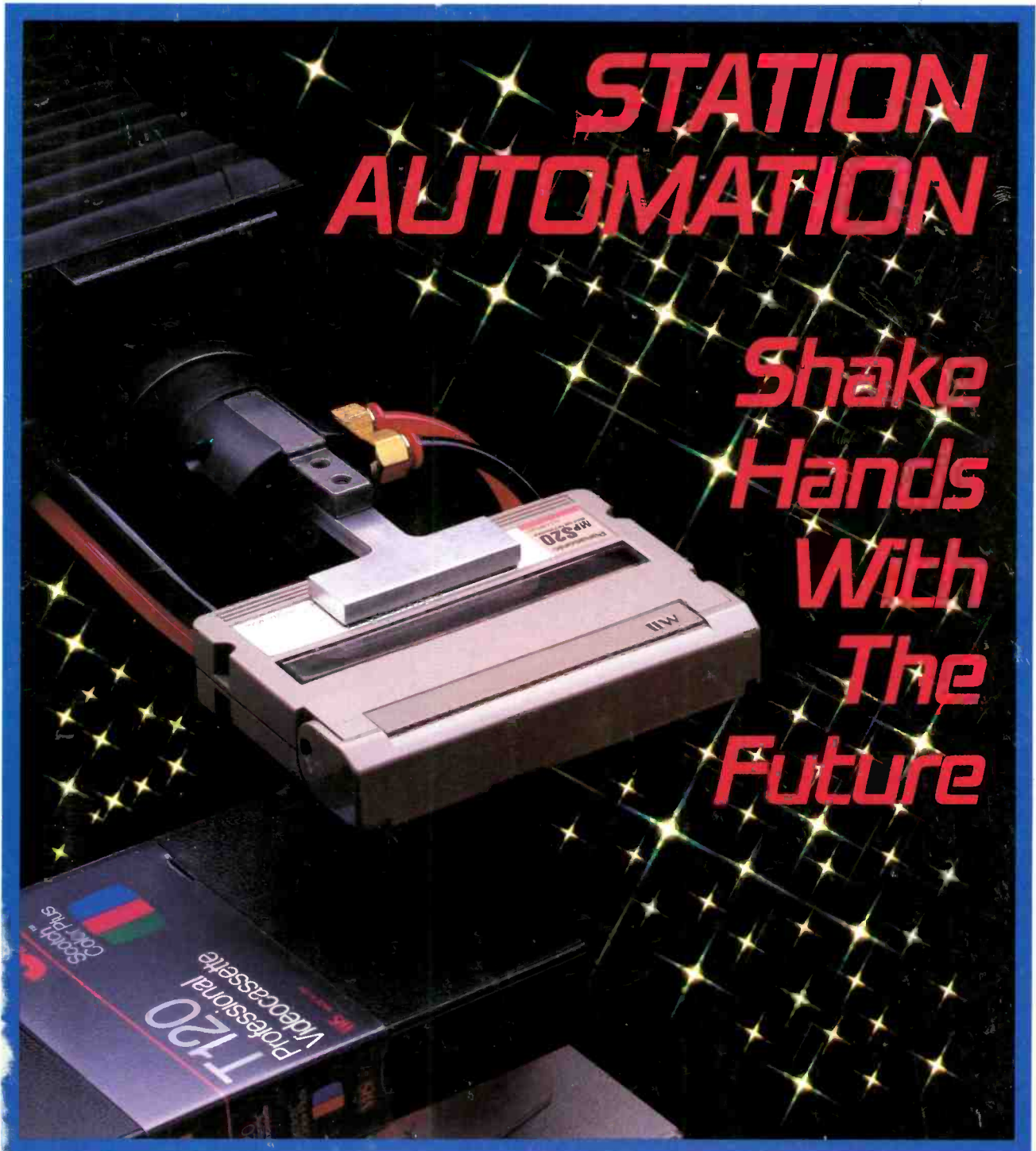


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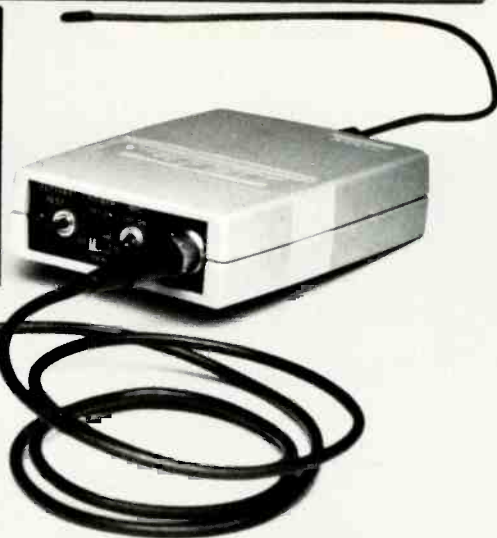
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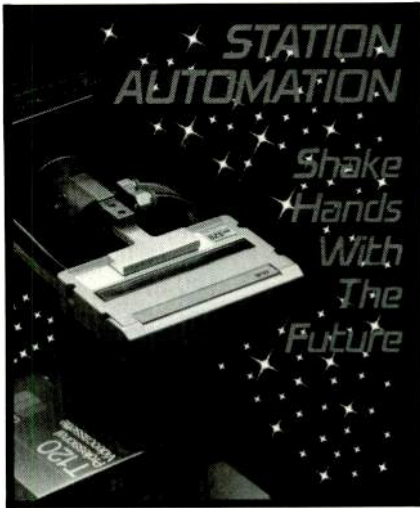
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APRIL 1987

VOLUME 24/NUMBER 4

# BM/E

BROADCAST MANAGEMENT/ENGINEERING



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Station automation, as illustrated by our cover, is reaching its robotic hand into various aspects of the modern broadcast plant. This photo composite includes a newly created starfield and an original picture supplied by *Lake Systems*.

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# Tautology and Technology

***“In a state of mind induced by too little sleep, too much walking, and probably too much of everything else, one is prompted to wonder what the idea is behind all of this.”***

Returning from the recent NAB convention, after four or five days on the two-tiered, cavernous floors that make up the equipment exhibit, it is often difficult to understand the necessity for such a repetitious display of hardware. One goes from booth to booth, often hearing the same kind of reasoning from different people regarding very similar products. At the end of this grueling tour of duty, in a state of mind induced by too little sleep, too much walking, and probably too much of everything else, one is prompted to wonder what the idea is behind all of this.

The idea is two-fold: money and change. That is change for the betterment of the industry and the public that it serves. Let's not be naive and think money is not important at this concentrated and ostentatious demonstration. Let's also not forget to put it into perspective; many of the large companies can, and do, make more money by investing in real estate and other programs; many of the larger companies make, in their consumer and industrial divisions, many times over what they make in broadcasting, yet they stay here. Why? This is the change part.

By change I mean the excitement generated by this fast-moving and technologically advanced industry and the way the philosophies and products shift according to need. That is the kind of change that will benefit everyone involved. That is the kind of energy that people in this business, both on the buying and the selling sides, enjoy, and that is why we stay here.

And that is why we return there. Every year, we trot ourselves off to where the convention is being held and we tread through the endless aisles of machinery. The endless lunches and parties are no less prominent. All the while thinking, “Well, here are all the same people (maybe with a different company's name tag on, but still the same people) in the same place doing the same thing once again this year.” Though it is hoped that some won't do some of things they did last year.

Yet, it is then that we find just the thing to solve the problem we'd been having at the station. Maybe it's a new automation system that will not replace people, but free them up to do something more creative or constructive; maybe it's a new paint system that will allow a station to compete, visually, in its market; maybe it's a new on-air board that has just the right features for the facility. That is the moment of excitement, the moment of change when the sore feet, the sore head, and the expense seem worthwhile. And that is why we stay here. And that is why, in a sea of wires, digits, sights, and sounds, we notice the subtler values on display and can dispel the sense of needless repetition.

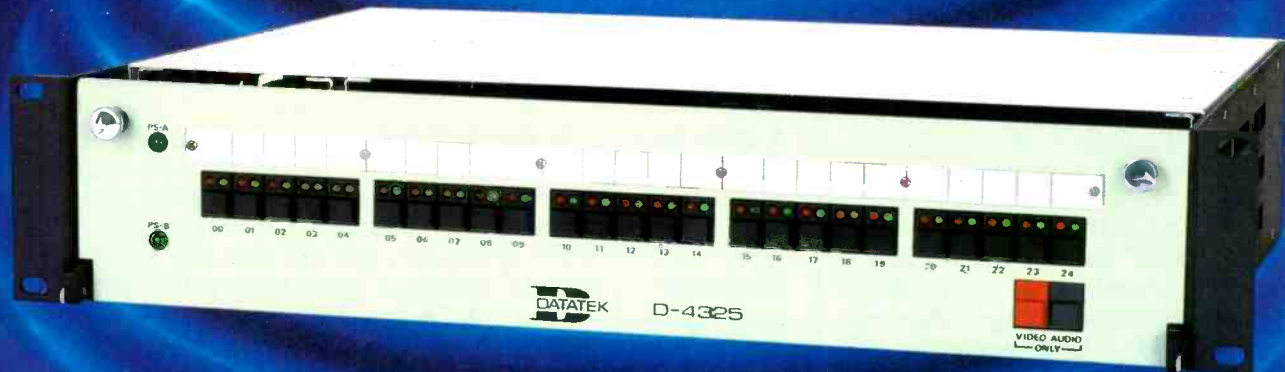
Will we return next year? You bet. Still, I wonder.



*Tim Wetmore*  
Editor

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## Station Acquisitions Challenged

A plan by NBC to buy Miami CBS affiliate WTVJ has reportedly prompted CBS to show an interest in buying independent WCIX in the same market, and both of these events have brought protest from WSVN, current NBC Miami affiliate.

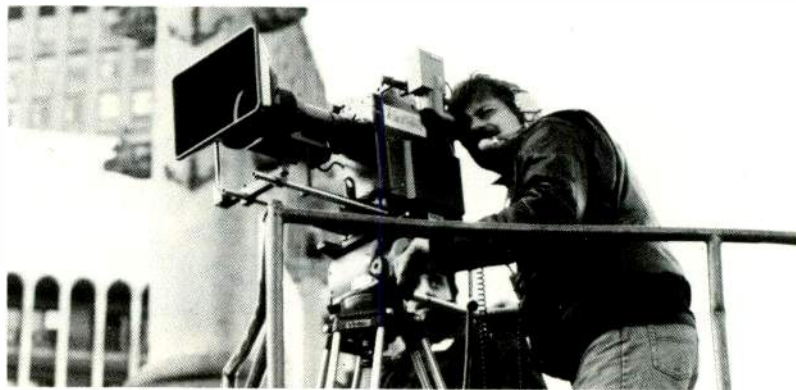
"A network should not be buying a station that's not already its own affiliate," says Edmund N. Ansin, president and owner of WSVN. "NBC shouldn't be leveraging, it's abandoning its affiliate partner and buying another station in the same market."

WSVN's affiliation agreement with NBC expires in January 1989. According to a position statement issued by the station on March 11, "Consummation of these deals would only represent a gain for media conglomerates and a loss for the public, at the expense of the local independently owned broadcaster."

The paper states that by publicly announcing that it will terminate its agreement with WSVN, NBC has damaged the locally owned station's status in the eyes of advertisers and programmers.

Another of WSVN's arguments is that WCIX—the station that CBS is reportedly considering purchasing—has restricted transmission power to avoid interference with channel 6 in Orlando, and because of this, large portions of the market will be deprived of CBS programming. As this issue goes to press, WSVN plans to petition the FCC to hold a hearing on the proposed sales.

"We're also speaking to members of Congress and to Congressional telecommunication committees charged with oversight of the FCC," Ansin said. "What we're bringing to the attention of the FCC and Congress is that the revision of rules on multiple ownership and the elimination of those on trafficking have predicated what's going on. It's a big mess. I personally would like to see those rules reinstated." Ansin



**A crew from 1125 Productions Inc. sets up to shoot in the streets of New York**, while several blocks away the company premieres its high definition video production center this month. 1125 Productions Inc. features the Sony high definition video system (HDVS), which includes the HDC-100 high-definition camera seen here. Taking its name from the number of scan lines in the HDTV standard, 1125 Productions is the brainchild of David Niles, founder and chairman of the Captain Company. Located in Paris, France, the Captain Company was the first studio to be equipped with Sony's HDVS.

"The U.S. television industry has heard a great deal about the capabilities of HDVS," relates Niles. "We've already received numerous requests, and are anticipating a high demand by producers who want to work with this technology."

The new facility will offer HDVS production capabilities, with one-inch off-line editing. In addition to two HDTV cameras, 1125 Productions features three Sony HDV-1000 one-inch VTRs, digital effects equipment, and HDTV-to-NTSC transfer facilities. The studio will also offer post-production services in various formats, and an insert stage.

In addition to television and video production, HDVS also has applications for motion-picture filmmaking. High definition video, with an aspect ratio of 5:3, can be converted to 35 mm movie film. "HDVS also offers filmmakers a great deal more creative flexibility than working in 35 mm film. This has been demonstrated by the growing use of electronic cinematography techniques in motion picture production," Niles explains.

Initial applications anticipated for 1125 Productions are the making of feature films, commercials, and high-quality industrial programming.

was referring to both WTVJ and WCIX having recently been involved in purchase agreements prior to these latest deals.

On February 25 *The Miami Herald* attributed to industry sources speculation that there may have been negotiations between CBS and WSVN, and that the network's plan to buy WCIX was meant to scare Ansin into making a deal.

George Schweitzer, vice presi-

dent of communications of the CBS Broadcast Group told *BM/E* that the network and WSVN were discussing a possible deal and that "by the time [this story] is published we'll have it worked out." NBC, meanwhile, refused to comment.

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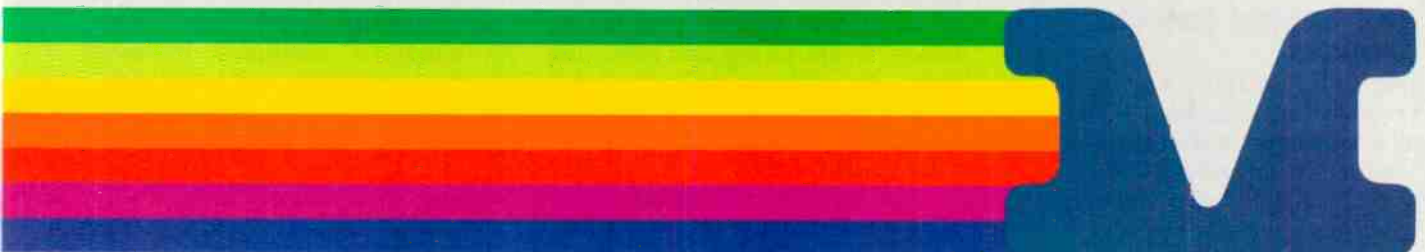
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fessional video dealers, the Professional Systems Network, Inc. (PSNI), has been formed as a result of dealer meetings held in New York late last year.

The stated aims of PSNI are to "provide marketing, public relations, and a wide range of production seminars for a nationwide network of professional video dealers" and to "broaden the corporate, industrial, and organizational use of professional video."

PSNI claims its affiliates will benefit by sharing sales and marketing experience and ideas. A toll-free customer inquiry number, a newsletter, and other information resources will be made available by the corporation as well.

PSNI reports that affiliated dealers support a Dealer Code of Ethics and a Customer Bill of Rights, and that a licensing agreement ensures that each dealer has exclusive rights to representation in his primary marketing area. PSNI plans to license a total of 20 to 25 dealers to handle customer needs on a nationwide basis.

Participation is limited by geographical area; so no more than one dealer from any region can purchase a licensing agreement from PSNI. The agreement doesn't limit a dealer's marketing area, but does allow PSNI to refer potential customers to represented dealers, and to show each dealer's primary marketing area in ads and seminars.

For more information contact John A. Grozik at (414) 357-7840.

### New Digital Satellite Services

Digital satellite services for broadcasters continue to expand in simultaneous developments at United Press International (UPI) and the ABC Radio Network.

UPI has unveiled its Pyxys system, a digitally-delivered satellite stills and graphics service primarily intended for the print media, but available in a television version as well. Pyxis operates on

Westar I, using a digital signal similar to T1. Downlinked, the Model 300 Pyxys unit for television can supply both audio cuts and UPI's average output of 150 color and black and white still images per day. The 300 combines a magnetic digital disk to store up to 300 frames, and a character generator with 68 fonts, choice of colors, and drop-out shadow capability. The unit allows for image modification, and can feed a switcher in component or NTSC.

"While other wire services have ignored television, Pyxys supplies audio and high-resolution stills," says Tom Sudman, president of Digital A/V, which designed the Pyxys. "It's especially good for those times when fast-breaking news stories allow only stills and audio to be available for television stations."

The ABC Radio Network, meanwhile, began testing its own new digital system in February. Known internally as the Affiliate Data and Information System, it is designed to provide affiliates with high-speed delivery of hard copy messages for programming and news-related messages, commercial schedules and affidavits, and operations/engineering information and automation cues.

"Instantaneous data communications to our affiliates will permit much easier access to the full range of audio services delivered across our nineteen 15 kHz audio channels," notes Aaron Daniels, president of the ABC Radio Network.

The system will consist of a "headend" computer, which allows terminals to create messages for individual stations or groups of affiliates; digital encoder/decoder for uplinking and receiving data; an affiliate printer; and a pair of modems for affiliates that have the receiver and studios in different locations.

Although the current tests have been confined to New York affiliate WABC and the ABC Radio Network headquarters (also in New York), the network anticipates full implementation of the service later this year.

### Participation Invited

The Network Transmission Committee (NTC), established in 1954 to promote uniform technical practices in television transmission, has invited representatives of the broadcasting and telecommunications communities to join its ranks. Previously, membership in the NTC was restricted to the Bell System and the major television networks.

The NTC cited rapid technological evolution as the reason for expanding its membership. In recognition of the need to develop unified operating practices and technical quality criteria, the NTC was recently reorganized based on three main goals:

To resolve within North America difficulties that exist because of a lack of unified practices and criteria; to identify areas of mutual concern in TV transmission, and develop reports and other documents as contributions to standards organizations; and to study the development of digital transmission systems, television audio, and vertical interval signals, and to identify problem areas and make recommendations.

Interested organizations or individuals should contact the NTC care of Mr. Howard Meiseles, Capital Cities/ABC Inc., 30 West 67 Street, New York, NY 10023.

### New E-Mail Service for AV Pros

Two recent surveys conducted by Bill Tullis, an Atlanta-based audio engineer, on trends in computers, electronic mail, and the sound and video industries has prompted him to create A-V Sync, a nonprofit computer bulletin-board service for audio and video professionals. A-V Sync is dedicated, Tullis says: "to the free exchange of ideas and information among professionals in the audio, video, and production oriented areas of the entertainment industry."

A-V Sync is scheduled to go on line later this month and will feature multiple lines that may be



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## Industry News

accessed via direct dialing or through various networks (except Tymnet) available to PC users. Tullis says the cost will be set between \$25 and \$35.

The topics covered by the service are organized into conference groups designed to cover most special interests within the industry, including: audio for video; TV sound; production Q & A's; new technology; manufacturers' forum (new products); trends (open dis-

cussions of systems and operations); and system files conference (special software files and text). New or modified files will also be available for users of software-based mixing and editing systems along with updates and related text files from various manufacturers and programmers.

"A lot of broadcast people are just starting to come play around with file transfers," Tullis says. "It provides production profes-

sionals with an alternative to the larger E-Mail services, where they may be paying for things they don't want."

For additional information, contact AV-Sync at (404) 438-5858, or write to P.O. Box 49567, Atlanta, GA 30359.

### Public Radio Seminar

Plans are being made by the National Federation of Community Broadcasters (NFCB) to conduct two public radio transmission training seminars this year.

The five-day sessions will focus exclusively on the transmission chain, and are intended for engineers who have primary responsibility for noncommercial radio stations. The registration fee is \$400, and partial reimbursement will be available to women and minorities, explains seminar coordinator Pat Watkins, of the NFCB.

"We set this up because there's a definite need for training for public radio engineers, and a gap between hands-on and theoretical training," she said. "Some engineers may want to attend the seminar as a refresher course, but we're concerned primarily with the intermediate-level people who are responsible for transmission system maintenance. And at non-commercial stations in rural or disadvantaged areas, that may be someone without much formal training. Such stations have limited resources for repair, so proper maintenance is even more essential for them."

The seminars, the first of which is to be held in late May in New Orleans, are funded by the Corporation for Public Broadcasting. They will be taught by volunteers from Harris, Orban Associates, and Shively Labs, and with equipment donated by those corporations. Topics to be covered include transmission, antenna patterns, studio grounding systems, maintenance, STLs, proof of performance testing, and safety systems. For more information write to Ms. Watkins at the NFCB, 1314 14th Street, N.W., Washington, D.C. 20005.

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**Fiber and Sat Link Used for First Bicoastal Recording Session**

A unique cooperative effort involving some of the most respected talents in contemporary music and several corporations has produced history's first digital recording session via satellite.

The event took place on March 4, and brought together recording artists Stevie Wonder and Nile Rodgers for some work on Wonder's

new anti-crack song, "Stop, Don't Pass Go." The artists worked together even though they were in separate recording studios, 3,000 miles apart. Linking the two facilities was a regional fiberoptic network, an uplink provided by New York's Teleport Communications, two audio and two video transponders on GTE Spacenet's GSTAR II satellite, and a mobile earth station from IDB Communications in Los Angeles.

After studio musicians laid down some background tracks on a Sony PCM-3324 24-track digital recorder at Master Sound Astoria at Kaufman Astoria Studios in Queens, NY, the tracks were mixed on the studio's console and converted back to digital data through a Sony PCM-1630 digital processor. The signals were then carried along the fiberoptic network to Teleport's satellite communications center on Staten Island, which uplinked them.

In Los Angeles, the signals were received by IDB's mobile Ku-band earth station and relayed to Wonder's Wonderland Studios, where Wonder and producer Quincy Jones added their overdubs, which were once again processed through a 1630 to reverse the transmission process. This time it would be Rodgers' turn, back at Master Sound, to lay down his guitar parts. Overall, the signals had travelled across 3,000 miles on land and approximately 45,000 of space.

The signal arriving in Queens from Los Angeles was recorded on a slave 3324. This was to account for the 520 millisecond delay between the the originating and returning signals. A comparable delay was put on the original version heard through the studio monitors in New York so everyone involved would be hearing the same thing at the same time (visual contact was accomplished with cameras set up in both studios). Later on, the slave deck was synchronized to compensate for the delay and digitally transferred back to the master.

The session went off without a hitch, and Kaufman Astoria Studios, which is directly linked to the Teleport Communications regional fiberoptic network, now plans to offer remote digital recording to clients on a regular basis.

"The technology of remote digital recording and mixing via satellite has the potential of opening new, previously unimaginable possibilities for musicians and producers," commented Jones. Meanwhile, musicians and technicians in both locations noted that the sound quality was comparable to conventional recording.



