QUALITY AUDIO.

Audio economy is born through quality—a high standard of excellence in design, components and manufacturing techniques. It is this level, maintained by McCurdy throughout their complete range of audio consoles, which results in decreased maintenance, less downtime, superior performance and an extended life expectancy. That's why McCurdy is your best audio investment for the future.

Our compatibility, flexibility and full range of standard audio products is also to your advantage, paying off in equipment which meets your exact requirements without a custom price tag. Look to McCurdy for total quality in audio consoles.

SS8816

The McCurdy SS8816 is an unusually compact, fully modular 16 channel stereo console with all the features of larger consoles in a desk-mounting package. Its size and level of sophistication make it perfect for 'on-air' control or small to medium production applications. Optional modules easily insert into the system, allowing a high degree of flexibility not otherwise found in this size of audio console.

SS8670

The McCurdy SS8670 21 channel stereo console is a fully modular, free-standing audio production system with full broadcast and other application capabilities. The new design, which incorporates an attractive blue facing, features superior performance and adaptability. Its compactness and flexible characteristics make the SS8670 perfect for use as an 'on-air' production or master control console.
THE ELECTRONIC NEWS ROOM BEGINS WITH DATA-PROMPTER

MULTIPLE INPUT-TERMINAL CAPABILITY: With Data-Prompter you can enter and store information on edit terminals. You can transfer information to the master terminal on call. You have full communication between terminals. The master terminal can be used to assemble your entire newscast. And its output goes directly into the prompter monitors. (Eliminating prompter cameras and conveyors). Communication between terminals can be set up on any twisted-pair or voice grade phone lines.

AFFORDABLE: Data-Prompter systems start under $10,000.

FULL WORD PROCESSING: Data-Prompter makes it easy to write and edit text. Data-Prompter allows you to insert and delete characters, words or entire sentences. And changes on Data-Prompter can be made without re-typing entire pages.

LATE NEWS HANDLING: With Data-Prompter that last second score or news event can be entered on an edit terminal and transferred to the master terminal and instantly inserted as part of your live newscast.

HARD COPY PRINTOUTS: Data-Prompter interfaces with multiple copy printers for talent copies and FCC filing.

WORD WRAP: A feature that allows you to type your story from start to finish without concern for line length or word breaks.

CLOSLED CAPTIONING: Line 21 closed-captioning for the hearing-impaired is an integral part of the Data-Prompter system. With over 6% of the population estimated to be hearing-impaired Data-Prompter offers a potentially greater share-of-market to broadcasters and advertisers.

REMOTE SPEED CONTROL: Data-Prompter gives you variable speeds both forward and backward. The operator will pace your on-camera talent.

COMPATIBLE: Data-Prompter feeds directly into existing camera monitors and will interface with existing computer systems for archiving.

Closed Captioning: Line 21 closed-captioning for the hearing-impaired is an integral part of the Data-Prompter system. With over 6% of the population estimated to be hearing-impaired Data-Prompter offers a potentially greater share-of-market to broadcasters and advertisers.

The National Institute for the Deaf indicated that approximately 6.4% of the U.S. population (18,400 per 100,000 people) is hearing impaired in a report dated June 1, 1978.

LOOK FOR BEI AND DATA-PROMPTER AT THE RTNDA SHOW - BOOTH 15

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THE COVER this month shows the audio production facilities of King Productions in San Francisco—a facility in which careful attention is given to high quality audio sound. This facility is a subsidiary of King Broadcasting Company, which also owns KYA AM-FM. This radio station uses much of the material it produces. King Productions boasts state-of-the-art design and instrumentation that includes 4-track and 8-track studios to provide commercial audio producers with the ultimate in recording equipment and engineering.

A future issue of BE is scheduled to cover a case study of the production facilities shown here as well as the design of KYA AM-FM.

This month quality audio signal handling is being stressed. See the contents page at the left for specific subjects to be covered.

NEXT MONTH
The September issue will be the 14th Annual Buyers' Guide Special Issue. It will provide a comprehensive directory to products and sources for broadcasters.
A Broadcast Breakthrough of Minor Proportions.

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Creating the world’s smallest, lightest ENG/EFP broadcast camera was no small accomplishment. But making it so without sacrificing a single spec or capability qualified as a genuine breakthrough.

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Circle (4) on Reply Card
I am delighted to be with you at your annual convention. As some of you may know, this is my first address to a broadcast group since becoming chairman of the Federal Communications Commission.

While you and I work at opposite ends of this great country, we in Washington are surrounded with a considerable amount of burocracy that contributes to the unique charm of this state. I refer, of course, to fog. Now in Oregon, fog is a balm, sometimes a soapy balm, but a balm nonetheless. It calms the environment, soothes its inhabitants and makes things grow.

The fog in Washington is different, for I refer to indoor fog, one that obscures the environment, clouds thinking and prevents things from growing. It is a most conducive atmosphere in which to cultivate, along with all sorts of funguses, a bureaucracy. In fact, production has been so plentiful that we have been exporting bushels of paperwork for decades.

I believe that one clear message of the 1980 elections was this: Dispel this fog, the pervading environment in Washington that induces not better government but bigger government. I view my job at the Federal Communications Commission as an important part of carrying out this mandate for a leaner, less intrusive federal government. I view the commission in this effort to cooperate fully with the Congress in its efforts to modernize the Communications Act.

Like the great Lewis and Clark who explored the Oregon territory more than a century ago, we in Washington have a similar mission. We must hack through the dense regulatory underbrush transplanted from the 19th century and try to create order from chaos. For the laws which to this day tend to cooperate fully with the Commission derive essentially from the same laws that chartered, in 1887, the Interstate Commerce Commission. Whatever the validity of those regulatory notions in the age of the buckboard and the waltz, their relevance must be questioned in the age of minicam and microwave.

You and I both know, however, that announcing that we are going to cut through the regulatory underbrush is much easier to say than to do. When I say the commission will unregulate, I am making a promise I intend to keep. I and my fellow commissioners have established "unregulation" as a primary objective to be vigorously pursued in the months to come.

Now, what does this unregulation process mean to you in radio and television? Before coming on the commission I reviewed the legislative history of the Communications Act. In doing so, it becomes easy to see why broadcasting was so trussed up in statutory thongs by the Congress.

You may recall the Greek legend of Prometheus who gave the world fire, the symbol for enlightening the masses. In return, the angry gods tied him to a rock. Well, broadcasting was and is, the fire of our own era. The legislative history of the 1934 Act reveals that the Congress at that time regarded you with the awe, suspicion and apprehension that describes how ancient gods were supposed to have viewed Prometheus. Radio was an unknown force, with the power to light the lives of people like nothing that had come before. Even broadcasters knew that radio was both science and illusion and talked about reaching their audiences "through the magic of radio."

Even now, when people know that—like the wondrous facade of the Wizard of Oz—radio and television are made possible by somebody turning knobs and pulling levers behind the scene, you are still regarded with the timorous fascination that resulted in your regulatory confinement nearly 50 years ago. The evidence of this phenomenon is attested to by the bulky commission rules affecting your operation and the thousands of tons of paper filed with us each year by your industry.

While deregulation has caught up to almost all the major industries that were harnessed by the "alphabet agencies"—the FCC, the FTC, the CAB, and so on—broadcasting has remained a conspicuous exception. In the last few years we have seen the
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FCC update

deregulation of airlines, oil and gas, and trucking industries. The FCC itself has substantially deregulated some common carrier services, and cable TV and even CB radio. But as for broadcasting, the FCC remains the last of the New Deal dinosaurs. There must come a time that the FCC catches up to the realities of your industry and eliminates regulations that no longer have valid purposes.

In my mind, it is time for fresh thinking, even radical thinking, when it comes to broadcasting. You in radio have seen the new approach. In radio deregulation, the commission prudently has begun to withdraw itself from areas that no longer require its attention. These efforts must continue. Moreover, I believe that we must now move on to television. Deregulation of television will be an important theme of my chairmanship. The technology bids us to pursue it, and the cost of continued regulation impels us as well.

