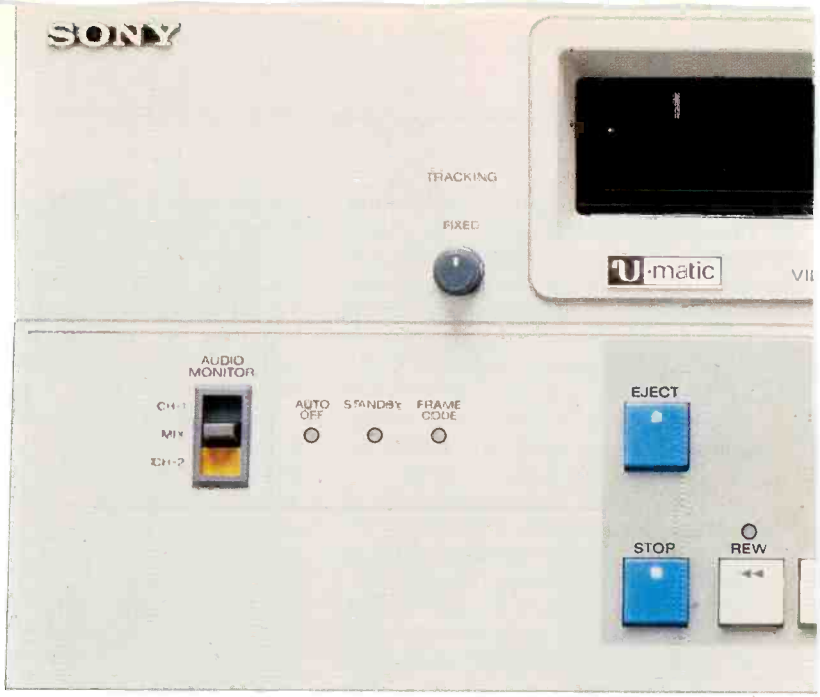

Some video experts would have you believe that the only way to upgrade your video equipment is to throw it all out and start over.

At Sony, it's a different story. And you'll see why when you see the new TYPE VII and TYPE IX series of U-matic players and recorders.

Not only are they compatible with your existing U-matic equipment,

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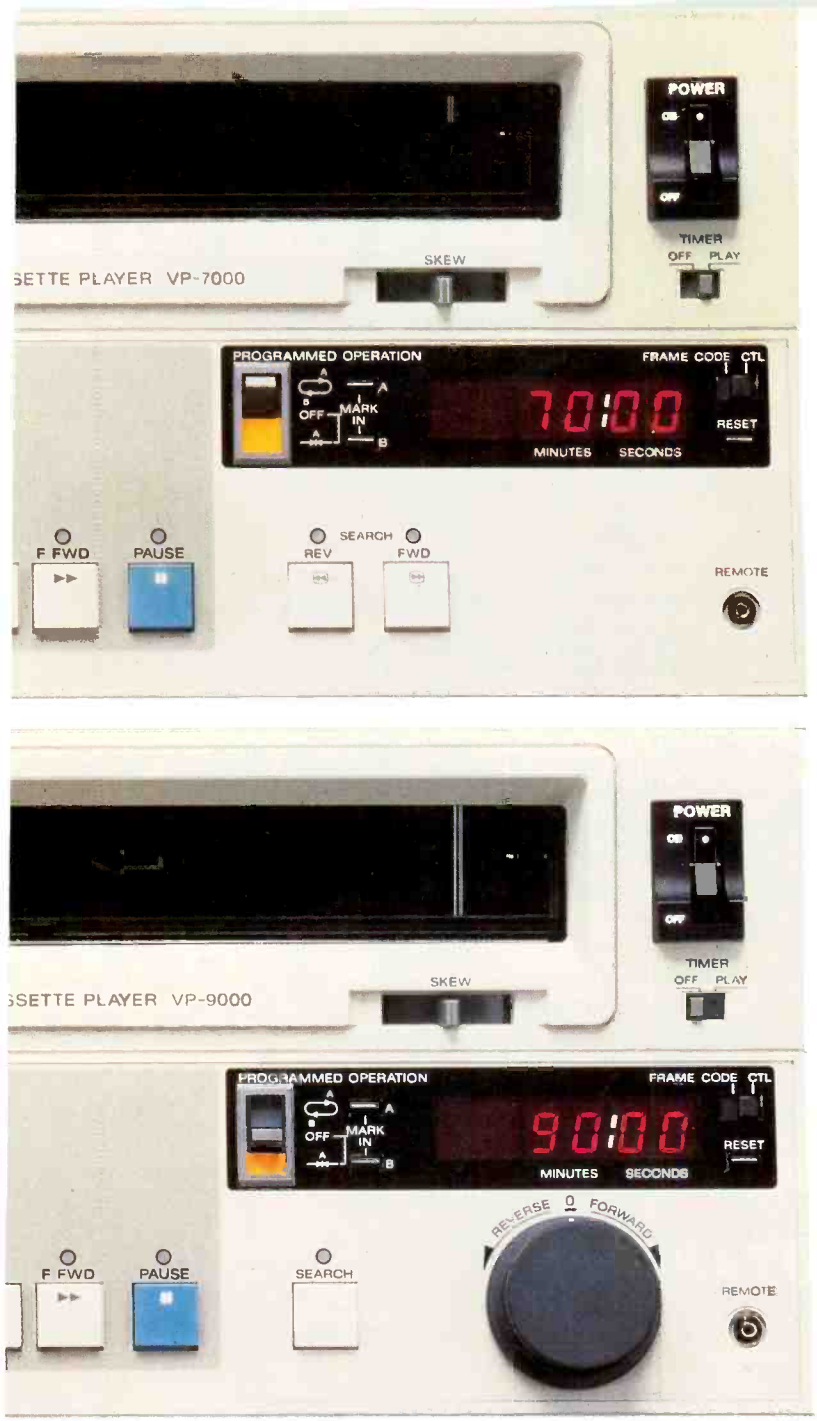

they offer performance that until now you could only get at twice the price.

The first improvement you'll notice is in the picture. Both the VP-9000 player and the VO-9600 player/recorder incorporate SP "superior performance" technology. This means you get an outstanding 330 lines of resolution.

It also means you can make copies without making compromises. With SP, third generation tapes look as good as first generation conventional U-matic. And sound even better. Because every word is heard through Dolby C noise reduction systems.

Playback is also more precise. A 33-pin parallel remote control comes standard on the VP-7000 as well as on the TYPE IX models. Even more impressive is a new system of absolute address called Frame Code. It assigns a number to each frame in your video which you can then locate automatically. With no guesswork.

In fact, with an RS-232C computer interface, you can preset your players and recorders to start and stop on certain frames or rewind and playback at certain times. So you can conveniently automate programming, insert commercials, or set up point-of-purchase displays.

What's even more convenient about the new U-matics is the price. Never before have Sony VTRs offered you so much for so little.

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To learn more about TYPE VII and IX, or to attend a Sony video workshop, please write to Sony, P.O. Box 6185, Department U-4, Union, NJ 07083.

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Audio

Though NAB '87 caught Dallas in the clutches of a rare cold spell, the show itself appeared to be a hot success. With record-setting attendance by both exhibitors and attendees, it was not uncommon to hear some NAB veterans describe it as the busiest show in recent memory. Most audio exhibitors reported significant increases in business from last year's gathering, and cited a new "market maturity" created by the continued success of stereo TV and advancements in radio technology.

The need in both media for increased versatility throughout the production cycle was addressed by a score of new audio consoles. Several manufacturers debuted portable and compact mixers for mobile and small studio installations, while most studio mixing systems were distinguished by expandable, modular designs that provide accommodation for future add-ons and upgrades.

Digital technology was also duly represented at this year's show. The current lines of DASH and PD digital tape recorders were once again on hand, as were new production libraries on CD and professional CD players. Likewise, digital audio editors—used primarily for audio/video assignments—were well received, with several companies introducing new and versatile software packages that provide enhanced operation and reduced equipment obsolescence. Software-driven architecture was also a key feature in many new effects processors.

As predicted in our NAB preview, digital audio storage and retrieval systems made an impressive showing. These devices are now jockeying for position in the marketplace as high-ticket alternatives to traditional analog spot players, offering varying lengths of audio storage on everything from hard and floppy disks to 8mm videotape, EPROM cartridges—and yes, even digital tape cartridges.

On the production side, diversity wireless mics and receivers have come into vogue, while the standard shotgun and lavalier designs continue to see improvements in electronics and materials. At the same time, communications and telco systems similarly offer enhanced performance capabilities via digital ICs and other state-of-the-art technology.

Modular Flexibility Highlights Console Introductions

The ongoing upgrade of broadcast audio (i.e., the growing acceptance of MTS and even the tragic saga of AM stereo) has underscored the importance of the audio mixing console in any TV or radio facility. Consequently, console introductions at recent NAB shows have consistently set the pace in audio trends for the coming year.

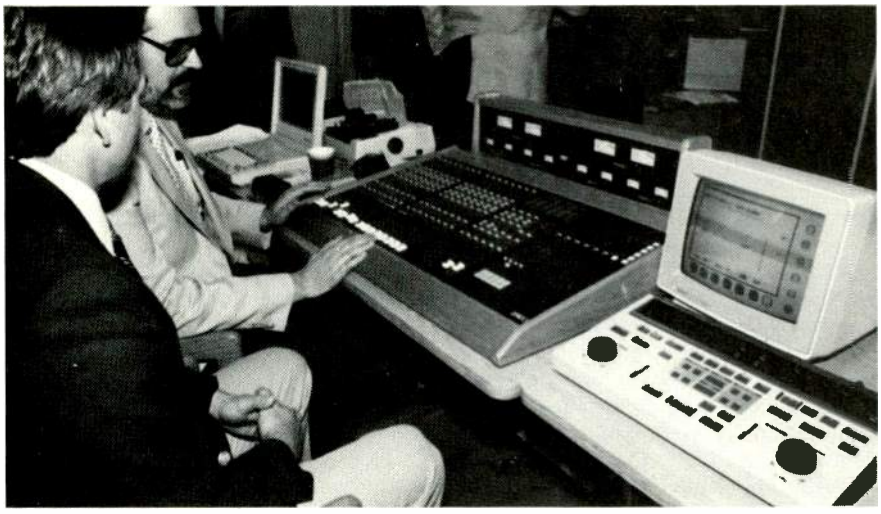
This year is no exception. With TV studios continuing to gear up for MTS transmissions and radio broadcasters striving to improve the sound quality of their programming, the audio console must be relied on to handle a growing number of specialized tasks. Thus, disk-based automation systems for storing and retrieving console settings—as well as programmable equalization functions and assignable channel strips—are now offered as means to simplify and enhance the mixing process.

One of today's most prevalent trends in console design is the use of plug-in modules. In addition to allowing subsequent expansion of the console for future upgrades, modular designs reduce the obsolescence factor and, in many cases, allow users to service parts without having to shut down the board.

Consoles 75
Audio Recording 82
Audio Processing 88
Microphones 92
Communications Gear 96

TV and Production Consoles

That is one of the many highlights of Sony's new 32-channel MPX-2036 console. The board was specifically designed for stereo broadcasters and offers up to two times as many inputs as its predecessor, the MPX-2016. The MPX-2036 is built on a 40-module frame that allows any type of module to function in any slot, which further allows virtually any physical arrangement of console functions. It accepts up to 32 stereo or mono input modules that can be as-



Orion president Richard Hajdu demonstrates the new AMU software-based audio mixing system, especially designed for TV audio applications.

signed to any of the console's four audio or VCA (voltage controlled amplifier) groups. Other features include switchable mic/line inputs, two pairs of stereo outputs and four stereo external monitor inputs, three-band EQ with variable mid-frequency turnover, and an outboard rackmountable power supply that reduces 60 Hz hum.

For on-air applications, the MXP-2036 can be used with the optional Dynamics Processor Module that offers compression, limiting, and expansion of all inputs and the four user-assigned groups. It also has facilities for the optional MXBK-EI21 video editor interface, which enables each of the console's VCA groups (or selected inputs) to be remote-controlled by many of Sony's video editors for video post-production assignments.

Orion Research's AMU audio mixing system is designed solely for TV post-production applications. The AMU is constructed like a video switcher with rackmounted analog audio processing electronics connected by a serial cable to a digital control panel, which has the look and feel of a mixing console. The system can handle up to 32 stereo inputs with four stereo program outputs (two subgroups and two master) and video editor interface. It also features ReMem, a disk-based recall memory system that can store, recall, and reset full console setups from 32 on-line setups.

The Graham-Patten 608 edit suite audio mixer (ESAM) also isolates the audio signals from the mixing controls in a video switcher-type architecture. It is designed to be controlled by a video editor with an edit controller for audio/video post-production assignments. Its edit system control provides manipulation of audio signals directly from the edit decision list (although it can be manually operated when necessary). Each of the unit's eight faders is used to control its own input, while the actual audio level is regulated by VCAs located in a separate electronics chassis. The 608 is compatible with video editors from Ampex, CMX, Calaway, Convergence, and Grass Valley. At the same time, The Montreal-based Triconcept showed its Scimitar S600 audio post-production editor and automated console system for audio/video work using SMPTE timecode.

Wheatstone's new MTX-1080 Reinforcement console, meanwhile, is primarily designed for audio production assignments. It offers programmable muting, eight effects send controls (each with pre, post, and off functions programmable to pre-fader or pre-EQ), sweepable four-band EQ, and eight 11 x 1 input matrix mixes (up to 16 available with optional matrix expander modules).

Mitsubishi Pro Audio introduced the Westar 8300 production console for film and video work. The 8300 features a modular design with two- or three-channel pan pots and plug-in modules for EQ, dynamics, and mic preamp. It is available in eight-, 16-, or 24-channel configurations and offers extensive fader options for audio, VCA subgroups, and tape and computer automation.

Arrakis Systems opted for an entirely modular design of its new medium-priced line of 10,000 Series consoles. The 10,000 Series is designed for a wide range of production applications and is available in a variety of frame sizes. Modular options include compressor/limiters, equalization, and remote control. Soundtracs took a similar approach with its new FME Series mixer, which also employs various modules to suit user applications such as radio and on-air production, video post-production, and four- and eight-track recording. It is available with 16 or 24 channel strips with 12-LED bargraph metering.

Tascam's new 16-bus M-600 Series mixer is available in 24- to 32-channel configurations with either stereo- or mono-balanced input strips and eight auxiliary sends. Its flexible monitor system can handle up to 32 tracks and features balanced line level inputs, EQ, and Aux systems on each channel. Monitor channels can also be used as additional input channels or effects returns. It further offers multipin quick-disconnect connectors for rear panel input/output, a modular patch bay head, and a stereo input module.

A unique feature of Soundcraft's new TS12 recording console is its ability to provide up to 102 inputs in a standard 36-channel frame, which is accomplished via a unique input/output module with dual signal paths that allows the mix to be done during recording on the main faders. Other features include twelve long-throw faders grouped in pairs, optional disk-based automation, six stereo effects returns with four-band EQ, and a 19-inch metal patchbay (an ADC-type patchbay is available for the 24-channel console for installation in remote trucks and small studios).

Soundcraft also introduced its SAC2000 broadcast console for distribution in the U.S. The console features a built-in sequencer that allows any combination of program sources (e.g., cart machines, CD players, cassette decks) to be started in sequence and two remote control inputs that enable broadcasters to play music and commercials from a remote location. It is also equipped with an air delay module for talk shows, electronically balanced inputs and outputs, two timers, and three differential program busses for RF protection.

Amek debuted its Classic broadcast/post-production console, with eight mono or stereo subgroup buses, two dedicated stereo groups, and 24-track monitoring capability. The new Amek G2520 multitrack mixdown console was also on display. At the same time, Connectronics had the Seck-62B, a broadcast version of the Seck-62 recording and portable

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Blane Webster,
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Features were important too, like the modular concept that lets me pull a module out and pop another one in almost as fast as making an Indianapolis pit stop. If I need another mike channel or cart machine channel, I've got it right here on the shelf for immediate use. The layout of the Auditronics 200 is almost self-explanatory so our on-air people can use it without making mistakes, and the 200 is rugged enough to withstand the jocks' abuse and coffee spills.

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P.A. audio mixing console. The TVA132 and TVA142 TV audio consoles were featured by Hallikainen and Friends.

Ramsa came back with its WR-8428 post-production and recording console, which was introduced at last year's show. The board can be outfitted with four to 28 stereo or mono input modules and features four group and matrix outputs, 24-track monitoring, stereo and mono outputs, and an optional surrounds-sound matrix module.

Rupert Neve, Inc. exhibited several of its popular mixing systems, including a 36-input V Series music recording console equipped with Necam 96 automation, a 32-channel 8232 console for video post-production, a 5106 stereo broadcast console with 36 inputs, a 5114/24 broadcast console, and three consoles from the 542 Series for remote broadcast applications. Meanwhile, Ward-Beck displayed its ST Series of stereo television consoles available in 24-, 36-, and 48-input configurations.

Advancing Automation

The ability to store and recall board settings has been a revolutionary innovation in console design. Although console automation systems have been available for several years, new approaches continue to be developed while older methods are updated.

Until recently, there was little need for console automation in broadcasting—and, to be sure, there still is practically no demand for it in radio. However, some TV networks (NBC, in particular) have already begun utilizing disk-based automation systems to store complex board setups for their stereo programs.

Solid State Logic, which has had enormous success with its SSL Studio Computer and Total Recall automation system in music recording and TV facilities, brought its new G Series Studio Computer to NAB. The G Series Studio Computer is a high-performance automation system designed for use with all SSL E Series consoles, providing storage of up to 80 floppy disks' worth of information on compact, portable 20 megabyte data cartridges—each weighing less than a reel of ¼-inch tape—while retaining full compatibility with the earlier E Series Studio Computer (via a pair of built-in floppy drives).

SSL also displayed its full line of audio production systems, including the new SL 5000 M Series of stereo broadcast consoles, which are designed for custom applications ranging from general production to stereo post-production and live stereo broadcasting.

Ikegami's new AXB-160 portable mixer is the company's first professional audio product.

Calrec by AMS introduced the Assignable console, a virtual system that can be set up to any configuration of channels, groups, outputs, and inputs. It allows up to 128 channels with eight stereo groups, and four stereo outputs. It further employs three separate RAM memories and disk storage for console setups, allowing up to 30 settings to be stored on disk and then placed in RAM for instant access at a cue point. The Assignable also features instant memory reset of all console settings and a digitally controlled routing system.

Neotek's Elan mixing console also made its NAB debut. The Elan is designed for radio, TV, and video post-production facilities and is available in 28- or 36-channel frame sizes. Its features include four-band sweep equalization, six auxiliary sends, mic and line level inputs on each module, and a high-resolution bargraph meter. It further affords a second input through each module, which, in effect, doubles the console's capacity to provide up to 72 inputs and 30 auxiliary buses.