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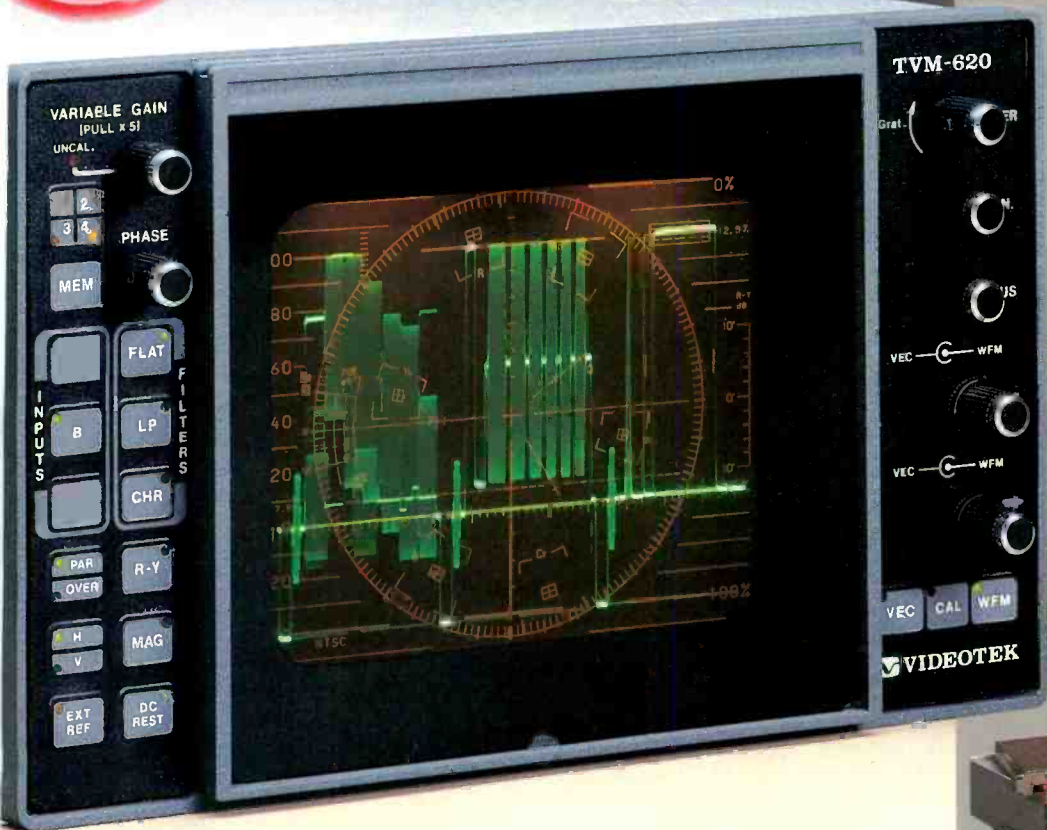
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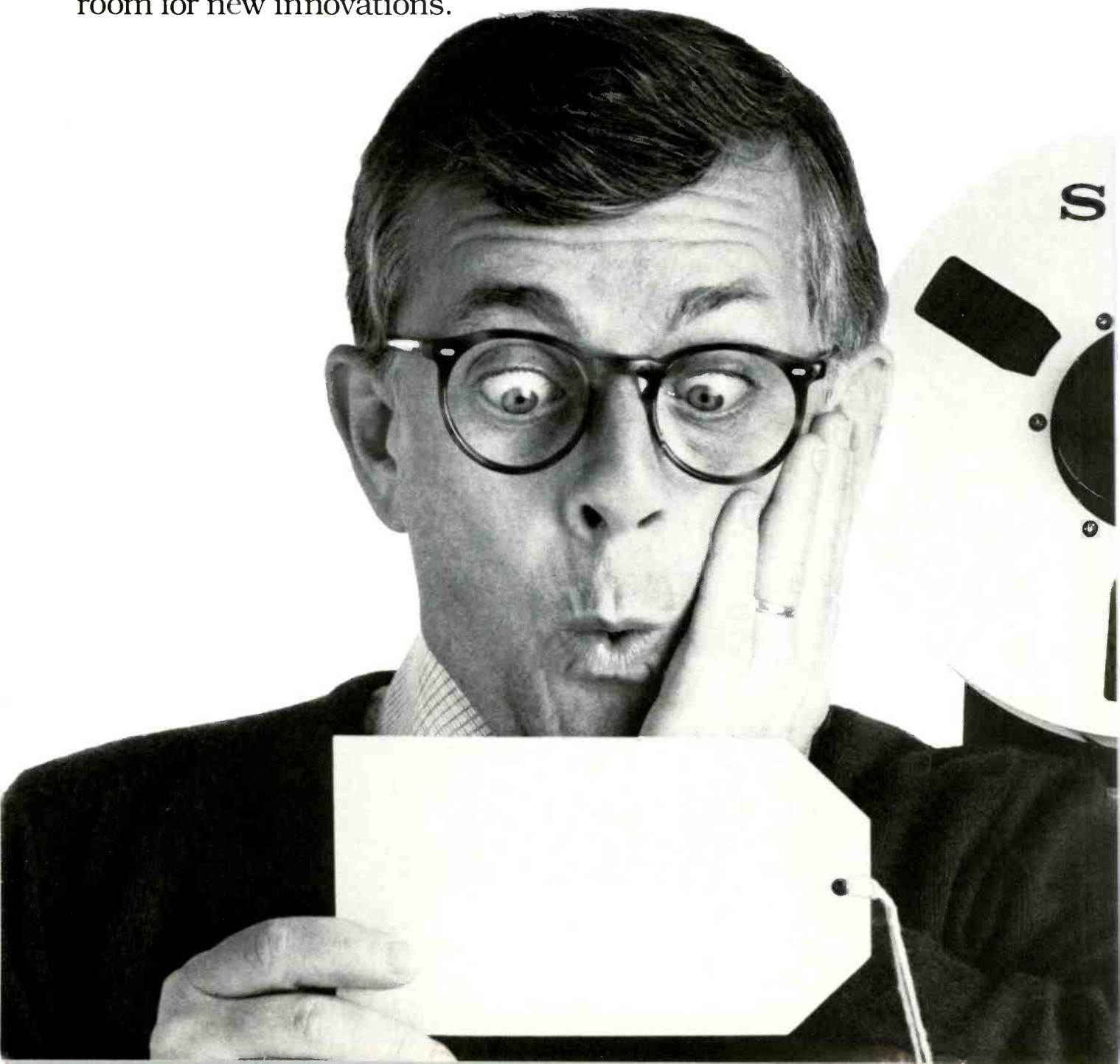
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# TV STATION AUTOMATION

*The gradual transition toward computerized automatic systems is changing the structure of the modern television plant.*

**By Brian McKernan**



Mention the word *automation* at any television station, and what do people think of? For some it may call to mind the advent of fully remote-controlled transmitters, or today's newsroom computers, or perhaps even a futuristic vision of a totally computerized facility into which humans never have cause to enter and where the nightly news is read by Max Headroom.

Automation has been finding its way into television stations for many years, showing up in such things as quad cart machines and camera control units. Like all computer-based sciences, automation offers numerous advantages, chief among them being the liberation of humans from tedious and repetitive work. Although computers will no doubt offer ever-greater wonders in broadcasting's future, for now automation means different things to different stations. Television station automation is in a process of evolution, and a variety of vendors are offering their own solutions to the question of how best to implement it.

"Television is going through a similar situation with automation that radio did a few years ago," observes Douglas Hurrell, president of Alamar Electronics, one of many companies offering automation systems for television stations. "But automation in television is very applications-oriented, and stations must address what those applications are. There are cost factors. And management must evaluate what needs to be controlled, and then list those areas according to their priorities."

## **Cameras and careers**

"News shows are so formatted, there's no reason to have a cameraman anywhere in the studio," says Jerry Plemmons, corporate vice president for engineering at Outlet Communications' WJAR-TV, in





Master control at KLJB-TV, in Davenport IA, includes the Central Dynamics MC-990 switcher, and a smart terminal for the station's Alamar MC-1050 automation system. The terminal features on-line event editing and full status display of scheduled spots.

Providence. WJAR will soon take delivery on a TSM/Total Spectrum Manufacturing MultiController studio camera automation system. "And a lot of the studio production at local stations—zooming in on a six-pack of Coke or a pair of tennis shoes—doesn't require a person standing behind the camera, either."

TSM's MultiController includes a joystick-equipped remote console for manipulation, storage, and recall of camera pan, tilt, zoom, and focus. An RS-422 data link commands servo motors integrated into the camera lens and support. Camera automation saves labor in the studio, but—as with all automation—the immediate question arises: What happens to the people whose jobs are eliminated by it?

"Someone still has to set up and trim the shots with an automated camera," says Plemmons. "We don't see automation as a way of eliminating staff, it just releases staff to do something else. It gives us one more person to run an editing session, or an extra crew member for a production. Automation gives you more people to do things that the budget wouldn't let you do before."

TSM's president, Bob Gonnelli, also has a perspective on the human role in automation: "It's a very young industry right now," he comments. "Some people are thinking pie-in-the-sky too soon, complete automation with no people. The first step in camera automation is to have an operator at the remote control console. This way the producer or director is comfortable knowing that he can still command somebody to trim up the camera in case the talent moves a bit."

That's okay for now, but what of the future? "It's a very difficult subject to talk about," states Tom Kennedy, network coordinator of NABET. "We've never opposed technological changes in the industry, and some of our own people have been credited with inventing these changes. In some areas automation has cost jobs, in other areas it creates jobs. Computers have made work in some areas less monotonous and onerous and more intellectually stimulating. In the overall employment of people in broadcasting I don't see automation as being something that has caused a great deal of concern in the amount of jobs that are available."

## The vanishing make good

The studio is not the only place where computers have made life easier. A number of companies offer computerized sales/traffic/billing systems that provide station traffic departments with an accurate and quick means to enter, organize, and keep track of the myriad events in a broadcast day.

TSM's HS-100P high speed programmable servo pan/tilt system, shown with its MultiController four-camera motion-control unit.





The Grass Valley Group 1600-4S/M-200 master control/automation system makes life easier for operators at KPTV, in Portland, OR.

A further benefit of such systems is comprehensive computer analysis of the television station as a business entity. Software to do everything from keeping similar advertisers as far apart as possible on the program log to noting the number of times a specific cassette played offers unprecedented exactitude in managing a station's most precious resource: its airtime.

Elsewhere in the television plant, microprocessors are increasingly being incorporated into everything from VTRs to master control switchers. It's an easy next step for all this intelligence to link up, and once a station has its program log in a traffic system's database, why not pass it along—electronically—as instructions to smart switchers and VTRs? Many stations are doing just that.

"When I first entered the business, it was tough to go through a day without make goods," recalls Ken Fitzgerald, studio supervisor or WLF1-TV, a CBS affiliate in Lafayette, IN.

"This has changed. We gave our log to VCI [Video Communications, Inc.] and they custom designed software for us, and supplied it with a Digital Equipment Corporation PDP-11 traffic computer. Some time after that we purchased a Lake Systems LaKart automated tape-playing system. Now the PDP-11 downloads a playlist of the entire day's events directly into our LaKart."

"Downloading is the logical continuation of the sales and traffic department's production of the daily program log," explains W. Lowell Putnam, president of VCI. "And provided your tape-playing equipment has a sufficient degree of intelligence and memory, such as the LaKart, the idea is that rather than having someone rekey the data—your program log—you can simply have one computer pass it on to another."

Disk memory within the LaKart records an "as-run" log of events as they are played. At specific intervals the as-run log is then uploaded back to the traffic computer, which compares the two. A terminal in the WLF1's traffic department flags discrepancies. "Now our accounting people don't have to inspect a 30-page handwritten log of every single break on every single show," says Fitzgerald. "In just a few minutes reconciliation is completed, and accounting is writing out invoices."

"We use the LaKart to run all our breaks. Ours happens to be outfitted with five Sony VP 5000s and one Sony VO 5850, all of them modified by Lake for RF dropout compensation. The output of all six is run through a Fortel Y-688 TBC," Fitzgerald explains. "As the station grows, we'll be able to run a combination of tape formats on LaKart. All we have to do is to change cables and board assignments. LaKart has a machine controller for every two VCRs, and it puts SMPTE time code on audio

channel two or in the vertical interval. That header information is an identifier, and the LaKart cues, plays, switches, logs, and recues all our spots.

"The LaKart also has a de-bug port that prints out automatically if there's a problem. Our person at master control still monitors audio and video quality, but he doesn't have to run every single break. Now he only rolls program material, and he can take better care of our on-air quality, attend to satellite feeds, and we don't have to spend our evenings spot reeling.

"Automation has eliminated mistakes people made but it hasn't eliminated people. It has provided our staff with time to do more things. We can do EFP in the morning, take more time on spots, and we now produce a nationally syndicated half-hour agricultural show," Fitzgerald explains.

### Robot revolution

Broadly speaking, devices such as the LaKart are coming to be known in the industry as MERPS, for multiple event record and playback systems. In the drive for ever-greater automation, the latest generation of MERPS can not only play spots and programming according to a preset log, they can even locate, insert, remove, and replace tapes all by themselves. A far cry from the old quad cart machines, these MERPS have robotic "hands" and carousel or other cassette-storage configurations, and can remove cassettes from assigned slots, insert them in the appropriate VCR for play, and return them back to storage when done. Bar codes or other information identifies which cart is which.

With as many as six video cassette players per MERPS, extended automatic play of spots, promos, bumpers, and even program material is possible. Robotic MERPS include Lake System's recently introduced AL'S (Automated Library System), Sony's Betacart and Library Management System, the Odetics TCS2000 Cart Machine, and

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### TV Automation

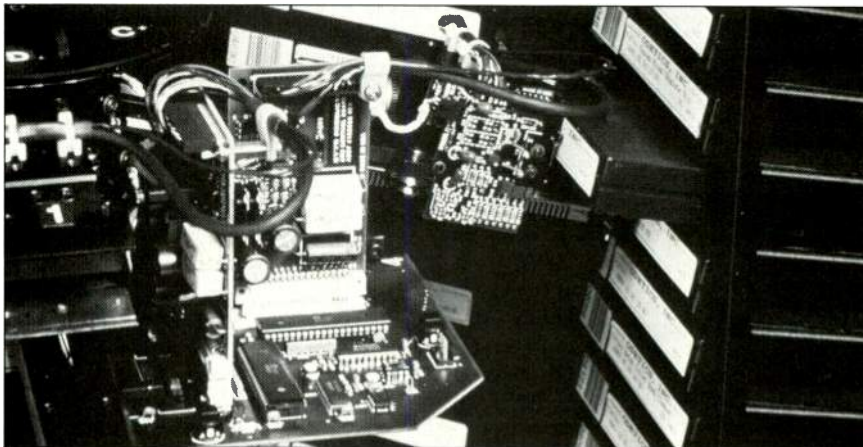
Asaca's ACL-6000C. But MERPS are only part of the picture of total station automation.

"We see Betacart as a peripheral, under the control of a higher-order automation system," states Ray Baldock, product manager for multicassette systems at Sony Broadcast. "An automation system that would control a master control switcher, Betacarts for commercial replay, other VTRs for longer programs, and still-store interfaces."

Baldock's vision is already coming true. In one case, Dynatech Newstar—a leading provider of newsroom computer systems—and CBS News have developed a sophisticated Betacart interface for Version 4 of Newstar software. With Version 4, as news stories are juggled up to time of air, their corresponding Betacarts are also automatically rearranged. Meanwhile, outside the newsroom, higher-order automation systems have already begun to appear at television stations.

The state of television station automation today consists of numerous manufacturers approaching the problem from slightly different angles. "When people say total automation, it's not always clear what they mean," remarks Mike Henning, product marketing manager of the switching products division at Grass Valley Group. "Some people will refer to a traffic or news computer as an automation system. We take a technical, master control on-air operations approach to automation. Rather than lump everything into one big system, we've built a group of systems intended to work with one another, which gives customers flexibility."

The Grass Valley Group's solution to automate a television station is the M-200 Modular Automation System, which is designed to work with the company's 1600-4S master control switcher. A building-block approach, the M-200 system enables the user to choose the degree of automation best suited for his station's current needs. Levels of automation within the M200 range from manual single-event intelligent



Robotic manipulator assembly of the Odetics TCS2000 Cart Machine. Each of the Cart Machine's 280 cassettes are identified with bar codes, which are read by the manipulator.

preroll to complete automation of the switcher and all source machines, with traffic computer interface. Rack-mounted units are the basis of the M200 system.

"You've got to have something that gives you leeway, especially when you're an independent. We usually don't time things to the last second, except when we have to hit the Fox network," says Gene Phelps, chief engineer of KPTV, in Portland, OR. "We chose a combination of automated and manual." To accomplish this, KPTV chose the GVG M203 20-event memory system to connect to their GVG 1600-4S switcher. The M203 includes a keyboard and video display for quick data entry of up to 20 events. Pressing the preroll and transition buttons runs an entire break.

"After the M203 plays a group of events the master control operator inserts a group more," Phelps explains. "Next year we're getting the M206 traffic computer interface. It allows the M200 system to be ordered directly by our BIAS traffic computer. We won't even need all the push buttons on the 1600-4S, because the automation will be working everything."

### One station's approach

"We're starting from scratch, and want to have true and full automation," explains David Jones, chief engineer at WATL, in Atlanta. On the air for 11 years, WATL plans to move into a totally new and automated facility

in August. Jones and WATL management have chosen the Odetics TCS2000 Cart Machine for commercial playback, but station automation doesn't stop there.

"We plan a Beta and one-inch facility," Jones explains, "so we chose an automation system that will integrate those—and other—formats. This way, when automation switches away from one-inch time-coded program segments to run spots on the Odetics—which will play Beta cassettes—the one-inch VTR will recue itself up to predetermined park points for the next program segment. The key ingredient in this is the Utah Scientific SAS-1 station automation system."

Utah Scientific's SAS-1 system is designed to take charge of television station audio and video switching and also the automatic control of machine functions required for program continuity. At WATL, the SAS-1 works in conjunction with Utah Scientific's MC502 three-bus master control switcher, AVS 1B routing switcher, and SMC-1 Dynabus machine controller. A distributed processing system, the SAS-1 works by having individual NCR PCs in different station locations taking care of different parts of the total task of automation.

Jones's design for WATL calls for a PC in traffic, where it will be interfaced with a BIAS business computer, and a PC in master control. Because it is the site of on-air control, master control's PC will

# UPGRADE YOUR ENG SYSTEM WITH MII

have priority for manual override of the SAS-1 system. Master control will also be the site of machine loading and assignment, and that information will be keyed into the system via that same PC.

The MC502 master control switcher incorporates a microprocessor, and two EPROMs for programming such things as length of VTR preroll time. The SAS-1, based on its BIAS-interfaced program log, downloads commands to the switcher to make transitions and control the AVS 1B router. The SAS-1 also commands the SMC-1 machine control system to initiate rolls in the appropriate machines at log-designated times.

The SMC-1 is actually a system made up of serial machine interface panels, each of which can control 4 VTRs. The Odetics TCS2000 has a different status within the system than do other VTRs and is integrated into the system as a "smart source." WATL's TCS2000 will download a program playlist via an RS-232 port from the SAS-1, and will filter that list to create its own playlist of only those events on Beta cassettes. Through that same link the TCS2000 transmits play verification back to the SAS-1.

Two IBM PC ATs handle the TCS2000's database, with one in master control to allow standalone operation of the unit, and one in the off-line dubbing room for encoding of identifier information (such as start/stop times, the name and length of the commercial, the date of its entry into the system, and other data). This is done in conjunction with a Beta recorder's SMPTE time code generator at the same time that the Beta cassettes are dubbed at the station from other media.

Complex but elegant automation systems such as the SAS-1 are changing the way switching is done at television stations. "It once was that switchers were switchers, and they were controlled by a human operator," observes VCI's Putnam. "Now there's a blurring of those lines. Because of the amount of intelli-



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### Putting It All Together

One of the keys to the future growth of television station automation is the need to interface both the hardware and software of different manufacturers. Manufacturers usually design their own products to talk to one another, but compatibility between different companies is rare. Existing standards such as RS-232 and RS-422 and the uniform hardware and command definitions of the ESBUS and Dynabus make today's automation systems possible. But although companies might use the same physical plug, they don't necessarily use the same digital commands or voltages. There currently is no universal standard for a machine control language.

To address this problem, the SMPTE Subcommittee on Control of Television Equipment is working "to standardize control messages for VTRs, production switchers, routing switchers, audio recorders, automation and editing systems, and to bring about full automated control of television stations."

Until such a machine control language is stan-

dardized, cooperation between manufacturers is the key to achieving a fully interfaced station automation system. "Interfacing with any specific vendor is still an issue of how easy or difficult that vendor makes themselves in terms of accessibility of their equipment and their software," observes VCI's Lowell Putnam.

Very often, to make interfacing possible, manufacturers must inform each other of their command definitions and then build an interface to translate those commands. "Black boxes" are often the current means manufacturers use to achieve this.

"It was fairly simple for us once we got everybody talking together," explains David Jones, chief engineer of WATL, in Atlanta. The station's automation system is described in the accompanying article. "The biggest challenge was just to explain how we wanted to run the station, then get all the manufacturers together and cooperating so they would release enough operating system protocols so everybody could talk together. And as it turned out, all the manufacturers were very cooperative and anxious to do it."

gence in those machines, they are now switching their own events. The master control switcher does the actual switching, and its human operator is just a fail-safe and verifier. It's possible in the future that master control could just become a subset of traffic."

WATL's Jones agrees that he's heard that idea expressed before, but points out that such a master control person—even if he is someday part of traffic—will always have to be technically skilled for those times when maintenance or emergencies require that breaks be run manually.

### On the bus

Computerized machine control is only part of the story in higher-order television station automation. Such systems require a means of exchanging large volumes of information at high speed between the command unit and the individual machines. The need for such a high-speed avenue of relaying commands to—and for receiving acknowledgements from—VTRs and other equipment is where control architecture comes in.

In response to the move toward automated systems, a standard machine control architecture has been developed in recent years by the SMPTE's Subcommittee for Remote Control and the European Broadcasting Union's Specialist Group for Remote Control. It is known as the ESBUS. Operating at a speed of 38.4 Kb per second, the ESBUS is a two-way, high-speed pathway for intersystem communication. It is the standard used by such leading manufacturers as the Grass Valley Group, Dynair, and 3M. With different manufacturers incorporating connections to this standard bus in their respective products, quick and easy interfacing is achieved by simply plugging into a commonly connected cable.

Even equipment that doesn't have the ESBUS built into it can still "get aboard" the bus. Dynair Electronics makes components that are compatible with the ESBUS, and offers machine interfaces for it that connect to RS-422 ports. In addition, Dynair makes the System 23 data switch to enable large facilities with many source machines to subdivide

their ESBUS system into multiple, more manageable smaller systems. The data switch can assign a VTR exclusively to a specified subnetwork, and protect that machine from receiving commands from other locations on the ESBUS system. Another Dynair product is the Series 1 bus controller, a microprocessor-based bus controller that polls each tributary of the bus—in turn—for traffic requests, and automatically manages the entire system.