At the heart of broadcast regulation is the public interest standard. The many coats of conceptual paint that have been slathered on the term down through the years have hampered our ability to see clearly what the public interest in broadcast regulation really is. Assumptions, programs and policies have grown thick over this basic concept.

A primary goal of the commission in the months to come will be to strip away the layers of rules, policies and programs that now encrust the basic public interest concept. The new age of alternative communications media—cable TV, MDS, STV, videodiscs and cassettes and perhaps DBS—clearly make some of these rules and policies as anachronistic as the vacuum radio tube. But our scrutiny of the broadcasting rules will not begin and end with those rendered obsolete by new technologies. Many rules have simply lost what usefulness they may have had because of the changes in American society that the passage of time has wrought. But many others, quite frankly, were ill-advised to begin with.

Top to bottom, we will take a look at each regulation imposed on broadcasters and ask, frankly, candidly, what would happen to the world if this regulation were eliminated? Does the regulation perform a function best undertaken by the regulators or by the industry? Do consumers really get enough back from this requirement to outweigh its costs on business and on the American public?

If this sounds radical to you, then you are hearing it exactly right. The historic role of the commission, a
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FCC update

grand Pooh-Bah of the Potomac determining what kinds of programs a broadcaster must air, must change. And it will change. Technology has already undermined it. Neither logic nor experience any more supports it. And the American taxpayer should no longer have to pay for it.

To summarize what I have been saying, if regulation is truly to be in the public interest, the definition of public interest must change with the times, embrace the new realities and in the end be keyed to serving the public. I believe that the public has lost more than it has gained under the old regulatory pattern. The cost of regulation alone has been staggering. Not only has the taxpayer paid to keep the FCC enforcing a ton of outdated rules, the costs of compliance to the industries has been enormous. It is money that is taken from production or profits and wasted on unnecessary compliance with unneeded government rules.

Furthermore, when government undertakes to define—in concrete rules—the product that may be offered, consumer choice suffers; rigidity is substituted for diversity and creativity. The media must be allowed to find new ways to communicate without having to fit them into preconceived patterns drawn up in Washington. I think that newspapers, magazines, book publishers, the theater, and record companies provide fresh, innovative and diverse material without processing guidelines and government policy statements. The public always benefits from an atmosphere of freedom and the incentives provided by marketplace competition.

And finally, the public will know that the regulations that are retained are those considered absolutely necessary to protect the public interest and will be enforced firmly. I would rather do a good job of enforcing fewer regulations that are essential than a superficial job of enforcing thousands of regulations, many of which have a tenuous connection to the public interest. The public will benefit from a cost-effective use of enforcement resources; and in an era of declining budgets, it is imperative that no government effort is wasted.

I know we have work ahead of us. And I know that our promises must be matched by our performance. Many difficult legal and economic issues do await us. And a new environment awaits you. I believe you will have much to gain in this new environment. And I know you will have much to offer.
Simplicity, reliability and high performance are the parameters needed by TV broadcasters in the 1980's. And Neve delivers just that in its wide range of purpose designed TV audio consoles; consoles surprisingly price competitive and often available on short delivery. Our 542 series spans 6 to 16 in, ideally suited for video production facilities and TV audio sweetening. The 5315 and 5316 consoles are available in sizes from 12 to 36 in with 4 or 8 submasters for TV sound production and on-air applications. Please write or call for our comprehensive TV audio console information package, so you can put Neve in your budget now. You'll be joining the Neve world of excellence!
CBS Broadcast executives hail compatibility developments

At the Videotex '81 conference in Toronto, CBS officials welcomed the compatibility standards being developed for the French Antiope broadcast teletext system, the Telidon system and the AT&T standard for videotext coding.

Speaking at the conference, Harry E. Smith, vice president, Technology, CBS, Inc., said: "From an engineering standpoint, future systems will be able to talk to one another in the same computer language, making it possible for terminals designed for one system to display the text and graphics of another without excessive cost or complexity. The result may well provide a positive impetus toward the establishment of a single broadcast teletext/videotext technical standard in North America that will help stimulate speedy development of a diversity of competitive electronic textual communication services.

"This development," Smith said, "will allow viewers in Canada and the United States to receive on their home video terminals a greater variety of information from many different sources—broadcast, cable television and telephone, and hybrid combinations of the three. In addition, the systems will be able to deliver more sophisticated graphics and a greater selection of color."

Commenting on the breakthrough, Gene F. Jankowski, CBS/Broadcast Group president, said, "We welcome the compatibility between these three systems. Since we are already on the air in Los Angeles with a modified version of the French Antiope broadcast teletext system, we applaud the fact that there will not be an electronic barrier at the border with Canada. In adopting the Antiope system, we stressed that it could be made compatible with other systems and technologies. Therefore, we anticipate supporting what may well become a North American broadcast teletext/videotext standard."

CBS has been offering broadcast teletext over the facilities of KNXT, the CBS-owned station in Los Angeles, since April 8, 1981, in a cooperative effort with KCET, the public broadcasting station in Los Angeles, and the West Coast office of the Caption Center of WGBH-TV, Boston. CBS explores news, informational and commercial applications of broadcast teletext as well as its application for captioning for the hearing-impaired, while KCET tests informational and educational uses.

RCA recently announced its decision to support the Antiope teletext system, and NBC plans to enter into teletext market tests at its station KNBC-TV in Los Angeles this fall. Smith said that the simultaneous testing by the three stations in Los Angeles would "go a long way toward demonstrating the public interest and benefits of teletext to other broadcasters, television set manufacturers, advertisers, the FCC and the general public."

John S. Suhler, president of the CBS/Publishing Group, which is involved in designing videotext products and systems, said he thought the development offered information and transaction providers something they had been waiting for.

"Now we will not have to worry about the problems of incompatibility and focus on the central issues that affect videotex's future—the creative, business and marketing aspects of providing information and services to the public through these new electronic channels," he said.

Smith said two developments led to the breakthrough. First, the use by all three systems of a common "presentation level protocol" defined the digital codes controlling the display of text or graphics on the screens of broadcast teletext and videotext terminals. Second, resolution of differences between transmission standards of the Antiope teletext system being proposed by CBS as a US broadcast standard and the Telidon teletext system being proposed for Canada made it possible for teletext broadcasts in either country to be received on standard teletext receivers in the other.

The difficult task of finding technical solutions to accommodate all three systems was made somewhat easier by the common software-based design approach, according to Smith.

Smith also said he expected intense competition in the making of teletext receivers and videotext terminals, and he had been assured by all parties that any applicable North American teletext system patents pertaining to the compatible standards would be made available free of charge to all interested manufacturers.

Unitel production employs Ikegami color TV cameras

A fleet of mobile TV production units has been put into operation by Unitel Production Services Inc., a New York City TV production facility. The system follows an unusual modular concept that permits the user to rent only the equipment needed, whether it be a small system on a roll-around cart or two trucks carrying six Ikegami color cameras and related equipment.

There are seven units in the Unitel mobile system. Three are mounted on carts for indoor use. The four larger units are carried in vans and trucks. The principal units of the system are the Mobile II and Mobile IIP. The latter is a mobile control room installed in a truck. It incorporates a production switcher, character generator and communication connections with the field crew.

Mobile II is housed in a van with a custom-raised roof on which is mounted a camera platform. The van's equipment consists of four Ikegami HK-312E studio field cameras and two Ikegami HL-798 hand-held cameras, plus associated video and audio recorders and a communication system.

According to Ed Levine, Unitel vice president of technical operations, reliability was an important factor in the selection of the Ikegami cameras for Mobile II.

"Both performance and reliability are especially important for mobile operations," Levine said, "especially reliability when you consider the conditions under which mobile production can and does take place."