Neotek also introduced and demonstrated an economical console mute automation option called MIDI Direct, which is now available for the Elite, Elan, and Esprit lines. MIDI Direct supplies read, write, and update commands of the console's mute functions. Data is sent to the MIDI bus and is stored and recalled by any standard MIDI sequencer.

Harrison Systems returned with an upgraded version of the fully automated Series Ten console, which now features the company's VGA Ten interactive graphics subsystem for on-screen display and mouse manipulation of console functions. The Series Ten employs a dual automation system with mix data stored on Winchester hard disk and archival storage on floppy disk or optional cassette. It further offers VCA-free operation, independent input modules containing all signal processing electronics and two audio channels, and frame sizes ranging from 16 to 80 modules. Harrison also displayed two versions of the Air 7 console for on-air radio production as well as the TV 3 and TV 4 consoles for television and post-production applications.

New Radio Boards

Modular designs are also being adapted for radio on-air boards as well. For instance, the economical 400 Series production console from Auditronics is available with 12, 18, or 24 input positions and four or eight output submaster groups (four-output boards are upgradeable in the field, as all modules support the eight-bus system).

Each console comes standard with six accessory module slots at the end of the board for such functional modules as telephone interface, meter changeover module, and test oscillator. Other features include VCA level control on all inputs and the stereo mix output, 16-track monitoring capability, submaster groupings, and a drop-in, flushmount mainframe.

The new RTV-12 transformerless console from Autogram Corp. similarly offers VCA control, as well as 12 P & G slide faders, remote controllable channels, electronic switching, and optional interface card for live assist and logging.

Wheatstone's new SP-6 radio production console is equipped with stereo and mono input modules with EQ and effects send capability on each channel. It also features machine control and remote on/off capabilities as well as two assignable tally relays and control room and studio muting. The SP-6 can mix down to stereo and composite mono and features four auxiliary send busses. It is available in four- or eight-track configurations with up 56 channel inputs.

At the same time, Audio Technologies Inc. (ATI) expanded its popular Vanguard Series line of on-air consoles with the debut of the BC12DSL, a low-priced, 12-channel board with 24-input capability and dual stereo/mono program outputs. It incorporates DC-operated VCA's for all level controls and features four-input headphone amplifiers and four muted monitor drivers.

Dorrough Electronics introduced the Model 700 dual-channel, seven-position audio console with 15 line inputs and three mic inputs, in mono or

stereo configurations. PKE featured its CSC-1 modular stereo radio broadcast console and the MC-200 stereo radio console in eight-, 12-, and 16-channel configurations.

LPB unveiled the new Signature III series of broadcast consoles. The new line features several improvements over former Signature boards, including new knobs and VU meters, state-of-the-art semiconductors, and a headphone amplifier with jacks on both sides of the front panel. Signature III consoles are configured in six, eight, and ten mixer duals in both mono and stereo (a 12-mixer dual stereo board will be available in the fall). All mixers on the stereo models can operate in mono or stereo with the function status displayed on the panel LEDs; each mixer can accommodate three inputs. Other features include rotary Shallco step or optional Penny & Giles stepless faders, switchable mic gain, all transformer inputs and outputs, an internal cue amplifier, and a five-inch cue speaker.

McCurdy Radio Industries made affordability a high priority this year. Consequently, the company's new Series "S" consoles accommodate a wide budget range with seven module options that allow users to customize their boards to meet their exact requirements. The Series "S" comes in a one-piece steel, desktop "drop-in" design with three frame sizes containing up to 26 input modules. Standard on all boards are stereo program and audition buses, balanced line/mic inputs and output amplifiers, digital logic control and interface, VCA-controlled monitoring, separate VU housing section for user-provided equipment, and a built-in solid-state intercom system for two studios and control room.

Meanwhile, Harris displayed its line of Medalist consoles. Ward-Beck showed the R1000, R1400, and R2200 stereo radio consoles. And HoweTech (formerly Howe Technologies) exhibited a nonworking prototype of its Gazelle mixing system, as well as several of its popular consoles including the customized modular Series 10,000, the expandable Series 9,000 and 8,000 boards, and the 12-channel 7012 with rotary faders.

Portables and Compact Consoles: Mixing on the Move

In the two years following their NAB introduction, portable audio consoles have undergone some significant improvements. Smaller and more rugged stereo units dominate this year's offerings with some featuring built-in limiting and compression for enhanced performance. At the same time, the latest generation of compact mixers for remote trucks and studio rackmount installations continue to incorporate a range of modular options for basic production chores.

This NAB saw the debut of Audio-Technica's AT4462, a portable stereo field production mixer with two pannable mono inputs and two true stereo inputs. The unit is all transformer-coupled at mic or line level and additionally features the ModuComm IFB communications system (with optional AT4522 decoder) a built-in three-frequency tone oscillator, phantom power capability, two stereo headphone outputs, built-in stereo limiter, and a unique feature called Lev-Alert, which supplies a warning tone through the headphones at peak levels. The AT4462 can be powered by two 9V batteries (three for phantom power) or DC power supplies using either polarity.

Shure introduced its second-generation field mixer, the FP51, which combines a gated-memory compressor with a four-input, one-output mic mixer. The FP51 provides a 40 dB compression range with an approximate 10:1 compression ratio in normal operating range. Once the compression level has been set the unit will ride gain automatically to maintain a constant output level. It features four transformer-coupled XLR inputs and one output, each switchable for microphone or line-level operation. Other highlights include phantom powering for condenser microphone operation, a built-in tone oscillator, ¼-inch and mini (3.5 mm) headphone jacks with level control, and an illuminated dual-range VU meter display for output level, dB compression, and battery condition.

A surprise entry this year came from one of the best-known names in video—Ikegami—who introduced the AXB-160, a portable broadcast-quality, 16-channel mixer. The new console is designed for a range of studio and mobile applications and provides four stereo line input channels, five AUX channels, three-band EQ on each input module, sliding faders, and FET switching. Optional fader group operation is also available.

ADM Technology unveiled two new downsized consoles this year. The RM1083 is a modular, rackmount 8 x 3 mixer designed for mobile and fixed installations with eight mic/line inputs and continuously variable three-band EQ. Each input is further outfitted with an auxiliary send, a high pass filter, and panning capability. The new RM1168, meanwhile, is an audio mix-minus matrix for multiple SNG feeds, which includes eight outputs and 16, 24, 32, or 48 inputs. An updated version of the BCS3643-PC automated stereo television console with an audio router interface was also on view.

Lectrosonics made its NAB debut with a prototype of the Quadmini, a four-channel highband receiver/mixer for use with its line of highband transmitters. Meanwhile, Audio Developments/Portland Instruments returned with its 260 portable

The updated Series X console from Harrison features new VGA Ten interactive graphics for on-screen display of mixing functions.

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stereo shoulder-mount mixer, which was originally introduced last year. The 260 is designed for ENG application with a Nagra field recorder and features talk back, stereo monitoring, and four input channels.

Studer Revox introduced the C279, a compact and inexpensive six-input mixer designed for basic audio production assignments. The C279 offers comparable signal quality to Studer's full-sized consoles. All six channels are switchable to accept either balanced microphone and mono line inputs or unbalanced stereo inputs. Each channel strip features 48 V phantom powering, a low cut filter, input gain control, HF and LF shelving EQ, pan (mono) or balance (stereo) control, and mono direct output. Other features include bargraph PPM metering of master output, phase metering for mono/stereo compatibility, balanced XLR and unbalanced master outputs, a headphone output, and level control for monitoring. An optional expansion module is available that provides two phono inputs, dbx noise reduction, a 400 Hz test generator, and fader start for all inputs and master.

The Stereomixer from Pacific Recorders & Engineering was offered as a follow up to the monaural Newsmixer introduced two years ago. The fully modular Stereomixer is specifically designed to meet the on-air and production needs of radio broadcasters with a 19-inch mainframe that accommodates up to eight modules. Four separate input modules are available—i.e., microphone, stereo line, tape recorder I/O, and telco I/O. Accessory modules such as remote line selectors, EQ, and voice processors can be used with any of the basic input modules. The self-powered Stereomixer is further equipped with a headphone jack and incorporates many of the full logic functions found in the company's BMX on-air console.

Logitek unveiled the Crossfire automated crossfader for use with any two two-channel audio sources. It provides three kinds of fades with adjustable fade duration in .1-second increments, and can be used with any mixer to crossfade between any two pairs of output channels, or go direct between two two-track recorders. The Crossfire can also be used to go in and out of satellite windows at automated radio facilities or for network joins between music and news broadcasts. In video edit suites it can be directly controlled by the video editor's GPI output or audio ramp signal. Logitek also introduced the new six-channel, rackmountable Stereorack console.

Lastly, Broadcast Audio Corp. addresses the remote vehicle market with the introduction of its first modular rackmount console, the 6RM. The economical, self-contained console offers six mixers, a front panel cue speaker, and metered level preselect. Broadcast Audio also introduced a three-frequency headphone EQ option for its Series II and Series IV consoles.

For More Information

Sony 485
Orion Research 486
Graham-Patten 487
Triconcept 488
Arrakis Systems 489
Soundtracs 490
Tascam 491
Soundcraft 492
Ramsa 493
Rupert Neve, Inc. 494
Calrec by AMS 495
Neotek 496
Harrison Systems 497
Solid State Logic 498
Amek 499
Wheatstone 500
Mitsubishi Pro Audio 501
Auditronics 502
Autogram Corp. 503
ATI 504
Dorrough 505
LPB 506
McCurdy Radio Systems 507
Harris 508
Ward-Beck 509
HoweTech 510
Audio-Technica 511
Shure 512
Ikegami 513
ADM Technology 514
Lectrosonics 515
Audio Developments/Portland Instruments 516
Studer Revox 517
Pacific Recorders & Engineering 518
Logitek 519
Broadcast Audio Corp. 520
PKE 521

New Directions in Audio Recording and Reproduction

NAB '87 set the stage for several major breakthroughs in audio recording technology—both in the analog and digital domains. As noted earlier, one of the most significant developments was the full-scale arrival of digital audio storage systems. Originally introduced at NAB two years ago (where they garnered much cautious acclaim), these devices have now emerged as an important new product category—one that seems likely to have a lasting impact on the future of radio technology.

The current generation of open-reel digital audio recorders and CD players are also keeping pace with the marketplace by continuing to incorporate more advanced features, providing added flexibility. At the same time, analog tape recorders and broadcast cartridge machines both received major product support this year.

Carts on Course

To paraphrase Mark Twain, reports on the demise of the broadcast cart machine seem to have been "greatly exaggerated"—for the time being, in any case. This NAB found the cart tradition going strong with several intriguing product introductions and a significant new player in the field.

The NAB introduction of the final production versions of Otari's CTM-10 series cart machines heralded the arrival of the first Japanese pro audio firm in the broadcast cartridge market. While the move can be expected to produce some major advancements in cart technology, it is also likely to arouse some concerns from manufacturers on this side of the Pacific, who, up until now, have not had to worry about much competition from abroad.

The new Digisound from MEI offers new software capabilities and combines the best features from earlier versions.

The new CTM-10 series consists of three NAB-style machines: the CTM-10SR record/play deck, the CTM-10MR mono record/play deck, and the CTM-10 mono/stereo play deck (with record option). All three players offer microprocessor control with the record electronics housed in a separate matching chassis.

The CTM-10 record decks are out-

fitted with Magnetic Technologies' Life+ heads (guaranteed for a 25,000-hour lifespan) and are unique in their application of Dolby HX-Pro bias optimization circuitry (an encoding-only system), which increases high-frequency headroom performance for significantly better quality reproduction on any cart player. Other features found throughout the line include transformerless balanced inputs and outputs, a parallel I/O port for interfacing with SMPTE-/EBU-based synchronizers, and an LED display of minutes and seconds for post-production applications.

Fidelipac introduced a production version of its Dynamax CTR30 Series three-deck NAB cartridge recorder/reproducer, available in mono and stereo configurations with built-in record electronics. The new decks record and detect three cue tones and are equipped with a self-contained audio switcher and mixer. Fidelipac also debuted its first new cart in several years: the cobalt-based, back-lubricated Dynamax Cobalt tape cartridge, reported to offer a 2 dB improvement in headroom between 8 and 12 kHz.

Meanwhile, International Tapetronics Corp./3M similarly became the first company to unveil a true digital cart machine. This development is particularly significant in view of the company's claims of a current market share of approximately 70 percent in analog cart decks. However, with the digital system costing almost three time as much as a comparably featured analog deck, ITC's marketing staff is quick to point out that the digital cart machine is strictly a high-end item.

The new 3M HCDA 3000 Digital Audio System employs a stationary head and 16-bit linear digital recording in a traditional cart machine setup. It consists of four components—the HCDA 3000 tape drive, rackmountable signal processor, record control, and expanded control panel—which may be arranged in several different configurations.

The system uses a 3M-developed digital audio cartridge (noticeably smaller than the standard analog cart) that is descended from the company's data carts currently employed in computer technology. Each cartridge contains 200 feet of tape capable of providing up to 20 minutes of stereo material without companding. Material may be recorded at either 48 kHz or 44.1 kHz sampling rates (automatically detected in playback); with an overall dynamic range in excess of 90 dB.

The deck features analog and digital inputs, instant start mechanism, and automatic cueing to the beginning of a selection or to the next selection. Cueing time to any particular cut on the tape is reported at less than 15 seconds. Delivery is slated for the end of this year. ITC also debuted the DCM-1 Dynamic Cartridge Monitor, a high-speed cueing version of its Omega Series cart machines, and the two new complete system packages.

In another "first," Pacific Recorders & Engineering demonstrated the industry's first application of the Dolby Spectral Recording (SR) system for cart reproduction using its top-of-the-line Tomcat cart machine and outboard SR processing. The company reported the combination acheived a dynamic range of 92 dB. Despite the apparent success of the demo, Dolby SR cards are not yet available for cart machines and PR&E has not announced any plans for a future Tomcat-SR product. PR&E also showed the new compact Micromax stereo cart recorder available with Maxtrax half-track or optional NAB quarter-track heads.

Broadcast Electronics took the wraps off its new top-of-the-line Phase Trak 90 cart machine, which features a unique built-in nonencoding phase correction system that continuously checks the phase relationship between left and right channels in playback of all cartridges—regardless of the system used to record them. BE's current line of cart decks has also been upgraded with the new Phase Lok V head block for improving phase stability.

Turning to larger cart applications, including automation, there were innovations aplenty at the show. IGM Communications debuted the SWx audio switcher, which is designed primarily for classical stations, providing expanded switching capabilities from 16 channels to 32, 48, or 64 channels. The company also introduced the FSK logging system for IBM and compatible PCs that enables live FSK operations to monitor up to eight audio sources and access the same data inherent in IGM automation systems. The GoCart and InstaCart cartridge playback machines, as well as the SC and EC automation controllers, were also on display.

Broadcast Automation introduced the BAI EC monitor, a cue and amp panel for the IGM EC automation

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system.

Systemation introduced its X-7D digital automation system that uses modified Sony 8 mm VCRs with digital audio capability to provide full random access of up to 150 songs on a single 8 mm videocassette. (In a related development, Media General Broadcast Services announced the introduction of random access digital [RAD] music formats on 8 mm cassettes to be used on the X-7D.) Systemation also unveiled its cassette-based SuperTrack automation system for subscribers to the Satellite Music Network, the Sales Force sales management system, and PC Playlist music selector software.

At the same time, Schafer World Communications showed the 7000 GLS automation controller in a working configuration with MEI's Digisound digital audio storage device, a Sony CDK-006 CD changer, and a Technics SL-P720 CD player.

Digital Audio Storage Hits the Spotlight

Although questions still remain as to the economic feasibility of digital audio recorders in broadcasting, there's no stopping progress. Despite the slow market penetration by digital recording equipment, the opportunity to replace an omnipresent—and often maintenance-prone—piece of analog equipment (e.g., the venerable cart deck) with a state-of-the-art digital equivalent raises some interesting possibilities. Thus, the logic behind this year's bumper crop of digital audio storage and retrieval systems quickly becomes apparent.

The selection runs the gamut from the predominating hard disk-based systems to new introductions such as the EPROM digital cart machine from Wendel EFX (which uses EPROM cartridges for five seconds' worth of digital audio storage) exhibited by Gotham Audio and the DV2 Digitalk from Broadcast Electronics, a solid-state digital voice recorder/reproducer with a six-and-a-half minute storage capacity.

Subsequently, prices on the hard disk units have come down substantially. For instance, MEI/Microprobe Electronics, one of the "old timers" in this category, unveiled the updated Digisound with prices starting at $26,900 for a single 280 Mbyte disk system that offers up to 65 minutes of monaural audio storage.

The revised Digisound incorporates new user-friendly software as well as a combination of features found in the previous Digisound and Digisound-E

Compusonics' DSP-1500 records and plays back digital-quality audio on floppy disks.

machines, such as an expandable modular design that can accommodate up to three additional hard disks, an RS-232 serial link, and four source interfaces. MEI also displayed its Satmaster satellite music programmer, which can be used with the Digisound in automated facilities employing satellite-delivered programming.

For high-end applications, Lexicon presented the Opus, a fully integrated digital workstation offering up to eight hours of random access digital audio on several hard disk drives. The Opus actually goes beyond conventional digital storage systems in that it performs a wide range of functions all in the digital domain, including recording, time alignment, mixing, panning, nondestructive editing, overdubbing, and signal processing.

A new face in the crowd, Mitsubishi International Corp., introduced the DAS-2 digital audio storage system developed and built by NTI (Nippon Television Industry Corporation). The DAS-2 has been redesigned to meet the needs of American broadcasters and is available in three models (for AM stations at 10 kHz and FM stations at 15 and 20 kHz). It also features automatic or manual operation and an expandable design to accommodate additional 330 Mbyte Winchester drives for up to 28 hours of digital programming.

Otari, meanwhile, displayed the AF200 Audio File digital random access spot system, which is currently in production in Japan. The AF 200 features 16-bit PCM digital recording and 33 kHz and 44.1 kHz sampling rates. The unit provides random access of up to 999 files and offers up to 33 minutes of monaural digital audio on a single 170 Mbyte hard disk drive (can accommodate up to four disks for more than two hours of audio storage).

For-A Corp. of America, a respected name in video, is earning a similar reputation in audio circles as well. The company returned to Dallas with its Sirius 100 Digital Audio Memory reporting ten units sold to European broadcasters in the past year. The compact Sirius 100 comprises a single rackmountable mainframe measuring 8.75 inches high and features 16-bit digital recording, and modular design with random access of up to 1000 minutes of high-quality audio. It also provides up to eight channels of audio instantly accessible by up to eight remote panels.