A machine control architecture with even greater speed than the ESBUS is Utah Scientific's Dynabus. Operating at 2 Mb per second, the Dynabus is an Ethernet type of local area network (LAN) control device. Dynabus is acknowledged to be faster than what is needed for today's applications, but its greater speed offers a margin of expansion for the future technologies, such as editing systems, satellite receivers, and HDTV. The SMPTE ESBUS and the Utah-Scientific Dynabus can communicate with each other via an EBU/SMPTE interface.

The Dynabus network can also

be divided into subnetworks with an intelligent processor—a node controller—determining which subnetwork data should be directed to. In this way, communications are relayed to a subnetwork—a segment of cable wiring that is split or T'ed off the main bus—only if it pertains to equipment on it.

### Another approach

Although comprehensive automation of the television plant is achievable today, it may not be preferable at every station. "We're a lot better off being machine-assisted, as opposed to being fully automated," says Don Bargmann, chief engineer at KLJB-TV, in Davenport, IA. A two-year-old UHF in an all-VHF market, KLJB has an Alamar MC-1050 automation system—which uses the ESBUS—and Columbine traffic software running on 4 IBM PCs. The Alamar system is designed—and normally used for—full station automation, but KLJB has opted not to go that route.

"In a market this size, not many things are written in stone," says Bargmann. "It's not uncommon for traffic to come in the door with a late entry or alteration. Most of the time, we sell right up to the last minute."

"We don't exact-time our logs," explains Dianne Costello, KLJB traffic manager. "We air two movies six days a week, with three on Sunday, and we receive these movies—and many of the older syndicated TV shows—on film. Those films aren't always exactly timed, and if the last station to play them changed the breaks, we don't have enough staff to check that in advance."

Given these conditions, KLJB's master control is supplied with hard copy of each day's program log, and they in turn enter it into the Alamar system in several segments on the day of air. "We find that a more flexible way of doing things," Bargmann says. "We can make last-minute changes. Alamar has made it very easy for the master control operators to create files, which typically in

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clude about 125 events. These files are saved away on floppy disk and called up as you would with any PC.

"At our station, typically the operator rolls the program, but the Alamar automation system rolls and switches the breaks. We have eight Sony VO 5000s for commercials, and the Alamar system controls them through its SC2000P parallel machine controller.

"We use FSK tones at the head and tail of each commercial," Bargmann says, "and the system uses them to roll the next spot. It's easier for us not to be involved with the heavy quality control necessary in putting cue tones on program material, so we roll that by hand. We have something like 1800 cassettes that have commercials on them, and our operators also have to dub, run master control, and load cassettes. But two people can handle this without being overworked, and if it wasn't

for the Alamar system, this would be difficult."

### Looking ahead

Judging by trends in television technology over the last decade—and by what has already happened in other industries—the station of the future may well be extensively automated. The implications of such technology in years to come are an interesting source of speculation now. For instance, many TVROs at network affiliates today include control computers that are commanded—via satellite—by other computers thousands of miles away at network headquarters. Might network TVRO computers one day interface directly with station automation systems?

"You may see the day when part of the schedule fed into traffic departments includes satellite program record lists and even specifies the transponder and polarization," says Sony's Baldock.



Utah Scientific's SAS-1 station automation system works in conjunction with the MC-500 series of master control switchers.

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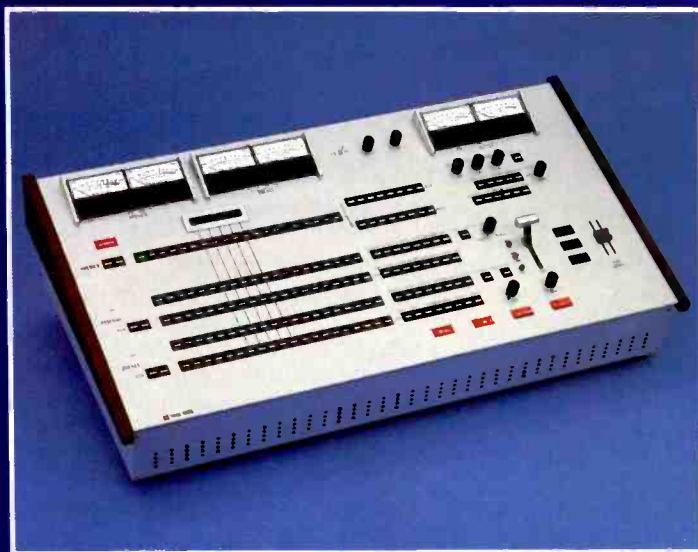


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"People are scared of one computer having total control," says Sandy Smith, of Dynatech Newstar. "But as long as reliability and redundancy issues are addressed, there are real operator benefits to machine control. Computers, properly programmed, don't make mistakes. Real cost benefits will be forced upon broadcasters. There will probably be some merging of the different computer systems in a television station, but it's not clear what form it will take."

"What you have to do with these automated station systems is stand back and observe how they interact with the other systems—be they manual or automated—that make up the overall system that we call a television station," says VCI's Lowell Putnam.

"The points of impact and the amount of data they exchange define the relationship. Business and newsroom applications share little common data, and if they were on the same system it would vastly increase the amount of hardware necessary to provide acceptable response times. The trend in the computer industry is toward distributing information processing among different systems."

Distributed processing or one master computer, automation will be increasingly pervasive in the modern television station in coming years. Although it's difficult to fully predict what impact this will have, new broadcast technologies have always been beneficial to the industry in the past, and there's every reason to believe that this will be the case in the future as well. BM/E



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1. Indicate your current status and future purchase intention for the automation equipment listed below.

	Have now/ on order	Intend to buy		
		within 6 mos.	within 9 mos.	within 12 mos.
<b>AUTOMATED</b>				
Cart Machines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cassette Players	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DAs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Master Control Switchers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Routing Switchers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>AUTOMATED MACHINE CONTROL SYSTEMS</b>				
Open Reel Decks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CD Players	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Computer Controllers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>AUTOMATED CAMERAS</b>				
Camera Control Units	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Video Cart Machines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>TV BUSINESS/TRAFFIC AUTOMATION SYSTEMS</b>				
<b>TV NEWSROOM AUTOMATION SYSTEMS</b>				
Newsroom Computers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Computer Controllers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Computer Software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>MULTI-EVENT RECORDER PLAYBACK (MERPS)</b>				
<b>TELEPROMPTERS</b>				

2. Do you plan to incorporate equipment for  partial  complete station automation during 1987?

Yes  No  Radio  TV

3. Do you anticipate installing a newsroom computer during 1987?  Yes  No

If yes, whose equipment will you buy?

\_\_\_\_\_ (name of manufacturer)

4. What is your greatest concern with integration of automated equipment into your operation?

\_\_\_\_\_

\_\_\_\_\_

5. About yourself: Do you work at a:

TV station

Radio station

TV network

Radio network

Other (specify) \_\_\_\_\_

Are you a:

Chief Engineer

Engineer

General manager

Production manager

Operations manager

Other (specify) \_\_\_\_\_

Do you:

use the equipment?

make buying suggestions?

make buying decisions?

evaluate equipment?

NAME AND TITLE \_\_\_\_\_

STATION OR COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY, STATE, ZIP \_\_\_\_\_

PHONE ( ) \_\_\_\_\_

MAIL BEFORE MAY 15, 1987

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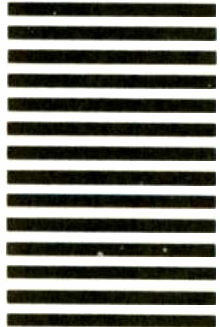
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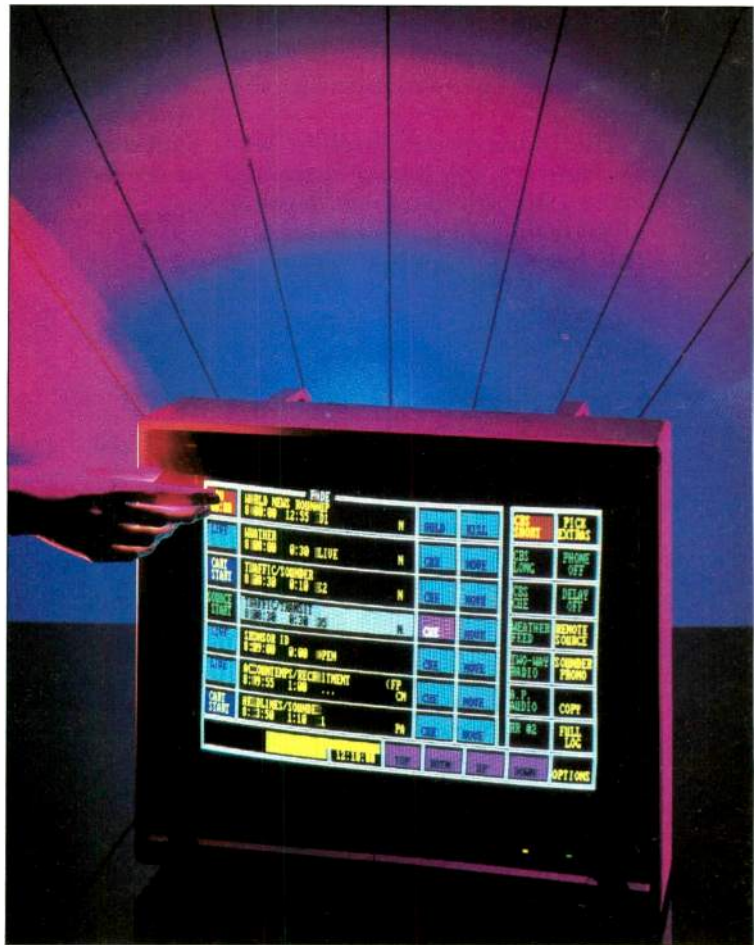


## APPROACHING AUTOMATION

*In addition to providing an economic solution to the rising costs of operating a broadcast facility, new automation equipment is supplying stations with some surprising advantages.*

By Steven Schwartz

The Touchstone system from Media Touch Systems uses a touch-sensitive screen to control a station's automation equipment.



Ever since the introduction of the cart machine in 1959, automation technology has been a major source of both joy and heartache in the radio environment. Although some early systems turned out to cause more problems than they solved, the work of pioneers in the field—such as Paul Schafer (who, in the late 1950's, built the first automation system—the Cue Dot—which consisted of an Ampex 350 tape recorder rigged up to two Seaburg

jukeboxes), Bill Moulic (inventor of the Carousel), and many others—laid down the cornerstone for most future innovations.

The current range of automation equipment and services—from computer-interfacing controllers for cart decks and open-reel recorders to live programming via satellite—offers station managers an unprecedented degree of control over the day-to-day functioning of their facilities. Not surprisingly, dozens of broadcast-

ers in today's highly competitive AM and FM markets are automating their stations to cut down overhead expenses and to simplify on-air activity and format changes. Still, many have retained an on-air staff for local coverage and live assists.

This may seem a bit incongruous in view of current technological capabilities. After all, isn't the incentive for automation to eliminate most of the problems—and costs—associated with live

broadcasting? Obviously, that's the main objective, but it is similarly true that, for some broadcasters, automation is not an end onto itself.

### Control from above

A common complaint heard among managers of automated facilities is that taped programming often lacks the sense of spontaneity inherent in live broadcasts. As a result, many broadcasters are now using their automation equipment in conjunction with one of several companies that provide live programming via satellite.

The Dallas-based Satellite Music Network (SMN), for instance, offers its 700-plus nationwide affiliates a choice of seven different formats: Country Coast to Coast (C&W), Rock 'n' Hits (top 40), Pure Gold (oldies), Heart and Soul (Motown/R&B), Z-Rock (hard rock), Stardust (classics from the 1940's to 1970's), and StarStation (adult contemporary). Each format features six full-time and three or four part-time personalities, as well as weekly music specials and "localization" services that provide affiliates with customized liners and local IDs. Furthermore, each SMN affiliate automatically receives the Satellite News Network, a 24-hour live news service.

All of SMN's programming originates from its seven on-air studios (four in Dallas, three in Chicago), which operate on a round-the-clock basis. Except for the Rock 'n' Hits format, which is uplinked to the Westar IV satellite via the single-channel-per-carrier (SCPC) method, SMN's programming is transmitted to Westar V using United Video's satellite communications system (SCS), which employs Wegener Communications' FM<sup>2</sup> technology.

Each format is scheduled according to individual "Flex Clocks," which allow local affiliates to insert their own news breaks, station IDs, and commercials in predesignated time slots. The network further provides combinations of subaudible 25 Hz and 35 Hz tones in the signal that

are used as contact closures to trigger an affiliate's automation system.

"It's incredibly easy for broadcasters to use," notes SMN's vice president of marketing, Kristine Sites. "They can hook up some sort of equipment to run their own commercials, maybe put in a newsmen, and walk away to sell ads. They don't need to worry about an on-air staff. They know they've got major-market air personalities—who are live on the air all the time."

SMN also offers prospective clients package deals that include some of the hardware (e.g., a dish antenna and demodulator) necessary for receiving the service.



The satellite automation system at WWJR in Sheboygan, WI, showing Instacarts in lower foreground and ICM Basic III controller at rear.

### Familiarity breeds success

The growing popularity of satellite-delivered programming has created new opportunities for hardware manufacturers. For example, Systemation in Decatur, IL, has addressed the specific needs of SMN subscribers with its Super Track automation system. The cassette-based Super Track records events sequentially and operates in a multi-unit configuration that automatically switches from deck to deck at the end of a unit's play cycle. This modular approach further allows

broadcasters to customize their systems to fit their spot load.

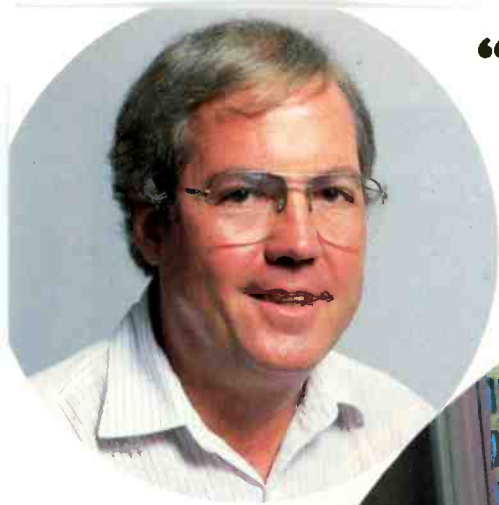
According to Systemation president Steve Bellinger, six Super Track decks are enough to handle 100 percent of any station's commercial library. "That means you never have to change copy until the advertiser does," he says. "Furthermore, six of our decks cost less than two Carousels."

Why did the company build an automation system around a cassette rather than a cart or tape reel? Says Bellinger: "There was a great need in the automation market for something that was simple to use and economical. The people at the Satellite Music Network have tried for years to take a reel-to-reel tape recorder and devote that to sequentially recording all of the events to fill the spots. That never worked too well because an open reel runs out. So, we decided to make things easy by using a cassette deck." He adds that the company will soon be introducing "Track" products for subscribers to the Transtar satellite system as well as users of syndicated programming.

Systemation also recently introduced a digital audio storage system, the X7V, that features random access for up to 10 hours of material on 8mm videotape. Like the Super Track, it features an expandable design that offers up to seven-day "walkaway" time. Two PC-based peripherals for the X7V are equally innovative. The Electronic Affidavit "listens" for commercials on the air (after the ad copy has been entered in the logging area) and records the time and date that the spots were played for billing at the end of the month. Meanwhile, the Information Base supplies on-air jocks with a full screen of biographical and pertinent information on any artist whose selection has been called up. Users can enter their own data or purchase a database containing entries for 12,000 songs from Systemation.

Bellinger adds that all Systemation equipment has been field-tested at his two radio stations—WDZ and WDZQ—in De-

# "Auditronics' 310 does everything we need to do, and didn't kill my budget,"



says Orlando's Jim Doyas.\*

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If you'd like to know more about why Meredith Broadcasting's Jim Doyas chose the 310 for his WOFL-TV showcase production facility, call Auditronics toll-free at 800-638-0977 for complete information and a demonstration near you.

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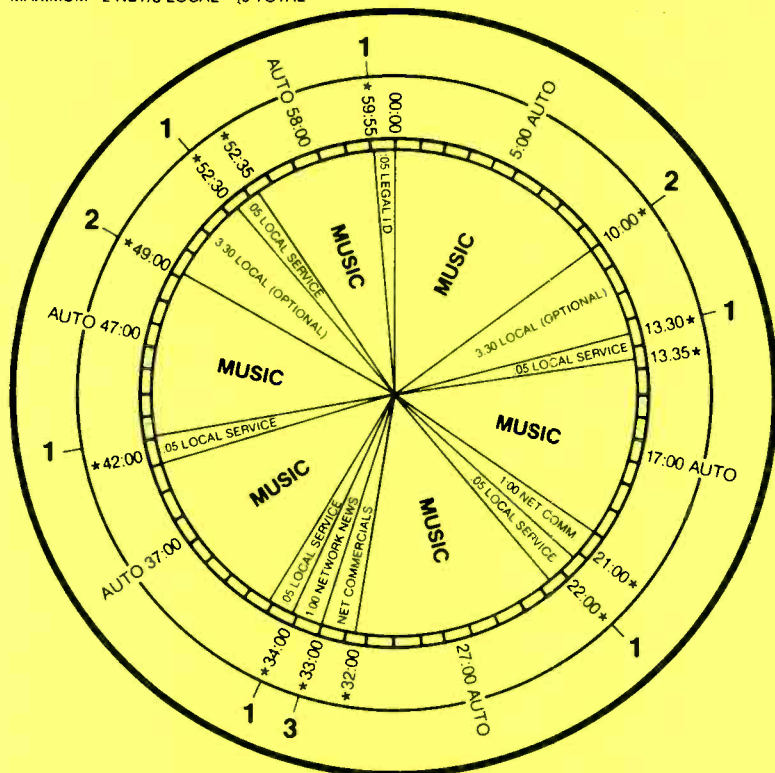
## SATELLITE MUSIC NETWORK Rock 'N' Hits FLEX CLOCK 1

SAMPLE HOUR 5 a.m. - 11 a.m. Central  
(Central Time) 3 p.m. - 8 p.m. Central

COMMERCIAL TIME -  
MINIMUM - 2 NET/0 LOCAL - 2 TOTAL  
MAXIMUM - 2 NET/8 LOCAL - 10 TOTAL

FUNCTIONS:

1. LOCAL SERVICE AND I.D.
2. LOCAL OPTION
3. LOCAL 1:00 OPTION



ALL TIMES MARKED "" ARE APPROXIMATE  
AUTO = AUTOMATION UPDATE TIMES

RECOMMENDED SPOT PLACEMENT  
(In Order Of Preference)  
A: 3:30  
B: 5:00  
C: 10:00

An example of one of Satellite Music Network's "Flex Clocks." Smaller time slots indicate local access periods throughout the day's programming.

catur. "We feel it's absolutely necessary that broadcast equipment be built for broadcasters by broadcasters," he notes.

### Back in the studio

Still, for most automation users, the conversion to a satellite delivery service often demands considerable rethinking of existing systems. At WWJR-FM in Sheboygan, WI, general manager James MacFarlane faced just such a predicament last October when the station switched from a contemporary hit radio (CHR) format using prerecorded music reels and

voice tracks to adult contemporary (AC) via satellite.

"There are plenty of stations that were automated and dumped their automation equipment when they went to satellite delivery," he notes. "We didn't. We still use our automation as a controller for different sources. For example, we use it to perform the switching functions in and out of the satellite broadcasts—taking feeds from the various satellites and also for live assist automation."

Located 55 miles north of Milwaukee, WWJR has been on the air since 1948. For the last six

years the station has used an IGM Basic III automation system with two 48-tray IGM Instacart machines, six Audicord single-play decks, and four reel-to-reel tape recorders (primarily used for live shows and specials). An Orban Optimod is used for signal processing, although there is little need for an STL since the station's antenna, transmitter, and automation system are located in the same area. However, the arrangement does create a lot of RF interference, so MacFarlane has installed copper shielding around the automation equipment.

WWJR receives the majority of its programming from the Satellite Music Network, but also picks up some specials from the Westwood One Radio Network—and even does an occasional live program; again, all of the switching chores are handled by source cards within the Basic system.

Contrary to what most people would expect, the station hired an extra person (for the news department) following the format change. "Before we switched to SMN, most of our liners were done by outside freelancers so we didn't really have to lay off anybody," says MacFarlane. "In fact, I originally wanted to go to a live format, but I really couldn't afford to hire seven new announcers of the calibre that we have through SMN. It's still live radio, though. It's just that our jocks are live in Chicago while our news staff is live in Sheboygan."

Meanwhile, the station's traffic and billing is kept on a Wang computer, which prints out a daily log that is used as a source document to set up the spot rotations for the day's broadcast. MacFarlane claims that an entire day's worth (i.e., from 5 a.m. to 1 a.m.) of commercials can be programmed in approximately ten minutes; on Friday afternoons, it takes only half an hour to program the system to run automatically from Saturday through Monday. Furthermore, changes can be made up to one minute before air time.

"Some folks look at automation as a way of cutting costs," he observes, "but I've always felt that

automation makes things easier for everyone. It gives you more control over your station and allows people to put their time to better use. You just come out with a better product."

### Tale of the tape

Quality and cost control were also key factors in the decision to automate at Atlanta's WQXI-AM. The Jefferson Pilot affiliate installed a full IGM system last October; prior to that, the station's programming was completely live using many of the same DJs on both its AM and FM operations.

"We have a lot of good talent here," says program and marketing director Fleetwood Gruver, III, "and we didn't want to have to keep on duplicating them on both stations. We looked at satellite delivery systems but we decided to go with automation because we could retain control of our commercial inventory and keep a very local area orientation to our programming, which we feel is very important."

WQXI's new automation system consists of four 78-tray IGM Go-Carts, for playing music selections; three 48-tray Instacart machines, which are primarily used for commercials, jingles, and promos; and two Revox reel-to-reel decks (one of which is used for voice tracks, the other for emergency fill music). Controlling the system is an IGM-SC (Sophisticated Controller), which is interfaced with an IBM-compatible PC.

The SC, IGM's top-of-the-line automation controller, offers random access operation with WQXI's Go-Carts and Instacarts via its RS-422 interface. It is further capable of controlling up to 16 sources and has memory storage for up to 2,500 events (with backup on floppy disk). Other features include: on-screen help instructions and real-time commands, programmable silence sensor, and universal source cards with LED indicators and diagnostics. An audio switcher and the necessary computer software are also included in the SC package.

According to Gruver, he chose the SC because "the extremely



WQXI's chief engineer Tom Giglio (in foreground) accesses the station's IGM-SC automation controller via a PC, while program director Fleetwood Gruver III looks over one of the facility's IGM GoCarts.

logical layout of the day by events and IGM's approach to programming the automation itself on any IBM-compatible PC was very easy for me to relate to. And, after going through their demo diskette, it was easy for me to see how to translate what we do on the air into something that could be done on automation without a lot of compromises."

Gruver adds the switch to automation allowed the station to trim back three full-time staff positions; thus, he expects the equipment to pay for itself within a year and to turn a profit within five years. "It lets us use some of the talent that we have in the station more effectively," he explains. "We have some people here who have worked with automation before and they feel very comfortable with it. The people that weren't familiar with the technology at first were really quite overjoyed when they realized that they could do an airshift in 35 minutes rather than sit around for five hours. So actually, our productivity and creative output has increased throughout the station because of this."