BBC broadcasts live stereo concert from China

Listeners to BBC Radio 3, May 17, heard the first live digital stereo concert from China. New digital encoding equipment was used to relay the BBC Symphony Orchestra's concert from the City Hall in Shanghai to the Broadcasting House in London via the Intelsat satellite over the Indian Ocean.

The new equipment, the NICAM 3 (Near Instantaneously Companded Audio Multiplex), was developed by engineers in the BBC's Engineering Research and Designs Departments, and this was its first on-air use. The equipment was designed to convert stereo signals from analog to digital form and then to compress the signal to a format that up to three stereo pairs could pass over conventional 2048 kilobits digital telephony systems.

The digital signal passed over a mobile radio link from the Concert Hall to the Shanghai Broadcasting Center. It then went via a radio link 750 miles to the satellite ground station at Peking. The signal was beamed
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News

up to the Intelsat satellite, which is in geostationary orbit over the Indian Ocean, and was picked up by British Telecom at its satellite ground station at Madley in Herefordshire. From there it was fed via conventional circuits to Broadcasting House in London.

Television becoming expanded information medium

Technological advances are transforming the home TV set into a vital medium of information and service that might change the way many Americans live, according to Stanley E. Basara, division vice president and general manager of RCA Broadcast Systems.

Services available on an experimental basis to some TV viewers—electronic shopping and billing, merchandise catalogs, fire and burglar alarms—should soon be available to many more. Teletext and viewdata are likely to become more widespread, Basara said.

Teletext experiments under way in several US cities and in Europe can provide printed information on such topics as weather, movie schedules and traffic reports. Viewdata, a system that links TV sets with information stored in a computer, can bring the library into the home or provide electronic shopping and billing.

Television can provide 2-way interactive services. A growing number of cable TV systems offer burglar, fire and medical alarm signals that travel upstream on the 2-way cable to a central control point where the signal is monitored.

NTIA funds satellite educational program

Two grants totaling $168,559 have been awarded by the Commerce Department’s National Telecommunications and Information Administration (NTIA) for a training program on the delivery of public services via communications satellites. The program is aimed at less developed countries and is entitled “Satellite Communications in a Developing World.” Representatives of less developed countries will attend seminars and workshops as part of their training. The number and identity of participating countries have yet to be determined. Others participating in the program include the State Department, Agency for International Development and Intelsat, an international communications organization.
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Introducing three fast, accurate and easy-to-use Distortion Measurement Test Systems. All three deliver precise information for the audio professional. All three offer a multitude of features that make them indispensable tools for the engineer/technician.

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For most applications, the 1700B will do a big job for very few dollars. With the 1701A you get ultra-low residual distortion spec’s, higher output level and integral, selectable meter detection circuits. Both models are great for R and D, engineering maintenance or Q.C. The 1710A was specifically designed for the broadcast and recording industry. It’s the only distortion analyzer available with balanced and floating outputs and RFI shielding.

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Master Digital formed

Master Digital Inc., Venice, CA, has been formed recently by Roger Pryor, formerly general manager of Digital Audio for Sony, and Arne Frager, owner and founder of Spectrum Studios in Los Angeles.

The company will provide services in a variety of areas including audiocassette duplication on a one-to-one basis from digital audio masters, digital audio transfer service and changing digital master tapes from format to format without any generation loss, thereby solving digital format problems.

Video music production will also be available, using digital audio soundtracks locked by SMPTE time code for television or cable simulcast and the videodisc/cassette markets.

Additional services will be provided in recording digital audio for video and film producers who desire soundtracks recorded either on location or in studios, and location digital audio recording services and equipment for music producers.

The list of clients currently ranges from companies using high quality audiocassettes duplicated directly from digital audio masters to use for artist approval, radio station or music review, to high end audiocassettes duplicated from major labels for the audiophile market and demonstration cassettes for equipment manufacturers.

A project completed in the last area provides high-end metal audiocassette tapes to be included with each Sony audiocassette player currently being installed in Saab cars.

For more information, contact Master Digital Inc. at (213) 399-1717.

**Harris Corporation wins Argentine contract**

Harris Corporation has won an international competition to design and install one of the world’s largest domestic satellite communications systems in Argentina. The initial contract is valued at approximately $30 million.

The company will deliver 38 earth stations to help extend TV, radio, telex and telephone service to the corners of the 2300-mile-long country, which has an area about that of the United States east of the Mississippi.

The Harris Satellite Communications Division will install part of the system this year and complete it in 1982. Argentina’s national telephone system, ENTEL, has committed itself to that country’s “Project Sovereignty,” calling for extension of telecommunications to all border populations. Twenty-four of the 38 Argentine earth stations will be located in small communities, ranging from the Andes in the northwest to Tierra del Fuego on the continent’s southern tip. Three of them will be at Argentine bases in Antarctica.

Eight of the stations will link the remote satellite terminals to the existing microwave and coaxial cable network in the more populated areas of Argentina. Two of them are designated sub-master stations, because they will provide electronic maintenance and control service for all the other stations in their regions.

A master station near Buenos Aires, equipped with a powerful computer, will analyze outgoing calls from every earth station and assign frequency channels for use by the calling station and the destination station in less than a second. Argentina will use an INTELSAT satellite over the Atlantic Ocean to relay its communications traffic.

**Dynatech/U-Z expands product line**

Dynatech/U-Z Inc., Culver City, CA, recently announced the expansion of its product line to include custom microwave components.

New products include filters, hybrids, multi-octave directional couplers, power dividers/combiners and variable attenuators.

U-Z has been supplying microwave switches to the industry since 1971.

**Lenco awarded Mexican contract**

Televiza S.A. of Mexico has placed an estimated $350,000 video equipment order with the Electronics Division of Lenco Inc., Jackson, MO. The order includes video test and switching equipment to be used in Televiza’s 60 translator locations throughout Mexico.

**3000 attend Video Forum ’81**

“Peirce-Phelps Video Forum was the best ever by numerical attendance, in terms of the professional status of our attendees and exhibitors, and in the industry leaders who spoke at our seminars,” said Henry S. Grove III, vice president of Peirce-Phelps Video Systems Division.

Three thousand broadcasting, industry, business and government video professionals visited the 40 exhibitors who were showing the latest equipment and attended the 12 seminars during the event. The 14th annual forum was held May 5-7, 1981 at Peirce-Phelps Corporate Center in Philadelphia, Pa, and May 12-14, 1981 at the Sheraton Inn/Washington-Northeast.

Hosted by Peirce-Phelps Video Systems, combined local meetings of the Society of Broadcast Engineers, the Society of Motion Picture and Television Engineers and the International Television Association were also held at the Forum.

Among the exhibitors were CMX Orrox, Eigen Video, Ikegami Electronics, ISI, JVC, 3M, Panasonic, Sharp, Shure, Sony and Zenith Data Systems.

Seminar speakers included Ken Winslow, Winslow Associates; Mark Heyer, Sony; Sue Miller Buske, National Federation of Local Cable Programmers; and Herbert Schnipper, Satellite Business Systems.

**RCA Americom adds Miami to satellite network**

Construction of a $5.1 million earth station and associated facilities to link the Miami area to its nationwide satellite communications network has been announced by RCA American Communications Inc.

The earth station, located in Medley, FL, will be linked via microwave to company central terminal offices and sales offices.

Other areas in the RCA Americom network include New York, Philadelphia, Chicago, San Francisco, Los Angeles, Houston, Dallas and Atlanta.

The Medley earth station is being constructed on a 10-acre parcel adjacent to the Palmetto Expressway. Initially, it will be composed of an 1800-square-foot building and two 13-meter antennas, each of which will access the company’s SATCOM communications satellites positioned over the equator at an altitude of 22,300 miles.

**Bardwell & McAllister moves to larger quarters**

Bardwell & McAllister has moved to larger quarters at 7051 Santa Monica Blvd., Hollywood, CA. The move signals an expansion from an area of 12,000 square feet to more than 23,000 square feet.