Compusonics debuted its DSP 1000 digital audio disk recorder, a computer that uses optical disk technology for recording and playback of up to 72 minutes of high-fidelity stereo music (or 512 minutes of monaural speech) on a single five-inch laser disk. The company also featured its DSP 1500 floppy disk-based digital broadcast spot recorder/player. Meanwhile, Advanced Music Systems (AMS) showed an updated version of its AudioFile hard disk-based digital recording system with expanded storage capacity and new software that provides for sync recording, punch in/punch out, remote machine control, and other previously unavailable features.

There were also two digital audio recording systems designed especially for music production. Fairlight featured *Miami Vice* composer Jan Hammer in audio-for-video demonstrations on the CMI (Computer Musical Instrument) Series III, a complete software-based integrated digital audio production system.

At the same time, New England Digital showcased its Synclavier digital audio system, a comprehensive workstation for composing, performing, recording, and editing. NED also demonstrated new Synclavier options for Direct-to-Disk digital multitrack recording, Sample-to-Memory (provides stereo sampling capability at 100 kHz per channel), and Engraving Quality Music Printing (music printing software that supports a variety of output devices).

Keeping Track of ATRs

With more radio and TV stations getting involved in multitrack audio production, the analog tape recorder continues to be a popular show item.

One of the showstoppers at this NAB was Studer's A820 24-track recorder. The first analog recorder to offer optional, fully integrated Dolby SR processing, the A820 is designed to

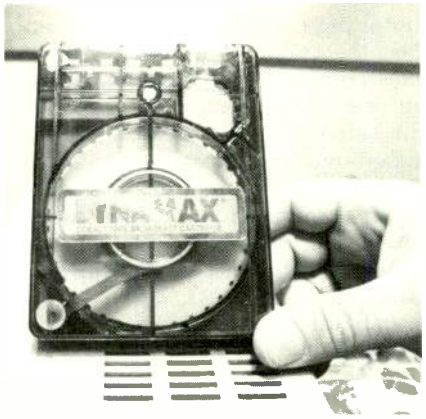
provide comparable—and perhaps even better—audio quality of far more costlier digital multitrack recorders. Its rugged tape transport can accommodate 14-inch reels and is convertible for one- and two-inch tape widths. It additionally features automatic alignment for all 24 channels and user-programmable transport controls with more than 40 assignable functions. Other enhancements such as high-output amorphous metal heads and Dolby HX Pro bias optimization system are also standard.

Studer also unveiled the final production version of its new A807, a compact 19-inch, two-track recorder with microprocessor control of transport functions and audio alignment parameters. It is similarly outfitted with Dolby HX Pro and offers full editing facilities with thumbwheel tape shuttle control as well as two user-programmable operating keys, phantom powered mic inputs, and a wide range of options. Available in console, rackmount, and portable versions.

Soundcraft USA presented the Saturn multitrack recorder, which features full microprocessor control over all analog recording functions, reducing setup time between sessions from over thirty minutes to less than five. The recorder's Total Remote console further provides user-programmable function keys that allow complex sequences (up to 32 keystrokes) to be recalled at the touch of a button. Its sophisticated transport incorporates bi-directional motor drives, automatic tension error sensing, and a tape path without any fixed components for superior precision. The Saturn's rear panel supplies additional flexibility, accommodating up to six interface modules for timecode reading, synchronization, and noise reduction.

Tascam introduced two new professional recorders this year. For production applications there's the ATR 80/24 two-inch multitrack recorder with "seamless" punch in/out capability provided by a 4-bit microprocessor and 8-bit D/A converter. It additionally features a new state-of-the-art power supply, 14-inch reel capacity, and a unique "rehearse" function that allows engineers to preview edits without affecting the master.

Meanwhile, the new rackmountable 122mkII is the latest installment in Tascam's 122 Series of broadcast cassette recorders. The three-head, three-motor deck features front panel bias and EQ controls as well as a test tone oscillator, full remote control (with console fader remote start capability), a real-time LED timer, ± 12 percent pitch control, Dolby B and C noise reduction systems, and Dolby HX Pro.



Fidelipac's new Dynamax Cobalt Tape Cartridge provides a 2 dB improvement in headroom between 8 and 12 kHz.

AEG showed its M-20 and M-21 open-reel recorders. The M-20 is a full-function model designed for audio production applications with four-speed selection, digitally controlled alignment, and RAM storage of all audio parameters. Other features include six-position locator with automatic last entry logging, ± 25 percent varispeed control, and 12.5-inch reel capacity. It is available as a standard ¼-inch two-track deck or ¼-inch with center-track timecode. The M-21 is a simplified version designed for broadcast and mastering applications. It uses the same microprocessor-controlled transport as the M-20 and offers two-speed operation, ± 10 percent varispeed, and two-position locator. It is available in ¼-inch and half-inch two-track versions.

In another development, Otari returned with its two-inch MX-80 ATR available in 32- and 24-channel versions. Its built-in mini-autolocator provides three cuepoint memories, as well as repeat and return to zero functions for easy tape access. Another unique feature is its user-selectable tape speed pairs (30/15 ips, 15/7.5 ips), which adapt the machine to both music recording and TV post-production applications. It additionally offers a microprocessor-controlled constant tension tape transport, Dolby HX-Pro, and a full-function remote session controller.

Fostex showed its lines of cassette and open-reel recorders, including the new 460 four-track cassette recorder/mixer with synchronization capability. Also showing cassette technology, Nakamichi U.S.A. dis-

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played the MR-1 discrete head professional cassette deck and the MR-2 two-head deck with "silent mechanism" transport, wired remote input and output, and Dolby B and C noise reduction systems.

For automatic on-air cassette record/playback applications, Schafer World Communications introduced the NICE (Network Information Control Equipment) ND-1 cassette controller. The ND-1 will automatically start recording by either its internal clock or by an external source. When the end of audio is detected the unit will rewind the tape and encode the start and end positions (number of clock cycles) at the beginning of the tape and then position it for playback. Upon receiving the start playback command, it plays the tape until it reaches the end of audio and outputs an EOM at a point specified in the initial setup of the unit. It will then rewind the cassette, clear the encoding from the beginning of the tape, and get ready to record the next event.

DTRs: Where's DAT?

R-DAT, the much-anticipated digital cassette recording medium, didn't exactly take Dallas by storm. In fact, the only signs of DAT at NAB were at the Maxell and 3M booths, where new DAT cassettes were introduced, and in Sony's corner, where a prototype of the DAT-X2 portable DAT recorder (also shown at last year's AES in New York) received a low-key display.

Because of the continuing legal battles surrounding DAT, Sony personnel remained vague as to the arrival of the unit in the U.S.—saying only that it can be expected "sometime next year." According to preliminary specifications, the recorder will offer two-hour recording/playback time with the NP-1A rechargeable battery and will feature AES/EBU digital I/O, selectable 44.1 or 48 kHz sampling rates, and timecode record and play capability. It is expected to sell for about $7,000—but that, too, is a matter of conjecture, depending on the outcome of efforts to counter the dollar's current instability.

However, Sony did formally introduce its first two-speed DASH digital audio recorder, the PCM-3402, a two-channel ¼-inch deck that operates at both 7.5 ips (DASH-S) and 15 ips (DASH-M or Twin DASH) speeds.

The fourth addition to Sony's line of professional digital recorders, the PCM-3402 incorporates the same electronic editing capabilities featured on the PCM-3324 multitrack digital recorder. Its RAM storage enables the deck to "remember" 12-second segments of a performance, allowing producers to audition parts and edit before altering the master. For audio-to-video applications, the PCM-3402 features built-in timecode reading/generation, chase synchronization, and composite video sync capabilities. It is also equipped with an AES/EBU digital I/O, as well as a Sony SDIF-2 digital I/O for connection to Sony digital audio processors.

Studer also came with its DASH digital two-track recorder, the D820X—although the spotlight this year was unmistakably on the two new analog machines. The D820X supports the Twin DASH recording format with 44.1 or 48 kHz sampling rates, and features razor/electronic editing and a built-in timecode reader.

Mitsubishi Pro Audio displayed its full PD format family, including the second generation X-850 32-track digital recorder, X-400 16-track recorder, X-86 2-track recorder, XE-2 digital editor and the DIF-32 AES/EBU standard interface. Otari also showed its 32-track PD format digital recorder, the DTR-900, with 48 and 44.1 kHz sampling rates, splice editing capability, built-in timecode generator, and optional timecode sync.

CD Players Gain Control

The CD player has found wide acceptance by broadcasters in a relatively short span of time—despite the limited selection of hardware aimed specifically at the professional marketplace. That appears to be changing. This NAB saw the introduction of several new professional players, as well as new hardware options for expanded control capability.

Studer unveiled the new A727 rackmountable professional CD player, an upgraded version of its A725. The A727 features new LSI chips and full 16-bit resolution, as well as dual D/A converters and digital audio outputs. It is also equipped with three pairs of analog outputs (balanced XLR, and unbalanced fixed level and variable level), varispeed operation (with external clock reference), a six- by two-inch numerical keypad for more accurate keying, and a new cue-to-music function. It further employs a new self-luminescent display (which makes it easy to read from a distance), and a flashing digit that indicates when a track is cued and ready. Studer will also continue to market Philips' LHH 2000 CD player under an agreement forged at last year's show.

Tascam introduced its new rackmountable CD-501 CD player, which was specifically designed for the radio environment with remote fader start capability that allows on-air talent to begin play via the console. A special link connector on the unit allows two CD-501 players to be controlled by a single hard-wired remote control unit. It also offers a fast search function with audible cueing for accurate track location as well as direct access of up to 99 tracks and a three-way repeat function (for individual track, sequence, or entire disk). Tascam also debuted the LV-

The 3M HCDA 3000 Digital Audio System from International Tapetronics/3M.

200A laser disk recorder system for video or audio applications in archival storage, reference, production, or distribution.

At another booth, Allied Broadcast showed the new DN-950F CD Cart Player from Denon, which imitates an analog cart machine in that the CDs are loaded into machine in plastic cartridge cases. This arrangement significantly reduces wear on the CD from handling as well as the amount of time it takes to load a disk. The deck further features a unique rotary dial for selecting track numbers and provides cueing for instant start. It also employs a warning light that can be programmed to flash from five to thirty seconds before the end of a cut to alert the DJ.

Allied also demonstrated the Media Touch Touchstone 2000 automation system, which uses a touch-sensitive computer screen to perform source switching and display programming data, as a controller for the Audiometrics AMCDS 1000A 100-disk capacity CD player.

Straight Wire Audio introduced the Speed Demon varispeed controller for CD players and the CDQue II, an updated version of its CDQue player/controller, with on-air controlling and video editor interface. The company is offering free upgrades to users of the earlier version.

At the same time, new CD production music libraries were shown by Century 21 Programming, Valentino, Inc, and Associated Production Music. Dimension Production Music showed CD and LP versions of its Holophonics-enhanced, ten-volume music library. Network Production Music and Firstcom introduced both music and sound effects CD libraries. Media General introduced its Digital Director library of 60-, 30-, and 15-second music and sound effects tracks, while Sound Ideas showed its stereo Sound Effects Library 3000 on CD.

Digital Audio Editors and Synchronizers

Digital technology is not confined to the realm of high-quality recording and playback; it is also employed in all of today's state-of-the-art audio editing systems. Despite the demise earlier this year of Droid Works, whose Sound Droid was one of the original—and most sophisticated—editors on the market, digital audio editors continue to find acceptance in the broadcast community for audio/video production and audio sweetening applications.

Studer's new A820 multitrack recorder features more than 40 programmable functions and optional built-in Dolby SR sound conditioning.

As demonstrated by Sound Droid's failure in the marketplace, price remains a priority issue in the purchase of these high-end products. Thus, manufacturers have concentrated this year on bringing down the cost of the technology by introducing new software packages and interfaces to increase product flexibility.

For example, Fostex introduced F.A.M.E. (Fostex Automated Media Editing) software for the Apple IIc and IIe personal computers (versions for IBM and Macintosh PCs are expected soon). Designed to interface with the company's 4030 synchronizer, F.A.M.E. can also be used with other Fostex products to create multimedia editing systems. The program provides editing and cueing capability, as well as database management and automated mixing (with an optional VCA adaptor).

Meanwhile, Soundmaster International debuted the Version 4 integrated audio editing system with Syncro (for IBM PCs). The new system offers simultaneous synchronization of all international time codes as well numerous programmable closures, multitasking capability, expandability to more than 16 transports, and variable speed lock of one-third to three times normal play speed.

Image Video, Ltd. announced the introduction of its AES-1000 digital editing system which digitizes an in-

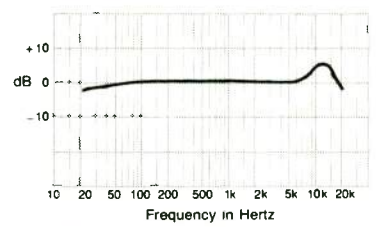
The Telex LM-100 miniature lapel mic system

TINY but TOUGH!

The LM-100 is an omni-directional condenser mike system which includes the tiny LM-101 microphone and Telex PS-10 in-line phantom power supply. This mike was designed for day-in and day-out professional use under the most adverse conditions. In environmental testing, the LM-100 performed perfectly in extremes such as below zero temperatures, snowy television interviews and on location in the boiling heat of a desert Hollywood movie set.

The Telex lapel mike has a non-glare black finish and is supplied with three styles of mounting clips. The mike has a three foot cord terminated in a TA4F plug. This specially designed cord is extra supple and quiet to prevent irritating clothing noise. A foam wind screen is available as an accessory for extra windy, outdoor use. For detailed information write Telex Communications, Inc., 9600 Aldrich Avenue South, Minneapolis, Minnesota 55420.

ACTUAL SIZE



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put analog signal and stores the digital image while providing real-time editing and output. The modular system consists of an editing control panel, A/D and D/A conversion unit, a processing unit with mass storage, a computer keyboard, and monitor. The system allows for sampling of analog signals at rates up to 48 kHz with 16-bit accuracy. Digital audio storage on hard disk is also provided with the basic system offering a storage capacity of 30 minutes (optional hard disks for expanded storage are also available).

Alpha Audio introduced a new digital audio storage interface for The Boss 8400 automated audio editor. At the same time, Nagra Kudelski debuted new RS422 interfacing software for its T-Audio system and the CMX video editor that enables the editor to read audio signals as if they were video.

Adams-Smith showed the 2600 CC Compact Controller wired remote control for its high-end 2600 AV audio/video editor. The lightweight 2600 CC is a five-transport controller that accesses all system controls and displays from up to 500 feet away from the chassis. It can also control all the timecode generating functions of an LTC Generator in the same system. Also shown was the new Zeta-Three AI synchronizer, which incorporates all previous Zeta-Three functions (including MIDI) and adds audio transport control to video editors. It additionally offers full chase synchronizing and eliminates the need for an intelligent interface.

Audio Kinetics showed its new low-cost Pacer synchronizer for two-machine applications and the Eclipse audio editor for Q.Lock 4.10 synchronizers. The Eclipse provides four-machine editing (expandable up to 32) and features dual-tasking and user-programmable Q.Keys.

Timeline showed the Link SAL standalone, chase-lock synchronizer and the Link VSI, a video interface that allows an edit controller to control an audio machine as it would a video machine for layback and audio edits. Tascam debuted the ES 50/501 SMPTE time code-based synchronizer with subframe accuracy offset of 1/100 frame steps. The ES 50/501 further employs a unique LSI that allows time code to be read from 1/30 to 100 times speed.

Cipher Digital displayed its modular Softouch audio editing system consisting of the Softouch editor/controller, Shadow II synchronizer, and CDI-750 LTC timecode generator, which are linked together via RS-232 interface ports. The Softouch keyboard provides full multitransport control and monitoring, as well as multitasking capability. At the same time, the unit's 16 Softkeys can be programmed to perform complex pre- and post-production routines at the touch of a button.

For More Information

Otari 522
ITC/3M 523
Pacific Recorders & Engineering 524
Fidelipac 525
Broadcast Electronics 526
IGM Communications 527
Systemation 528
Schafer World Communications 529
Gotham Audio 530
MEI/Microprobe 531
Lexicon 532
Mitsubishi International Corp 533
For-A Corp 534
Compusonics 535
Advanced Music Systems/AMS 536
Fairlight 537
New England Digital 538
Studer Revox 539
Soundcraft USA 540
Tascam 541
AEG 542
Fostex 543
Nakamichi USA 544
Sony 545
Mitsubishi Pro Audio 546
Allied Broadcast Corp 547
Straight Wire Audio 548
Century 21 Programming 549
Firstcom 550
Valentino, Inc 551
Network Production Music 552
Associated Production Music 553
Media General 554
Dimension Production Music 555
Sound Ideas 556
Soundmaster International 557
Image Video, Ltd 558
Alpha Audio 559
Audio Kinetics 560
Nagra Kudelski 561
Adams-Smith 562
Timeline 563
Cipher Digital 564

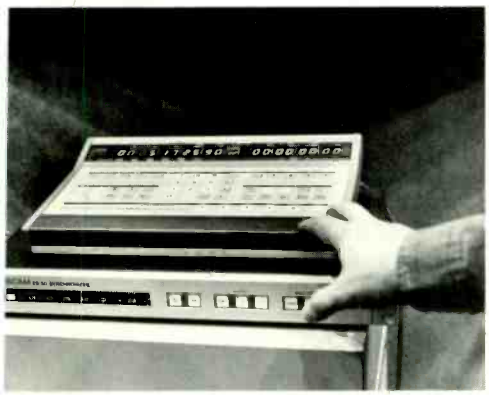
What's new at Firstcom is written all over this gentleman's face.

Audio Processors Meet New Market Demands

This NAB found audio processing gear going stronger than ever. With the growing popularity of MTS and new AM and FM technologies, more broadcasters are turning to these powerful black boxes to sort—and soup up—their signals.

The increase in demand for audio processors has similarly raised competition in the marketplace. This year, the big contest was between Orban and Texar, with both companies presenting side-by-side comparisons of the other's products. Texar apparently threw down the gauntlet by introducing the RCF-1 Card 5 replacement for Orban's 8100 Optimod-FM, which it demonstrated in conjunction with its own Audio Prism processor (comparing it with the unaltered Optimod). Meanwhile, Orban showcased its new XT2 six-band limiter accessory for Optimod-FM in comparison to the Audio Prism.

To keep the contest fair, representatives from both companies set up their own equipment in the other's booth. The result, as you may have guessed, was that each side claimed



Tascam's new ES-50/501 synchronizer is SMPTE-based with subframe accuracy.

the competition had somehow favored the home team. Once again, the decision will go to the judges in the field.

Other new products at the Orban booth included the 787A Programmable Mic Processor, designed to improve the performance of on-air and newsroom mics as well as to enhance studio mic/line processing chores. The new 787A provides 32 memory settings for instant setup and recall of selected parameters as well as three-band parametric EQ and a de-esser. It also incorporates adjustable compression, noise gate and compressor gate, and effects send and return. Also making its debut was the stereo 464A Co-Operator, an integrated four-stage level-control system with selectable pre-emphasis and a gated AGC leveler in a 19-inch rackmount unit.