WXQI's automation has made life simpler in other respects as well. Whereas the station's golden oldies format (i.e., music from the 50's to the 70's) formerly relied on an extensive record and tape library, all programming is now put on carts.

On weekdays, the station uses live assists in the morning and mid-day and then switches to full automation with voice tracks for

the rest of the day and night (weekends generally require a live assist operation). Gruver claims that the arrangement of the voice track tapes keeps the station sounding very much as it did back in the days of live programming, with lots of local content and up-to-date information. The tracks providing local content are done in-house by two of the station's FM announcers and the production director.

"We're not able to say 'It's five past four,' but we do say 'It's a little past four.' So, we can hedge it a bit," he admits. "During the day when the time is important, we're live, so we can give a lot of on-air immediacy. There is a slight compromise with how we are able to take care of commercials in that we have to preplan and build the system pretty tight behind the scenes. If there's a foul-up in the machinery or if a cart isn't there because of a traffic or continuity error and it requires a make-good, a live on-air disc jockey would catch that immediately, whereas it takes a little longer for the automation to catch it since it may or may or may not know what's there."

Meanwhile, automation is nothing new at KBEE-FM in Modesto, CA, which has been using its Harris 9000 automation system for the last five years. According to Tom Ehrman, Sr., KBEE's vice president and general manager, both KBEE and its AM sister station, KHYV, are totally automated without any live programming at all. KBEE uses the

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## Audio Engineering & Production

### Radio Automation

Ultra (i.e., easy listening) syndicated music package from Bonneville Broadcast Consultants in Northbrook, IL. Bonneville also offers an AC syndicated package called Alpha; both formats are delivered on 10-inch, two-track reels with built-in 25 Hz tones for usage with automated controllers.

At the same time, KHYY features a classical format (broadcast in AM Stereo using Motorola's C-Quam process) employing both syndicated and satellite-delivered programming. The syndicated material, which is used throughout the day, is supplied by the Seattle-based Broadcast Programming International; from 10 p.m. to 6 a.m. it switches over to the Beethoven Satellite Network, a subscription service provided by WFMT in Chicago.

In addition to the Harris system, the station is equipped with two 48-tray IGM Instacarts, one SMC Carousel, and four open-reel decks (for playing the syndicated material); an STL is also used for both AM and FM transmissions.

Ehrman takes a straightforward approach in describing his station's operation: "We play 45 minutes of music per hour with 15 minutes of interruptions. That's all. My philosophy about radio is pretty simple. People tune us in for music. They don't tune us in for BS or to hear some jock tell about how bad world conditions are. They listen to us for good music, and that's what we give them. When it comes time for a station break, we'll do our station IDs, a set of about three commercials, a weather update, and then get back to the music." Evidently, there is something to Ehrman's philosophy; KBEE held the number one position for the Modesto/metro market in a recent Arbitron survey, and came in at number two in a similar Birch survey.

Meanwhile, most of the station's buffers and liners are handled by Ken Lamb, program director at WPAT in Paterson, NJ, who specializes in voice tracking for a number of automated stations around the country. Lamb supplies KBEE with a series of 100

liners twice a year, which are customized to fit appropriate holidays, weather conditions, and events. "We keep them in the system at all times," explains Ehrman. "It's just a matter of inserting the ones that fit the mood or the mode of that particular day. In many ways, it's like having New York personalities on a Modesto station." He adds that each day's scheduling is done 24 hours in advance and typed into the system overnight. Local news is also recorded directly to carts and loaded 15 minutes prior to broadcast.

Still, the station's reliance on its automation equipment has not eliminated the need for qualified personnel. Ehrman points out that the station currently employs a staff for 16 full-time and five part-time positions. Most of the staff's responsibilities include commercial production, accounting, maintenance, and, of course, sales. It is also interesting to note that the commercial rotation log is not printed off the Harris 9000, but the Marketron computer that is used for billing. The operator receives the printout and then dials the information into the automation system, manually checking off which spots ran. Meanwhile, the billing part of the Harris system is used to keep track of the music selections. Ehrman explains: "This way, if someone calls up and says, 'I want to know the name of that song you played three songs back,' we can print it out and tell them rather than having to go back and research it."

Ehrman is naturally enthusiastic about automation technology. "We're in control of our station 24 hours in advance of what we're playing. You can't do that when you're live. For instance, let's say you have a popular morning deejay—what happens if he's sick for a week? Simple, you don't have a morning guy during that time. Our morning guy is always there because he's on tape. So, we're always the same; we don't change. And people like that. They like the consistency of the way we operate."

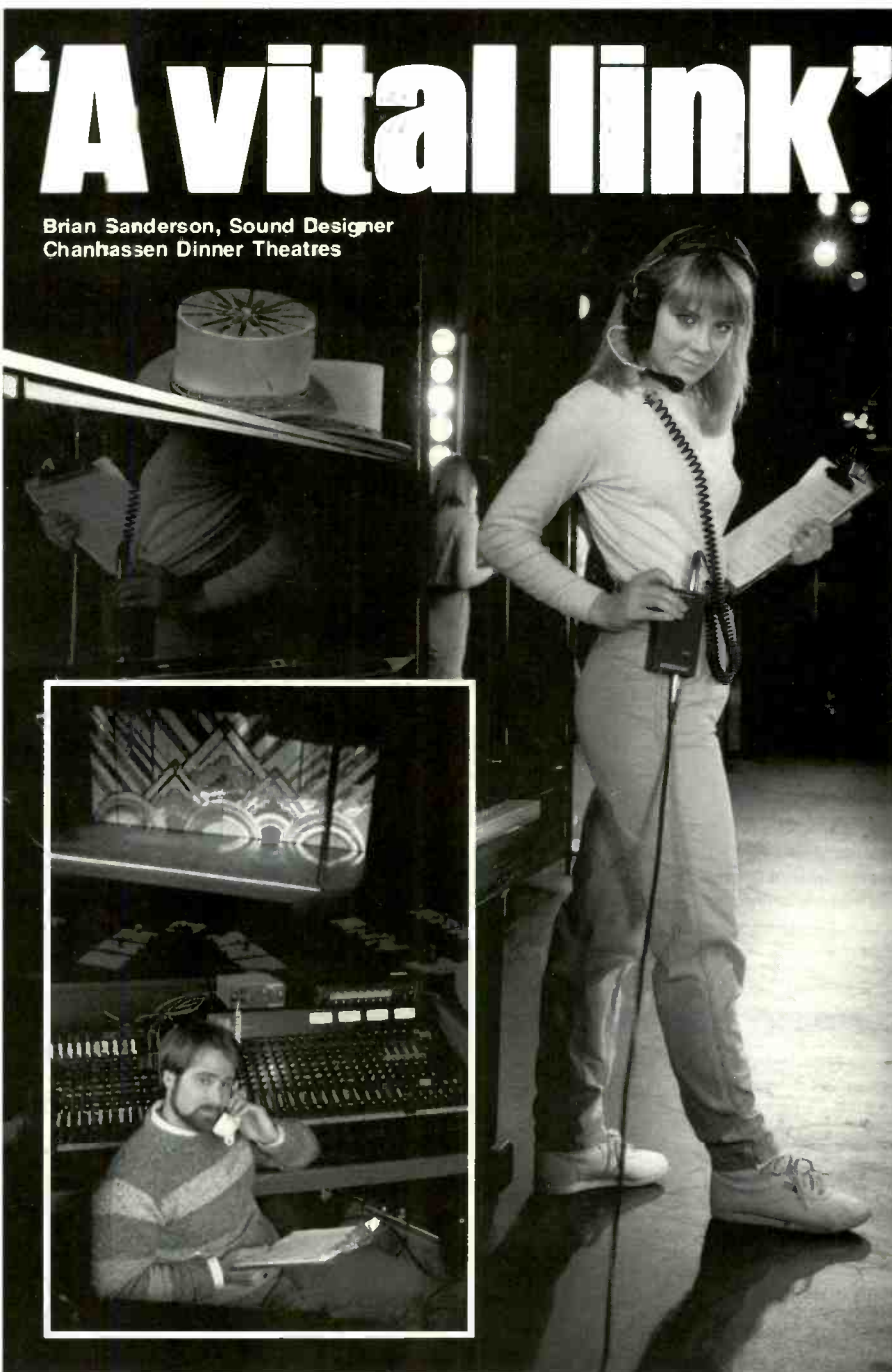
## Long distance operator

In addition to "always being there," the current breed of automation equipment similarly allows you to be where you're not. KOLA-FM in Riverside, CA, is a good example of this principle.

Early last year, when the station's management decided to change formats from album-oriented rock (AOR) to CHR, they also opted to upgrade their automation. In the spring of 1986, KOLA replaced its older IGM MOS Memory controller with a new IGM-EC (Economical Controller)—which incorporates many of the same functions as the top-of-the-line IGM-SC—with control of up to 12 sources (compared to the SC's 16-source capability). That summer, a second EC was purchased for KOLA's sister station, KMET-AM, in Benning, CA.

The stations' owner and general manager Fred Cote, an automation user for over two decades, had considered running the AM facility using a satellite feed on a full-time basis to cut down overhead. But, he explains, "the problem is that your breaks are all preset and you're sort of locked in to whatever their format is. If you have a heavy spot load, you have to run over the music, or, if you have a light spot load, you have to fill with PSAs. With automation you can open or close the breaks as much as you want; it leaves you a lot more flexibility."

Cote's solution was to operate the AM station in Benning from KOLA in Riverside—26 miles away—using a single operator to change the carts at KMET. "This is kind of a unique situation as far as I know," he observes. "We have most of the system sitting in our FM facility in Riverside and a switcher operating two 24-tray SMC Carousels at our station in Benning. We change the music in the Carousels on a daily basis, but we're able to program it back and forth using the EC that's kept in Riverside. We have a Marti STL with an SCA on the subcarrier, which controls the signals going to the transmitter and the studio out in Benning, and a Marti TSL



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### Radio Automation

which relays the information back. For example, the start tone goes out from Riverside and subcarriers the SCA out to Benning. It plays the source and sends back an end-of-message tone, which comes all the way back to Riverside and starts the next event. That means each event travels a total of 52 miles."

Furthermore, there are three 48-tray IGM Instacarts (for commercials) and five Ampex 351 open-reel decks (for additional music programming) in the Riverside facility to supplement KMET's programming. According to Cote, this arrangement is necessary under an FCC rule that maintains a station must have 50 percent of its programming originating from the city of license.

Meanwhile, KOLA uses four Instacarts and five Revox reel-to-reel decks for its own commercial and music rotation; voice and music tracks for both stations are

supplied by Concept Productions of Sacramento, CA.

### The next wave

Automation is not only limited to stations with music formats and/or limited personnel. For instance, Boston's WEEI-AM features an all-news format with live announcers in the studio at all times (except when it switches over to CNN from midnight to 5 a.m.), yet the station employs a revolutionary approach to automation. The announcers merely need to touch a screen in order to access any of the station's 32 sources or select a needed switch function from a bank of 50 electronic switches. The screen will also bring up all data pertaining to scheduled events as well as live copy and billing information.

The Touchstone 2000 Series automation assist system used at WEEI is the creation of John Connell, president of Media Touch

Systems in Salem, NH. It was actually devised by Connell when he was chief engineer at WEEI, and initially designed as an in-house system for improving the lines of communication between the on-air announcers and their producers. Connell's inspiration for the touch screen came from observing announcers pointing to the producers when it was time to cue a source. The search for a "better way" led to the development of a screen that allowed the announcer to handle the job himself.

WEEI's current system consists of a 19-inch, touch-sensitive Sony monitor in the on-air studio; an IBM-AT with a 30 Mb hard disk, which logs all events and contains the 24-hour log; three IBM-XTs (one for running the screen, the other two for editing); a Ramko RS 1616 audio switcher; two printers; a copy monitor for live commercials; an electronic switcher; and an automation de-



multi-repeatable Events Control, Automatic Dialogue Replacement, and centralised command of up to five synchronised audio and video machines. All of this is thoroughly integrated with the SSL Studio Computer — the world's number one choice for mixing automation.

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coder. Although the Touchstone sends and receives all information via its RS-232 port, it uses an adaptor to access the station's five Instacarts, which use an RS-422 interface.

"You have a tremendous amount of power with this screen," says WEEI's director of technical operations Larry Vidoli. "You simply touch the screen and you can turn on CBS news for an exclusive bulletin or turn on the tape recorder right behind you. Another touch will let you call up some copy and play it on the air or move it to another slot. It's that easy to use."

Digital technology is similarly having a profound effect on the course of automation—as it is with almost everything else pertaining to professional audio. Many syndicated music companies are now providing clients with libraries on CD, while hardware manufacturers such as Sony,

Philips, Studer, and Audiometrics offer multiple-CD players (with capacities ranging from 10 to 100 CDs) with RS-232 ports for computer-control capability.

CD Filer software (for the IBM PC/XT and compatibles) from Ron Schiller Associates was designed specifically for such applications. The program provides cataloging, sorting, and managing of more than 2,000 CDs and can simultaneously address 99 players.

Other technologies include hard disk-based digital audio storage devices that are trying to find a place along with traditional cart systems. The new Digisound-E from Microprobe Electronics, Inc. (MEI), for example, stores 62 minutes of monaural audio on a single 280 Mb drive and is targeted for use with automation and satellite-fed installations.

"The primary difference between the Digisound and cart-based machines is its interactive

intelligence with other systems. It interacts with the host system in a way that cart machines never could," explains MEI president David Collins. "It also takes the human error factor out of cart changes and makes meeting that tight satellite window extremely easy."

What lies on the horizon in automation technology? Without the luxury of a crystal ball, one can only guess—even the future of the standard tape cartridge is matter of conjecture. Still, there are current trends that are likely to have lasting impact. Software-based designs, for one. The advantages to this approach (i.e., greater flexibility, less obsolescence) overcome two of the major pitfalls inherent in past systems. However, a third factor, product reliability, will probably be the key in determining the success of any future introductions—just as it has always been. **BM/E**

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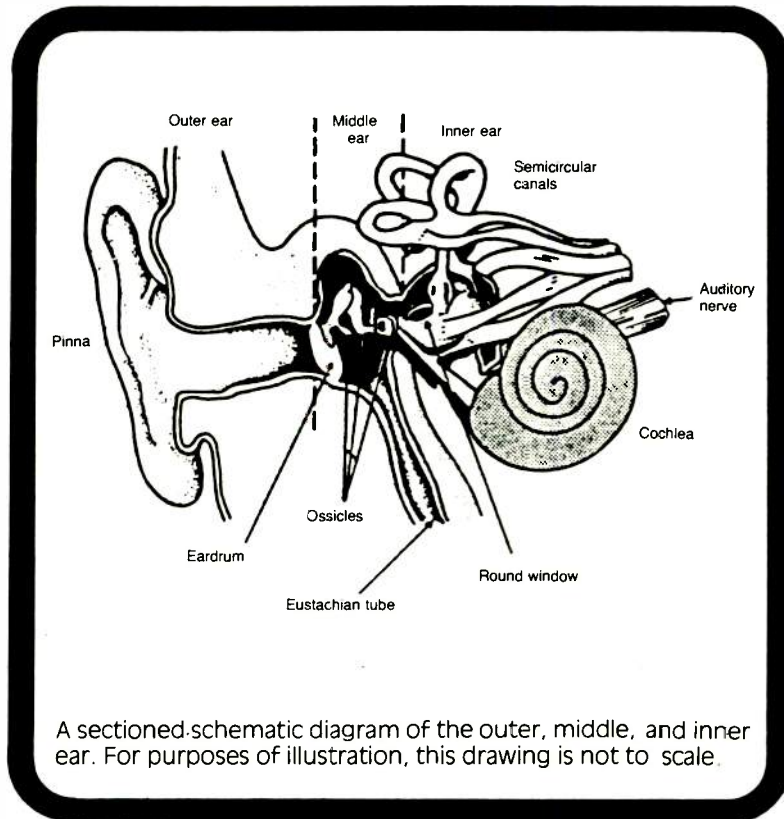
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# PSYCHO-ACOUSTICS:



## The Science of Sound Perception

### Part II

## Loudness, Sound Pressure, and Power

Paul B. Christensen, Chief Engineer WIVY-FM,  
Gilmore Broadcasting Corp.

In part I, of *BM/E's* psychoacoustics series (February 1987, p. 47), we discussed the mechanics of the hearing process and how the psychoacoustical attributes of *pitch*, *loudness*, *duration*, and *spectrum* relate to our

sound perception. In this segment, we will discuss the quality of loudness and the various physical parameters that determine it. The prominent factor as we learned in Part I is the sound pressure level. Related to the sound pressure are

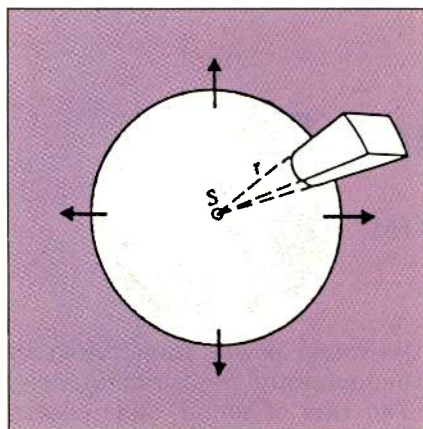
the sound power transmitted by the source and the sound intensity (The rate of sound wave energy flow). Sound pressure can be measured directly, and our ears (similar to most common microphones) respond to sound pressure.

Jet departure (50m)	120 dB
Rock concert	110 dB
Construction site	100 dB
Heavy traffic (10m)	90 dB
City street	80 dB
Car interior	70 dB
Conversation (1.5m)	60 dB
Office	50 dB
Home living room	40 dB
Bedroom	30 dB
Radio studio	20 dB
Rustling leaves	10 dB

### Sound pressure level

Sound waves emit extremely small periodic vibrations in atmospheric pressure to which our ears respond in a complex manner. The minimum pressure variation to which the ear responds is less than one billionth ( $10^{-9}$ ) of atmospheric pressure. This threshold audibility can vary substantially among individuals, but corresponds to a sound pressure amplitude of about  $2.5 \times 10^{-5}$  N/m<sup>2</sup> (Newtons per meter squared). Conversely, the threshold of pain represents a pressure amplitude approximately one million times greater, but is still less than 1/1000 of the mean atmospheric pressure.

Since there is such a great variance in pressure stimuli, it is convenient to express sound pressure on the logarithmic scale in decibels (dB). Even though the decibel scale is a means of comparing two



**Figure 1a:** Sound waves emitted in a free field. Power source S is distributed over an area of  $4\pi r^2$

sound sources, we can define the decibel scale of sound pressure by comparing sounds to a reference sound with a pressure of  $P_0 = 2 \cdot 10^{-5}$  N/m<sup>2</sup>. This value represents a sound pressure level of 0 dB. Therefore, we define sound pressure level as  $L_p = 20 \log P/P_0$ .

Sound pressure level is conveniently measured by a sound level meter employing a microphone, amplifier, and a meter that displays the detected sound pressure level. Table 1 illustrates typical sound pressure levels emitted by various objects.

### Sound power and intensity

Other levels can be expressed in decibels in addition to sound pressure: One such level is the *sound power level*, a measurement of the total sound power transmitted by a sound source in all directions. Similar to electrical power, sound power is measured in wattage. In the case of sound, the power level is extremely small. Thus, the reference level selected for comparison is the picowatt ( $10^{-12}$  Watt). The mathematical formula for determining sound power level is defined as:  $L_w = 10 \log W/W_0$ , where  $W_0$  is the sound power level reference and  $W$  is the sound power level transmitted by the sound source.

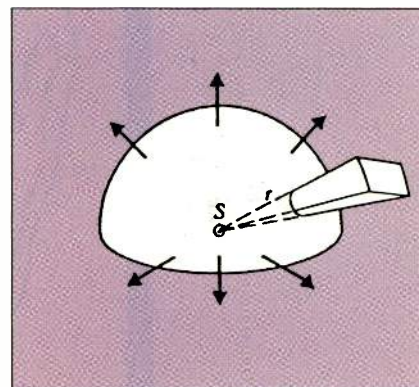
The relationship between sound power level and sound pressure level is dependent on several complex factors, including the geometry of the source and field. All other factors remaining constant, the sound pressure level of a source increases 10 dB with a 10 dB increase in sound power level. A source that emits sound in all directions is said to radiate in a *free field*. The sound pressure level decreases by a factor of 6 dB as the distance from the source is doubled (See Figures 1a and 1b).

Another quality of sound expressed by a decibel level is the *sound intensity level*, the rate of energy flow across a unit area. The reference for the measurement of sound intensity level is ( $10^{-12}$  Watt/m<sup>2</sup>). The mathematical formula is defined as  $L_i = 10 \log I/I_0$ , where  $I$  is the intensity

level and  $I_0$  is the intensity reference. For a free sound wave in air, sound intensity level and sound pressure level are almost equal.

### Multiple sound sources

The manner in which multiple sound levels add depends on the correlation and sound pressure level. For example, two uncorrelated sound sources with equal sound pressure levels will add to produce a combined sound



**Figure 1b:** Hemispherical waves emitted by source S. Power is distributed over an area of  $2\pi r^2$

level that is 3 dB higher than the single sound sources. Figure 2 illustrates the effect on sound pressure level with increasing amounts of uncorrelated sound sources. It is easy to see based on previous discussion that the doubling of the sound power increases the sound power level by 3 dB, and therefore raises the sound pressure level by 3 dB. However, under some conditions, this edifice may not hold true due to interference from reflections.

When two or more waves of the same frequency reach each other at the same point, they will interfere with each other either constructively or destructively. If their amplitudes are both equal to level A, the resultant amplitudes will add to produce an amplitude anywhere from 0 to 2A. Additionally, the resultant intensity may vary from 0 to  $4A^2$ . If the waves have different frequencies, the two sources are uncorrelated, and thus no destructive interference will occur.

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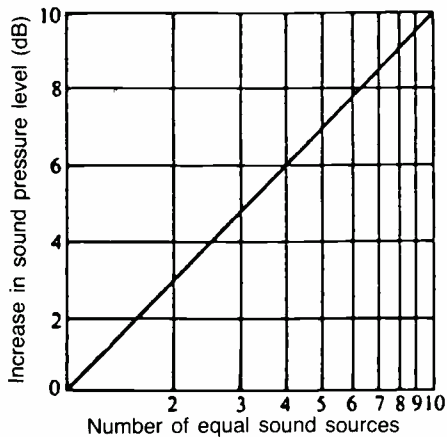
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## Psychoacoustics



**Figure 2:** Summation of equal uncorrelated sound sources.

### Loudness levels

Under most instances, sounds with greater sound intensity or sound pressure levels sound louder. However, this is not always the case. The ear's sensitivity varies with the timbre (quality) and frequency of the sound. In the early 1930's, Fletcher and Munson conducted tests to determine curves of equal loudness for steady tones. The International Standards Organization recommends the curves of Figure 3, which are very similar to those adopted by Fletcher and Munson in 1933. It is readily seen that the ear is much less sensitive to sounds of low frequency at low intensity levels. Interestingly, the ear is most sensitive to frequencies near 4 kHz (an excellent peak frequency for speech recognition). A second peak occurs near 12 kHz; the frequency of the second resonance.