The new phone number is (213) 466-9361.
The Dolby® Cat. No. 155 or 255 module allows you to plug the benefits of a Dolby A-type noise reduction directly into your Sony® BVH-1000/11C0 or Ampex® VPR-2 1” VTR. Operation is fully automatic. And at long last the audio performance of your VTR will rival that of professional audio tape recorders.

Dolby A-type noise reduction has been accepted for years throughout the world for high-quality tape recording and other audio transmission and storage media. It provides 10 dB of noise reduction from 30 Hz upwards, increasing to 15 dB at 9 kHz and above, without the audible side effects (such as noise modulation and overshoot distortion) associated with more conventional techniques. Dolby noise reduction can also lead to lower distortion, as it permits more conservative recording levels to reduce the risk of tape saturation.

Today wide audio bandwidth and low noise are becoming commonplace in many parts of the television origination/transmission chain. Contact us to find out how Dolby noise reduction can prevent the VTR audio track from being one of the weak links.

*Outboard Dolby noise reduction units are available for use with virtually any other video or audio recorder.
Dial changes not supported by Canada's private broadcasters

Canada's private broadcasters have released the contents of a letter sent to all members of Parliament urging them not to back a proposal that would require virtually all AM radio stations in the western hemisphere to change dial positions.

The Canadian Association of Broadcasters (CAB) has spent more than two years examining a US government proposal calling for all radio stations to move closer together on the dial in order to make room for new stations. The study concluded that: such a scheme would produce few new stations for Canada in areas where they are needed; the total cost of changing dial positions would range from $19 to $36 million; the public would experience severe service disruptions in a changeover; the quality of AM radio would deteriorate and it would be difficult to add new services such as AM stereo.

According to the CAB, 95% of Canada's 400 AM stations would be required to change their dial positions if such a scheme were put into practice by a new international treaty, to be signed later this year, concerning the allotment of frequencies in the AM radio band.

MST counters FCC's short-spaced VHF drop-in proposal

The FCC's proposal to permit short-spaced VHF drop-ins on an unlimited basis threatens to undermine the system of broadcasting according to the Association of Maximum Service Telecasters Inc. One of the commission's primary assumptions is that growing demand for additional TV services—including new commercial networks—cannot be satisfied with the present system. Short-spaced VHF drop-ins are proposed to remedy this supposed deficiency.

MST said it believes that this assumption is wrong. The current system, providing for stations that meet minimum mileage separations and providing for UHF to develop side-by-side with VHF, still affords the best opportunity for additional TV stations. This system can provide the capacity for new networks, more diversity and competition and more ownership opportunities for minorities and public television, and it can do so without the destructive interference that short-spaced VHF drop-ins would cause to the public's VHF service and without their adverse impact on existing and potential UHF service, MST said.

To emphasize its point, MST has undertaken a number of extensive computer studies and on this basis filed the following counterproposal with the FCC. The counterproposal urges the commission to:

• abandon the proposal for new short-spaced VHF allotments; and
• focus, instead, on the potential of the existing structure, especially for UHF television, to provide for additional full-spaced stations.

The counterproposal demonstrates that the current Table of Allotments, without change, provides for five or more regular full-spaced allotments—enough for four commercial network affiliates and a noncommercial TV station—in 95 out of the top 100 markets, and in 129 of the top 150 markets. It also shows that, if the FCC wishes to do so, it can add to the top 150 markets substantial numbers of new UHF allotments in full compliance with the mileage separation requirements.
A Word About Our Product . . . From You!

Instead of boring you with the same claims our competitors are using about "CLEANER, LOUDER & MORE RELIABLE," we thought we would let you read what YOU have been saying about US.

We'd like to thank Neil Hart and Ed Sherlock of WAMQ for this unsolicited "pat on the back."

Chuck,
The CRL units are dynamite! Best damn thing to happen in radio broadcasting!
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Neil Hart
Ed Sherlock

CRL... making friends and building new frontiers in audio processing design, control and flexibility.

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Circle (14) on Reply Card
"Our Sony BVE-5000 editing system is unbelievably reliable," says Randy Cohen, vice president and editor for Broadway Video. "Amazing that Sony could come up with a state-of-the-art computerized system on its first try," Cohen continues. "And because it's specifically designed for one-inch, it lets me do more with my equipment than other editors."

Broadway Video is both a production and post-production facility in New York City. Its recent credits include "The Best of Saturday Night Live," major political campaigns, promos for the cable network Showtime, and a variety of industrial shows.

"The BVE-5000 worked right out of the box and has been performing flawlessly ever since. With no problems of any kind. Unlike some other systems, whose manufacturers wait for customer complaints to get the bugs out, instead of thoroughly testing their equipment before it's sold."

"With its simplified keyboard, the BVE-5000 is
Easier to use, too. It has saved me 25% to 50% of the time other systems require. And since you don't have to be mechanically oriented to use it, the editors can be artists rather than technicians.

"Other advantages include variable search, dual audio, vertical interval time code. And the ability to interface with a wide variety of switchers.

"I'll be buying more Sony equipment in the future. Because there are enough reasons for indigestion in this business without machines that hiccup and burp."

Sony makes a full line of 1" and 3/4" broadcast equipment, including cameras, recorders, editors and digital time base correctors.

For more information, write Sony Broadcast, 9 West 57th Street, New York, New York 10019. Or call us in New York/New Jersey at (201) 368-5085; in Chicago at (312) 792-3600; in Los Angeles at (213) 537-4300; or in Atlanta at (404) 451-7671.

Sony is a registered trademark of Sony Corp.

Circle (15) on Reply Card
State-of-the-art FM audio: A practical guide

by Robert Orban, chief engineer, Orban Associates Inc., San Francisco, CA

The simultaneous advent of modern audio processing and mass market FM receivers capable of high quality sound reproduction has severely escalated the audio quality requirements in FM plants. It is an unhappy fact that any audio processor degrades audio quality to achieve loudness, consistency and absolute peak control. If the processor is well-designed, it will still sound excellent on high quality receivers, provided that the quality of the audio at its input is immaculate. However, a distorted input signal will be further degraded by the processing and may wind up sounding offensive and unlistenable.

Computer people have long used the phrase: "garbage in/garbage out." This is especially true of audio processing, where the rule is: "garbage in/more garbage out."

The purpose of this article is to provide some hints on how to achieve immaculate audio at the processor input terminals. Such a discussion could easily fill a thick book. We can only hope in a limited space to cover the most important points.

The systems approach

Processing will not be discussed specifically. However, experience in designing processors has clearly shown that it is difficult to obtain optimum results from a set of casually interconnected boxes from different manufacturers—or sometimes, from the same manufacturer. This writer's processing philosophy, therefore, leans strongly toward the systems approach: All aspects of the processing are designed to work together harmoniously.

Achieving consistent, state-of-the-art audio quality in FM broadcast is a difficult task, requiring considerable skill, professionalism and great dedication. But, as certain stations with stand-out audio have shown, it is possible.

DISC REPRODUCTION

Most radio programming still comes from phonograph records, either directly or through tape dubs. I will address the problems of tape later in this article; the current discussion centers on accurately retrieving as much information as possible from the grooves.

Disc is intrinsically a high quality medium and much effort has been expended by consumer manufacturers in developing audiophile cartridges, pickup arms, turntables and phono preamps of highest quality. Unfortunately, much of this equipment is not mechanically rugged enough to withstand the pounding that it typically receives in day-to-day broadcast operations. There are few reasonably high quality cartridges that are generally accepted to be sufficiently rugged to withstand professional use and abuse. None produce the same cleanliness and transparency as the best audiophile cartridges.

This phono cartridge dilemma is the prime argument for transferring all disc material to tape in the production studio and playing only tape on the air. In this way, it is possible (with care) to use state-of-the-art cartridges, arms and turntables in the dubbing process because requirements for mechanical ruggedness are relaxed. Also the problem of record wear is eliminated. However, maintaining tape equipment so that it causes no noticeable quality degradation is by no means easy, and the smaller station (particularly one without a full-time engineer) may well be able to achieve superior quality by playing discs directly on the air.