Incidentally, Orban was the hands-down winner for this year's most successful show giveaway. The company's blue and purple plastic "Slinkies" (intended to promote the Blue Chip line of products) were so popular, in fact, that they were only made available at selected times each day to stretch out the all too limited supply.

SR Advances

With all the accolades being heaped upon digital audio these days, it should be acknowledged that analog still has a lot of life left in it. In fact, the Dolby Spectral Recording (SR) process—introduced last year and featured once again in Dolby's booth at this NAB—may very well be the most important development in analog technology since the introduction of magnetic tape.

Dolby SR can be used with any analog recording or transmission medium to provide it with a dynamic range and S/N ratio that rivals—and sometimes surpasses—digital-quality recordings. The process employs a minimum of signal processing, rather it uses a powerful algorithm that responds to variations and level changes throughout the signal spectrum. Priced at $750 per channel, a full SR upgrade for a 24-channel analog recorder would cost $18,000—approximately 15 percent the price of a new digital multitrack machine.

Not surprisingly, a Dolby spokesman has estimated that the company is about six month's backordered for the Cat. No. 280 module for 360 Series and M-Series Dolby A frames. Other modules are due soon, although no release date was announced.

In the Studio

Digital audio processors were found in great supply at NAB '87, with several products incorporating integrated processing operations that provide a high level of flexibility and cost effectiveness.

For instance, Lexicon showed its new top-of-the-line 480L digital ef-

This new portable UHF Field Strength Meter gives you accurate readings across the entire band.

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fects system with high-speed processors capable of performing 16 million operations per second, 18-bit A/D conversion, and multitasking capability. The new system also features full MIDI capability and allows users to store 50 memory settings inside the unit plus an additional 50 on a removeable cartridge. It is also compatible with the Lexicon Alphanumeric Remote Console (LARC), which was previously employed on the popular 224XL digital reverberator. Also shown were the PCM 60 digital reverberator and room simulator, and the new 2400 stereo audio time compressor/expander.

AKG also displayed its new

Production Equipment: Gear for the Future

Audio upgrades don't necessarily involve costly hardware renovations. Oftentimes, replacing an outdated piece of production gear will do the trick. This year's assortment of headphones, speakers, and other studio standards incorporate subtle improvements that compliment the advances made in other product categories, enabling users to work faster and more effectively.

Headphones and Speakers

Telex showed its full line of professional headphones and headsets. The new lightweight PH-24/25 (monaural and binaural, respectively) announcer's headsets features a miniature, noise-cancelling electret mic that provides an extremely flat frequency response with significantly reduced background noise. The full-cushioned PH-91/92 announcer's headsets are updated versions of the company's Sportscaster model with field replaceable earphone and mic elements. The PH-81/85 series of camera intercom headsets is designed to provide high-quality communication through camera intercoms in TV studios or on location. They are compatible with Western Electric-type intercom circuits and feature sensitive carbon microphones with a frequency range of 200 to 4000 Hz. Monaural and binaural models with push-to-talk switches are available as well. A wide selection of monitor and specialty headphones was also shown.

R-Columbia Products introduced a slew of new products, at NAB, including the 52/700 ultra-lightweight amplified cameraman's headphone, designed as a replacement for "carbon mic" type headsets that are used for communications between camera operators. The unit plugs in directly to the camera's carbon mic circuit, eliminating the need for a battery or auxiliary amp. Also new this year are the 52/100 single- and 52/111 double-ear cameraman's headphones for new cameras equipped with four-circuit mini plugs; CC-777 director headphones with two built-in mics that allow directors to control two intercom systems simultaneously; TR-55 switchable five-channel FM wireless headphone; the SB-777 and SB-700/2 (double-ear version) sportscaster headphones with on-air quality, noise-cancelling electret condenser mic; and the TR-50/B wireless-to-wired base station interface, which interfaces any camera or hard-wired intercom to headphones with full or partial duplex operation (depending on which headphone is selected). Beyer Dynamic also introduced the DT-770/990 studio monitoring headphones.

Ramsa by Panasonic showed its WS-A70 near-field monitor speaker, WS-A10 compact monitor speaker, and the WS-A240 subwoofer. JBL/UREI introduced the Control 1 magnetically shielded monitor, a downsized speaker with optional mounting bracket. A new mounting bracket for the 4408 monitor speaker was also introduced. UREI Time-Align studio monitors were also on display.

Electro-Voice exhibited its line of Sentry studio monitors consisting of the compact Sentry 100A for limited spaces, the Sentry 100EL with a built-in 50-watt power amp, the Sentry 500 with uniform coverage over a 100-degree angle from 250 Hz to 10 kHz, and the Sentry 505, which incorporates the same acoustic characteristics as the 500 in a 30-percent smaller housing. Meanwhile, Anchor Audio showed a new self-powered monitor speakers as well as and battery-powered sound systems.

Other Essentials

Bryston Ltd. introduced the 6B 500-watt monaural power amplifier and the 10B two-way stereo, three-way mono crossover.

Howe Technologies debuted the HDP 1000 external stereo headphone amp with two balanced inputs and two 200-ohm headphone outputs, each with independent volume control and switch-controlled signal matrix.

PKE International showed the DP-5 intelligent remote-site control and interrogation system, which includes such features as 24-hour monitoring and control, auto after-hours technician call-up, and auto log with visual and hard copy.

Shure introduced the new line of BC phone cartridges, consisting of the BC70 spherical stylus, BC80 P-mount cartridge, and the half-inch-mount BC-90. At the same time, Broadcast Supply West introduced the ProBase III isolation base for Technics turntables and the Radix TP500 phono preamp and TM500 studio timer.

Meanwhile, Leader-Brac Industries debuted a new leader/splicing tape dispenser that accommodates both ¼-inch and half-inch tape formats. The unit attaches to the right side of the recorder and dispenses any length of leader tape or a premeasured one-inch strip of splicing tape (or longer, if required). The cutting blade is also adjustable to the four industry-approved cutting angles.

multieffects processor. The ADR 68K digital reverb and effects unit is based on the same 68000 microprocessor chip used in the Macintosh and other personal computers, and uses employs EPROM cartridges to access and store program settings.

At the same time, Studio Technologies opted for a simple, straightforward approach in the creation of its new Mic-PreEminence, a two-channel microphone preamp designed to provide completely transparent sound. Independent controls for gain, phantom power, and output reverse/normal phase on each channel allow users to obtain the cleanest results possible for a wide range of applications: from minimizing console signal flow in recording to creating more realistic samples.

Eventide introduced a MIDI control interface for its SP2016 effects/reverb processor that will enable it to receive and send MIDI commands. The new BD980 broadcast delay and the H969 and H949 Harmonizers were also shown.

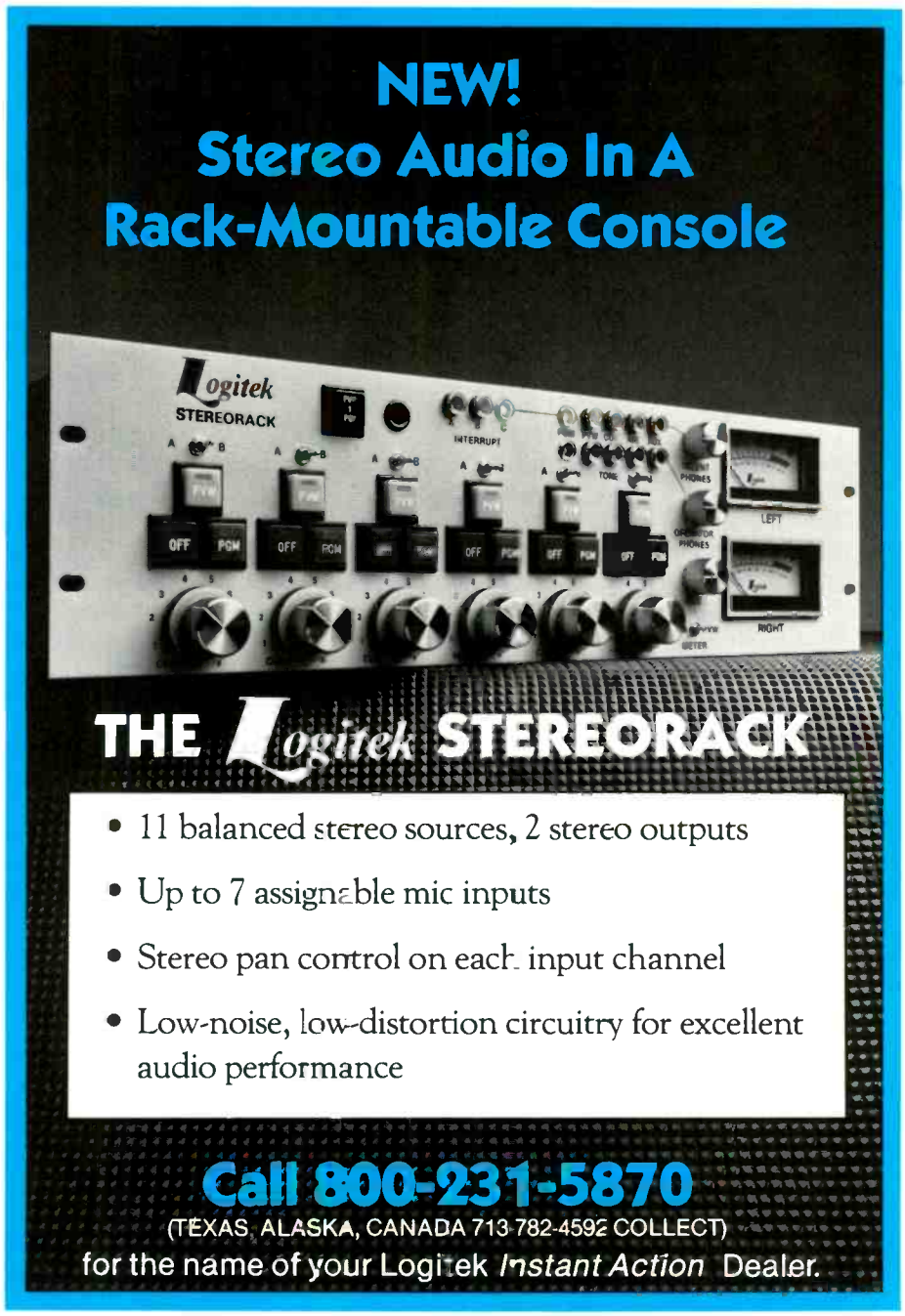
Aphex Systems showed an updated version of Aphex B Aural Exciter and the Model 700 Studio Dominator triband peak processor with new automatic limit threshold (ALT) circuitry and factory options for audio pre- and de-emphasis and matrix and de-matrix. The Compellor automatic gain control and compression unit was also on display. Straight Wire Audio showed its modular Scamp audio processing system. At the same time, Dorrough displayed its Model 610 Discriminate Audio Processor and Model 80-B FM stereo generator.

CRL introduced the single-ended DX-1 noise reduction system with new Dynafex circuitry that provides 30 dB of noise reduction without encoding or decoding. The company also upgraded its entire line of FM processors with the introduction of the SGC-800 Gain Controller, a stereo-coupled multiband AGC with CRL's Dynafex single-ended noise reduction system; the programmable SEC-800 Spectral Energy Compressor; the SG-800A FM Stereo Generator with improved stereo separation characteristics and overall better specifications; and the all-new SMP-850 Stereo Modulation Processor, which features selectable dual-band input compression and "multiband" spectrum control of pre-emphasized audio without the loss of loudness and high-frequency response of multiband and wideband limiting.

Meanwhile, dbx unveiled its new 150X Type I noise reduction system for audio analog tape machines. The Performer Series of intelligent signal processors as well as the full 900 Series Modular Signal Processing System with six different modules including de-esser, compressor/limiter, noise gate, parametric EQ, Type I noise reduction, and Type II noise reduction were also shown.

Valley International introduced the Autogate, a sophisticated noise gate/expander with proprietary circuitry that automatically alters the gating/expansion slope as dictated by program content. Two new modules for Valley 800 series rack mount enclosures were introduced. The 817 Comander module features a compressor section with an interactive expander to eliminate residual noise, while the single-channel 816 Leveller module provides precise level control to prevent tape saturation and speaker overloads.

Akai Professional featured its S900 Super Sampler with 40 kHz sampling rate, 32 sample points, and 12 seconds of sampling time at full bandwidth



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(64 seconds at 4 kHz bandwidth). The S900 also features a built-in 3.5 disk drive for sound storage and editing and a wide selection of sound disks. The S612 sampler with add-on MD280 disk drive were also shown.

Gotham Audio introduced the new EMT-258 dynamic noise filter for cleaning up audio recordings and soundtracks. Symetrix showed the new 528 integrated voice processor/mic preamp with built-in parametric EQ, compression/limiting, and expander. Advanced Music Systems-Calrec showed the DMX 15-80S dual-channel digital delay and pitch change processor as well as the Timeflex stereo compression/expansion and RMX 16 digital reverb units. Audio Developments/Portland Instruments displayed its 066 compressor/limiter device for portable mixing systems.

For More Information

Orban 565
Texar 566
Dolby Labs 567
Lexicon 568
AKG 569
Studio Technologies 570
Eventide 571
Aphex Systems 572
CRL 573
dbx 574
Valley International 575
Avian Professional 576
Gotham Audio 577
Symetrix 578
Advanced Music Systems-Calrec 579
Audio Development/Portland Instruments 580

Microphones Show Diversity and Diversification

This year's microphone introductions offer unprecedented variety in styles, applications, and electronics. Diversity wireless systems have gained considerable manufacturer support, while improvements in directional control and durability are found in most lines.

Another new product development is the arrival of packs that hold multiple wireless receivers for consolidating communications in the field. HM

New Telephone Hybrids Shown

This year also marked the emergence of digital telco equipment, incorporating state-of-the-art microprocessor technology to provide extremely clean line connections with a high level of reliability. Modular designs and more compact units also distinguished the new breed of telephone interfaces.

Gentner RF Products debuted its Digital Hybrid telephone system, which uses digital signal processing (DSP) to provide automatic nulling upon connection and continuous fine tuning of the hybrid null during the call. It also employs digital and analog filters for removing line hiss as well as advanced send and receive processors for consistent levels without the pumping typically associated with AGC functions.

Gentner also introduced new video terminal emulation software, TERM, that allows DOS-based personal computers with modems to call or answer a call from the company's VRC-1000 remote control unit. The menu-driven package has built-in script file capability for creating automatic functions, while log printouts and disk memory storage are also possible. New firmware for the VRC-1000 was also shown. The new firmware adds 16 functions to the unit and is being made available to all current VRC-1000 users through a field update program.

At the same time, Bradley Broadcast Sales showed the Telos Systems "Echo" digital automatic telephone answering device, which can be employed as an alternative to cart-based phone answering systems. It features auto disconnect and remote operation from newsrooms or production suites. The Telos-10 digital telephone hybrid was also shown.

Comrex unveiled several new products this year. The new PLXmicro is the company's newest one-line extender specifically designed for ENG applications. Small enough to fit into a briefcase or attach on to a cellular phone, it features a built-in telephone coupler with monitor jack as well as microphone and tape inputs. Comrex also introduced the TH-1, TH-2, and Basicplus extenders. The TH-1 is the basic system featuring manual operation or automatic answering with calling party disconnect, remote relay for cart start, and selectable ring count. It is contained in a single half-rack with an optional rack adaptor. The TH-2 is a one-line frequency extender containing both encoder and decoder with automatic leveling and diverta coupling. It also works with any phone system or any other Comrex one-line extender. The Basicplus system is an updated version of the Basic extender introduced at last year's NAB, which now features a built-in telephone coupler and balanced I/O.

Allied Broadcast Supply introduced the Telemix X, a new multiline on-air telephone system manufactured by Gentner. The Telemix X consists of three different modules that allow users to configure their own systems with off-the-shelf components. These include: the Call Director, which directs and controls phone lines from a 1A2 key service unit; telephone hybrids, which are responsible for the actual interfacing between the phone lines and the user's equipment; and individual control surfaces, which are used by on-air talent to access the system. Allied also returned with the Telnox radio/telephone system and Titus Technical Laboratory's "Last Word" system, which were introduced at last year's show.

Advanced Micro-Dynamics made its NAB debut and unveiled its new TC-8 remote control unit with full logging and optional speech capability, which offers synthesized voice readings of status updates. The system can also be controlled by a personal computer. Symetrix introduced the 109 single-line auto-null hybrid designed as an interface for audio equipment and two-wire phone systems.

Electronics, for instance, introduced the FR-200A Field Pac, which holds up to six of the company's wireless mi- while improvements in directional control and durability are found in most lines.

Another new product development is the arrival of packs that hold multiple wireless receivers for consolidating communications in the field. HM Electronics, for instance, introduced the FR-200A Field Pac, which holds up to six of the company's wireless microphone receivers. The new handheld HM58 dynamic and HM77 electret reverb cabled microphones were also on view.

Shure Brothers introduced two new wireless microphone systems at the show—the nondiversity W1020 and the W1025 diversity system, which includes the W10BT body-pack transmitter, W25DR receiver, and WL83 lavalier mic. The new W25DR wireless receiver incorporates phase-correcting circuitry that keeps the two antenna signals in phase at all times, which greatly increases antenna gain. Also new was the SM 89 shotgun condenser mic designed for TV production and ENG applications.

Miami Vice musical director Jan Hammer demonstrates his skill on Fairlight's CMI Series III digital audio production system.

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The SM 89 features a highly directional polarity pattern and fine-tuned frequency response, which provides accurate sound pickup without offensive on- or off-axis coloration.

Telex introduced the FMR-4 professional FM diversity wireless mic receiver, a four-channel unit operating between 165 and 216 MHz. The system runs on any four fixed frequencies and can be used with the WT-400 two-channel transmitter or others working on the same frequency. Up to seven systems may be used in the same location simultaneously. Also new is the LM300 unidirectional lapel mic system consisting of the WLM-60 lapel mic and separate PS-10 power supply. The WLM-60 is approximately half the size of other lapel mics and weighs just 15 grams (including cord and connector).

In RF mics, Samson's Broadcast STD (Synthesized True Diversity) Series wireless microphone features ten selectable digitally synthesized channels on both the transmitter and receiver and dbx noise reduction as an integral companding system.

New this year from AKG Acoustics was the T185 wireless microphone system available with diversity or nondiversity receiver and five interchangeable heads. Also new was the C522, a hand-held or boom X-Y stereo cardioid microphone for ENG applications with 9-52V phantom powering and internal rechargeable battery. It can be connected to both balanced and unbalanced recorder inputs and comes standard with a carrying case and a full line of accessories. Another new introduction was the C562 omnidirectional disc microphone, which works on the boundary level principle for mounting on large, flat surfaces.