The contours of equal loudness are designated in units called *phons*. The level in phons is numerically equal to the decibel sound pressure level at 1 kHz. Since the phon is an arbitrary measuring unit, it is not widely used in the measurement of sound. It is important to note that the ear is relatively insensitive to low frequency sounds, and, thus, weighting networks are routinely employed in sound measurements.

Measurements of sound are usually conducted using the "A" weighted scale as it reasonably approximates the sensitivity of the ear (see Figure 4). Such mea-

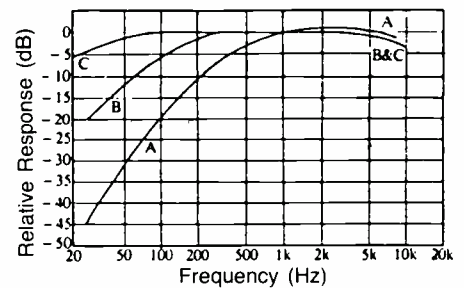
surements are properly designated as  $L_p(A)$  in dB, although dBA is often used to denote the "A" weighted level. Most sound pressure level meters have selectable meter movement constants. The slow response time constants. The slow response measures an "average" level, whereas the fast response measures a quasi "peak" level. Inside an industrial building, the "C" weighted scale may reveal substantially higher readings than the "A" scale because of low frequency machine-generated noise to which the ear is generally insensitive.

### Loudness of steady tones: sones

In Part 1, we discussed Fetchner's Law, the relationship between stimuli and sensation. This relationship provides a simplistic approximation to listener's estimates of their own sensation of loudness. In order to obtain a quantity proportional to loudness, a scale was adopted in which the unit of subjective loudness is the *son*. It is defined as the loudness of a 1 kHz pure tone at a sound level of 40 decibels. For loudness levels above 40 dB, the relationship between loudness A in sones and loudness level  $L_s$  in phons

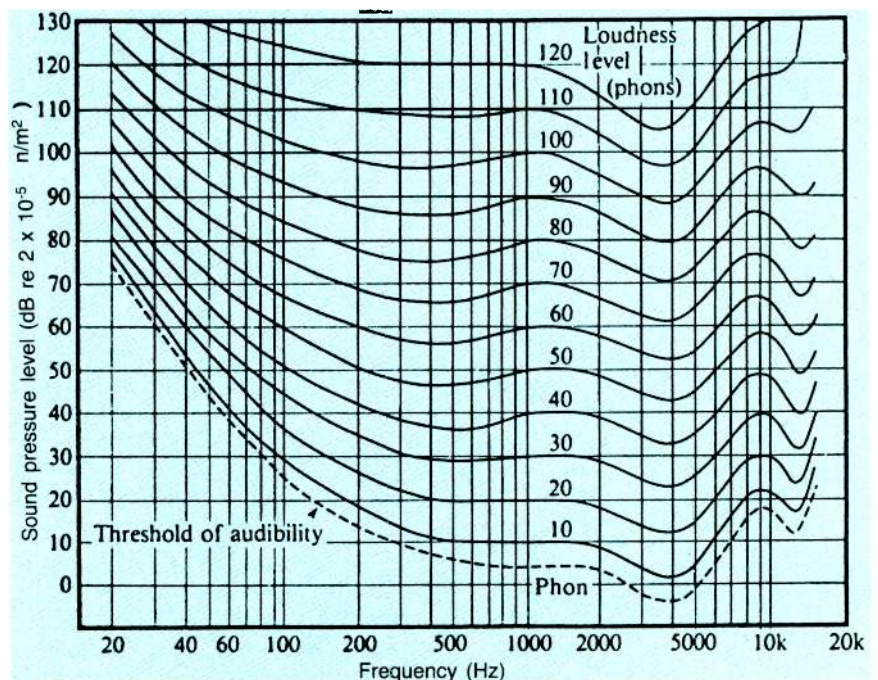
recommended by the International Standards Organizations is  $A = 2(L_s - 40)/10$ . This equation is the result of the work conducted by S.S. Stevens, who indicated that a doubling of loudness occurs for a 10 dB increase in sound pressure level. However, some researchers have found that a 6 dB increase in sound pressure level yields a doubling of loudness (Warren, 1970).

A method of representing the loudness graphically is to combine this mathematical expression for loudness with the curves of equal loudness (see Figure 3). The solid



**Figure 4:** Frequency response of three weighting networks.

lines in Figure 5 represent the loudness of pure tones at various frequencies and reflect an environment where sound comes from all directions, such as a live room.



**Figure 3:** ISO equal loudness contours. Loudness levels are expressed in phons.



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The peaks that occur near 4 kHz are due to the first resonance of the outer ear canal. Also depicted in Figure 5 are dashed lines, which indicate the subjective loudness of "musical" tones, which consist of a fundamental plus four harmonic overtones. The sound pressure level is what would be measured on a sound pressure level meter employing the "C" weighting scale; the sound level of each harmonic is 7 dB below the total level.

### Critical Bands

In Table 1 of Part I, (*BM/E*, February 1987, p. 52) we observed that loudness depends primarily on sound pressure, but also varies with frequency, duration, and spectrum.

Wideband sounds, such as white noise, seem louder than pure tones having the same sound pressure level. Figure 6 illustrates the effect of bandwidth on loudness. It can be observed that

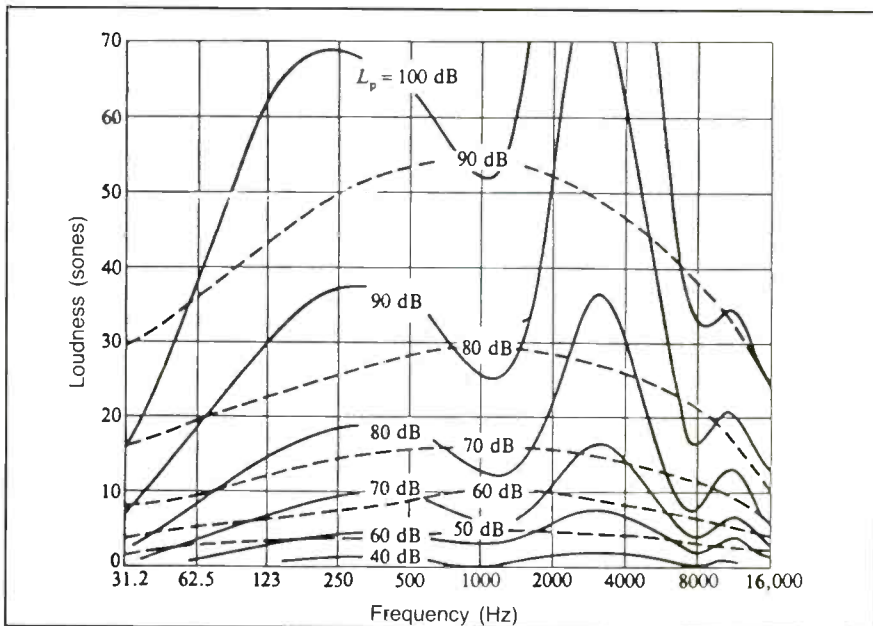


Figure 5: Subjective loudness of steady tones (solid lines) and "musical" tones (dashed lines).

loudness is not affected until the bandwidth exceeds the *critical bandwidth*.

The study of critical bands is

important in our understanding of the hearing function. Each critical band can be thought to represent a collection of data receptors

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## Audio Engineering & Production

### Psychoacoustics

on the cochlea's basilar membrane. Approximately 25 critical bands cover the audible frequency range, and the area on the basilar membrane that these frequencies represent is about 1.5 mm long and contains approximately 1000 neurons. The critical bandwidth is a function of its center frequency and may vary substantially depending on the type of experiment used in the measurement.

In musical terms, critical bands are slightly less than 1/3 of an octave in width (Also the same as 4 semitones or a major third). The ratio of frequencies of two tones that are 1/3 octave apart is  $\sqrt[3]{2}$  or 1.26. Audio spectrum analyzers are commonly available that measure the sound pressure in each of the approximately 30 1/3 octave bands.

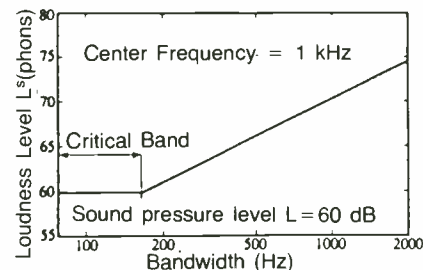


Figure 6: Relationship of bandwidth to loudness level.

## Loudness of combined sounds

The subject of the loudness of combined sounds can generate some interesting discussions. For instance, how many trumpets must play together to double the loudness? Or, how does airport traffic noise depend on the number of jets? Using the mean-square pressure rule, we found that the sound intensities from multiple uncorrelated sound sources mathematically add to give total intensity.

For estimating loudness in sones to a reasonably accurate degree, a model has been developed for complex sounds from "A" weighted levels (See Table 2).

## Dynamics and loudness

The range of sound level is known as the dynamic range and may vary from as little as less than one dB, as in the case of a

tightly processed radio station, to the greater than 50 dB, as in the case of a symphony performance.

Sound intensity measurements of a number of musical instruments have revealed that performers rarely play as many as six distinguishable dynamic levels. A 10 dB increase in sound pressure level usually results in the doubling of subjective loudness.

## Masking

One interesting psychoacoustical effect relates to the area called *masking*. When the ear detects multiple tones, it is quite

Lp(A)	30	40	50	60	70	80	90	dB
S	1	2	4	8	16	32	64	sones

possible for one tone to mask the other. Masking can best be explained as the upward shift in the hearing threshold of the weaker

tone by the dominant tone. The extent of masking is a function of the frequency of the tone sources. Steady tone, musical and complex tones, and narrow and wideband noise all exhibit differing degrees of masking. Masking can also occur when one tone is preceded by another tone a fraction of a second after the masked tone.

Many interesting conclusions have been drawn from the many masking experiments that have been conducted. Some of the more prominent results are:

- A pure tone masks tones of higher frequency to a higher degree than low frequency tones.
- As the intensity of the masking tone increases, the range of masked frequencies increases.
- Pure tones, juxtaposed together in frequency, mask each other more effectively than widely separated tones.
- Masking by a narrow band of noise reveals many of the same effects as pure tone masking.

• If two tones are widely separate in frequency, very little masking occurs.

• Wideband masking noise reveals a very linear correlation between masking and noise level (i.e., if the noise level increases by 10 dB, the threshold of hearing increases by the same amount. Additionally, wideband noise masks tones of all audible frequencies.

• The term *forward masking* refers to the masking of a tone by another sound that terminates a very short time (roughly 25 mS) before the tone begins. Theories regarding forward masking suggest that newly stimulated cells are not as sensitive as rested cells.

• *Backward masking* refers to the masking of a tone by a sound that occurs a few milliseconds later. Tones can be masked by noise that begins a few milliseconds later. However, the effect of masking is lessened as the time interval increases.

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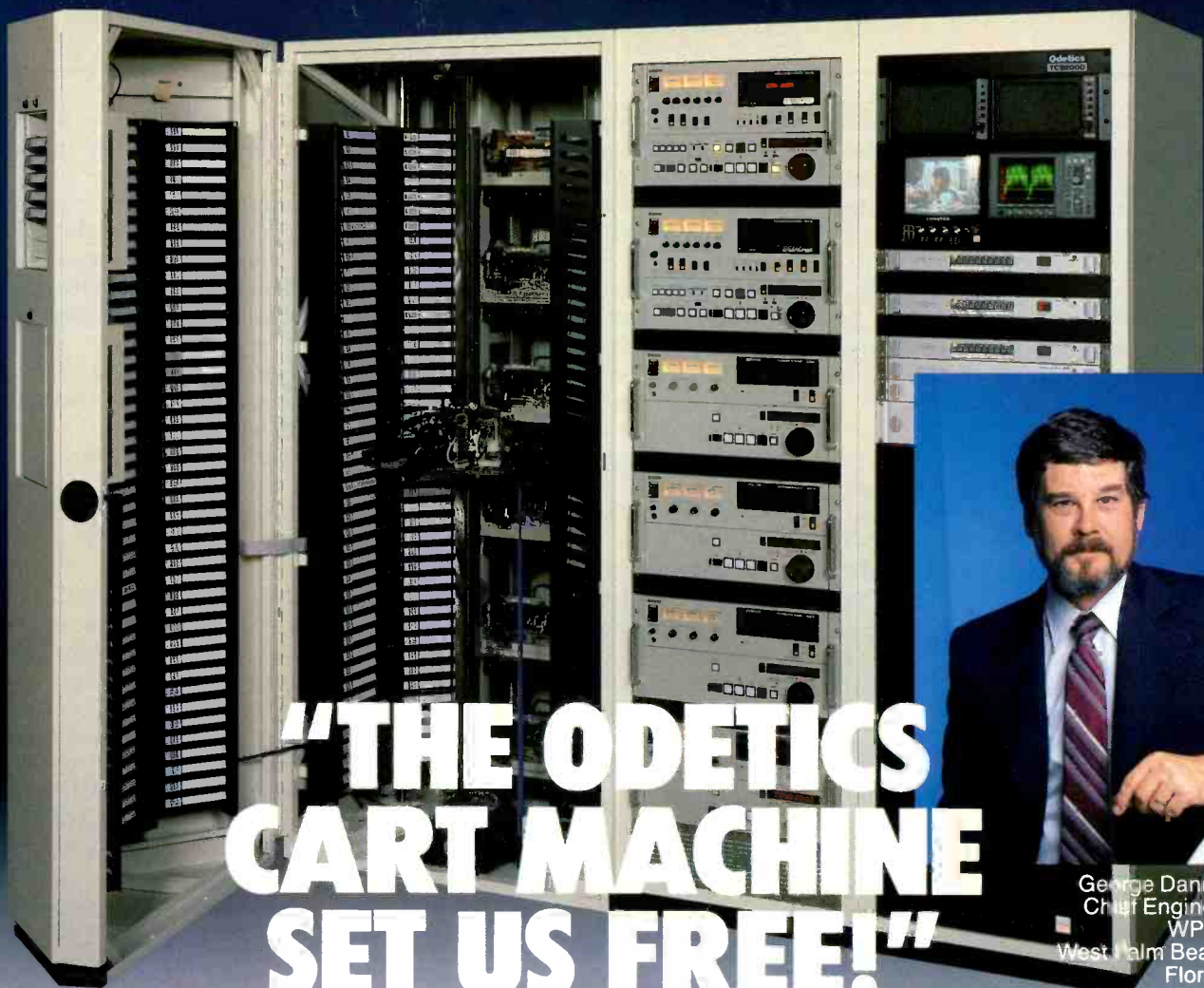
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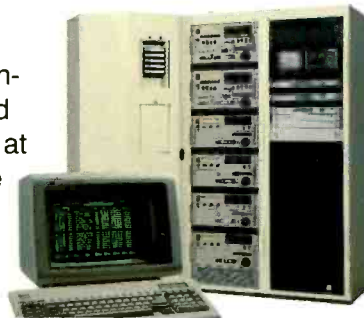
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• Under certain conditions, the masking of a tone in one ear can be caused by noise in the other. This term is called *central masking*.

Some conclusions regarding the masking effects can be best understood by analyzing the method in which pure tones excite the basilar membrane. Low frequency tones excite the basilar membrane away from the cochlea's oval window. Conversely, high frequency tones excite the region of the basilar membrane near the oval window where the membrane is more rigid. The excitation of a tone is asymmetrical along the basilar membrane. From Figure 7, it is apparent that a tone of high frequency is easier to mask than a low frequency tone. As the intensity of the masking tone increases, a larger part of its trailing end has sufficient amplitude to mask tones of higher frequency.

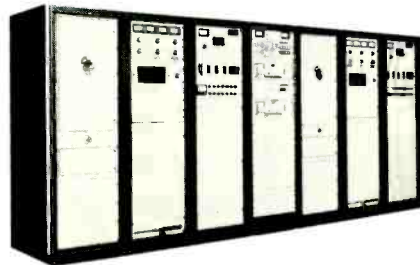
**Loudness and duration: impulsive sounds**

Numerous experiments have conclusively shown that the ear averages sound energy over a 250 millisecond period. Thus, loudness increases with duration up to this value. In other words, loudness increases by 10 dB when the duration is increased by a factor of 10. The loudness level of wideband noise tends to depend

on stimulus duration rather than loudness level of pure tones, however (see Figure 8).

As sensitive as the ear is to variations in sound pressure

level, a means of protection is necessary to avoid injury from very loud sounds. Approximately 20 dB of protection is provided by a set of muscles attached to the eardrum



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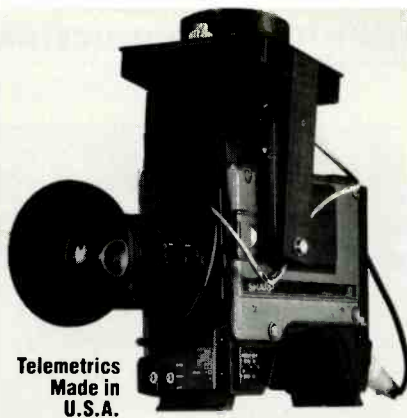
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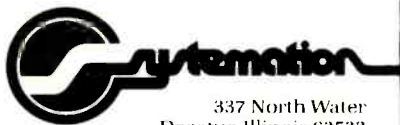
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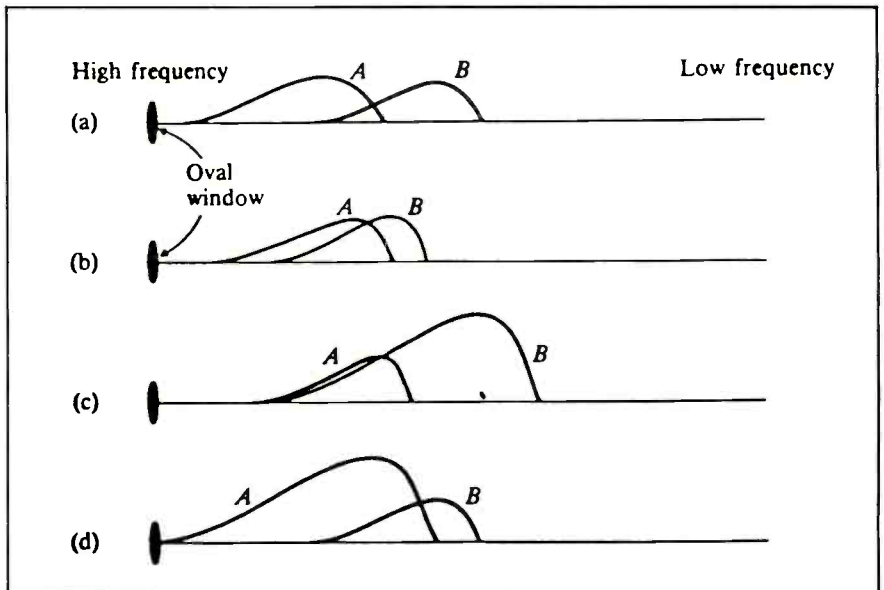


Figure 7: Response of the Basilar membrane for two steady tones, A and B.

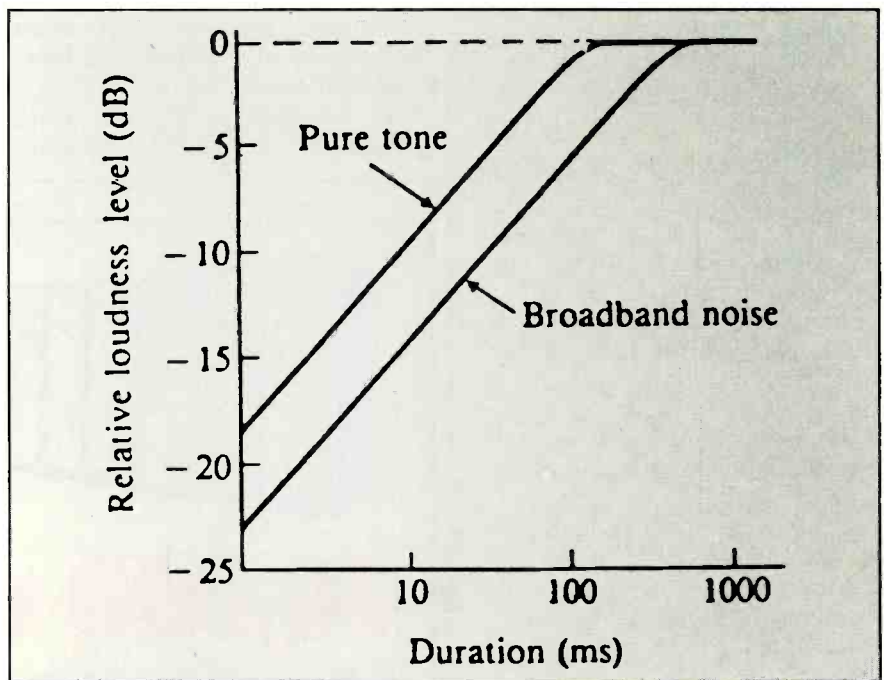


Figure 8: Relationship of duration to loudness.

and ossicles. If the ear is subjected to sounds greater than 85 dB, these muscles tighten the ossicular chain and release the stapes away from the oval window of the cochlea. This spontaneous action is termed the *acoustic reflex*.