The following should be carefully considered when choosing and installing disc playback equipment:

1. The cartridge must be scrupulously aligned. When viewed from the front, the stylus must be absolutely perpendicular to the disc, or separation will suffer. The cartridge must be parallel to the air. Otherwise, a fixed tracking error will be introduced. Overhang should be set as accurately as possible (± 1/16 inch), and vertical tracking angle should be set at 20° (by adjusting arm height).

2. The tracking force must be correctly adjusted. Usually, better sound results from tracking close to the maximum force recommended by the cartridge manufacturer. If the cartridge has a built-in brush, do not forget to compensate for it by adding more tracking force according to manufacturer's recommendations.

3. Anti-skating force calibration on many pickup arms is questionable. The best way to adjust anti-skating is to obtain a test record with an extremely high level lateral cut (some IM test records are suitable). Connect the left channel output of the turntable preamp to the horizontal input of an oscilloscope and the right channel preamp output to the vertical input. Operate the scope in the "X/Y" mode, so that a straight line is visible at a 45° angle. If the cartridge mistracks assymmetrically (indicating incorrect anti-skating compensation), then the scope trace will be bent at its ends. If this happens, adjust the anti-skating until the trace is a straight line, indicating symmetrical clipping.

It is important to note that in live-disc operations, use of anti-skating may increase the incidence of the arm's sticking in damaged grooves instead of jumping over the bad spots. Increasing tracking force by approximately 15% has the same effect on distortion as applying anti-skating, and in live-disc operations, the former expedient may be preferred.

4. A modern, direct-drive turntable must be used. None of the older design professional broadcast turntables have low enough rumble to be inaudible on the air. These old puck-, belt- or gear-driven turntables might as well be thrown away. Don't even hand them down to an AM operation—modern multiband processing will cause the rumble to be audible even on automobile AM radios.

5. Proper turntable mounting is crucial to avoid picking up footsteps or other building vibrations and to avoid acoustic feedback from monitor speakers, which will cause muddiness and severe loss of definition. The turntable is best mounted on a vibration isolator, which in turn is placed on a non-resonant pedestal mounted as solidly as possible to the building (preferably to a concrete slab).

6. Until recently, most "professional" phono preamps were seriously deficient compared to the best "audiophile" preamps. Fortunately, this situation has recently changed, and a small number of high quality professional preamps are available (usually from small manufacturers). A good preamp is characterized by extremely accurate RIAA equalization, high input overload point (better than 100mV at 1kHz), low noise (optimized for the reactive source impedance of a real cartridge), low distortion (particularly CCIF difference-frequency IM), load resistance and capacitance adjustable for a given cartridge and cable capacitance and effective RFI suppression.

After the preamp has been chosen and installed, the entire disc playback system should be checked with a reliable test record for compliance with the RIAA equalization curve.

(Special note: If you wish to equalize the station's air sound to produce a certain sound signature on the air, the phono preamp is not the place to do it.)

Orban is a recognized authority on the ultimate in high quality audio reproduction. In this article, he discusses a number of factors broadcasters and production people should consider in delivering a quality product. Although the author draws from a wealth of experience, the opinions expressed are personal and may or may not be shared by others in the industry or by Broadcast Engineering.
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Suggested Reel-to-Reel Recorder Maintenance

This maintenance schedule, suggested by ITC, is intended as a guide for maintaining a unit in optimum condition, and is for units in routine daily use. The schedule may be varied depending on a particular machine duty cycle. The intent is to develop a schedule to allow maximum use with minimum maintenance time. In most cases, this maintenance schedule will enable you to pinpoint potential trouble areas before they become problems that may potentially remove the machine from service. (Check the manual for your particular recorder for specific maintenance procedures and schedules.)

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<tr>
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Courtesy of International Tapetronics Corporation

Sloppy slitting, causing the tape to weave across the heads, or, if too wide, to slowly cut away the tape guides

Poor signal-to-noise ratio

Cheap Tape

Cheap tape, whether reel or cart, is a temptation to be avoided. Cheap tape may suffer from any or all of the following problems:

- Poor signal-to-noise ratio

FM audio

Some of the better preamps have adjustable equalizers to compensate for frequency response aberrations in phono cartridges. Because deviations of 0.5 dB can be detected by critical listeners, ultra-accurate equalization of the entire cartridge/preamp system is important.

The load capacitance and resistance should be adjusted according to the cartridge manufacturer’s recommendations, taking into account the capacitance of the cables. If a separate equalizer control is not available, load capacitance and resistance may be trimmed to obtain flattest frequency response. Failure to do this can result in frequency response errors as great as 10 dB in the 10-15 kHz region.

The final step in adjusting the preamp is to accurately set the channel balance on the basis of a test record, and finally, to set gain such that output clipping is avoided on any record. If you need to operate the preamp close to its maximum output level because of the system gain structure, put a scope on the output of the preamp and play a loud passage from an audiophile or direct-to-disc record. Set the gain so that at least 6 dB peak headroom is left between the record. Set the gain so that at least 6 dB peak headroom is left between the record.

There is no better example of false economy than waiting until styli fail before ordering new ones or hanging onto worn-out styli until they literally collapse. Note also that smoke-laden air may seriously contaminate and damage shank mounting and damping material. Some care should be used to seal your stock of new styli to prevent such damage.

8. There are several impulse noise reduction systems currently available that effectively reduce the effects of “tics” and “pops” in disc reproduction without significantly vailing audio quality. They are particularly useful in live-disc operations where discs tend to become worn and damaged. The Burwen TNE-7000 is effective in removing small “tics”; the SAE 5000 works well on larger scratches. Both devices can be connected in series at the output of the phono preamps to virtually eliminate the effects of disc damage. They must not be used elsewhere in the chain (such as in the program line), because the supersonic energy necessary to trigger their control circuitry will probably be rolled off.

9. Do not forget that records wear out, particularly when tracked at 3-gram forces. Live disc operations should save spare copies of promo records for use when the originals wear out, rather than giving them away to the production director’s friends. Frequently played cuts should be transferred to tape or cart; although the copy will initially sound inferior to the original, 50 plays down the road the tape should sound about the same, whereas the disc would be seriously deteriorated.

TAPE

Despite its undeniable convenience, the tape cartridge (even at the current state-of-the-art) is still inferior to reel-to-reel in almost every performance aspect. Unlike the sometimes mystical sonic differences attributed to preamps and amplifiers, performance differences between cart and reel are readily measured and include differences in frequency response, noise, high frequency headroom, wow and flutter and, particularly, azimuth and interchannel phasing stability.

Sum-and-Difference Recording

Because it is vital in stereo FM broadcast to maintain mono compatibility, sum-and-difference recording is preferred in either reel or cart operations. This means that the mono sum signal (L + R) is recorded on one track, and the stereo difference signal (L-R) is recorded on the other track. A matrix circuit restores L and R upon playback. In this system, interchannel phase errors cause frequency-dependent stereo-field localization errors rather than deterioration of the frequency response of the mono sum.

Several manufacturers make external sum-and-difference matrix processors to be used in the cart machines’ input and output lines; at least one manufacturer incorporates a compandor-type noise reduction system within the same package.
DBX HELPS KMJQ WORK MAJIC.

Majic. It's a black format that's living up to its name in several markets across the country. And perhaps the biggest success story is Houston's KMJQ. Back in 1977, KMJQ adopted the Majic format and went from near bottom to #1 in just 2 short Arbitrons.

Yet KMJQ was the softest station on the dial.

"To achieve our goal," explains Chief Operator Leroy Dietrich, "we placed a lot of emphasis on the quality of the sound. By the day we started the Majic format, we had built a technical ability that we think is probably one of the best in the country.

"We hired an audio consultant to get us started," continues Dietrich. "He installed P 303 pre-amps and MC20 moving coil cartridges on SL-1100A turntables. Then he recommended dbx equipment for definition and dynamics."