Nady Systems debuted the 501 VR VHF wireless mic receiver for ENG and EFP applications. The receiver can be used with any Nady 501 or 701 VHF wireless transmitter. The 501 and 701 VHF wireless transmitters were also shown, as were the Nady 49 MHz short-range FM communicators—including the Model PRC-1X bodypack, PRC-2X integral headset, PRC-3X full duplex body pack, and PRC-4H hand-held unit.

Cetec Vega introduced the Model R-33 Pro Plus miniature wireless microphone receiver for ENG or studio use. It is small enough to mount on the side of a camera or on the user's belt, and features Dynex II audio processing for high S/N and wide dynamic range and battery operation. The R-33 compliments the Dynex II bodypack and hand-held transmitters such as the new T-86 omnidirectional unit, which is designed for interview applications. Also shown were the new Traveler and Reporter portable wireless microphone systems.

Beyer Dynamic introduced a slew of new products this year, including its first hand-held, omnidirectional mic, the M58, which is designed for ENG applications and is expected to be available later this summer. Meanwhile, the new electret condenser MCE 10 lavalier is billed as one of the smallest hypercardioid mics available. It employs "back-electret technology" to counter feedback problems arising from simultaneous sound coverage and weighs only 15 grams (without connector and cable). Also making their NAB debut were the MC 736PV short shotgun and MC 737PV long shotgun condenser mics with direct connection to all phantom power sources between 12 and 48V.

Lectrosonics introduced the H185, a

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We went to network and independent broadcast engineers, and leading film and A/V audio people to learn your problems and needs first-hand. And we returned again and again to test our solutions. These tough critics agree that the new AT4462 sets up far faster, provides better signal control, and results in better audio...even in the hands of inexperienced personnel.

NEW AT4462 STEREO FIELD MIXER WITH EXCLUSIVE MODU-COMM™

Introducing Modu-Comm™
The AT4462 is designed for the real world. For instance, let's assume you're doing a simple sports remote. You set up microphones for the sportscaster and the color announcer, plus a stereo mike for the ambient crowd noise. Normally you would also have to run a

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high-band plug-in transmitter capsule for its M185 transmitter, and the QUADmini, a four-channel highband receiver/mixer for multichannel field use. The company also showed the new PRO-185D, a fixed-frequency highband diversity wireless microphone system for field and studio use that can be powered by either 12 volts DC or 110 volts AC. Another new product is the PROmini miniature wireless microphone system, which features a pocket-size highband all-aluminum receiver.

Sennheiser announced the introduction of its new RS-2012 "Six Pack" wireless multichannel receiver, which holds up to six EK-2012 VHF Body Pac transmitters, as well as the final version of the M-8 eight-channel portable ENG mixer. On display was the new MKE-42PU gooseneck cardioid mic with built-in 48V phantom power adaptor for console and podium mounting.

Gotham Audio showed the new Neumann RSM 190 stereo condenser "zoom" shotgun mic for sports coverage and ENG applications. It features two separate capsule assemblies that provide middle signal and side information, while a built-in matrix on the accompanying MTX 190i amplifier allows both M-S and X-Y stereo recording. Micron Audio Products showed its full line of wireless microphone systems for ENG, film, and studio applications, including the CNS-500 series with complimentary noise suppression and the MDS-2 modular mulitchannel space diversity system.

Crown International showed four new lavalier mics: the omnidirectional GLM-100D and unidirectional GLM-200D dual- lavalier condenser mics, and their single-element, field equivalents, the GLM-100/ENG and GLM-200/ENG. Sony introduced the new lightweight (8.8 ounces) ECM-672 electret condenser shotgun mic designed to work with the new generation of smaller video cameras and camcorders. The ECM-672 employs a supercardioid, unidirectional pickup that filters out background and internal VTR operating noise.

Swintek showed its new SM-55 wireless omnidirectional electret microphone that can be used with all Swintek field production receivers. The SM-55 is designed for hand-held TV interviews and simulates the sound quality and polarity pattern of Sony's ECM-55 lavalier mic. It incorporates Swintek's db-S "audio scaling" companding system and can be powered by a rechargeable Nicad battery or common 9V battery for four to five hours of continuous operation. Swintek also showed the new SL-170 FM wireless sound link system for video cameras and camcorders.

Known for its microphones, Electro-Voice showcased its ELX-1 four-channel mic mixer with transformerless balanced inputs. Benchmark Media Systems showed its MIA-4 microphone preamp card, which offers a 200 kHz ultrawide bandwidth, 75 dB gain range, and switchable phantom powering. At the same time, Audio Engineering Associates displayed its line of MS (Mid-Side) microphone products at Soundmaster International's booth, featuring the MS-38 active matrix decoder and the MS-380 mic/line amp for stereo broadcast feeds in theaters.

For More Information

HM Electronics 581
Shure Brothers 582
Telex 583

wired or wireless feed to the sportscaster for his cue phone.

But with the AT4462 and Modu-Comm, cue is fed through the announcer's mike cable already in place. Add a small accessory decoder to the end and plug both the cue phone and the microphone into the same cable. Cue can be program, an outside line, or "talk over" from the mixer. No extra wires, no crosstalk, and no change in audio quality! Nothing could be simpler or more efficient.

Now, No-Fuss Stereo

Actual stereo mixing is equally straightforward. The sportscaster and the color announcer in our example appear on separate pannable inputs so they can be centered as desired in the sound field. The stereo crowd pickup goes to a stereo input, with clutch-ganged controls for one-hand level control. And there's a second stereo input for another mike or line level source (a second field mike perhaps, or for pre-show interviews on tape).

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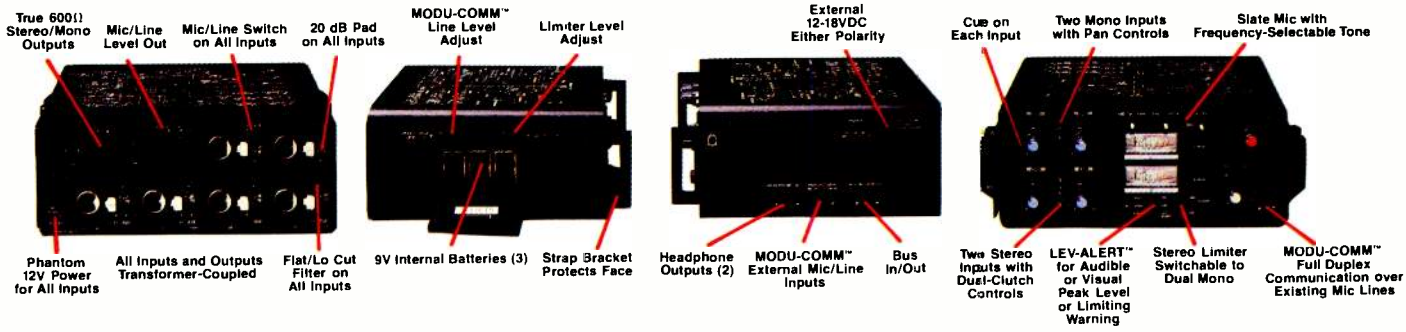

Samson 584
AKG Acoustics 585
Nady Systems 586
Cetec Vega 587
Beyer Dynamic 588
Lectrosonics 589
Sennheiser 590
Gotham Audio 591
Micron Audio Products 592
Crown International 593
Sony Pro Audio 594
Swintek 595
Electro-Voice 596
Benchmark Media Systems 597
Audio Engineering Associates 598

Communications Go Digital

The need for higher quality, more efficient communications gear in the studio and in the field is a direct result of the current audio upgrades in the broadcast environment. Not surprisingly, digital technology is now cropping up in new intercom and IFB systems, offering microprocessor accuracy and dependability.

One of the most sophisticated new communications systems previewed at NAB comes from McCurdy Radio Industries. McCurdy's CS-9400 digital intercom is a modular system with interchangeable plug-in circuit boards and a digital, microprocessor-based architecture that provides instant access between stations regardless of system size or configuration. The CS-9400 also features totally balanced solid-state switching and a sophisticated keypanel control with dedicated "listen" keys for monitoring the output of any station and integral tally LEDs that show operating status. There are also also telco and two-way radio interface options as well as optional floppy disk storage and retrieval of system parameters.

It was a particularly busy show for McCurdy, which announced an agreement with Utah Scientific that gives McCurdy the Canadian distribution rights for Utah Scientific's lines of switching and control equipment.

Clear-Com also introduced a digital-based intercom system. The new Series 500 intercom beltpacks incorporate custom-designed digital logic control for all audio and signaling circuits as well as for a variety of user-programmable functions—including "remote mic kill." The Series 500 are available in single- and two-channel models. Pesa America introduced the SIM 4000 intercom system with matrix core and smart micro terminals.

At the same time, Swintek Enterprises debuted the Mark 200D/C radio intercom for use with RTS, Clear-Com, or Telex units. Com-Tek showed its RC-72 wireless IFB systems for studio and remote applications. Meanwhile, RTS displayed its Series 800 intercom system and the Series 4000 IFB system. Telex showed the Audicom line of intercom systems.

Cetec Vega unveiled the "Q" Plus wireless intercom system, a single-package that accepts all types of headphones and dynamic or electret mics. It uses standard 9V batteries and offers near-program audio quality with a S/N ratio of 80 dB and frequency response of 70 to 7500 Hz.

For More Information

McCurdy Radio Industries 599
Clear-Com 600
Pesa America 601
Swintek 602
Com-Tek 603
RTS 604
Cetec Vega 605
Telex 606

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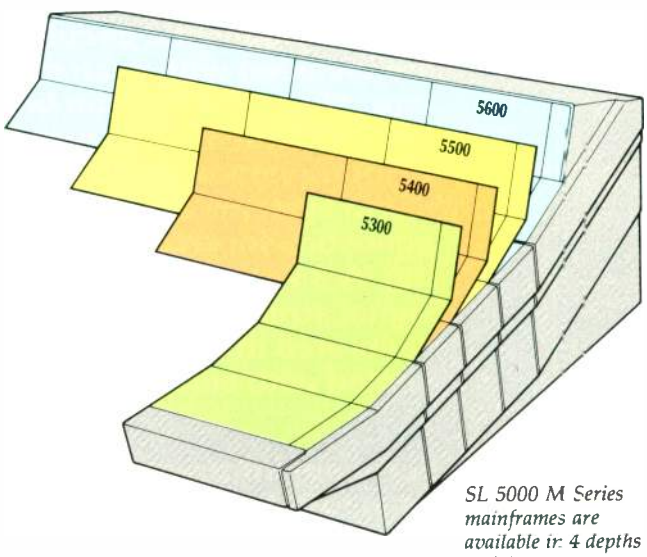
The SL 5000 M Series is designed for a wide diversity of applications – live radio, continuity, outside broadcasts, film and video post. It will satisfy your requirements for many years to come.



SL 5000 M Series mainframes are available in 4 depths and from 8 to 72 channels wide, allowing consoles of almost any size and capacity.

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23 GHz

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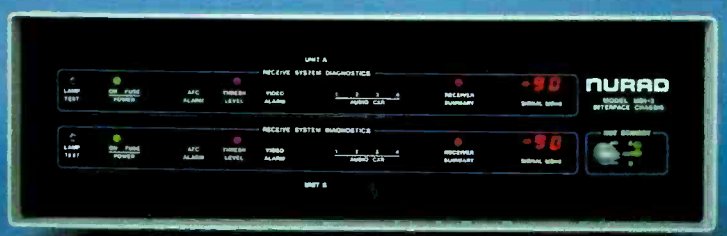

Video/audio interface unit with hot-standby switching.

For 23 GHz STL/ICR applications Nurad offers complete systems that meet or exceed EIA RS-250-B short haul standards. Modular in design, the systems can be configured in a variety of versions from single channel simplex to hot-standby, dual channel simplex.

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Transmission/ Satellites/RF

Perhaps the last bastion of analog technology lies within the RF and transmission areas, where only recently have computerized remote control and diagnostics come to the fore, and where other forms of digital processing have yet to make pervasive inroads. Perhaps, too, the death knell has been sounded for this line of defense as digital product showed up in this category, and from significant sources. Solid-state and higher power are other changes that are taking place rapidly in this field as AM stereo appears to languish.

Much of the change comes in transmission due to the healthy (finally) state of competition, leading to external-cavity klystron developments, and others. The latest chapter in the klystrode history books has been written and it looks like it will include WBFF, Baltimore.

Microwave developments showed no radical departure from existing technology, but rather continued movement toward 18 and 23 GHz systems with audio and data added to video.

In the satellite hardware picture, newsgathering vehicles continued to proliferate and many new faces appeared on the scene with fly-away units, several flying in from the U.K. As more stations get involved, not only in SNV activity, but other types of satellite endeavors, the services, too, must increase. Transponder packages and satellite services, such as news feeds, as of this last NAB are now offered in a wider variety of sophisticated presentations.

NAB '87 had radio engineers scrambling to understand just what digital amplitude modulation is all about. Everyone had questions: How does it work, what does it mean, when will it hit the market? TV engineers had their own puzzles to sort out at NAB. Is the klystrode for real? Have high-powered solid-state TV transmitters really arrived? Or should I save money on my next UHF and go with an external-cavity klystron for which there is plenty of competition? And what's this about Acrodyne being in high-power TV?

Harris was busy supplying answers to questions about digital modulation in radio transmitters starting with an engineering paper the first day. Better clarity through less distortion is what digital modulation means, and it's available now in the new Harris DX-10, 10 kW AM transmitter.

Sorting out what is happening in the world of TV transmitters was a bit more complex. Was Comark affected by Thomson-CSF's decision to close down its video operation in the states? What happened to Thomson's 30 kW solid-state TV transmitter so balleyhooed last year? Isn't the klystrode transmitter behind schedule? Has the rising yen hurt NEC? Is Townsend investing its capital in transmitters or studio equipment? And what's this about Varian taking over Philips' transmitters through its acquistion of the Pye TVT transmitter operation. With the Continental acquisition the previous year, and now Pye, Varian really is competing with its customers isn't it?

TV Transmission 100
Radio Transmission..... 102
Antennas 102
STL and Remote Control . 103
Satellites..... 104

Television Transmission

Post-RCA Stability

Despite the many questions that were on visitors' minds, there were obvious signs that much of the uncertainty that existed following RCA's dropping out of the TV transmitter game two years is no longer there. Back then, two of the heirs apparent, Comark and Townsend, were thought to be too small or financially weak to compete. That doesn't seem to be the case now. If first impressions at Dallas count for anything, the RCA vacuum was filled by Comark! Looking right, upon hitting the exhibit floor from the main entrance, there was Comark's klystrode transmitter big as life and a 30 kw solid-state VHF unit right behind it.

Facing the main aisle as it did, as part of the Thomson-CSF exhibit, Comark had not only top visibility, but it was showing *the* two standout transmitters of last year year—the klystrode UHF it was pioneering and Thomson's breakthrough 30 kW s-s VHF. Comark made the most of it—the kystrode transmitter is now ready for shipment it said, and the French-designed solid-state unit is now Americanized even to the point of using U.S.-made transistors. With Thomson's solid backing, Comark was riding high. (A look, left, incidentally, revealed RCA, but it was the Americom satellite division. Vestiges of RCA's broadcast prowess was still brought to mind, however, by virtue of the Power Tubes on display by the Lancaster, PA-based New Products Division.)

Less visible on the exhibit floor, but equally bold and aggressive was Townsend—now known as Townsend Broadcast Systems, Inc., by virtue of a name change following the acquisition of Broadcast Systems Inc. of Austin, TX. By so actively promoting its acquistion and name change, Townsend's genuine transmitter progress might have been obscured for the casual looker. Townsend was not only showing some new models—a one-tube 40 kW UHF, a new wideband klystron 60 kW model, a 15 kW aircooled klystron, plus a new 30 kW VHF—but it published its list of 1986 and 1987 installations, which is impressive (some 20 Us, five Vs).

Moving up into the high-power U and V arena as a major contender is Acrodyne. At NAB, Acrodyne showed off major technological upgrades which, in effect, represent a new family, the Freedom Line. Among its brand-new entries were a single-tube 30 kW V and and a 30 kW U using a tetrode final. Also in the high-power

Advancing transmission technology at NAB was Comark with the industry's first working UHF klystrode.

UHF class this year was Televison Technolgy Corp. It introduced the UHF-60S as a 60 kW TV transmitter using dual klystrons and dual power supplies.

Such solid marketing achievements on the part of Comark, Townsend, and Acrodyne dispelled a lot of questions. What with Philips' transmitters coming off of a good year of sales in the U.S. (and now assured continuity by being acquired by Varian) and in view of the already established positions of Harris, NEC, and Larcan, it is clear there are plenty of healthy contenders serving North American TV broadcasters. Philips, incidentally, as the transmission subsidiary of Pye TVT (UK), will henceforth be known as Varian TVT Ltd.

Technology advances

With corporate images now clarified, let's look once more at technology advances, first in TV then radio. The promise of klystrode transmitters moved a step closer at NAB. On display was a production 60 kW model, the CTT-U-60SK, which meets all of the tests expected of it. This unit will be configured into a 360 kW system that will be installed later this year at WBFF, Baltimore. This superpower transmitter, incidentally, will be feeding into a low-gain antenna to improve the station's close-in primary coverage area. The high power will maintain a strong field at the horizon. The efficiency of the klystrode makes the investment in power worthwhile. (This subject was covered in the technical sessions; the paper is available in the *NAB Engineering Proceedings*.)

The virtues of wideband klystron tubes in external cavities were sung by everyone—it has become the industry standard says Townsend. Townsend introduced a new 60 kW klystron transmitter the TB-60TA. The design permits the customer to use either EEV, Amperex, or Thorn-EMI wideband klystrons. (It also works with the new gridded klystron from EEV). Harris joined the bandwagon by announcing the UX series of external-cavity UHF transmitters, available in 60, 120, and 240 kW models. It, too, can work with tubes from three different sources.

The move was in response "to market demands for lower initial and replacment tube costs," said Harris. External-cavity tubes are about half that of internal-cavity klystrons, according to Townsend.

A 60 kW output unit was shown by NEC. The latest PCU-900 series of UHF transmitters features a new frequency-synthesized exciter with very few circuit components, thanks to the use of hybrid circuity. Units can be paralleled to a maximum of 240 kW. A new higher power wideband klystron was on exhibit at NAB by Thorn EMI Varian; the PT 5090 ACE is rated at 65 kW.

One does not have to go klystron to get a respectable power. Acrodyne, quite proudly, talked about its 30 kW UHF that used a Thomson-CSF tetrode, the TH-563, operating class AB1. One of the advantages of tetrodes is that they are much lower in cost. The bandwidth of the amplifier is 10 MHz, ensuring that tube aging will not affect signal bandpass appreciably. While the final is a composite signal, intermodulation is down −54 dB or better.

There were several new, lower power UHF transmitters at NAB. Comark showed at single 5 kW tetrode unit (air-cooled), which featured separate visual and aural amplification up to the final stage, at which point a diplexer combines the signal.