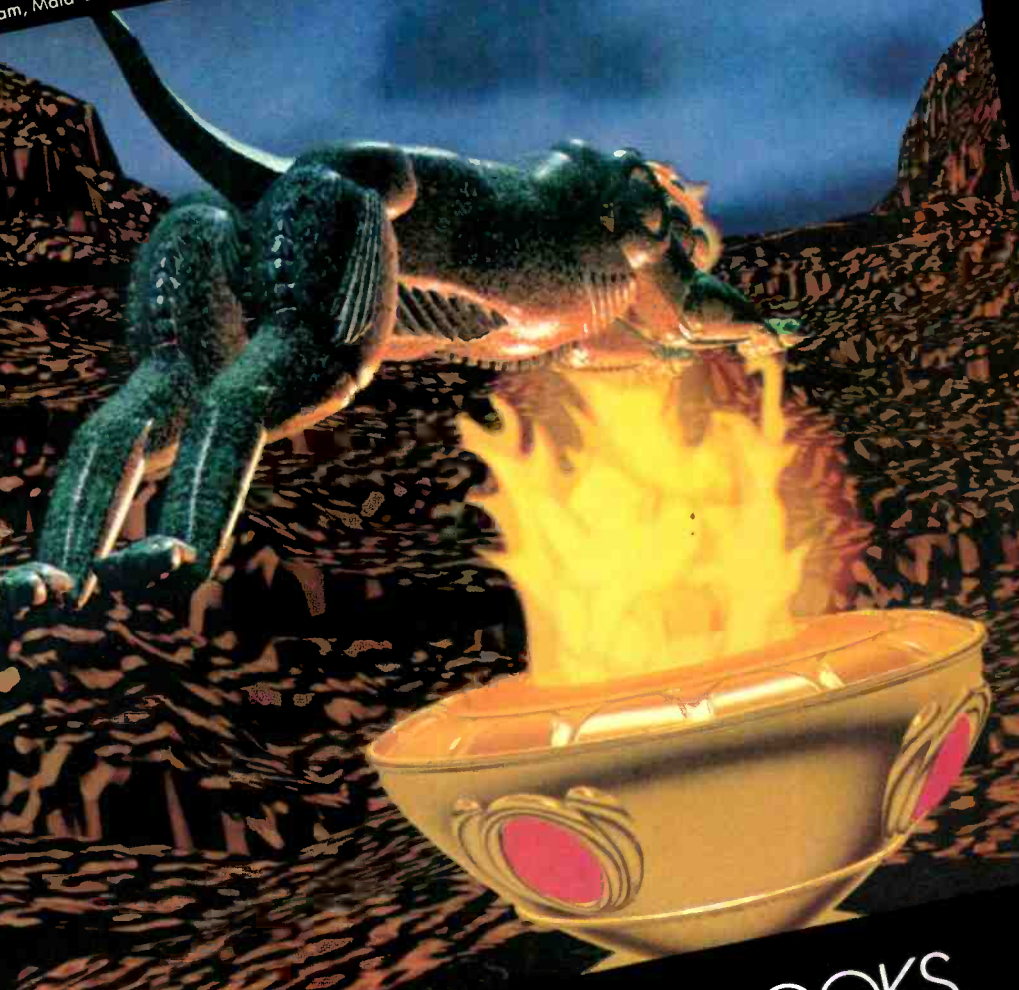
Although this is a highly effective mechanism of protection, the reflex does not begin until 30 to 50 mS after the sound overload occurs, and complete protection does not occur for another 200 mS or so. In the instance of a loud impulsive

sound, this is much too late to protect the ear from injury. Some researchers have suggested a pre-conditioning of the ear at a sound pressure level of 100 dB as a method of triggering the acoustic reflex.

We have examined the aspects of sound pressure, power, and loudness. To complete the analysis of qualitative relationships of sound, Part III of this series will address the attributes of pitch and timbre in detail.

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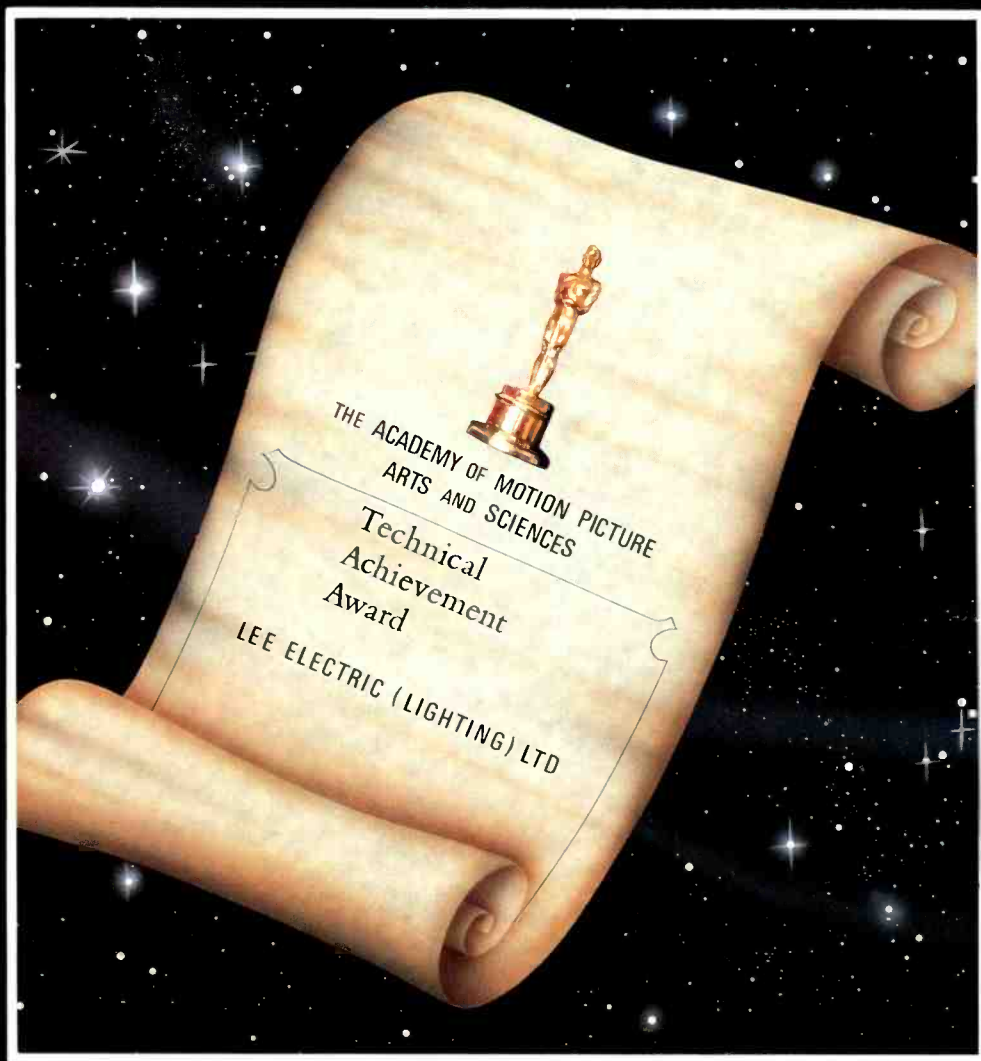
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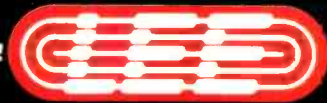


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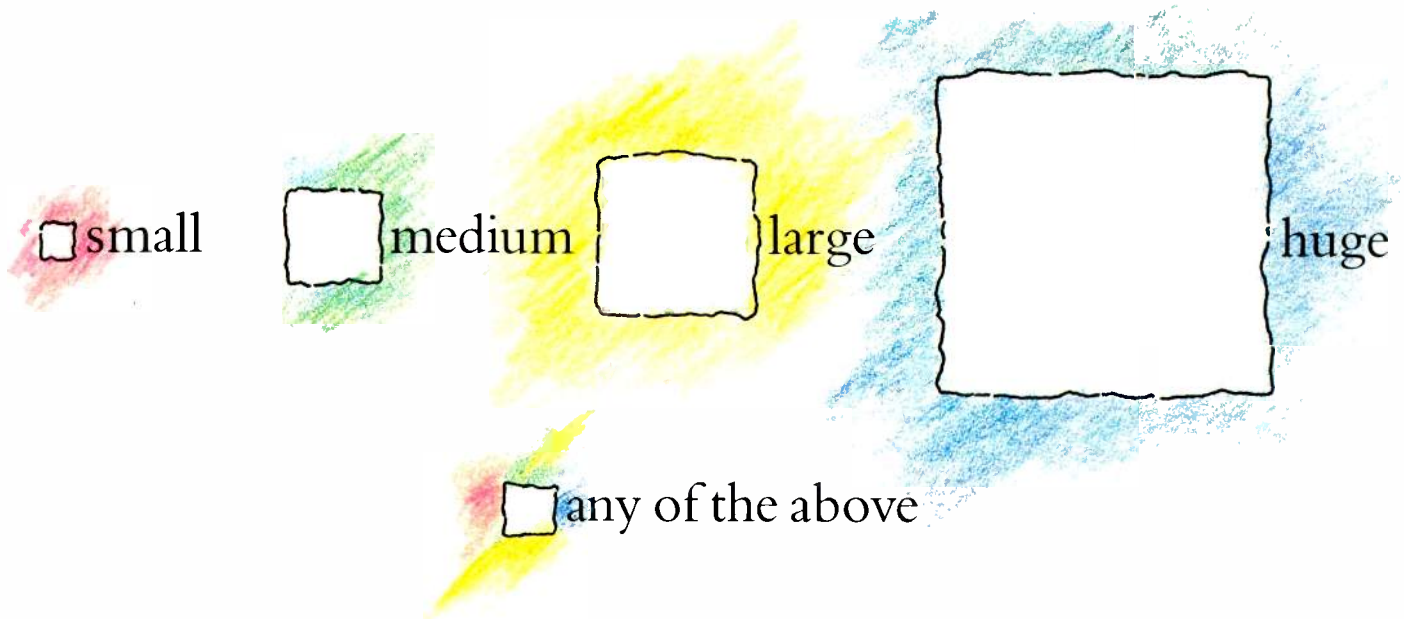
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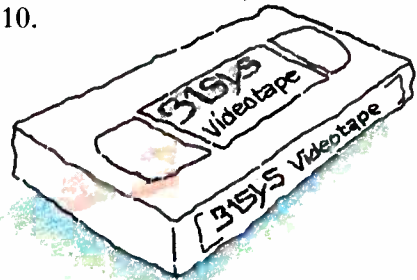
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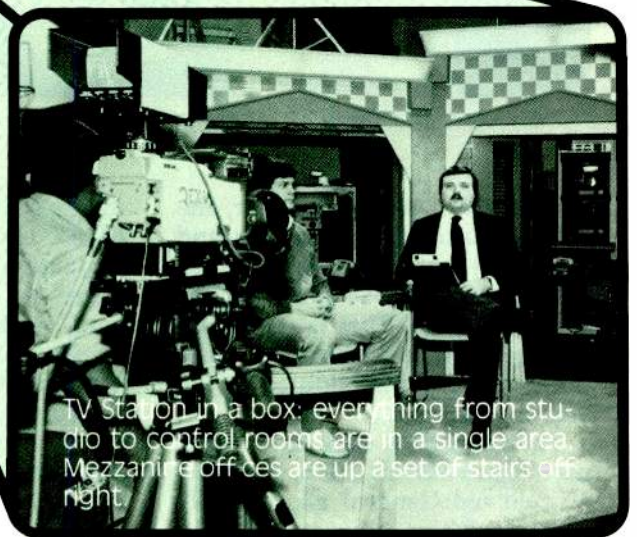
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# AUTOMATION: WQEX-TV IN A BOX

*Station automation has made many inroads into the standard broadcast operation, changing the way the normal station operates. Previously unrecognized is the ability of automation to make possible broadcasting in places where it was never before possible.*



By Myles H. Marks and Kenneth D. Tiven

It is possible, with modern automation, to contain a complete television station within a single room. As hard to believe as it may seem, that is exactly what WQEX-TV did in Pittsburgh. The current home of Channel 16, WQEX was formerly Studio C for WQED Channel 13. The 28- by 32-foot space contains everything from a Betacart automation system to the X-Y-Z Axis computer graphics system from Cubicomp.

Luckily, the studio is two stories high so a substantial mezzanine was built to handle staff and the videotape library. The main floor accommodates two half-inch editing suites, the barcoding station, the graphics room, the station manager's office, space for six staff people, as well as the studio

island for VJs, the on-camera announcers who appear between most programs. If it sounds a little tight, it is. Except that the well-designed space and rather intriguing interior decoration tend to offset the lack of space.

The new QEX16, as it calls itself, is an independent public television station that broadcasts 15 hours a day with 14 ½ hours of its programming originating on videotape. The extra half hour of air time is a live studio sports talk show. QEX airs no PBS network programming directly from the satellite.

Instead, it originates 95 percent of its programming from Betacart tapes regardless of the format in which the program was received. All satellite feeds are recorded in

this same facility. The dubbing of one-inch tape is usually handled with a single Sony BVH-500 in the on-air operations space, two-inch quad tape, however, requires renting videotape facilities from its big sister station. While non-Beta tape can be played back

#### **About the authors:**

*Kenneth Tiven has been in broadcasting since 1969, including duties as senior producer for NBC network news and as bureau chief for ABC news; he has been station manager at WQEX for one year. Myles Marks, technical director at WQEX, has also been with the station for one year. He has been a television engineer, recently with WPXI in Pittsburgh, for 19 years.*

## Broadcast Management

Station in a Box



Master control operator Dave Foreman enters *The News at 10* playlist into the Betacart computer.

through the master switcher, the ease of automated operation and the desire for a single-format tape library makes it worth the cost for the initial dub. This is especially true on programs where there are numerous plays scheduled in the years ahead.

The old WQEX went dark unexpectedly in March, 1985, when the 25-year-old General Electric TT-25A, black-and-white transmitter finally pumped its last carrier. At the time the station departed from the airwaves, its 12 kilowatt transmitter was used to telecast repeats of its sister station's (WQED) programs as well as other programming that didn't fit into the bigger station's schedule.

### Humans behind the hardware

WQED is one of just eight public television organizations in the nation to hold two television licenses for the same city. When Lloyd Kaiser, president of Metropolitan Pittsburgh Public Broadcasting, Inc., decided to spend nearly \$500,000 for a new color transmitter, he felt the station should have a separate identity.

After much discussion, Kaiser approved a plan that would make WQEX a standalone technical

and operational facility. Parent WQED is organized as a national production center for such programs as *Mr. Rogers' Neighborhood*, while the new station is a purpose-built facility with only one ambition: being America's most unusual noncommercial station. Moreover, it has accomplished this on a technical level as well as a program level.

Director of engineering Fred Majewski and station manager Kenneth Tiven, wanted a station that would take minimum manpower for the on-air aspects as well as reduce all the time-consuming details of station operation. All of this had to take place on a budget as small as the space into which it had to fit. Clearly, the station needed technologically advanced equipment and a substantial commitment to a computerized environment at every level. Majewski and Tiven hired Myles H. Marks away from another local station because Marks had the technical experience and the computer background necessary to help translate the dream into a reality.

In exactly six months the station went from nothing but a memo outlining a vision to an on-air operation. The talented engi-

neering and studio staff already in place at WQED made this construction schedule possible.

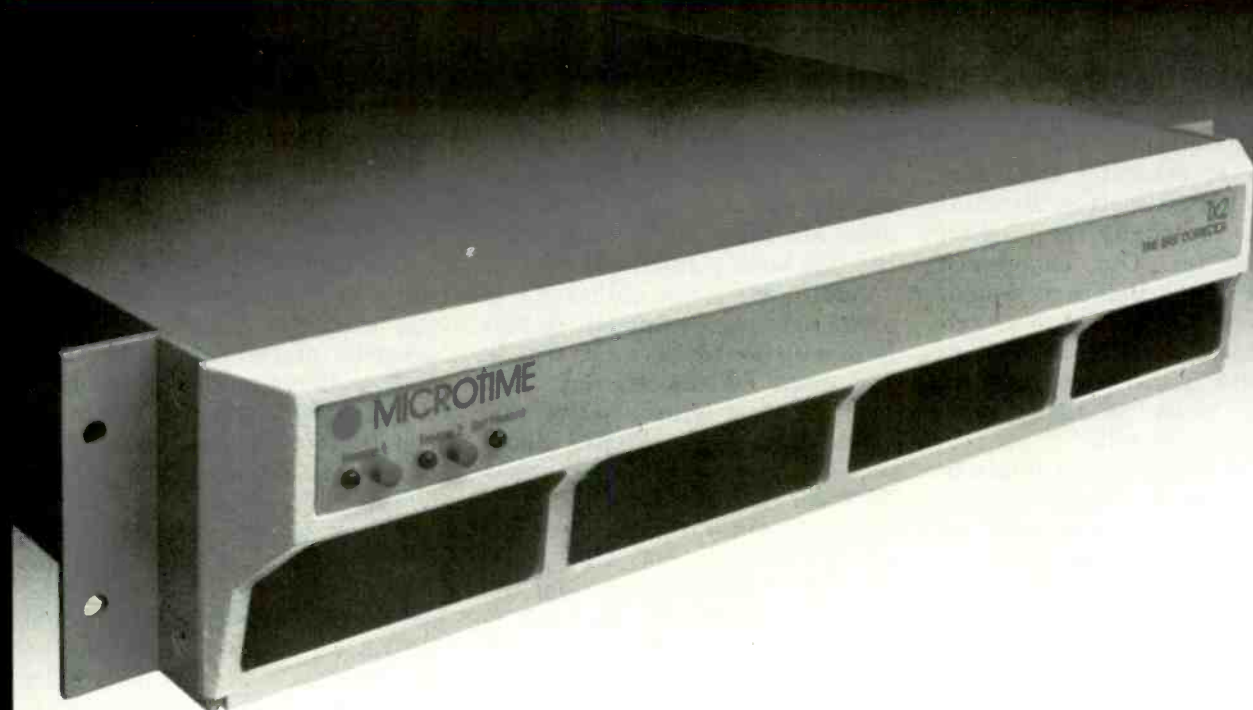
### Hardware behind the screen

WQEX is engineered on the philosophy that everything has to do double duty, and sometimes equipment must do things it was never designed to do in the fire.

To date, WQEX is the only station in the country using the Betacart system for total station operation. Most of our program material, as well as spot announcements, are either originated on or transferred to Betacam cassettes and barcoded. Programs that run longer than 30 minutes (the maximum length of material that a Betacam cassette can hold), require multiple videocassettes to sequentially play the entire program. To ensure invisible transitions during the switch between cassettes within a program, sufficient overlap time is incorporated when the program is transferred. For example, with a 59 minute program, the first 30 minutes are recorded on the first cassette. The final 30 minutes are recorded on a second cassette. This method provides an overlap of one minute of identical

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VARI-TRAK™ provides stable pictures from -1 to +3x play speed with DYNAMIC TRACKING® VTR's, and in pause mode, Tx2 turns on the interpolator for optimum playback of the single field output. In shuttle, you can view the pictures at up to ±40x for rapid searching.

The built-in sync generator conforms to RS-170A (EBU standard in PAL) and lets you achieve matched frame edits with ease. If a reference is unavailable, the Tx2 automatically selects stand-alone mode and the arithmetically correct sync-to-subcarrier relationship will be maintained. The Tx2 output provides a color-field identifier pulse for edit systems interface. Drop-out compensator is standard, as are proc-amp presets.

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## Broadcast Management

### Station in a Box

program material at the end of the first cassette and at the beginning of the second cassette.

Subsequently, a convenient scene change can be selected to cue the outpoint of the expiring cassette while the identical frame is chosen as the inpoint on the succeeding cassette. For further convenience of selecting the same frame on both cassettes, identical time code is usually recorded on both cassettes. Our experience with the Sony Betacart system has proved we are able to switch entire cassettes on the exact frame with which they are programmed, with as little as a three-second pre-roll.

A single computerized database using the Lotus Symphony software package is used to generate simultaneously our daily videotape recording schedule, the Betacam cassette labels, the daily program schedule/log, the daily list of cassettes to be erased, as well as the playlist for the Sony

Betacart. (The actual playlist is created on 3.5-inch minidisk with the "Playmaker" hardware/software package supplied by Philip Cary of Las Cruces, NM). All pertinent data regarding each program or announcement is stored within this database. To further automate the operation, the system can automatically purge all corresponding records from the database after each daily erase list has been printed.

Additionally, our philosophy of using existing equipment to perform multiple tasks can be seen in our main editing station. This consists of a Grass Valley 100 video switcher, a Ramsa audio console, a BVW-10 player, and a BVW-40 recorder interfaced to a BVE-800 editor. It doubles as our on-air control room. Our spare BVW-11 side-load player (for the Betacart BVCE-10 console) is used as a player for a second machine-to-machine edit station and doubles as our "slo-mo"/freeze

frame device since it is our only standalone dynamic tracking machine. Moreover, thanks to nine-pin data switches, we are able to configure our two editing stations as either separate and independent two-machine operations, or, with a flick of a switch, our BVE-800 editor can control either one of the second editing room's machines for a three-machine editing station.

Our BVT-810 time base corrector also functions in more than one capacity. When we receive program material in either one-inch or U-matic format, we have the capability of airing the material directly from the original medium while simultaneously transferring it to Betacam (for future playback on the Betacart). Our BVH-500, one-inch portable recorder, and our BVU-850 SP, U-matic recorder both share a single BVT-810 time base corrector. The BVU-850 uses the TBC's multicable while the BVH-500 is lashed up via a stabilizer to the external ports of the TBC. A convenient selector switch was installed (replacing the TBC's bypass switch) for ease of operator selection of inputs.

Finally, our Chyron VP-1 video printer serves a multiple function as well. We use it not only as a conventional character generator, but also as our video display of database printout for classified listings from a databank.

### Necessity is the mother of automation

Each morning WQEX airs two half-hour shows titled *Job Bank*, with classified job listings to help the unemployed find work. These job listings are compiled from the Pennsylvania State Department of Labor. One part-time person maintains a database, which was created on Wordperfect's SSI Data program on an IBM XT-type computer. The information from this database is sorted and compiled by various criteria. Each week, the database is resorted and directly translated into a word processing text file with the use of a short utility program.

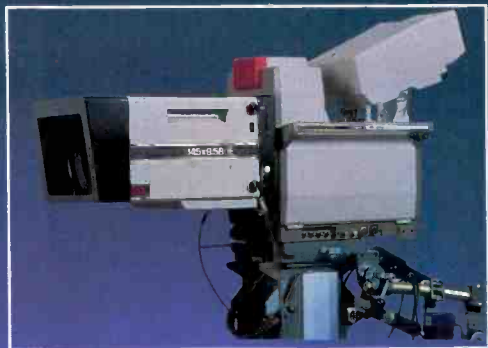
Next, this text file is loaded into



Station manager Kenneth Tiven supervises the editing of news stories. The editing station also serves as the on-air production control room.

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Circle 140 on Reader Service Card

## Broadcast Management

### Station in a Box

the text editor of the word processing program on the PC in which an RS-232 serial communications card resides. This serial card has a dedicated feed to a Chyron VP-1 video printer, which we use as our character generator. Using the built-in functions of the Chyron VP-1, we can control the actual on-air display of the *Job Bank* listings; the set-up string to initialize the video printer contains the commands necessary to automatically change each page of job information every ten seconds (or any length of time) as well as control the font and size, character color, edge type and color.

We discovered by making efficient use of our IBM XT-type PC's capabilities and practical applications, that many heretofore cumbersome or redundant tasks in character generator operations have been either greatly reduced or eliminated by using the VP-1 video printer rather than a dedicated integrated unit.

Computers are the dominant tool at WQEX, with only one typewriter available for filling in forms and some mailing labels. An IBM AT with a 30-megabyte hard disk drive is used as a host for our Cubicomp PictureMaker system, an integrated product from Cubicomp, Hayward, CA; Island Graphics, Sausalito, CA; and Diaquest, Berkeley, CA.

A Tandon "A" computer is used for our programming database, a Leading Edge "D" is used for letter writing and memos, and two IBM XT-type computers are used for Chyron composition, script writing, and other general purposes. Lastly, a small Commodore C-64 is the heart of the teleprompter system, designed by Telescript in Norwood, NJ. Even when the Commodore is in use for actual teleprompting during rehearsals, videotape recordings, or live on-air purposes, we can compose scripts for later retrieval on one of the IBM computers and transfer them to the Commodore at a later time. Since the Commodore uses CP/M and the IBM uses DOS, files created on the IBM computer are not directly interchangeable. Therefore, a simple transfer pro-

The screenshot shows a terminal window titled 'Editing Record 1418 of 2000'. The form contains the following fields and values:

WQEX Program Data Base			
Program Name	Sesame Street	Program #	Beta # 6316
Source	Xpd B 4000	Episode #	2272
Record Day	Tues	Rec. Date	01/20/87
Air Day	Wed	Air Date	01/21/87
Air Time	05:30:00 PM	Duration	00:29:18
Off Time	05:59:18 PM		
Producer			
Type			
Cost	\$8.00	Rev. Rec'd.	\$8.00
Net	\$8.00		
Paid?		Dispos.	
Media		Rights	
Erase Date	01/00/00		

At the bottom left, it shows '22-Jan-87 05:25 PM'. At the bottom right, there is a 'Calc' button.