KMJQ installed dbx tape noise reduction on all their cart machines. Not just for their program material, but for their commercials, too. "That keeps our advertisers happy because their commercials sound as clean as our music," says Dietrich. "And we use a dbx Model 500 subharmonic synthesizer to restore the low end. It makes the station sound especially well balanced. Even at low listening levels."

KMJQ also needed a compressor/limiter - but they didn't want to ruin the sound quality they had worked so hard to get. "After hearing how smooth the dbx 165 compressor/limiter works, there is no doubt in my mind that it's the best limiter I've ever heard in my life. We use it on voices, and it gives us the control we need without sounding like we have any control."

As you'd expect, KMJQ has constantly been making subtle technical changes to maintain their leadership position. "Due to competitive forces in the market, we've had to crank our signal up louder. Without dbx tape noise reduction on our carts, the noise would have been cranked up, too. Now I'm happier than ever that we're fully dbx'ed," says Dietrich. "We not only get the sound we want, but the whole system is incredibly reliable - bulletproof."

Dietrich summarizes his feelings about KMJQ's technical product by saying, "A lot of this is subtle stuff, psychoacoustics. But people comment to us that our station sounds more like the record they bought than the other stations do. A psychological thing, agreed. But it all adds up when you start reading the Arbitrons."

For more information on dbx's complete line of equipment for the broadcast industry, write Professional Products Division, dbx, Incorporated, 71 Chapel St., Newton, Mass., 02195, USA. Tel. (617) 964-3210. Telex: 92-2522. Distributed in Canada by BSR (Canada) Ltd., Rexdale, Ontario.
FM audio

- Poor high frequency response and/or high frequency headroom
- Inconsistency in high quality, bias requirements or record EQ requirements from reel to reel, or even within a reel
- Splices within a reel
- Oxide shedding, causing severe tape machine cleaning and maintenance problems
- Squealing due to inadequate lubrication.

High-line, name-brand tape is a good investment. It provides initial high quality and guarantees that recordings will be resistant to wear and deterioration as they are played. Whatever the choice of tape, you should standardize on a single brand and type to assure consistency and to minimize tape machine alignment problems. Some of the most highly regarded tapes in current use (1980) include: Agfa PEM 468, Ampex 406, 456, BASF SPR-50 LHL, EM-861, Fuji type II, Maxell UD-XL, TDK GX, Scotch (3M) 206, Scotch 250, Scotch 226 and Sony SLHII.

It goes almost without saying that cheap carts are to be avoided, considering that even the best carts provide barely adequate quality. Because carts will interact with different transport designs in different ways, one of the best ways to choose a cartridge brand is to make extensive tests on the in-house cart machines, and to choose the brand exhibiting the best interchannel phase stability and lowest wow and flutter with the particular machines.

Tape Speed

If all aspects of the disc-to-tape transfer receive scrupulous care, then the quality difference between 15 ips (38 cm/s) and 7.5 ips (19 cm/s) recording is easily audible; 15 ips has far superior high frequency headroom. The effects of dropouts and tape irregularity are also reduced, and the effects of interchannel phase shifts are halved. Also, a playback machine can deteriorate (due to oxide buildup on the heads or incorrect azimuth) far more severely at 15 ips than at 7.5 ips before an audible change occurs in audio quality.

Nevertheless, because of playback time limitations at 15 ips, most stations operate at 7.5 ips (Many carts will not operate reliably at 15 ips and are subject to jamming and other problems.) This speed seems to be the lowest that is practical for use in day-to-day broadcast practice. Although 3.75 ips can produce good results under carefully controlled conditions, there are few operations that can keep playback machines maintained well enough to obtain consistent high quality 3.75 ips playback day in and day out. Also, use of 3.75 ips results in another jump in sensitivity to bad tape, high frequency saturation and interchannel phase shifts.

The use of cassettes as a serious broadcast program source is currently being promoted in some sectors. I feel that cassettes' low speed, tiny track width, sensitivity to dirt and tape defects and severe high frequency headroom problems demand careful engineering evaluation of such proposals to ascertain whether consistent quality is obtainable in real-world operations.

Use Of Noise Reduction

In order to reduce or avoid tape hiss, I recommend use of a compandor-type (encode/decode) noise reduction system in all tape operations. The two well-accepted systems are Dolby and dbx. In general, the more noise reduction a compandor noise reduction system attempts to deliver, the greater the danger of such audible side effects as breathing and mismatching between encode and decode sections. The selection should be made by deciding which is more important to you: a high amount of noise reduction or freedom from side effects.

If you choose Dolby, bear in mind that to achieve accurate Dolby tracking, record and playback levels must be matched better than 2 dB (preferably 1 dB). The Dolby tone should faithfully be recorded at the head of all reel-to-reel tapes, and level matching should be checked frequently. There should be no problem with level matching if tape machines are aligned weekly, because level standardization is part of this procedure. If a different type of tape is put in service, record machines must immediately be aligned to the new tape before any recordings are made.

In my opinion, all single-ended (for example, dynamic noise filter) noise reduction systems cause totally unacceptable audible side effects (principally program-dependent noise modulation) when used with music, and should never be used on-line. They may have their place in the production studio, but even there they must be used judiciously, with their operation constantly monitored by the station's "golden ears." Some possible applications include noise reduction of outside production work and, when placed after the microphone preamp, reduction of ambient noise in the control room or production studio.

Tape Recorder Maintenance

Regular maintenance of magnetic tape recorders is of vital importance in achieving consistently high quality sound. Maintenance of tape machines requires expertise and experience. Here are a few suggestions:

1. Heads and guides should be cleaned every four hours of operation.
2. Tradition has it that machines should be demagnetized every eight hours. In my experience, magnetization is usually not a problem in playback-only machines in fixed locations. A magnetometer with a ±5 Gauss scale (R. B. Annis Co., Indianapolis, IN) should be used to periodically check for permanent magnetization of heads and guides. You will soon obtain experience on how long it takes for your machines in your environment to pick up enough permanent magnetization to be harmful. You may well find that this never happens with playback machines. Record machines must be watched much more carefully.

3. Deterioration of tape machine performance is usually gradual, not catastrophic. It is therefore necessary to measure the performance of an on-air machine weekly with standard test tapes, and to take whatever corrective action is necessary if the machine is not meeting specifications.

4. Weekly maintenance should include measurement of flutter, using a flutter meter and high quality test tape. Deterioration in flutter performance is often an early warning of impending mechanical failure. Spectrum analysis of the flutter can usually relate the flutter to a single rotating component. Deterioration in flutter performance can, at the very least, indicate that adjustment of reel tension, capstan tension, reel alignment or other mechanical parameter is required.

5. Weekly maintenance should also include measuring frequency response and interchannel phase shifts with a high quality alignment tape. These measurements, which are expedited by the use of special swept-frequency or pink noise tapes available from some manufacturers (such as MRL), provide an early indication of loss of correct head azimuth or of head wear. (The swept tapes are used with an oscilloscope; the pink noise tapes with a third-octave real-time analyzer.)

If a head becomes worn, do not try to compensate by adjusting the playback equalizer. This will increase noise unacceptable and will also introduce frequency response anomalies because the equalizer cannot accurately compensate for the shape of the rolloff caused by a worn head. Instead, the head must be replaced or lapped.

The reader should be particularly
That's right. Whatever your needs for rigid coaxial transmission line may be, we can meet them. We offer a full range of sizes from 7/8 inch to 3 1/8 inch in 50 ohm impedance and 6 1/8 inch in both 50 and 75 ohm impedances. All line is fabricated from high conductivity hard drawn copper tubing with precision machined, pin-type Teflon dielectric insulators. EIA bolt type flanges and connectors are fabricated to EIA standards and US Mil specifications. You have the option of ordering in 20 foot sections or any special length with flanges on both ends, one end or without flanges. A full line of matching components, hardware and installation accessories are also available.