High-power solid-state TV transmitters continue to intrigue broadcasters, and this year NEC created still more interest by talking about an all solid-state unit rated at 30 kW—the same power rating shown by Comark/Thomson. Comark's unit is VHF, NEC was talking UHF. While lower-power solid-state transmitters are quite common, the higher powers haven't yet seemed practical because of their higher prices. But if reliability is there and if operating costs are lower, the initial higher price can be justified. The Australians will be the first customer of NEC's 30 kW UHF transmitters. WIN-4, Wollonogong, NSW, has ordered six, with installation of the first scheduled for August

of 1987. While the cost of a solid-state transmitter is higher, there are savings in terms of cooling equipment.

Comark called its solid-state VHF transmitters the "H" series. A power range of 5 kW to 50 kW is offered though the 50 kW model does use one tube in the visual output. Comark reports 192 output transistors are used in a hybrid combination. Parallel drivers and dual exciters make the system fully redundant for continuous on-air performance.

Solid-state is, of course, employed by other manufacturers as the aural amplifier and as the visual driver. Acrodyne's Freedom Line VHF series is all solid-state except for the tetrode visual final (which uses a RCA 9007 as the visual for 20 and 30 kW outputs and the RCA 8984 for 50 kW).

Among other klystron transmitter advances was the announcement of a 10 kW air-cooled model by Townsend. The Amperex YK1270 (rated at 16.5 kW) is cooled by an internally mounted blower. The visual is driven by a 30 W solid-state amplifier.

In the TV power tube area, Varian Eimac introduced a new ceramic/metal power tetrode, the Y863, as a replacement for the NEC 8F76R in VHF amplifier service.

Low-power TV

Acrodyne, EMCEE, ITS, TTC, and others showed low-power TVs and exciters. EMCEE introduced several new products including a new synthesized frequency-agile transmitter for ITFS/MMDS and a new broadband downconverter. Itelco and Pesa also showed low-power units. ITS introduced a new solid-state video modulator, the ITS-75 to work with older RCA transmitters. ITS now has a full line of exicters to work with most RCA and Harris transmitters. Larcan introduced a 5 kW high band, the TTS-5LH, which is externally diplexed as well as a 250 W translator.

Orban continued its leading edge efforts with this new TV stereo generator.

For More Information

Thomson-CSF 607
Television Technology 608
Townsend 609
Larcan 610
NEC 611
EEV 612
Pye TVT 613
Amperex 614
Varian 615
Thorn-EMI 616
Harris 617
Comark 618
Varian Eimac 619
RCA 620
EMCEE 621
Acrodyne 622
ITS 623

30 kW

VHF Television Transmitter

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Putting you on the air... Keeping you there

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Radio Transmission

The Digital Amplitude Modulation scheme is used by Harris to achieve high-quality audio performance at high efficiency. The input audio waveform is converted into a series of 12-bit digital words by a high-speed analog-to-digital converter (ADC). These binary words are encoded into a form optimum for switching the power amplifier circuitry, called a power multiplying digital-to-analog converter (DAC). The encoder output, during each sample clock cycle, turns on the proper number of solid-state Class D RF power amplifiers. The output of each amplifier is summed to produce the desired RF level. The digital output of the DAC is multiplied by the radio frequency waveform to form an amplitude modulated carrier with a digital envelope.

The overall efficiency of such a digital technique is 80 percent, and the total harmonic distortion is less than one percent at 95 percent modulation. Intermodulation distortion is less than one percent. Superb phase linearity is evident from the square wave response, and there is no overshoot regardless of the frequency. Stereo performance is no problem; incidental quadrature modulation is better than −35 dB.

All of this has been incorporated into the DX-10 10 kW transmitter. Some 213 low-cost MOSFET transistors are used. Operation continues despite the failure of one or more high-power RF amplifiers. A front panel signal-flow diagram eliminates the need for a complex diagnostic system.

While demonstrated without fanfare, undoubtedly one of the most significant events at NAB '87 was Continental's move into solid-state. While many companies have announced solid-state devices only to withdraw them later, neither Continental (nor Collins, which it acquired) ever showed any inclination of having to offer such "state-of-the-art" hardware. But this year it displayed two such transmitters—a solid-state 1 kW transmitter, the 314F, and a 3.8 kW FM transmitter, the 814C.

The transmitters are high in performance, and include self-protected modules for high reliability. Protection prevents device failure caused by excessive power supply voltage, VSWR overload or, high temperature. The FM unit is based on a 700 W broadband module using a splitter/combiner to achieve 3800 W output. Continental also introduced an extended-bandwidth solid- state driver, the 816R for use in higher powered FM transmitters.

A fully solid-state 5 kW FM unit was previewed by AEG Bayly. The unit is designed for (n + 1) automatic changeover and can be paralleled for 10 kW ouput. First units are slated for the Canadian market, but will then be "fully Americanized" says the company. Bayly was also showing a fully computer-controlled 10 kW transmitter, which reads out all parameters every four seconds.

Although the Continental and Bayly announcements show the further encroachment of solid-state, the cutting edge is still held by Nautel, despite the fact that it did not add any new models this year. Of course, with its range already extending to 50 kW AM, there was no need to.

One of the true believers of AM stereo was Delta Electronics.

Tube transmitters, of course, are still an important segment of the market, and Continental unveiled a new tube transmitter in its lineup, the 815A, a five kilowatter. IC logic is used for control functions and a memory is incorporated for restart after a power failure. Automatic filament voltage regulation and automatic power control is included for unattended operation.

Most of the other transmitters on display were previously announced. One significant change here was displayed within the QEI move into the high-power FM class with its 695T30kW unit; the series of 695 transmitters however, has been shown before. Transmitters in the Broadcast Electronics booth, ranging from 100 W to 60 kW, were all familiar. The FM line will have a 20 kW unit added later this year. The wide lineup of FM Philips transmitters announced a few years ago still stands. Highest power is 40 kW, obtained by paralleling two 20 kW LDM 1236s. CCA, CSI, and Singer were at NAB but came with no new product.

For More Information

Harris	624
Nautel	625
Continental	626
Broadcast Electronics	627
Collins	628
CCA	629
AEG Bayly	630
CSI	631
QEI	632
Singer	633

Antennas

The many complex features of different antenna technologies make it difficult to both quantify and qualify introductions at a show such as the NAB. There were, however, some dynamic introductions by forward-looking companies in a variety of antenna-related areas.

Something new in waveguides was demonstrated by just such a company. In fact, Dielectric Communications called its new Doubly Truncated Waveguide (DTW) a "quantum jump." Just what is a DTW? It's a waveguide that approximates an elliptical cross section in a circular shell. Because of its circular exterior, a DTW has the low wind loss of a circular waveguide. But it avoids the cross-polarization modes and extreme sensitivity to temperature changes that plague conventional circular waveguides.

Rather, the elliptical cross section has the stability of the high wind load rectangulars. So it offers the best of both. Because of the cylindrical shell, both the interior and exterior surfaces can be pressurized, thus virtually eliminating the effects of rapid temperature change. Power-handling capability is similar to that of rectangular guides.

Another new Dielectric product was the UHF Polarizer, an antenna design that adds a vertically polarized radiation component to supplement the horizontal polarization of UHF pylon antennas. Its made up of eight layers of full-wave dipoles (within pressurized radomes), which can be face-mounted or corner-mounted on any type of tower.

Two new slotted-array antennas featuring traveling-wave technology were announced by Andrew Corp. As part of the Trasar VHF line, the new units are in the high band. They are available with a variety of polarizations and patterns. The channel 9 antenna provides a horizontally polar-

ized cardioid pattern. A channel 8 design offers a circularly polarized omnidirectional pattern. Andrew also announced several new configurations in its rigid coaxial line. The ACX-675 (six-inch, 75 ohms) offers a bellows as part of the inner conductor to accommodate differential expansion without sliding wear. A 50 ohm version is available in three-, four- and six-inch diameters.

Bogner had a new line of side-mount UHF antennas this year, the DUI series. Micro Communications, Inc., showed a dual-channel combiner for mutliple UHF transmitters. Shively Labs featured combiners and broadband panel antennas. A multistation combiner capable of handling up to a megawatt of power was shown by Tennaplex Systems. Tennaplex also showed FM and TV antennas ideal for filling nulls in the vertical pattern, as well as broadband panel antennas. S.W.R. also showed some multistation FM antennas as well as high-power UHF antennas.

For More Information

Dielectric 634
Andrew 635
Bogner 636
Micro Communications 637
Shively 638
Tennaplex 639
S.W.R 640

STL and Remote Control

Spectrum-efficient versions of 950 MHz aural STLs (narrowbanded STL) have become popular in order to get more service in major cities. Marti, Moseley, and TFT all showed such units. These same companies are also active in remote control units. Moseley showed a new MDU dial-access remote control. Hallikainen showed some UHF control equipment that works with its DRC 190 system. CAT Systems unveiled a computerized remote control system for transmitters and earth stations.

Also joining the ranks of remote controllers was Advanced Micro-Dynamics with its TC-8. Their unit reads and controls eight channels at the modest cost of $2195. New pickup receivers were shown by TFT and Marti.

New Point-to-Point Options

The scarce studio-to-transmitter spectrum space in major markets and the desire to add data to many existing microwave carriers has triggered a number of product innovations. The expanding use of the higher bands to solve some of these problems is leading to product refinements. NAB featured a potpourri of such point-to-point offerings.

The 18- to 23-GHz band has been seeing lots of activity. Marti Electronics gained a lot of attention for its new low-cost 23 GHz digital STL for radio introduced at the show. With a wide response of 10,000 to 20,000 Hz, noise at less than −90 dB, plus great stereo separation and almost unmeasureable distortion, the STL-23 delivers *all* of the performance of compact discs, said Marti.

The basic price starts at $5345; with stereo, $8350. The latter includes a PCM/video encoder and decoder. You have to add more for another subcarrier but the stereo package with bidirectional subcarrier comes in at only $11,500. That's comparable to a 950 MHz STL when you figure in the "real" costs, according to Marti.

The Harris Corp., which has done well with its Microstar 23 video radio

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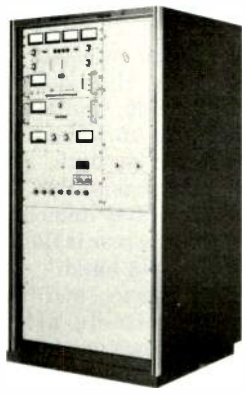

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system (in part due to the fact that it met RS-250B standards for short-haul video transmission), added a T-1 telphone modem that allows the simultaneous carriage of voice and data. The addition of the modem greatly enhances the utility of microwave radio systems for closed-circuit television and video conference users. Up to three audio subcarriers and as many as 24 PCM voice channels and/or data up to 1.536 Mbps can be run simultaneously with video over the link.

Motorola, which introduced the Starpoint 23 family last year showed three products: an FM STL video unit, an FM video unit, and a digital voice/data unit. Broadcast Microwave Services also showed microwave systems for STL.

Nurad now offers complete 23 GHz systems for STL/ICR applications. Meeting RS-250B, the unit also offers up to four audio subcarriers and full diagnostics. Also introduced were the 3-Series family of IF heterodyne transmitters and receivers that can be configured for use in STL and multi-hop links. For ENG use, the AR3 line of receivers featuring dual conversion and low-noise preamps were introduced. Also new was the RX2-Series of portable receivers about a third smaller than the earlier RX1.

M/A-Com MAC introduced at NAB a new microwave radio system operating in the 17.7- to 19.7-GHz band. It's a solid-state FM microwave communication system generally good in the range of up to 15 miles. The new system meets or exceeds RS-250B short-haul specs. High-definition TV carriage is possible, said M/A-Com. It can carry three 15 kHz subcarriers above the video or data. (For more than three subcarriers, PAC 10/12 audio modulators and demods can be used.) The transceiver is field tunable over the 470 MHz band.

M/A-Com, Nurad, and Broadcast Microwave Systems all showed ENG/EFP microwaves but no new models. For stadium use, BMS's beltpack ENG unit caught attention. In terms of what was new, only RF technology scored. It showed a new remote-controlled low-cost self-contained weatherproof repeater for unattended tower or rooftop mounting. Called the Longranger, the unit extends the range of ENG pickups.

A new microwave link, the PP-70, was shown by Ikegami. One of its advantages is the high degree of built-in automatic features.

The Collins Microwave Systems Division of Rockwell introduced a new microwave video radio system, the MVR-1000. Although the new system is designed for operation in the 2-to 13-GHz band (seven different models), video plus one to four program channel operation is possible. Special applications can go further to include T-1 over video, FDM over video, or digitized stereo audio operation. The latter makes its use as a STL a distinct possibility. Also in the Rockwell booth was a product from the Wescom Telephone Division known as a D-4 Channel unit. Rockwell demonstrated how the leasing of a private digital line or network might pay off with the use of this product, which permitted voice and data to be mixed and transmitted.

General Electric's Comband Product Operation was at NAB showing how bandwidth compression systems, addressing systems, and scrambling methods could help microwave users deliver television programming. Two-for-one compression and three new block-down converters for MDS/MMDS/ITFS operation was shown. Included were a 31-channel 2.5 GHz-to-superband downconverter, a 33-channel 2.5 GHz-to-superband and midband downconverter, and a eight-channel to midband converter.

A line of microwave transmitters and repeaters for ITFS, OFS, and MMDS applications were shown by COMWAVE. Showing an "affordable" portable microwave systems controller was Microwave Radio. Its microprocessor-based system provides remote control of MRC and 2 GUX receiver functions. Control systems, were, of course, shown by antenna systems manufacturers.

Among the most noteworthy of the many manufacturers showing fly-aways and SNVs was Midwest.

For More Information

Marti 641
Nurad 642
Moseley 643
M/A-COM 644
TFT 645
Ikegami 646
Hallikainen 647
Collins/Rockwell 648
Cat Systems 649
Wescom Telephone 650
Advanced Micro Dynamics 651
General Electric 652
Harris 653
COMWAVE 654
Motorola 655
Microwave Radio 656
Broadcast Microwave Sys 657

Satellites Abound

SNV's Grow Larger and Smaller

All of the major SNG vehicle manufacturers were there: Hubcom, first in the business and offering more models than anyone else; Midwest, with more vehicles on exhibit than anyone else; Dalsat; Roscor; BAF; and Centro, the latest entrant. It was once said that some of the more recent entrants got into the market simply because Hubcom was so back-ordered. No one at NAB '87 would claim business was quite that good now. In fact, expected orders from some of the ABC and CBS affliates seem slow in coming, due in part to apparent confusion regarding what they are expected to buy, or should buy. The specifications are out—and have been since the RTNDA—but some of the would-be purchasers are wondering if they they should go for the whole cheese as proposed by the networks. Such a commitment is expensive, even though the respective networks may pick up half of the cost.

A network-equipped vehicle is expected to meet a variety of specifications covering the vehicle and the required video/audio RF transmit and

receive equipment. Latest specs call for four-port operation (transmit and receive on two polarizations simultaneously). In addition, it should be equipped with communications gear that provides three full-duplex voice channels, DAMA for program production purposes, and an "all-call" channel, PAMA, for the coordination of the SNG vehicle. Such communications have to go through another transponder. The mandated communication package is to be purchased through GTE Spacenet.

It's the required communication package, the necessary redundancy, plus some of the "bells and whistles", as it relates to test monitoring, that has made the vehicles so expensive—likely over $500,000. The need for a stable platform and antenna that will work with satellites within the two-degree orbital spacing is not questioned. Nor are specs controlling out-of-band emission and antenna sidelobe requirements.

Everybody claims to meet these specs—a claim you should test, says GTE Spacenet.

Meeting the network's design criteria was welcomed by Centro. Indeed, it has named its new SNV unit "The Networker."

And, so confident is it that its vehicle will stand the test of use that a purchase is backed up by a three-year client protection plan. An unequalled reinforced vehicle frame and support system is a Centro claim. A Satcom Technologies 2.37-meter antenna has been selected. To meet a frequent user demand, The Networker has an ENG capability in the form of two masts for such antennas. Other features include a third axle and a custom designed HVAC system. On top of that, the unit is handsome. As Centro says, "The Networker's aerodynamically designed shell and shroud enhance your station image." A color-impregnated gelcoat fiberglass does not show mars and nicks.

Hubcom's lineup included five sizes plus a sixth ENG vehicle. On the exhibit floor was the low-boy, the SNG-LB, introduced last year that can be driven into a C-119 for air shipment. Its latest addition is the SNG-450, so named for the Iveco Z-450T three-person tilt cab truck. This unit has a 22,800-pound gross vehicle weight, thus accommodating a lot of additional payload. The spec sheet covers a wide variety of transmitter configurations, communications systems, and equipment options. Antenna specified is a 2.3-meter prime-focus parabolic with a transmit gain of 49.2 dBi. On exhibit in the outside area was the company's popular SNG-220.

Midwest's S-23, which also uses the Iveco Z-450T chassis, is about two feet shorter than the large Hubcom unit but two feet higher (clearance is 148⅓ inches). It supports a larger antenna using the Vertex 2.6-meter offset-fed unit with a 50.1 dBi transmit gain. The S-18 is a much smaller unit supporting a 1.8-meter offset-fed antenna (gain 46.6 dBi) on top of a Ford E-350 extended-body Supervan. The unit can accommodate dual phase combined 200 W amplifiers in the three equipment racks supplied. But there is room for a fourth rack for VTR systems, microwave equipment, or a variety of communications packages.

Dalsat had two transportable units on display: its older SNG-12, which features a 3.7-meter (12-foot) tri-fold antenna with a transmit gain of 52.9 dBi, and the new SNG-8, equipped with the new Andrew 2.3-meter (8-foot) offset-fed antenna rated at 49.2 dBi transmit gain. The chassis is a Ford E-350 Supervan with an extra axel.

Roscor unveiled for the first time its SNG vehicle the Star Fleet 21. Built for WTMJ-TV, Milwaukee, the highly engineered box, fabricated entirely out of aluminum, keeps the gross vehicle weight to under 10,000 pounds. Chassis is a Ford E-350. Inside there is 46 square feet of standing room and seating for four. The truck for WTMJ also includes ENG microwave. Antenna is a 2.4-meter prime-focus type.

New from BAF was the BAF 22/220-A (22 feet long; Iveco 220 chassis). This unit also incorporates the new Andrew offset-fed 2.3-meter antenna. The transmitter was available as a hub mount or a rack mount. The company's BAF 25 was also on hand with an increased production area space. Wolf Coach makes the BAF bodies.

Offering a design service for those planning satellite usage was RF Scientific.