All pertinent information about each program can be entered and retrieved in the database. A spreadsheet-type printout is generated from this form and then becomes the daily program schedule/log.

gram, written in BASICA and using another RS-232 serial port, does the job at 300 baud very nicely.

Currently, we are working on the implementation of a Local Area Network (LAN) for the entire station's computer system. A token ring networking system developed by Proteon, Natick, MA, and being installed by Robert C. Arthurs III of Information Management Group, Pittsburgh, will allow us to further integrate all our individual computers to a single server. This server will be the storage medium for all our computer files and programs, thus eliminating redundancy and floppy disk transferring. When the LAN is finally installed, it will be like having a mainframe computer serving six terminals throughout the station. Each PC, regardless of its resident storage capacity, therefore, will have the capacity and power of a 30 MB hard disk drive.

In an average day, the station broadcasts 180 to 200 Betacart events. There are no slides or audio carts as all promotional messages are prepared off-line. At the same time, the station needs to record nearly a dozen events each day fed by satellite. How to do this

without tying an operator to a videotape machine was a problem until Marks turned a liability into an asset. The station uses a BVW-25 field recorder as its primary network record machine; Marks, longtime inventor of practical electronic gadgets in his spare time, devised a unique timer that consists of a one-transistor amplifier circuit added to an ordinary \$8 digital alarm clock.

The theory behind the circuit is: unless a composite video signal is present at the input of a BVW-25 recorder, the transport will remain in the record-pause mode for up to a half-hour, therefore the circuit merely energizes a S.P.S.T. (single pull/single throw) relay contact whenever the alarm goes off. Subsequently, the relay contact toggles the video input to the BVW-25 cassette recorder. The videotape operator can set the alarm up to a half-hour in advance of the start of a network feed and place the BVW-25 into "record" mode. The recorder will immediately go into record-pause until the alarm sounds, which, in turn, energizes the relay circuitry controlling the video input.

Tiven, who has spent 20 years in newspaper and television news, wanted this small television sta-



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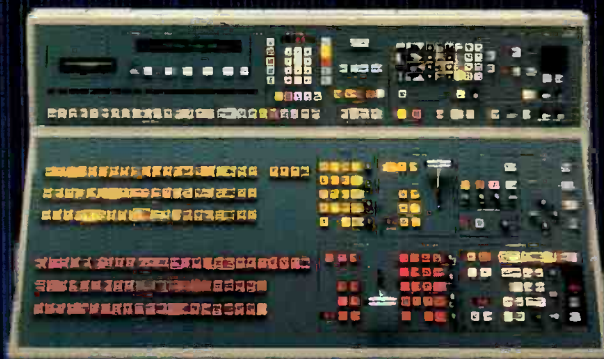


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tion to have a local newscast. He found an ally in John Craig, editor of *The Pittsburgh Post-Gazette*, the morning newspaper. They formed a co-production called *The News at 10*, which is the only locally originated 10:00 p.m. newscast in the Pittsburgh, PA, area each weeknight.

A highly-skilled team of professionals comprise *The News at 10*. At 3:00 p.m. each day, the producer and videographer leave the station to go to the *Post-Gazette*. They use a Sony DXC-3000 CCD camera and BVW-25 portable recorder in the large city room of the newspaper. The reporters are busily preparing their stories for both the television program and the newspaper.

Senior editors of the paper rotate in serving as the program host (a title we like better than anchorperson). The host interviews various reporters about their stories. The program producer is responsible for organizing the elements in the program and frequently does some of the interviews himself.

Each report is placed on its own Betacam field tape. By 6:30 p.m., the producer telephones the station with the lineup and begins to dictate the list of Chyrons for the evening's show. By the time the field crew returns to the station (around 7:15 p.m.), the Chyrons are already loaded and the title pages for all the stories are reproduced. As soon as the producer returns, he composes the evening's news rundown list on a computer and distributes it to each person involved with the production. We use the four-digit Beta number for the page numbers of the program and the master control director enters each story into the Betacart system's playlist.

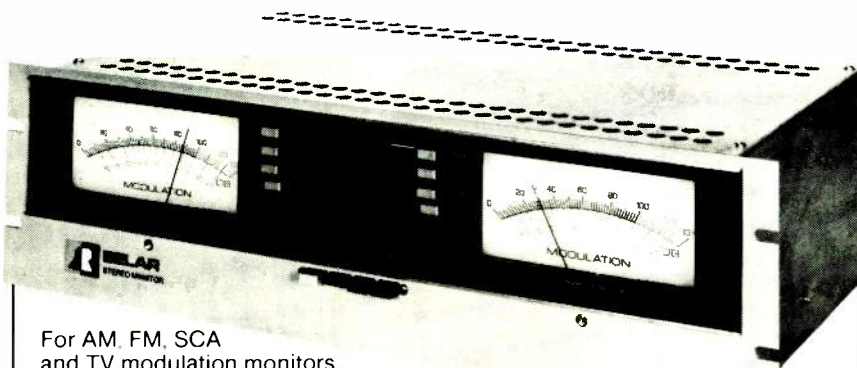
From 7:45 p.m. up to (and sometimes past) air time, three editors are busy editing the field tapes and barcoding cassettes. If a story only needs graphics, we frequently barcode the actual field tape and insert edit the graphics.

The graphic artist, David Kholodenko, works in an area next to, and connected with, the

main edit suite. Using his PictureMaker system he can compose graphics quickly and can grab frames of video from tape or camera. This allows him to add color and additional material to the pictures we take from the *Post-Gazette* each day.

Since there are no commercial interruptions, WQEX has the


opportunity to fill the entire 30 minutes of air time with news. Each story is edited on a separate cassette and appropriately barcoded. Most stories are separated with one-second bumpers consisting of such information as the state lottery winning numbers, stock market closing results, and local weather forecasts.



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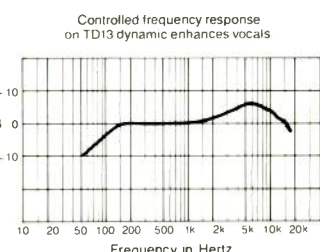
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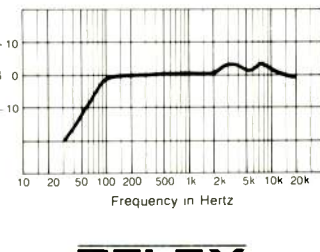
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Controlled frequency response on TD13 dynamic enhances vocals

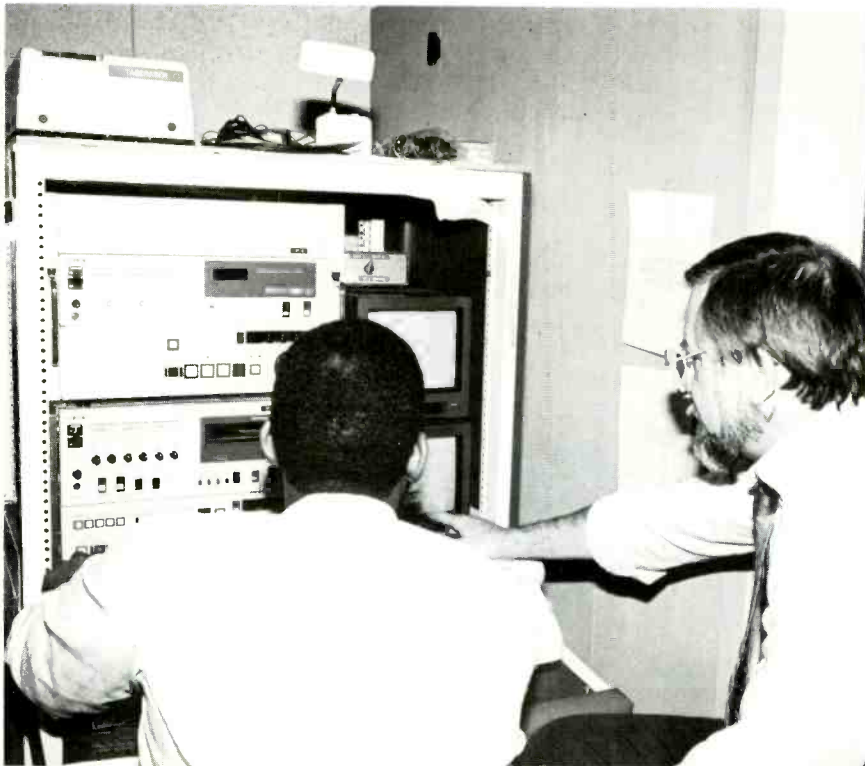


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Videographer/editor Lenni Todd and Tiven edit graphics and headers in the second two-machine edit station.

Our programming format at QEX is unique. Being the second Public Broadcasting Station in the Pittsburgh ADI, we have the luxury of experimenting with station breaks. Boring spot announcements are replaced with a human VJ (Video Jock a la MTV). Our high-tech studio efficiently uses every square foot of its 1300 square feet of space to house a VJ island, two cameras, two edit suites, a master control room, a computerized graphics-compose room, 11 work stations, an office/conference room, and sufficient storage space for thousands of Betacam cassettes.

It is unlikely that, presently, any other station in the country is using available equipment the way it is employed at WQEX. Rather than take automated station equipment and force it into our facility, we designed our facility around station automation. In this case, truly an extraordinary operation. **BM/E**



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**T** One definition of "broadcast" is to scatter in all directions. One reason: because that's where the receivers are. The tower provides the technical facility to broadcast, yet is often the most overlooked part of the plant. Also overlooked are the issues of tower lighting and painting.

## LOWER Highlights

By Donald J. Rowe

**B**roadcast product, the signal, emanates from a broadcasting tower. This vital element in our business is usually a skeletal steel unit that either mechanically positions or is itself the signal-transmitting antenna. As important as this link is to all listeners and viewers, the tower is often the most ignored part of a facility. It is safe to say that, in most situations, the tower receives major attention only at the beginning or the end of its functional life.

One of the parties interested at the time of a tower's beginning is the Federal Aviation Administration which, after a study of a tower's proposed height and site, may find that the unmarked tower would be an aviation hazard and, therefore, would request that the Federal Communications Commission require marking and lighting as a condition of the broadcaster's construction permit.

Thus required, towers almost universally have been marked with stripes of aviation orange and white paint and lighted with an array of incandescent flashing and steady-burning red lights. Partially as a result of liability in-

surance escalation, repainting a broadcast tower has become a rapidly increasing cost item, while the incandescent red light systems are characterized by high maintenance and emergency service requirements, especially in those areas with high lightning incidence.

Affecting the situation, though in a quiet way, is a change in the standards regarding the way new or existing towers meet FCC requirements. The current issue of FAA Advisory Circular 70/7460-1, Obstruction Marking and Lighting, now permits you to choose an optional aviation obstruction marking method that eliminates the need for aviation orange and white paint on towers 500 feet or less in height. The alternative may save over 80 percent of the electric energy used by the obstruction lighting and will eliminate the need for any lighting-preventative maintenance program. In addition, the new option reduces weight and wind load on the tower, provides better

An example of a medium-intensity beacon is the EG&C Electro-Optics LS-161 StrobeGuard shown here.



## Tower Lighting

protection for tower and signal during periods of reduced visibility, and has a lower initial cost.

The new option is really a new application of the existing standard FAA Specification L-866 Medium Intensity Omnidirectional Obstruction Light, a two-intensity (day/night) capacitive discharge light that, to this point in time, has been used almost exclusively as an appurtenance light on structures marked with the FAA Spec L-856 High Intensity System. Table 1 summarizes the operating and environmental characteristics of this L-866 beacon.

The new standard is stated: "During daytime, medium intensity white obstruction lights with automatically selected reduced intensity for night operation may be used. When this type of system is used on structures 500 feet (153 m) AGL (above ground level) or less in height, other methods of marking and lighting the structure (i.e. paint and red lights) may be omitted." The required number and placement of beacons on various structure heights is shown in Figure 1.

### Beacon components

The medium intensity beacon has three functional components: flashhead, power supply, and photoelectric control. When operated

Table 1—Summary of Operating & Environmental Specifications for L-866 White Obstruction Beacon

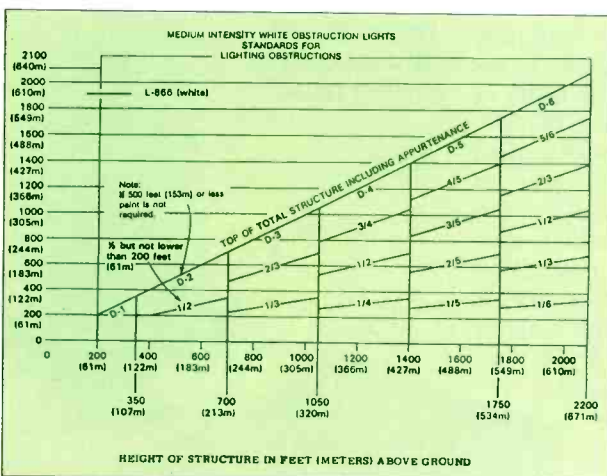
Operational	
Light Output—Beam Peak	
Day	20,000 effective candela nominal
Night	4,000 effective candela nominal*
Beam Spread	
Horizontal	360 degrees
Vertical	3 degrees minimum
Flash Rate	40 per minute $\pm$ 5%
Flash Duration	
Day	20 milliseconds
Night	100 to 250 milliseconds (extended flash)
Environmental	
Temperature Range	-50 to +55 degrees C
Relative Humidity	95%
Windspeed	150 m.p.h.
Exposure to Rain, Snow, Hail, and Sleet	

\*Conflict between Advisory Circular 77/460-1G and A/C 150-5345-43C (4,000 vs. 2,000 eff. cd.) resolved by letter authorizing deviation from A/C 150-5345-43C requirement.

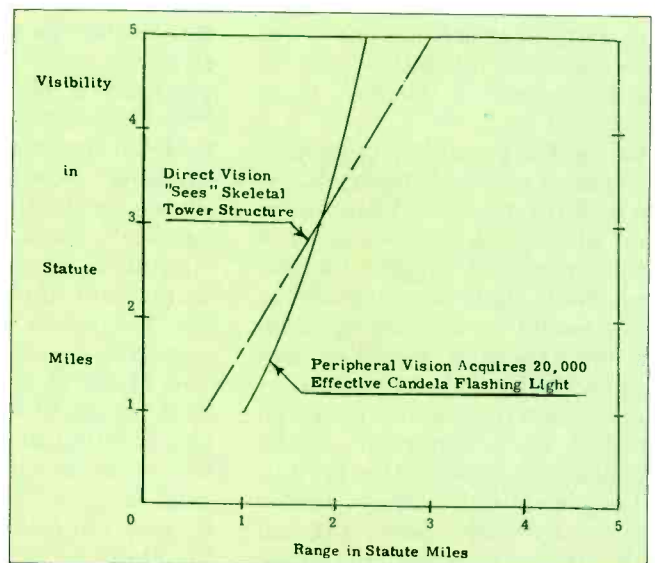
on alternating current, low-voltage power is fed into the primary of a step-up transformer, and the resulting voltage from the transformer secondary is rectified to direct current, and the energy result is stored in capacitors. This energy is held off by the flashtube,

which is loaded across the capacitor bank selected by the photoelectric control to produce the correct light beam intensity (day or night).

A big convenience is provided with these systems in that the flashhead, power supply, and pho-



**Figure 1:** Graph reproducing the chart shown is the FAA's Advisory Circular 70/7460-1G. This graph displays the number and placement by tower height the spec. L-866 medium-intensity beacons required for standard marking and lighting of the structure.



**Figure 2:** Calculated rate of day acquisition for FAA spec. L-866 white medium-intensity obstruction beacon versus flight experiential distance for visual acquisition of skeletal tower structures.





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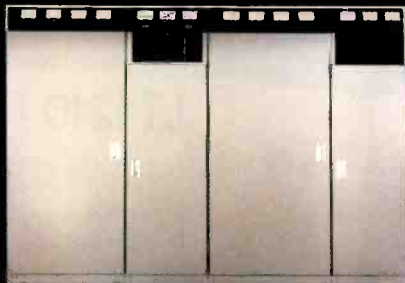
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## Tower Lighting

### BROADCASTING

Aug. 18, 1986

"Both COMARK and Thomson-LGT made news at the NAB..."  
 "COMARK introduced a 60 kw UHF transmitter with a KLYSTRODE..."

"...Thomson-LGT introduced a 30 kw SOLID-STATE VHF Transmitter..."

"Comark...first domestic source for BCD/ABC beam current pulsing systems."



**LEADING THE INDUSTRY  
 IN TECHNICAL  
 INNOVATIONS**

### BM/E June 1986 NAB Show-In-Print

"...the principal advance reported at this NAB was the long-awaited commercial realization of the KLYSTRODE TUBE design in a production transmitter from COMARK."

"COMARK is first US manufacturer to build production transmitters specifically designed for and featuring wide band external cavity KLYSTRON amplifiers."

**BROADCAST ENGINEERING—  
 May 1986 Transmission  
 Systems Special Issue**  
 "High-performance Klystrons, Klystrodes and solid-state RF amplifiers are reducing operating costs and improving broadcast transmitter quality."

"COMARK was the 1st domestic manufacturer to design and produce no-tuning solid-state exciter/driver for use with Klystron transmitting systems."

toelectric control can be placed close together such as in a cluster on the top of a short tower on the roof of a tall building, or separated by distances up to 1000 feet.

Calculations shown in Figure 2 were used to determine the pilot's probable acquisition range and pertain to a 20,000 effective candela flashing light under low-but-legal visual flight rules (VFR) visibility conditions. Also shown are the results of early flight tests, which explored the eye's capability to acquire a skeletal structure under the same conditions. In the foreword to A/C 70/7460-1, the FAA states that an aircraft traveling at 165 knots (190 miles per hour) to respond and avoid an object by 2000 feet requires 1.18 miles for the pilot to see, recognize the object, and initiate evasive action.

An FAA flight program, "Evaluation of L-866 Obstruction Beacon," provided a direct comparison between the visual acquisition of the painted surface of a skeletal steel tower and the L-866 white flashing beacon. The calculated improvements under one- to three-mile visibility conditions were confirmed. Night lighting comparisons between the L-866 white and red beacons were made

as a separate part of the same study and are treated separately in this article.

Listed in Table 2 is a comparison of day obstruction marking characteristics of the paint and flashing light marking systems. This includes a cost comparison. Tower repaint costs vary widely due to a great number of factors, including wide variance in tower member size and shape, surface condition, local labor rates, and, very important in these days of escalating insurance costs, tower location. A tower repaint may cost as little as four times the cost of the paint materials to as much as 63 times the cost. The numbers shown in Table 2 represent the repaint price for a three-foot face tower at a remote site and should represent the low end of the range for a 350 foot tower.

In contrast, comparing the characteristics of two flashing lights contains fewer variables. The incandescent lamp bulb has been around since the creative days of Thomas Alva Edison and, even though manufacturers claim breakthroughs, actual improvements are minor. For color efficiency, or efficacy, a tungsten filament with a melt temperature of 6140 degrees F is operated at

Table 2—Daytime Obstruction Marking Comparison for Skeletal Towers

Protection Characteristic	Paint	L-866 White
Pilot Acquisition Distance* 1-mile visibility (minimum VFR in uncontrolled airspace)	0.6 miles (same as no paint)	1.1 miles
3-mile visibility (minimum VFR in controlled airspace)	2.0 miles (same as no paint)	2.2 miles
5-mile visibility	3.0 miles	2.3 miles
Effect of overcast sky and twilight conditions	Reduced ability to distinguish color	Increased acquisition distance
Pilot retention during avoidance maneuver	Requires direct vision at all times	Retained with peripheral vision/ allows other tasks
Other Considerations		
Life	4 to 5 years (average)	Life of tower
Yearly energy consumption	None	875 kW/hour/year
Yearly maintenance with 5-year paint life and estimated \$3,500 painting cost	\$700.00	\$60.00 (half of \$120 annual accrual)
*Acquisition distance varies with the pilot's visual acuity, visual background, and tower leg size.		

### Bibliography

The following are sources of information used in preparing this article and are valuable for further reference:

Obstruction Marking and Lighting, "Advisory Circular 70-7460-1G, Federal Aviation Administration, U.S. Department of Transportation, Washington, D.C.

"Specification For Obstruction Lighting Equipment," Advisory Circular 155/345-43C, Federal Aviation Administration.

"Evaluation of L-866 Obstruction Beacon," Technical note DOT/FAA/CT-TN85-3, Technical Center Library, Federal Aviation Administration, U.S. Department of Transportation, Atlantic City, NJ.

Engineering Bulletin 0-324, Sylvania Lighting Center, GTE Products Corp., Danvers, MA.

close to 5000 degrees F and is very susceptible to catastrophic failure with small increases in current.

In contrast to incandescent bulb characteristics, repetitive ignition of the Xenon gas used as the light source in the L-866 white beacon does not "wear out" the gas. There is, however, a very low gradual reduction in the useful light emitted from the flashtube envelope as a result of vapor deposition of metal "boiled off" the cathode during discharge. The outside of the envelope also is degraded by the accumulation of particles from the atmosphere.

### Lighting comparisons

A comparison, shown in Table 3, of the two nighttime obstruction lighting systems is calcu-

lated from the application of known incandescent lamp and xenon gas flashtube characteristics with both operating at the minimum 97 percent of rated lamp voltage required by Advisory Circular 70/7460-1.

The eventual flashtube changeout should cost no more than \$600 in labor and material; this requires an annual accrual of \$120. No other preventative maintenance monies need be scheduled. In comparison, the traditionally marked tower should require semi-annual lamp bulb replacements at an average \$300 labor and \$50 parts charge each time. Repainting costs, as noted, vary widely; an annual accrual of \$700 should be conservative. These figures calculate out to \$1280 of annual savings for each medium-inten-

sity beacon installed without even considering the commercial or public relations value attached to the 3565 kW/Hr saved annually by each beacon (\$428 at 12 cents per kW/Hr).

If aviation safety is improved and money is saved through use of the L-866 white beacon, what about this beacon's environmental aspects? With proper installation, the L-866 beacon is a very good neighbor. The lens and light source combine to provide a narrow vertical beam with low scatter, meaning less light on the ground in the vicinity of the tower. Use of the L-866 medium-intensity beacon eliminates the need for steady burning lights on the tower at night, the prime cause of tower-associated migratory bird kill. For towers in rural areas, the clear lens, short "on" time, and low ground light combine to make the L-866 beacon an uninviting target while the lens' slanted wall and flexible material resist bullet penetration.

Lower obstruction lighting life cycle costs have been amply demonstrated, and, should the station be in the market for a new tower, this new option can be specified in the Notice of Proposed Construction or Alteration, FAA form 7460-1, filed at the time of application or, through amendment, at any time prior to erection of the tower.