Special assemblies? Absolutely. We design and build rigid line terminations, power dividers, FM Broadcast antennas, low pass filters and directional couplers.

Write, telephone or telex for Catalog 737 with all the details: Phelps Dodge Communications Company, Route 79, Marlboro, NJ 07746, (201) 462-1880, TWX (710) 722-3661.

Phelps Dodge Communications Company
Division of Phelps Dodge Industries, Inc.
Circle (18) on Reply Card
aware that alignment tapes wear out. With wear, the output at 15 kHz may be reduced by several decibels. If you have many tape machines to maintain, it is usually more economical to make your own secondary standard alignment tapes to use for weekly maintenance, retaining your standard alignment tapes for reference use.

Do-it-yourself alignment tapes are best made with the traditional series of discrete tones. Begin by aligning the playback section of the master recorder on which the homemade alignment tape is to be recorded, using a fresh standard alignment tape.

Coarse Azimuth
First obtain a coarse adjustment by peaking the level of the 15 kHz tone on the alignment tape, making sure that you have found the major peak. (There will be several minor peaks, many decibels down. You will not encounter these unless the head is totally out of adjustment.)

Reproduce Equalization
Run the alignment tape and adjust the reproduce equalizers for flat high frequency response and for low frequency response which corresponds to the fringing table supplied with your alignment tape. The fringing effect appears below 500 Hz and ordinarily will result in an apparent bass boost of 2-3 dB at 100 Hz, because the alignment tape was recorded full-track and is being reproduced on a half-track head. (Fine azimuth adjustment will not work correctly if the playback equalizers are not set for identical frequency response, because non-identical frequency response will also result in non-identical phase response.

Fine Azimuth
This adjustment is ideally made with a full-track mono pink noise tape and a real time analyzer. If this instrumentation is available, sum the two channels together, connect the sum to the real time analyzer, and adjust the azimuth for maximum high frequency response.

Other possibilities include observing the mono sum of a swept-frequency tape and maximizing its high frequency response, or aligning by ear by listening to the mono sum of the announcer's voice on the standard alignment tape and adjusting for crispest sound. (The azimuth on the announcer's voice will be just as accurate as the rest of the tape).

If the traditional Lissajous pattern is used, use several frequencies and adjust for minimum differential phase at all frequencies. Using just one frequency (for example 15 kHz) can give erroneous results.

Calibration
After the azimuth has been carefully adjusted and the playback equalizer adjusted for maximally flat response from the standard alignment tape, write down the actual VU meter reading produced at each frequency on the spot-frequency standard alignment tape. Use the fringing table for subtracting the compensation from the readings you have made. You will use the compensated readings below when you are recording your tape, because you are recording in half-track stereo instead of full-track mono.

Record Azimuth
Record your alignment tape using an audio oscillator. First, adjust the azimuth of the record head by observing the mono sum from the playback head and exciting the record amplifier with pink noise, swept tones or wideband music (for by-ear adjustment). If you use a Lissajous pattern, be sure to use several frequencies, as was previously mentioned.

Recording The Tape
You are now ready to record the spot frequencies on tape. Set the VU meter to "playback" and observe the reading as each tone is recorded. Adjust the tape recorder Record Gain immediately after each frequency is switched until the VU meter reads the same as it did when you were playing the standard alignment tape. Your homemade tape should have an error of only 0.5 dB or so if you follow these steps carefully.

Remember that your homemade tape will deteriorate with use; check it frequently against your standard reference tape.

The homemade tape is not suitable for critical azimuth adjustments. These should be made using the methods described previously, employing a test tape recorded with a full-track head. Even if you happen to have an old full-track mono machine around, getting the azimuth exactly right is not practical, and a standard commercial alignment tape should be used for azimuth adjustments. Because ordinary wear does not affect the azimuth properties of the tape, it should have a long life if properly stored.

Special note: All test tapes should be stored tails-out (under controlled tension) in a temperature- and humidity-controlled environment. Neither edge of the tape pack should touch the reel flanges. This cannot be achieved unless the tape is wound onto the storage reel in normal PLAY mode, not in fast forward or rewind.

6. After the reproduce section of the tape machine is aligned, record alignment should be checked and adjusted as necessary. This involves setting record head azimuth, bias, equalization and meter calibrations according to manufacturer's recommendations. I recommend that tape machines be adjusted so that +4 dBm in and out corresponds to "0 VU" on the tape recorder's meter, and also to Dolby level and "Standard Operating Level." This is ordinarily 185 nW/m for standard tape and 250 nW/m for high output tape.

KYA audio productions

The audio production facilities of King Productions in San Francisco is an area in which careful attention is given to high quality audio sound. This facility is a subsidiary of King Broadcasting Company which also owns KYA AM-FM. The radio station uses much of that produced material. King Productions boasts state-of-the-art design and instrumentation that includes 4-track and 8-track studios to provide commercial audio producers with the ultimate in recording equipment and engineering.
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Circle (19) on Reply Card
FM audio

Current practice calls for adjustment of bias by the "high-frequency overbias" method rather than by the "peak bias with 15mil wavelength" method, as was formerly standard practice. Briefly, bias is adjusted by recording a 1mil wavelength on tape (5kHz at 7.5ips) and increasing bias until maximum output is produced from the tape. Bias is then further increased until the output has decreased by a fixed amount, usually 1.5–3dB. The correct amount of decrease is a function of both tape formulation and width of the gap in the record head. The tape manufacturer's datasheet should be consulted.

8. Last, but no means least, keep it clean. Dust is a great destroyer of precision mechanical parts, (and cigarette smoke is not good either.) In addition to keeping dust away from the heads and guides, periodically clean the rest of the machine with a vacuum cleaner (suction mode) or soft clean paint brush.

Cartridge Machine Maintenance

The general comments above apply to cart machines as well. However, these devices have their own set of idiosyncrasies, largely because much of the tape guidance system is in the cartridge and is thus subject to the vagaries of the construction of the individual carts.

1. Because the lubricated tape deposits lubricant on pressure rollers and guides, frequent cleaning is advisable to assure lowest wow and flutter and to prevent possible cart jams. Cleaning should be performed as often as experience proves necessary. (Interestingly, because of the nature of the tape lubricant, it does not tend to deposit on head, gaps, and head cleaning is rarely required.)

2. Even with the best maintenance, interchannel phase shifts in conventionally designed cart machines will usually prove troublesome. Check head alignment frequently. Also, different brands of cart will show significant differences in phase stability in a given brand of machine. Run tests on various brands of cart and standardize on the one offering best phase stability.

3. Because of the vast differences in design among manufacturers, it is difficult to provide much more specific advice. Precisely follow manufacturer's instructions regarding periodic maintenance, mechanical alignment, tensioning and lubrication.

4. Many early (and some not-so-early) cart machine designs were saddled with completely inadequate electronics. Considerable improvement can be achieved in some of these machines by electronics' modifications. Check electronics for record-amplifier headroom (be sure the amplifier can completely saturate the tape before it clips); record-amplifier noise and equalization (some record amplifiers can actually contribute enough noise to dominate the overall noise performance of the machine; playback preamp noise and compliance with NAB equalization; power supply regulation, noise and ripple; and line amplifier headroom. Check the alignment of the record level meter. (In order to improve apparent signal-to-noise ratio at the expense of distortion, some meters are calibrated so that "0" corresponds to significantly more than 1% third-harmonic distortion.)

Probably the most universal problem is inadequate record amplifier headroom. In many cases, it is possible to improve the situation by increasing the operating current in the final record-head driver transistor close to its power dissipation limits. This is usually done by decreasing the value of emitter (and sometimes collector) resistors while observing the collector voltage to make sure that it stays at roughly half the power supply voltage under quiescent conditions.
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FM audio

and adjusting the bias network as necessary if it does not.

SYSTEM CONSIDERATIONS

Other than bad styli, the single most common cause of distorted air sound is probably clipping. The gain and overload point of every electronic component in the station must be critically reviewed to make sure that components are not being operated so that they introduce clipping distortion or excessive noise.