Fly-aways everywhere

Fly-away units, which have become so popular, were exhibited by SNV makers Midwest and Hubcom, plus others. BAF was talking about the Ranger imported M1500; its antenna had good side-lobe performance but

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couldn't be knocked down and thereby has to travel as passenger freight. A.F. Associates was showing the Marconi Newshawk. Hubcom's basic unit traveled in eight aluminum cases, the largest weighing 70 pounds. Antenna is a ten-petal parabola. Midwest's S-1 requires 14 cases, but that included two 200 W amplifiers with independent switching power supplies. CNN, purchasing this unit, said it met their requirements best. The 1.8-meter antenna by Vertex breaks down easily.

Spectra showed its familiar Rover but said advances in HPAs and switched power supplies would lead to a smaller package. RF Scientific stood ready to build you a fly-away. IDB exhibited audio fly-aways. Turning most eyes, however, for compact size and design detail (and styling) was a new British import, the Mantis system, from Advent Communications Ltd.

Advent flew over a four-package system (without being charged for excess baggage). A fully redundant system with a large communications package occupies only seven flight cases. A compliant antenna (meeting every off-axis gain specification in the world, said Advent) has six petals and a central hub locked together with precision locating spigots. The standard package is 1.5 meter in diameter; 1.8 meter is an option. The unit is engineered to survive any environment, the company said. The 300 W system is priced at $125,000; it's available for rent.

Though it has stayed out of the SNV business, Scientific-Atlanta demonstrated its fly-away entry this year. A compact unit able to pack up easily in a couple small cases, the system may help spur this market in the U.S. and abroad.

SNV components also everywhere

Since SNG vehicles can be equipped with a variety of electronics, most SNV brochures (BAF's were an exception) didn't say how a particular SNV was equipped other than describing the antenna system. But there is no alternative for the Tektronix 1705 spectrum monitor and the Tek 2710 spectrum analyzer so it was seen everywhere.

MCL, manufacturers of TWT amplifier systems for transportable earth stations, had its own exhibit to discuss HPAs and switchable power supplies, including those that could be modularized for fly-aways. Satellite Transmission Systems (STS), which has been working closely with ABC, had much of its equipment on display in the Midwest outdoor exhibit. Touted was the ABSCAMP RF subsystem, which interfaces with the video exciter and Andrew's antenna subsystem. The exciter system includes a new direct-coupled modulator with dual deviation.

Scientific-Atlanta introduced a new video exciter at NAB, the 7555-03, based on the popular 7555. IF switching capability permits full- and half-transponder bandwidth and deviation selection from the unit's front panel. Tuneable audio subcarriers are controlled from a front-panel keypad.

New at the Keltec Florida booth were the R60 series of TWT amplifiers. This series of HPAs (160 W to 300 W) comes in a compact seven-inch rack—smaller than anything else, the company said. Keltec is a leader in switchmode power supplies.

Microdyne featured new agile receivers for broadcast and cable use. Standard Communications showed a new Agile OMNI international satellite receiver with a RF bandwidth of 800 MHZ.. Front panel controls could switch between satellite and PAL/SECAM, NTSC, and MAC broadcast formats. Standard said that for C-band and Ku-band, full- and half-transponder bandwidths, there is no other receiver that offers such flexibility and performance.

DX Communications was on hand with a full line of reception equipment, including the new DSB-800, stereo satellite system for home use. The company announced an order from HBO for a hotel reception package consisting of a 1.8-meter antenna, low-noise block converter and Ku receiver.

Offering a means of tuning in a satellite at a location remote from the antenna site was Catel with its 3000 series.

Among those showing antenna systems for land use were Scientific-Atlanta, Andrew, Microdyne, Radiation Systems, Comtech, United Satellite Systems, Vertex, and Wegener. S-A actively promoted the DAT-32 for digital reception from Satcom 1, the radio satellite.

Comtech showed a new 3.5-meter dual-axis Ku-band antenna that can be microprocessor controlled. Microdyne had a transportable Ku

ENG and Other Mobiles

Satellite newsgathering vehicles (SNVs) were caught in heavy traffic at NAB '87; foot traffic, that is. But although interest in SNVs was intense at the outdoor exhibit area, ENG and EFP are still very much part of broadcast operations, and these mobiles attracted just as many tire-kickers as their dish-bearing cousins.

E-N-G Corporation showed its Ford E-350 Supervan, this year outfitted with a second equipment rack to hold an Ampex Beta editing system. The Supervan also comes with a 30-foot mast.

Wolf Coach showed one of their B-series removeable boxes for one-ton trucks, on a vehicle owned by WTVC, in Chattanooga. The B series box is a body and interior designed to outlive multiple chassis. A 52-foot mast enables the truck to act as a 2 Ghz mobile repeater.

From Shook Electronics came the model 24/31 ARA 32-foot full-facility truck with a separate graphics area and audio room. The 24/31 ARA is designed as a complete production unit for six or more cameras.

Television Engineering Corporation parked their TEC-14 BX at the outdoor exhibit lot. Built on a Ford E350 cutaway, the truck features a 6.5 Kw generator, four equipment racks, and a 13,500 BTU roof-top air conditioner.

NBC brought their impressive new twin N8 45-foot production trucks to Dallas. Centro Corporation custom outfitted both trailers. The A unit carries audio mixing and video switching facilities; the B truck holds graphics and editing equipment, VTRs, and utility storage.

There was one mobile at the outdoor lot that didn't even have wheels: but the Aerospatiale 350 helicopter doesn't need them. Top speeds of 145 mph and a range of over 450 miles make this "vehicle" a truly mobile mobile.

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uplink. Although Andrew and Vertex mobile uplinks were seen on various SNVs, both also had units on display in their own exhibits. A pole wall mount for fixed Ku-band receiving antennas was shown by Rohn. Among Wegener's offerings was the Series 2600 Agile SCPC transmission system for adding audio and data to satellite links. Several levels of automation were possible. Microdyne also featured SCPC equipment.

For More Information

Hubcom 658
MCL 659
Midwest 660
Satellite Trans. Sys. 661
Dalsat 662
Scientific-Atlanta 663
Roscor 664
Keltec Florida 665
BAF 666
Microdyne 667
Centro 668
Standard Communications 669
GTE Spacenet 670
DX Communications 671
Satcom Technologies 672
Andrew 673
Wolf Coach 674
Radiation Systems 675
A.F. Associates 676
Comtech 677
Vertex 678
United Satellite Sys. 679
Spectra 680
Wegener 681
RF Scientific 682
Rohn 683
Advent 684

Satellite Services: Everywhere Else

There may be some idle transponders up there in the geosynchronous orbit, but you couldn't tell that from all of the bustle on the ground at NAB. How the industry ever got along before *without* satellite services is hard to image. Distribution of sports is a natural; program syndication by satellite goes without question. High-definition television, if it comes, will be distributed by satellite. But at NAB '87 the hot topic was (as it has been for some time now) satellite news gathering (SNG)—on the Ku-band, by truck (SNV), or fly-away.

There was plenty of advice available on the subject from vendors and from speakers at numerous sessions, but nobody worked harder than the GTE Spacenet in spreading the word. Spacenet even ran a private seminar on SNG as a "business tool."

GTE Spacenet certainly looked like a force to be reckoned with at NAB. Joining ABC, CBS, and CNN Newsbeam as a user of Spacenet's News Express service was Gannet Broadcasting's nine stations. "With the addition of Gannett, more than 22 individual stations will be using our News Express along with the hundreds of ABC, CBS, and CNN affliates that will be initiating SNG service within the next two years," said president C.J. Waylan.

Introduced at NAB by GTE Spacenet was Call Express. This new satellite service allows a user to connect into the public telephone network from any location. In a hands-on demonstration at the IDB Communications "outside" exhibit, such calls were being made though IDB's fly-away unit. Offered as a "free" service to News Express members was a new electronic bulletin board feature. Called News Express, the service allows member stations to list stories that are available for sales, including the time of the broadcast, transponder number, and telephone number. Other items, such as trucks for rental, can also be put on the bulletin board.

Among other announcements by GTE Spacenet was the opening of its new McLean (VA) video control center for Occasional Use and SNG support service. Computerized measuring devices and computerized scheduling are state-of-the-art features. The control center handles the system's two SPACENET satellites (C- and Ku-band) and the two GSTAR (Ku-band only) sats.

RCA Americom was at NAB, of course, but this time as part of GE's new Communications & Service organization, an operation combining seven GE and RCA businesses. Some of its former aggressiveness seemed missing, but with a dedicated route to 674 broadcast stations via two Satcom K-2 transponders carrying four video channels, maybe it could afford to be less aggressive. K-2 does carry the NBC network feed and serves other broadcasters frequently, including the Independent News Network and Conus.

RCA Americom was demonstrating the clarity of two-channel transmission on one transponder. A new March 1987 rate card clearly showed Occasional service is not expensive and C-band a bargain—though Ku-band is the technology of choice, said RCA, for data and video.

Conus showed no signs of being bowled over by GTE Spacenet. Newsgathering at an affordable price is its strong suit for national and regional coverage. Its primary satellite is SBS III along with Satcom K-2. While GTE Spacenet made much of its round-the-clock voice communications service (using the Skyswitch DAMA system—dialtone on demand) once the antenna on the transportable unit establishes contact with the satellite, Ray Conover of Conus said that the optimum SNV communication package is really a function of tradeoffs.

Conus has opted for "what's proven satisfactory, at the lowest cost," said Conover. This means putting communications on one transponder along with two videos, rather than using a separate SCPC system over a separate transponder. The Conus approach (detailed in a technical session) offers IFB and private line between the truck and its station, plus two-way radio via satellite. But its IFB is "on-hold" until needed, thereby saving costs. To avoid intrusions on others through error (which can be prevented with full voice communication on a separate channel), Conus "talks-in" a truck setting up. It authorizes low-power transmission only until it knows that the truck is in position and can hear Conus's operating center. With over 50 stations as part of its satellite system, Conus was talking news coordination services and special programming, including its new joint venture with the Associated Press.

IDB Communications Group Inc., growing rapidly following its entry in video uplinking services as well as radio (its revenues were up 61 percent last year), announced that it has leased two C-Band transportable earth stations from NETCOM International. These units will be integrated with other Ku-band facilities and tied into the company's overall facilities now in New York (Staten Island Teleport), Los Angeles, and 31 other cities. IDB expects CBS to continue to be a user of the C-band trucks. Featured in its outdoor exhibit were a new Midwest SNV and audio fly-aways. Demo'ed was GTE Spacenet's Call Express service, which ties any fly-away into the public-switched phone service.

Wold Communication's role in mobile uplinking is big but more in special events and programmig distribution than in news. Continued expansion into international markets was its message at NAB; most recent was the agreement with the telecommunications carrier DGT of France to operate and market a full-time two-way channel between North America and Europe. A current user is the U.S. Information Agency with its "Worldnet" programming.

Offering an alternative to the GTE

Spacenet Skyswitch communication route through Gstar, was the U. S. Satellite Corp., a common carrier out of Utah. Information distributed at the Centro stand said that through the use of a frequency-agile upconverter, the ASC-1 satellite could be used. Rates quoted were $20 a month for the line plus 40 cents a minute for usage. The company also offered a Ku- to C-band turnaround service.

Shades of the Conus model were evident in two other services at NAB. Guycom (GUY Communications Co., Inc., Houston), which owns five transportable uplinks and markets the Metroplex teleport in Dallas, has set up and operates an uplink/downlink service called TRANSAT. Participants currently offer 23 transportable uplinks (C- and Ku-band) around the continental United States. Coverage last year included such things as the Hormel union strike in Minnesota, Hurricanes Danny and Elena, as well as several presidential news conferences.

Also coming to NAB from Houston was Ethereum Scientific Corp., which offered the EMBARC Network. EMBARC is short for the Ethereum Mobile Broadcast and Reception Consortium. Its plan has the fifty states divided into twenty independent regions, each to be serviced by a representative located centrally within the region. Each rep is, in effect, a franchisee, which gets its mobile uplink (Ku-band) from Ethereum. Representing the service was Kentucky Uplink, the most recent franchisee. Others in operation are located in Arkansas, Ohio, and Texas. EMBARC is available for news, but it sees its main business coming from sporting events, special events, and video conferences. Four teleports located in Oklahoma City, Albuquerque, San Antonio, and Harrisburg, PA, are part of the net.

Coming to NAB with a new satellite courier service was Cycle Sat Inc. Unveiled was a new system "designed to streamline the delivery of television commericals." The time needed to deliver a spot from advertising agency to the station has been shortened (to within 24 hours), while simultaneously simplifying traffic instructions. The heart of the system is a Cyclecypher decoder-controller, which permits only those stations addressed to receive commercials. Stations agreeing to receive the satellite transmissions will be provided with such a decoder, at no cost. Cost of delivery, put at $15 to $30 per spot, is about a third less than that of videotape via air courier, the company claims. Cycle-Sat is a subsidiary of Winnebago Industries.

For More Information

COMSAT 685
GTE Spacenet 686
U.S. Satellite 687
IDB Communications 688
Guycom 689
RCA Americom 690
Ethereum Scientific 691
Netcom 692
Cycle Sat 693
Conus 694

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AVCOM's Single Channel Per Carrier Receiver, model SCPC-2000E, has been developed for the reception of FM SCPC signals from satellites operating in the 3.7 to 4.2 GHz band. The SCPC-2000E is a complete receiver that can tune up to 4 specific crystal controlled audio or data channels from a given transponder and is available in either wide or narrow band models. Optional circuitry is available to allow up to 8 crystals for channel selection. The SCPC-2000E may be used with the SS-1000 Slave for simultaneous reception of additional channels. **$1875**

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Test & Measurement

Perforce, the test and measurement sector of the industry follows what the rest of the business is doing. Obviously, there is no reason to have measuring instruments for, say, component digital until those kinds of machines exist. This is not to say, however, that there are no leading-edge technologies involved in the instrumentation side. The 1987 NAB convention showed both faces of the signal checking business, demonstrating intelligent responses to market trends as well as innovative uses of new technolgies, some of which were pioneered by these companies. On the business front, changes were no less evident as companies formed new international alliances and renewed commitments for U.S. operations.

In hardware—digital circuitry, portability, added features, touch screen, and membrane panel interactivity combining measuring parameters into one instrument: these were some of the significant innovations at this year's show, demonstrating a dynamic market going into the second half of 1987. An added benefit of all the activity in T&M is that prices are coming down due to a combination of competition, refinement of technology, and manufacturing techniques.

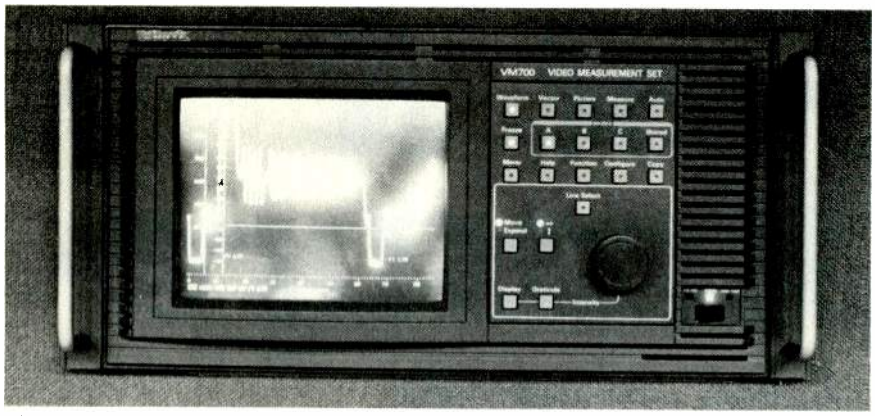
A note of interest here regarding digital circuitry. For those requiring measurements above 6 MHz, standard waveform and vector monitor (something equivalent to Tek's 520 and 1480) will still be needed since front-end digitizers cut off right around 6 MHz.

One of the determining factors of future success in this end of the broadcast market will be pricing. It has been said that in the new industry climate price is the most important element in the future of test and measurement, and the companies who survive will respond to this need with better manufacturing, including digital circuitry and better, more efficient integrated circuits. Design approach is one of the disciplines that must be mastered in order to accomplish these feats.

Tektronix, in spite of, or perhaps because of, its size remains able to respond to the aforementioned constrictions and can offer the marketplace something new. Though still in prototype, the VM 700 automated video measurement set, was demonstrated in a small, closed theater within the larger Tektronix booth. The unit is Tek's answer to its previous Answer. The new VM 700, having the same primary application (i.e. automated transmitter monitoring) as the earlier Answer machine, incorporates many new techniques and truly provides a plethora of capabilities. In the interest of adaptability, the VM 700 is approached on the platform design concept, allowing the company to take all input from users and incorporate those of universal concern. Studio measurements are, of course, possible since the device can provide a full set of measurements automatically.

The unit is a complete video monitoring and measuring instrument that can be used for automatic monitoring as well as for manual measurements. As an automated measurement tool, the VM 700 makes a prescribed set of measurements, comparing each one to limits preset by the operator. Reports can be printed on any local or remote printer via the standard RS-232C interface.

The VM 700's digital waveform monitor allows manual use as well as automatic features, and ensures a bright display with unique cursors and full line selector. The digital vectorscope within the instrument permits calibrated rota-



The Tektronix VM700 turned heads at this NAB, offering advanced measurement techniques.

tion and expansion of a standard display for analysis of color signals. The noise measurement set offers a numerical value for weighted and unweighted S/N ratio plus a display of the spectral distribution of the noise. Other features include freeze and storage of waveform representation for later viewing or analysis and a touch screen that allows the user direct, tactile interaction for expansion of on-screen information. The price for the unit is not yet settled on, but the reports on projected price range indicate that with its automated approach and combination of capabilities, the VM 700 will be a cost-effective instrument.

In other areas of technology, new products were introduced by Tektronix to handle a wide range of testing requirements. The 1705 Spectrum Monitor was introduced for the growing satellite newsgathering operations around the country. In response to other significant developments in the industry, Tektronix offered the 1735 dual-standard waveform monitor and the component trio of the WFM-300 component waveform monitor, the TSG-300 component test signal generator, and the 650HR-C component/composite picture monitor.

On a smaller corporate scale, but no less innovative, Videotek, a growing, agile company, brought new tools for the video checker. Perhaps most interesting among the many offerings was the TVM 620 combination waveform monitor/vectorscope. Not only is the 620 a combination instrument, but it offers a combined look at three filters together: flat, low-pass, and chroma. The ability to look at all three simultaneously is an unusual technological innovation in a half-rack-width test device. The unit is microprocessor-based and features tactile membrane control panels allowing individual or combined viewing of parameters.

Additional features that contribute to the trend towards combined, easy-to-use instrumentation include vector overlays for simultaneous observation and comparison of the phase and amplitude of up to three signals. Also included are four user-defined memories allowing rapid recall of frequently used modes as well as diagnostic testing of the front panel controls and LEDs.

Bearing in mind the previous point made regarding price consciousness, a look at Videotek's new SC/H phase indicator, the VPH-360, demonstrated an economical solution to timing and color framing problems. The 360 is designed for use as an inline device and can be connected to any vectorscope for observation of timing and color framing information by generating H phase markers on the display of the vectorscope.