Eliminating the need to paint eliminates the need to provide a paintable surface on tower structural members; study of the life cycle cost effect of alternate tower materials is certainly justified.

Table 3—Nighttime Obstruction Lighting Comparison for Skeletal Towers

Protection Characteristic	L-866 Red	L-866 White
Initial Light (Beam peak nominal)	1,500 eff. cd.	2,000 eff. cd.
Light output after 180 days	Down 20% with color change	Down 1% no color change
Light output at 90% Volts	Down 25% with color change	Same as rated no color change
Expected useful life in number of flashes	2.6 million	100 million
Life at 110% Volts	Down 75%	Same as rated
Surge current susceptibility	High	Low
Yearly Operating Energy & Estimated Expense		
Old A2/ new A1 configuration (with balance resistor)	4,748 kW/hour	307 kW/hour
Scheduled Yearly Maintenance (2 group relamps + labor)	\$700.00	\$60.00 accrual for flashtube change (5 years)

What about replacing incandescent red lighting systems instead of repainting under an existing tower FCC construction permit? It seems that everything in the broadcast industry begins as paper, including changing your mind. Both the FAA and the FCC are involved, the FAA to change the chart, and the FCC to chart the change.

Since replacing the obstruction lighting does not alter any site or structure data contained in the original Notice of Proposed Construction or Alteration, FAA regional airspace specialists contacted regarding this re-marking have advised that the FAA process requires only a letter referencing the original aeronautical study number (from your files) and a statement of your planned change to "an obstruction marking and lighting system consisting of L-866 white medium-intensity obstruction beacons operating 24 hours per day. No other alteration will be made to structure or site." Alternatively, if you wish, you may file FAA form 7460-1 with the same notation.

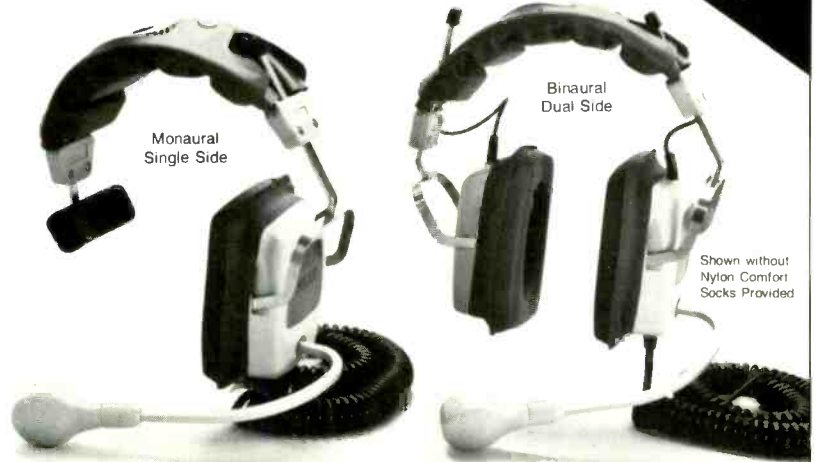
After receipt of your confirming FAA "Determination of no Hazard," a letter (or telegram) request for this same change should be submitted to the FCC, attention Field Operations Bureau, which, if requested, will provide an immediate telegram authorizing the obstruction marking change. Receipt of the FCC document authorizes a better-marked tower with operating and maintenance cost improvements for the broadcaster. You will see your tower in a new light. **BM/E**

**About the author:**

*Donald Rowe is senior product sales specialist with EG&G in Salem, MA. After getting a BS degree from Iowa, he served 16 years with General Electric in the electronic component application engineering division and nine years with Sprague Electric as product manager for magnetic components and fixed dielectric capacitors. He is a former U.S. Navy and current instrument-rated private pilot.*

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## The New Fees

By Harry Cole, Bechtel & Cole, FCC Counsel

That dull ringing you may have been hearing in the background lately is getting louder and louder—it's the sound of the FCC's cash registers getting ready to start collecting fees, fees, and more fees as of April 1, 1987. (The selection of April Fool's Day as the start of the Commission's fee program may have been nothing more than coincidental, but we're willing to give them the benefit of the doubt). Starting in April, the Commission will once again charge for the services that it provides those who want to become, or want to stay, broadcasters. Since the Commission has been without a fee system for more than ten years, we thought it would be a good idea to let readers know how things will be when fees return.

As you may have heard, the Commission once did have a fee system more than a decade ago. Each time an applicant tendered an application it was required to tender a check in the appropriate amount (depending on what kind of application was being filed); annual license fees were also charged. The amount each type of application cost was established somewhat arbitrarily, which led to the demise of the fee structure after the U.S. Court of Appeals in Washington decided in 1976 that the Commission could charge fees only to the extent that they were reasonably related to the nature of the services rendered. Since the fees then being charged were not necessarily reasonably related to anything, the Court declared them unlawful and required that the Commission refund all fees paid pursuant to that system; the Court also prohibited the Commission from requiring the payment of any further fees until the FCC had devised a more appropriate schedule of fees correlated to the nature and cost of the service to be rendered in connection with the fee.

Needless to say, the refund process was not completed overnight. The FCC had to invite fee refund requests and then had to process the thousands of requests that were filed in response. The process required years to develop and implement. In the meantime, the Commission chose not to put a new fee system in place. Rather, it sought to clean up its first mistake before running the risk of making another.

This is not to say that the FCC ignored the fee problem. These are, after all, the days of Gramm-Rudman, when governmental budgets are thin and dollars are scarce. It therefore made sense to look to the regulatees themselves to finance in part the activities of the regulators. With that in mind, the FCC worked with Congress to develop a

fee structure that would satisfy the standards laid down by the Court of Appeals, and that would generate some much-needed revenue for the Treasury. Last April the President signed into law a bill that, among other things, added a new section to the Communications Act. That section required the Commission to adopt, within a year of the new section's enactment (i.e., by April, 1987) a fee schedule established by Congress. Last December the Commission followed through with that assignment, with the resulting fee schedule to go into effect as of April 1, 1987. Some of the fees most broadcasters are likely to encounter are as follows:

**Applications for construction permits for new stations or major changes to existing stations:**

TV	\$2250
AM	2000
FM	1800
FM/TV Translators and LPTV	375
Applications for minor changes (all services)	500

**License Fees:**

TV	\$150
AM	325
AM (Directional Antenna License fee)	375
FM	100
FM/TV Translators and LPTV	75
Renewal Fees (all services)	30

**Applications for Assignment or Transfer of License:**

Long form (FCC forms 314 or 315)	\$500
Short form (FCC form 316)	70
FM/TV Translator and LPTV Stations	75

**Applications for major actions:**

Auxiliary Services	\$75
Hearing Fee (all services)	6000

**Additional fee information**

• The fees themselves are subject to adjustment every two years to reflect changes in the Consumer Price Index. No change will be made unless the increase or decrease amounts to five percent (or, for fees under \$100, \$5.00). Fees will be adjusted only in increments of \$5.00.

• There will be no special fee form to be submitted with your fees; you will need only file the application itself with the check, bank draft or money order payable to the Federal Communications Commission.

• Payment in full is required at the time the application is tendered—no partial or installment payments will be accepted. If you tender an applica-

tion with less than the required fee, the application will be returned, unprocessed, to the applicant and will not be deemed to have been received by the Commission for the purposes of meeting any FCC deadline unless the application is retendered by the deadline with the proper fee. However, the Commission may, in certain limited instances, grant deferral requests (with the FCC then billing the applicant). Also, it is possible that an insufficient fee may not be discovered until after processing of the application has begun. In those events (which are likely to be few and far between) a 25 percent late penalty will be imposed.

- You will be expected to tender separate checks for each application or filing. However, if a single applicant is filing multiple applications for the same FCC actions in the same service on the same FCC forms, a single payment may be permitted.
- Requests for waiver or deferral of a fee must be made at the time the application is filed, and must demonstrate that good cause for waiver or deferral exists and that it would be in the public interest.
- The fees are nonrefundable except in certain limited instances. That is, the Commission keeps the money irrespective of the ultimate disposition of the application or filing for which the fee is paid. The only times you might expect to see a refund will be when the application is returned because the fee tendered is insufficient, when no fee is required to be tendered, or when an overpayment has been made.

The people who will be hardest hit by the new fees will be the universe of applicants trying to get new stations. They obviously face the biggest application fees, all of which are in the range of \$2000. While the same fees are charged to existing licensees seeking major changes of their facilities, such licensees are in a far better position because they at least have some broadcast facilities with which to generate some income while they wait for the Commission to act; also, recent definitions of the term "major change" have dramatically reduced the number of such changes. New applicants, by contrast, can't start generating any income until their applications are granted and their stations are constructed. Thus, the thought of spending about \$2000 is more likely to deter a new applicant than a major change applicant.

And for those brave souls who do dare pay the initial filing fee for a new broadcast station, the worst is still to come. As you all doubtless know, these days it is almost unheard of for just one application to be filed for any available frequency, no matter how undesirable that frequency might appear. And, where more than one applicant files for a given frequency, the result is a comparative hearing. The "hearing fee" on the new schedule is a whopping \$6000. In other words, an applicant for a new station is looking at a minimum of ap-

proximately \$8000 in non-refundable out-of-pocket costs (over and above engineering, legal, and other expenses necessary to prepare the application, get it on file, and keep it current) just to get in the hearing, with no guarantee of success. That obviously represents a strong disincentive to the filing of purely speculative applications.

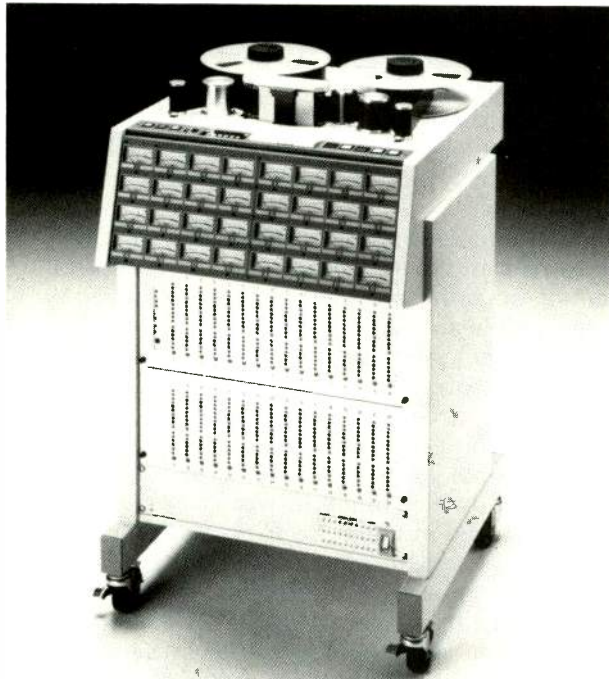
The deterrent effect of these fees may prove to be a blessing to serious applicants. At present, it is not unusual to see 10, 20, 30, and even 40 or more applicants lining up for some new TV and FM channel availabilities. While many of those applicants are likely to be serious, many others are likely simply to be speculators, looking to avoid running up significant costs while staying in the game long enough to participate in any settlement which might be reached. Such speculation has been nurtured by Congress' decision several years ago to eliminate the limits on how much an applicant could receive for the dismissal of its application. Now that the sky is pretty much the limit in settlement situations, there appears to be a greater tendency for applicants to tie their settlement negotiations to the perceived value of the station for which the applicants have applied. As a result, as station prices have increased substantially over the last few years, so have the total values of settlements.

The trouble with speculative applications is that they constitute an inconvenient, and usually an expensive, impediment to conclusion of the comparative proceeding. Every additional party in a comparative proceeding means extra work and more expense for every other party at virtually every stage of the proceeding. Further, even though many apparently speculative applicants may not have a chance at winning the proceeding under the standard comparative criteria, they are still entitled to appeal their loss through the Commission and into the courts. Since the appeal process can consume years, such applicants have a certain degree of leverage. By imposing, in effect, an \$8000 ante to get into the comparative hearing game, the Commission is almost certain to scare away some if not all of these speculative applicants. The result will not necessarily be a dramatically reduced field of applicants; it will, however, be a field of applicants who are serious about getting the station.

One area that appears not to be covered by the Commission's new fee schedule involves upgrading facilities through the process of changing channels or channel classifications. For example, if you are operating on a Class A channel and can demonstrate to the Commission that a Class C (or some other superior class) station can operate on that channel or on an adjacent channel, you can ask the FCC to change its Table of FM Allotments to reflect the change and simultaneously to order that your authorization be modified to reflect the upgrading.

BM/E

## New Equipment



### Otari Unveils Recorder

The MX-80 analog tape recorder, available in two-inch, 32-channel, 24-channel, and a 24-channel prewired for 32 versions, is the latest product release from Otari. The MX-80 features include a microprocessor controlled constant tape tension transport with DC-servoed reel motors; tape-speed referenced seamless punch-in/gapless punch-out; HX-Pro bias optimization; and a full-function session controller.

A built-in mini-autolocator with three cue-point memories, repeat function, and return to zero capabilities is front-panel programmed and can be activated "on the fly." The MX-80 is the first Otari machine to feature such an autolocator.

The unit is user-convertible between 30/15 and 15/7.5 ips speeds, which allows the recorder to adapt to both music production and audio sweetening and post-production. List price is \$34,950 for the 32-channel version and \$27,950 for the 24-channel version.

*Circle #200 on Reader Service Card*

### New Sat Video Receiver from Scientific-Atlanta

The Series 7514 Intelsat video receivers, new from Scientific-Atlanta, are designed to comply with all Intelsat standards to provide broadcast-quality reception of TV video and audio signals from satellite transmissions.

The unit features extended tuning (3.625 to 4.2 GHz) over the entire C-band range, which is necessary to access Intelsat VI and future satellites;

and video threshold extension demodulation via a synthesized audio demodulator that features frequency agility.

While one audio demodulator is standard with the 7514, up to four subcarrier demodulation units can be accommodated, providing an option for stereo or SAP.

In addition, the modular unit features a removable down converter, six user-programmed memory channels, phase-locked frequency synthesizer, and an SAbus to facilitate control of the receiver from a protection switch or other controller device.

*Circle #201 on Reader Service Card*

### NEC Intros Solid-State UHF Transmitter

NEC Corp. has recently introduced a new high-power UHF 30kW transmitter that is 100 percent solid-state, both visual and aural. In addition, The PCU-930SSW transmitter requires no klystrons or tetrodes, effectively reducing power consumption, maintenance, and replacement costs.

Designed for reliability and operational stability, the new transmitter incorporates hybrid circuitry, nonlinear correction, wide-band power amps, and an IF modulation system to deliver transmission compatible with any presently available stereo generators.

In addition, the PCU-930SSW features a brand-new all solid-state exciter with 30 percent fewer circuit components.

*Circle #202 on Reader Service Card*



### Barco High-Res Displays Bow

The CDCT 6000 Series, a family of new graphic display monitors featuring resolutions up to 1280



x 1024 pixels, has been announced by Barco. The series includes four models of monitors, for applications from business graphics, to process control, to high-end CAD/CAM, to mapping and image processing.

Very high color fidelity and consistent image reproducibility are two major features of the monitors, and a new picture tube, combined with a 120 MHz video amplifier, will provide flicker-free image on the rack-mountable displays.

All models have an RGB bandwidth of up to 120 MHz, and scanning rates range from 15 to 75 kHz.

Prices range from \$3100 to \$4900.

**Circle #203 on Reader Service Card**

## Double-Buckle Battery Belt from Alexander

New from Alexander Batteries is the "double-buckle" battery belt. The all-leather belt, which features long-lasting polypropylene battery and charger pockets, can be secured from both a front exterior buckle and a rear interior buckle.

In addition, the belt's shoulder strap provides extra support and evenly distributes the weight of the unit across the entire torso.

Model BB8304A is equipped for 30 Volt, 4 amp power supplies; BB8307A is for 12 Volt, 4 amps; and BB7007A is for 12 Volt, 7 amps. All three models can be used with either overnight or fast chargers.

**Circle#204 on Reader Service Card**



## Low-Cost EFX Titler from MFJ

The MFJ-1480B is a standalone titler that features a professional typewriter-style keyboard, true genlocking for title supering over any NTSC source, two-font display per page, automatic line and page centering, slow scroll, repeat keys, highlight keys, and additional optional font cartridges.

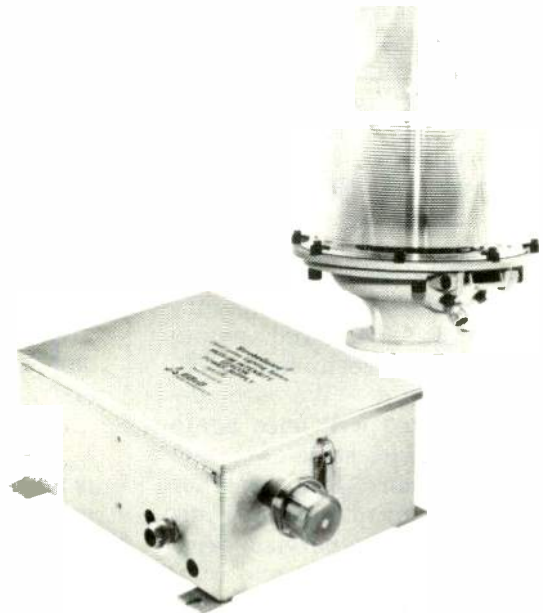
In addition, each line and background page can be transparent or colored in any one of 15 available hues. Up to 30 pages of titles can be retained

in memory, even when shut off, and each page is directly accessed.

An optional smart computer interface device allows programming of the MFJ-1480B from any computer to perform animation, logos, special effects, and display of text from the controller memory.

List price is \$599.95; the smart interface lists for \$169.95.

**Circle #205 on Reader Service Card**



## EG&G Lights the Way

A new beacon system, specifically designed to conform to new FAA Obstruction Marking and Lighting Standards, has been announced by EG&G Electro-Optics. The LS-161 system provides increased protection for structure function in minimal flight visibility conditions while negating the cost of tower painting and saving on power consumption as well.

Precision optics allow the system to "scatter" light on the ground, and LS-161's flashtube provides a source life ten times longer than incandescent bulbs. A built-in surge arrestor and PC boards protect the beacon from harsh weather conditions.

The beacon works in two modes: Day mode, to replace traditional red and white paint; and Night mode, in lieu of flashing red and steady-burning white side lights. A photoelectric controller automatically sets the mode. List price is \$3,800.

**Circle#206 on Reader Service Card**

## Business Briefs

**Harris Corp.**'s Broadcast Division and **Allied Broadcast Equipment** have entered into a joint sales and marketing arrangement designed to pool both companies' broadcast products. Announced at a combined meeting of Harris and Allied sales managers, the agreement provides for each organization to retain separate identity as well as its own dedicated sales force. Effective immediately, Allied Broadcast will assist Harris in the marketing of its radio transmission products and will act as an "exclusive authorized representative" in their distribution.

**A.F. Associates** has been awarded a major contract to design and fabricate the new technical center for **PBS** headquarters in Alexandria, VA. The former tech center, destroyed by fire and water damage three years ago, was replaced with temporary quarters and borrowed equipment. Richard Green, senior VP, operations, said, "We are delighted that we will once again have our own state-of-the-art broadcast center." Plans call for four on-air control rooms, transmission and duty supervisor facilities, a videotape area, and complete playback and transmission-to-air operations. The center is slated for completion by the second quarter of 1987.

A new publication, *Go Public! A Traveler's Guide to Non-Commercial Radio*, from Wakerobin Communications in Lincoln, NB, provides readers with a road atlas to public radio stations across the U.S. The spiral-bound book organizes its 1,100 listings of noncommercial nonreligious stations by geographic location, replete with scheduling information and regional maps detailing each station's coverage area. . . . Following its network's lead, **KARK**, the NBC affiliate in Little Rock, AR, has opted to standardize its newsgathering operation with **NEC SP-3A** CCD cameras. NBC had previously inked a long-term agreement with NEC involving the purchase of a large quantity of the SP-3A three-chip CCD cam-



The first public demonstration of an operating klystrode television transmitter was recently conducted at Comark's Southwick, MA, facility before members of the Connecticut Valley SBE Chapter 14. The transmitter, a Comark CTT-U-60SK, performed at over 60 kW peak output power while meeting all broadcast linearity requirements.

According to the company, the klystrode's primary advantage over the klystron tube is its Class B mode of operation, which automatically modulates the beam power required by the tube as a function of the RF drive.

eras for network news and O&Os. According to **KARK** news director Bob Steel, seven of the station's ten news photographers have already received and are using their **SP-3As**.

Last month, **The Academy of Motion Picture Arts and Sciences** awarded its Scientific and Engineering Award to **Sennheiser Electric Corp.** for its development of the interference tube directional mic. . . . New deliveries of **Ampex** equipment have been announced by NBC affiliate **WMAR-TV**, Baltimore, MD, and **Boston Post Production**, Boston, MA. The Maryland station received nearly a million dollars worth of Betacam ENG equipment, including a full range of camcorders, studio VTRs, and accessories. Boston Post Production is the proud owner of a new **AVA-3** paint system. . . . **Otari**, as well, has made a few new deliveries of its 32-track PD-format **DTR-900** digital tape recorder: One to Nashville's **Masterfonics Studio**, the first facility in the U.S. to

make a purchase of the new recorder; and two to New York's **Power Station**. In company news on the West Coast, **Audio Images Corp.** has been pegged by **Otari** as its Northern California full-line dealer.

The first totally integrated **Grass Valley Group** post-production system featuring the **GVG Kaleidoscope** effects unit is now in place at **Discovery Systems** in Columbus, OH. . . . **Fuji Photo Film** recently announced the expansion of its Dallas office and its move to newer, larger offices at the Valwood Office Park, Carrollton, TX.

Other movers this month: Headquarters for the **International Teleproduction Society (ITS)** will move to 990 Avenue of the Americas, Suite 21E, New York, NY 10018. New phone number is (212) 629-3266. . . . **Sony's Pro Video Division** has relocated its offices in Teaneck, NJ. New address: 1600 Queen Anne Road, Teaneck, NJ, 07666; (201) 833-5200.

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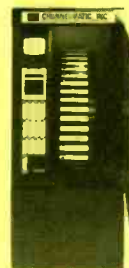


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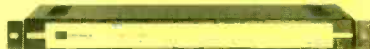
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Circle 158

## SYNC STRIPPING PULSE DA

- Looping hi-Z input
- Built-in sync stripper
- Wide bandwidth integrated drivers
- 6 isolated 75Ω terminated outputs
- Front panel I/O test points



The SDA-1A Sync Stripping Pulse Distribution Amplifier takes one high-impedance composite video or sync input, and gives six perfect 4V peak-to-peak composite sync outputs. It is ideal to sync-lock VCRs to a video source for clean, vertical interval switching. The unit occupies one 1.75-inch high standard rack mount package, and it is a perfect system mate to the Universal Audio Amplifier when interfacing VCRs to a sequential playback or ad insertion system. \$550 Write or call now for more information.

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- Front panel gain adjustments and I/O test points
- Specs meet critical broadcast standards

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- DC output coupling
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- Auto DC offset

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From \$375

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