Further expanding the application of new technologies to the instrument field, Videotek demonstrated its new DM-140S stereo tuner demodulator, employing a membrane-panel front keyboard that has LED feedback. The unit has switchable MTS/SAP decoder outputs and dbx processing of stereo signals, and the audio outputs can be either balanced or unbalanced. Other striking presentations included two new blackburst generators: TIMES SIX and TIMES SIX PLUS for centralized control of system timing.

In addition to digital circuitry and applications of recent technologies for operator interaction (such as touch screens and membrane panels) making it easier and more efficient to accomplish signal checking, a very pragmatic consideration has, in the last few years, entered into test and measurement design. The most significant manifestation of this is portability, demonstrated by Leader Instruments. One of the problems to solve in taking instruments afield is how to deliver power. The use of a battery is the obvious answer, but designing the instrument to operate efficiently, properly, and continuously makes the solution more difficult to achieve than it may first appear.

Leader's LCG-409 is a battery-operated pattern generator offering a precision source for NTSC signals for field adjustments of VTRs, large-screen TV receivers and monitors, and for complete video system field checks. Housed in a metal cabinet, the unit weighs just over 6.5 pounds, including the four C cells required for power. Another addition to its portable line is the new LVM-5863 waveform monitor for EFP applications.

A multipurpose test generator was demonstrated at the show by Leitch Video as well. The unit is small and modular. The system is based on the MTG-2600N series with the ability to add modules of one RU or two RUs in mounting frames with genlock and a variety of plug-in test signal modules offering 12-bit signal generation on a single card. Each module provides black burst and up to seven related test signals, selectable with an onboard rotary switch.

Market Considerations

Hardware and software are not the only areas where a company can impact the industry. As the broadcast equipment business matures into a market-driven industry, responding to the needs and input of customers begins to take a priority. The NAB announcement of Philps Test & Measurement and Fluke Manufacturing joining forces in a marketing exchange agreement involving LU.S./European operations demonstrates a response to such changes in broadcasting.

Perhaps such a move will allow the combined Philips/Fluke entity to compete better in the U.S. with both the larger, established companies, and the smaller, more agressive ones. The industry awaits the results. Meanwhile, at NAB '87 Philips showed a new line of equipment, stressing the brightness of display offered by digital processing. In addition, Philips is convinced the market demands a greater variety of features and, contrary to what other manufacturers believe, not continual downward pressure on prices.

The added features are most evident in the PM 5665 and 5667 wave-

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Providing the capability to view three measurement parameters simultaneously, the Videotek TVM620 was a hit.

form monitors and vectorscopes, respectively, as well as the other models of waveform and vector monitors and SC/H phase meters. One noteworthy feature is that all waveform monitors and combination waveform/vector units have line selection and can be combined to read lines from vectorscopes. Always a quality feature, the internally etched graticule has proved popular in the past while a new capability is the expansion of information on the screen up to five times for closer analysis. Other useful provisions include calibrated power supply from 90 to 250 volts and oscilloscope probe inputs on the front panel.

Of course, companies, like Philips and Fluke, joining together is not revolutionary, nor is it unusual for them to split apart or to have spinoffs. Large companies, like Tektronix, experience this. A case in point is Magni Systems, which, made up of a group of engineers and managers, is an offshoot of people and ideas from Tektronix that began in 1984.

The company now seems to be in full stride and, in the last year, has shown some product that appears to offer intelligent solutions to typical video measurement problems. The people at Magni contend that the technology is there, both hardware and software, but that it is now a matter of delivering useful instruments to the customer when they need them.

The key products shown at the NAB this year were the 2015 programmable test signal generator, the 1520 combined test and measurement package, and the 1515 component and composite test signal generator.

The 2015 is probably the first video instrument to use an IBM-compatible personal computer to program custom test signals for new and emerging video technologies including 112/560 HDTV and others. The unit offers software selectable clock frequencies and 30 MHz bandwidth analog outputs. With another of its products, the company has responded to the demand for smaller packages with more capability: the 1520 combined test and measurement unit. To the standard, combined waveform monitor/vectorscope, Magni added a test signal generator allowing greater portability of complete instrumentation while providing cost effectiveness. Further flexibility is provided by the model 1515 component/composite test signal generator with component analog video test signals plus NTSC composite test signals in one instrument.

Other combined instruments were also on display. Broadcast Video systems showed the Electronic Visuals EV 4061, a combined waveform/vector monitor with switchable display modes. Model 4050 is a multi-standard, component waveform unit with three looping inputs plus external reference. It contains a sequential switcher, parade, plus expanded overlay and a vector display of color difference signals.

Corporate Developments

International marketing agreements seemed to be the order of the day for the NAB. In keeping with this, Rohde & Schwarz announced an agreement with Moseley Associates to supply the Video Analyzer UVF as an integral component to the MRC-2 microprocessor remote control system from Moseley. The UVF is designed as a fast adjustment and alignment device and is also useful for multipoint monitoring functions. In its fast mode, a complete data update occurs every 2.15 seconds.

Another newly exploited technol-

Magni's new set of gear drew crowds looking for advanced features.

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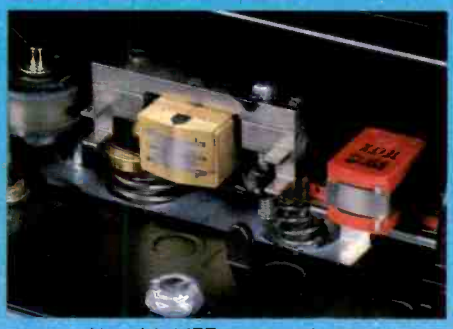

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Amber's PC-based audio analyzer and instrument controllers attracted much attention.

ogy, as already mentioned, in T&M is the pervasive use of digital circuitry. Cost effectiveness, versatility, and flexibility are among the reasons for such usage. Rohde & Schwarz offered their first digital TV oscilloscope at this year's show. The instrument has a high-speed 10-bit analog/digital converter permitting resolution of 1/1024 of display height. Several graticules and tolerance masks are electronically inserted in the display. The operating speed of the 16-bit microprocessor allows the difference between two signals to be obtained with a high-repetition frequency.

With a heightened sense of audio awareness in the video business (and hopefully in the audio business) one signal checker that has become increasingly important is the audio analyzer. Rohde & Schwarz demonstrated at the show its new audio analyzer UPA for measuring audio equipment in the 10 MHz to 100 kHz frequency range.

Testing instruments have in recent years been microprocessor based. Naturally, new developments in such a field include as much software as they do hardware. Crown International's Techron division offered new software at the show for its System 12. This unit uses Time Delay Spectrometry (TDS) in acoustic analysis for determining areas of sound reflection or origin to within parts of an inch. It also ignores ambient interference and provides documentation, an outgrowth of the increased storage abilities of the new software allowing for later analysis of the data. Since the software expands the number of "instruments" available to the user, it is easier to take to remote sites. While the Polar software offers polar response plots for loudspeakers and microphones, the Workbench program incorporates four instruments: sound level meter, digital volt meter, oscilloscope, and function generator.

Potomac Instruments also delivered an impact product in the QuantAural audio program analyzer. The unit can take audio from any source and measure peak level, overall processing effectiveness, tonal balance, stereo image width, and preemphasis. Potomac's other product drawing great attention at the show was its solid-state UHF field strength meter, which offers 470 MHz to 960 MHz continuous tuning and has switch selectable 20 or 60 dB meter range, as well as AM or FM demodulator.

Another important audio product was offered by Audio Precision. The unit is an automated test system operating on a Compaq portable computer, permitting the complete range of audio analysis parameters. In Amber's booth the Series 8000 PC instrument controller was displayed alongside the 5500 programmable distortion and noise measuring instrument.

RF Checking

Modulation Sciences, continuing to advance the science of Multichannel Television Sound (MTS), introduced new products at the NAB. Perhaps most notable was the Modminder, which works with a wideband demodulator (such as the Tektronix 1450-1) to give a continuous quick-read status display of the complete MTS signal: total modulation meter, status of subcarriers, overmodulation peak flasher, and injection level of subcarriers. Accuracy is enhanced due to the unit's direct use with the station's already existing wideband precision demodulator.

Modulation and reference monitors were at the show in numbers. Some of those numbers were represented by Belar Electronics with its FMS-2 stereo unit, its solid-state AM model and its TVM-200 TV stereo device. Featured were units from the 200 Series, highlighted by the new TVM 210 reference monitor offering direct-reading equivalent mode separations of 60 dB out to 14 kHz.

TFT, well known for its monitoring equipment had considerable impact at the show with its SAP Pro monitor, the 855 BTSC in prototype. Model 851, now available, has a composite input only. The BTSC TV stereo modulation monitor Model 850 contains RF and IF composite inputs allowing punching in of cable channel numbers to see how the performance is in regard to BTSC stereo. Other models on display included the 8500 subcarrier generator with its 8501 demodulator.

B&B Systems brought its line of phase monitors offering real time phase, level, and audible monitoring of the stereo audio signal.

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Rohde & Schwarz offered new products, including this new monitoring device with digital window.

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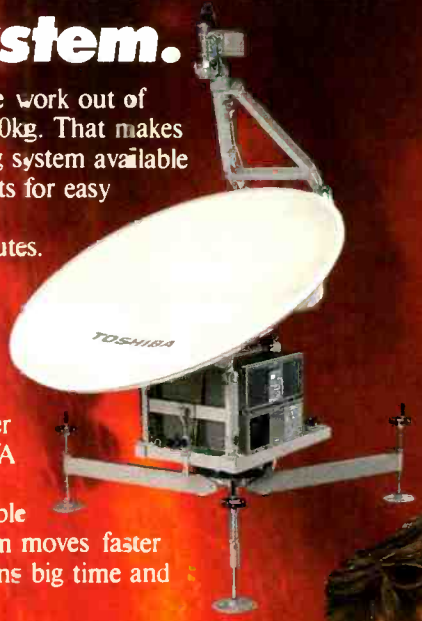

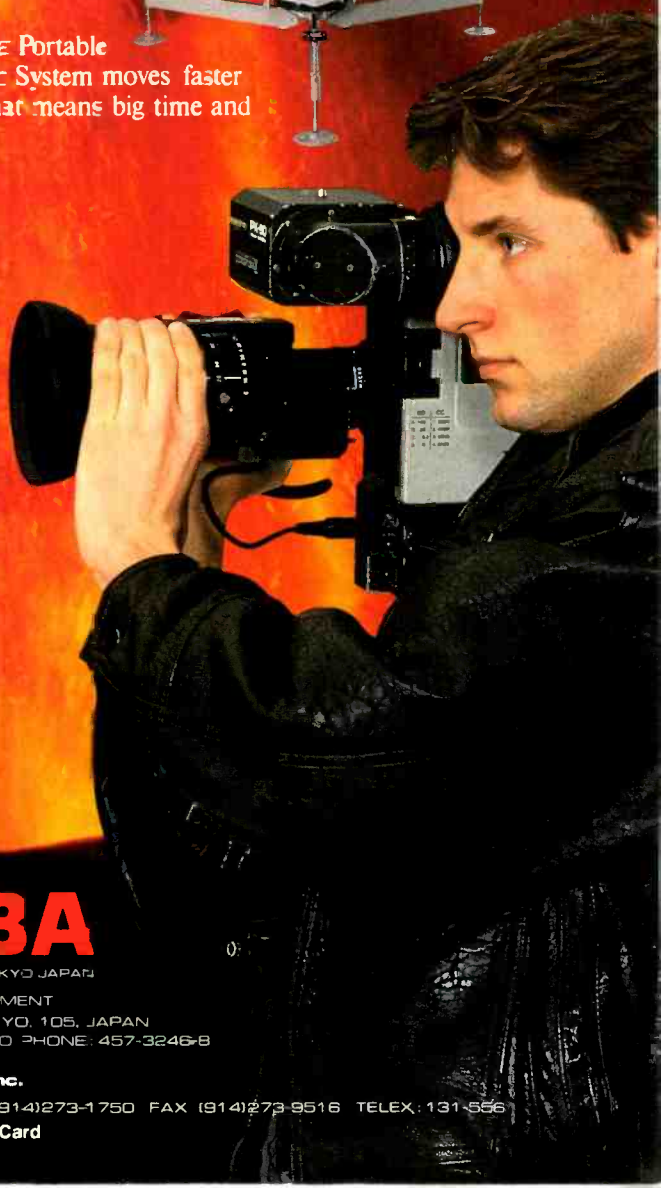

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Manufacturer	Page No.	Circle No.
Abekas Video Systems	31	117
Acrodyne Industries, Inc.	101	154
AF Associates Products	57	130
AKG Acoustics	81	143
Alpha Audio	70	137
Ampex Corp./MTD	18-19	111
Angenieux Corp. of America	22	113
Ant Telecommunications	53	128
Audio Technica, U.S. Inc.	94-95	150
Audio Technologies	93	149
Auditronics, Inc.	78	142
Avcom of Virginia	109	151
Belar Electronics	71	138
Broadcast Audio Corp.	77	141
Bryston Vermont Ltd.	83	144
BTS Broadcast Television Systems	49	126
Camera Mart, Inc., The	5	103
Canon USA, Inc.	15	108
Canon USA, Inc.	55	129
Cetec Vega	96	159
Cipher Digital	69	135
Comark Communications, Inc.	11	105
Continental Electronics, a Division of Varian Associates, Inc.	103	156
Datatek Corp.	32	118
Dictaphone Corp.	85	145
Digital Services Corp.	27	115
Express Tower Co.	105	157
Fidelipac Corp.	1	101
For-A Corp. of America	37	120
Fujinon Inc.	39	121
Fuji Photo Film USA	29	116
Grass Valley Group, Inc., The	8	104
Ikegami Electronics (U.S.A.) Inc.	25	114
Ikegami Electronics (U.S.A.)	115	163
Imageering Laser Disk Systems, Inc.	4	102
JVC Company of America	17	110
Lake Systems Corp.	51	127
Leader Instruments	112	161-162
Logitek	91	148
Maxell Corp. of America	66	—
McCurdy Radio Instruments	Cov. 3	165
Midwest Corp	13	106
3M Magnetic Media	6-7	—
NEC America, Inc.	41	122
Nurad	98	153
Odetics	59	131
Orion Research Inc.	16	109
Otari Corp.	74	140
Panasonic Broadcast Systems	61	132
Panasonic Broadcast Systems	63	133
Panasonic Broadcast Systems	65	134
Perrott Engineering Labs	70	136
Potomac Instruments	89	147
Quantel	35	119
Rational Broadcast Systems	45	124
Schneider Corp. of America	42	123
Scientific-Atlanta	107	158
Shallco	103	155
Shively Labs Div. Howell Labs	109	152
Shure Brothers Inc.	14	107
Solid State Logic	97	—
Sony Broadcast Products Inc.	2-3	—
Sony Pro Audio	72-73	139
Studer Revox America, Inc.	Cov. 2	100
Telex Communications	117	164
Telex Communications	87	146
Toshiba Corp.	119	166
Total Spectrum Mfg.	20	112
Utah Scientific	47	125
Videotek	110-111	160
Ward-Beck Systems	Cov. 4	—

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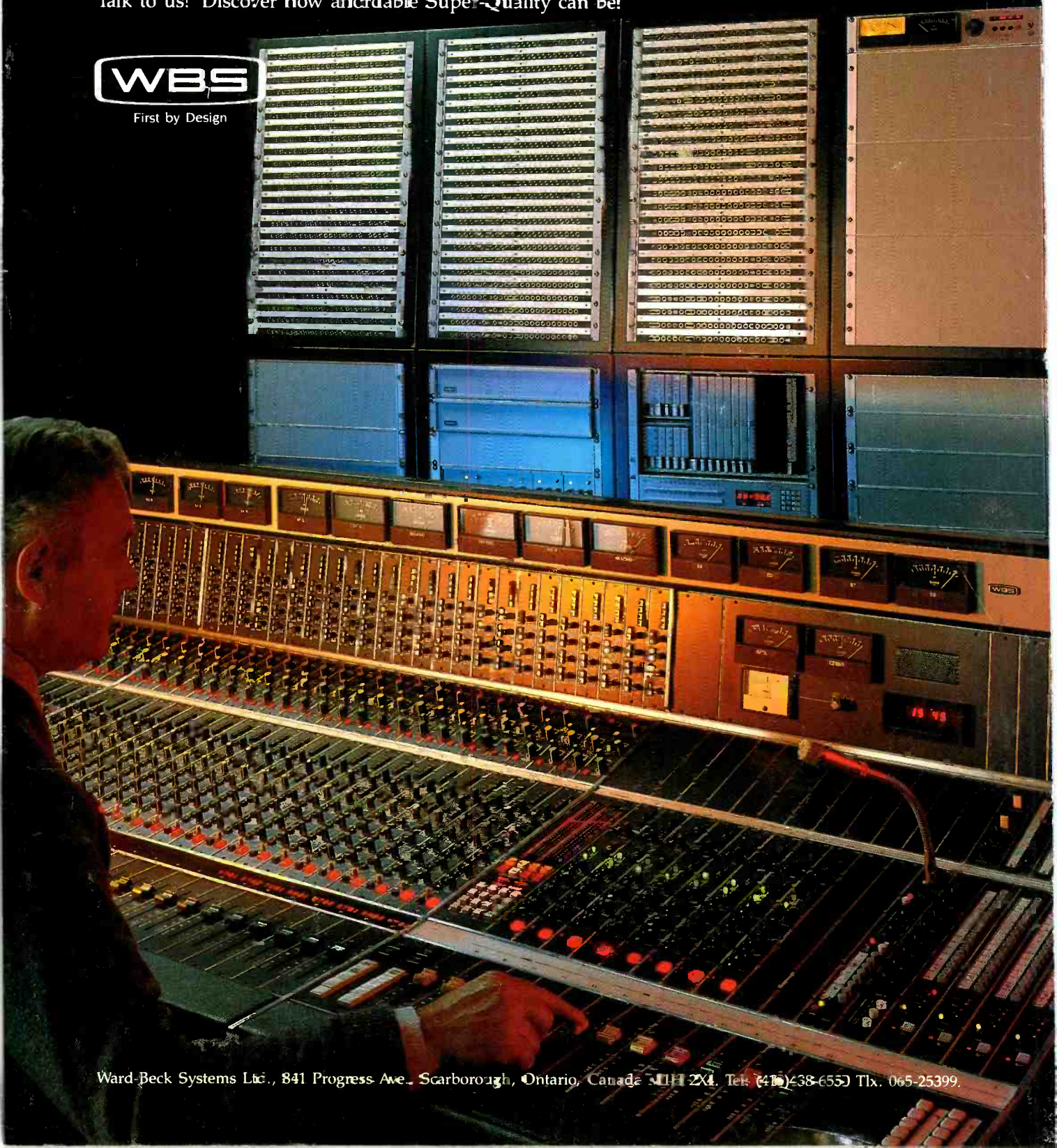

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