VU meters are worthless for checking peak levels. Even Peak Program Meters are not fast enough to indicate clipping of momentary peaks, because their integration time is approximately 10 ms. Although the design of PPM's makes them excellent for monitoring operating levels in media with limited dynamic range (such as magnetic tape), in which small amounts of peak clipping are acceptable to achieve optimum signal-to-noise ratio, there is no excuse for any clipping at all in the purely electronic part of the signal path, because low noise and wide dynamic range are readily achieved with good design.

For this reason, the peak levels should be monitored with a true peak-reading meter or with an oscilloscope, and gains should be adjusted so that peak clipping never occurs under any reasonable operating conditions (including sloppy disc jockey gain riding.)

In the case of older equipment with soft clipping characteristics, it may be impossible to see a well-defined clipping point on a scope. Worse, audible distortion may occur many decibels below the apparent clip point. In this case, the best thing to do is to determine the peak level producing 1% THD and to arbitrarily call this level the clipping level. The scope can be calibrated to this 1% THD point and headroom measurements can then be made.

The canny engineer will also be aware that certain system components (such as microphone or phono preamps) have absolute input overload points. Difficulties often arise when gain controls are placed after early active stages, because the input stages can be overloaded without clipping the output. Many broadcast mic preamps are notorious for low input overload points and can easily be clipped by high output mics and/or screaming disc jockeys.

Similar problems can occur inside consoles if gain structures and operating points have been poorly chosen by the console designer or if master gain controls are operated.
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with unusually large amounts of attenuation. When operating with nominal line levels of +4 or +8dBm, the absolute clipping point of the line amplifier becomes critical. The headroom between nominal line level and the amplifier clipping point should be greater than 16dB. This implies that an amplifier for a +4dBm line should clip at +20dBm or above, and that an amplifier for a +8dBm line should clip at +24dBm or above. In particular, it means that IC equipment (which almost always clips at +20dBm or so unless transformer-coupled) is not suited for use with +8dBm lines. The +4dBm lines have become standard in the recording industry and are preferred for all studio construction (recording or broadcast) because of their compatibility with IC op-amp operating levels.

The following components of a typical FM audio plant should be checked for operating level and headroom:

- Phono preamps
- Tape and cart preamps
- Record amplifiers in tape machines
- Microphone preamps
- Console summing amplifiers
- Line amplifiers in consoles, tape recorders, etc.
- Distribution amplifiers (if used)
- Signal processing devices such as equalizers
- Specialized communications devices, including remote broadcast links and telephone interface devices
- STJs, whether land-line or microwave.

Voice/Music Balance

The VU meter is deceptive in indicating voice/music balance. The most artistically pleasing balance between voice and music usually results from peaking voice 4-6dB lower than music on the console VU meter. If heavy processing is being used, this factor may have to be increased further.

Following this practice will also help to reduce the possibility of clipping. This is because clipping is much more sensitive to clipping distortion than most music in the electronics. It is sometimes difficult to train operators to follow this practice. If the console has (or can be modified to have) separate summing amplifiers for live voice and music, then the correction factor is easily automated by building a separate summing amplifier (using a single IC op-amp) to drive the VU meter, and summing the output of the voice summing amplifier into the VU amplifier with greater gain than the output of the music summing amplifier.

Electronic Quality

FM has certain limitations that prevent it from ever becoming a transmission medium totally satisfying to the "golden-earerd" audiophiles. These limitations must be considered when discussing the quality requirements for FM electronics. The problems in disc and tape reproduction that have been discussed are much more gross by comparison, and the subtle masking of basic FM transmission limitations is irrelevant to those discussions.

There are three fundamental limitations. The first is multipath distortion. In most locations, a certain amount of multipath is unavoidable, and this is exacerbated by the inability of many apartment-dwellers to use roof-mounted directional antennas.

The second is the bandwidth limitation of the FM stereo multiplex system, which is theoretically 19kHz but is practically limited by the characteristics of real-world filters to between 15 and 17kHz.

The third is the IF bandwidth of receivers necessary to eliminate adjacent and alternate channel interference. This effect can be clearly heard by using a tuner with switch-selectable IF bandwidth. Most stations cannot be received in wide mode because of interference. But if the station is reasonably clean (well within the practical limitations of current broadcast practice) and free from multipath, then a clearly audible reduction in high frequency "grit" is heard when switching from normal to wide mode.

These limitations have considerable significance in gauging cost-effectiveness in current broadcast design practice. Most of the older design broadcast electronic equipment (whether tube or transistor) is measurable and audibly inferior to properly designed modern equipment. This is primarily due to a design philosophy that stressed ruggedness and RFI immunity over distortion and noise and to the excessive use of inferior transformers.

Frequency response was purposely rolled off at the extremes of the audio range to make the equipment more RFI-immune. Cascading equipment of such design tends to increase both distortion and audible frequency response roll-offs to unacceptable levels.

Modern design practice emphasizes the use of high-slewrate, low-noise IC operational amplifiers such as the Signetics NE5534 family and the Texas Instruments TL070 family. Although some designers insist that...
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Circle (25) on Reply Card
FM audio

Only discrete designs can provide ultimate quality, the performance of the best of the current ICs is so good that discrete designs are just not cost effective for broadcast applications when the basic FM quality limitations are considered.

It has recently been discovered that capacitors have a subtle, but discernible effect upon sonic quality. Polar capacitors, such as tantalums and aluminum electrolytics, behave differently than ideal capacitors. In particular, their high dissipation factor and dielectric absorption can cause significant deterioration of complex musical waveforms. Ceramic capacitors have problems of similar severity. Polyester film capacitors can cause a similar, although less severe, effect when audio is passed through them.

For this reason, dc coupling between stages, which is easy with op-amps operated from dual positive and negative power supplies, is best. Coupling capacitors should be used only as absolutely necessary (to keep dc offsets out of faders, thus preventing scratchiness, for example). If capacitors must be used, film types such as polystyrene, polypropylene or polycarbonate are preferred.

If it is impractical to eliminate capacitors or to change capacitor types, do not be too concerned. It is probable that other quality-limiting factors will largely mask the capacitor-induced degradations.

It goes almost without saying that the number of transformers in the audio path should be kept to an absolute minimum. Transformers are sometimes the only practical way to break ground loops and/or eliminate RFI. If a transformer is necessary, use a high quality device such as those designed by Deane Jensen and manufactured by Reichenbach Engineering, North Hollywood, CA.

In summary, the path to highest quality is that which is closest to a straight wire. More is not better: every device removed from the audio path will yield an improvement in clarity, transparency and fidelity. Use only the minimum number of amplifiers, capacitors and transformers. Never leave a line amplifier or compressor in "test" mode on line because it seems too much trouble to take it out. Small stations often sound dramatically superior on the air to their big-time rivals because the small station has a simple audio path, while the big-budget big-timer has thrown everything but the kitchen sink on line. The more equipment the station has (or can afford), the more restraint and self-discipline is required to keep the audio path simple and clean. Every amplifier, resistor, capacitor, transformer, switch contact, patchbay contact, etc., is a potential source of audio degradation. Corrosion of patch-bay contacts and switches can be particularly troublesome, and the distortion caused by these problems is by no means subtle.

Any program director who boasts of his station's $20,000 worth of "enhancement" equipment should first be taken to a physician who can clean the wax from his ears, then forced to swear that he is not under the influence of any suspicious substances, and finally placed gently in front of a high quality monitor system and shown exactly the sort of degradation that $20,000 worth of "enhancement" causes.

There is no situation where an old '70s cliche is more valid: less is more. A simple audio path, while the big-timer has thrown every-thing but the kitchen sink on line. The more equipment the station has (or can afford), the more restraint and self-discipline is required to keep the audio path simple and clean. Every amplifier, resistor, capacitor, transformer, switch contact, patchbay contact, etc., is a potential source of audio degradation. Corrosion of patch-bay contacts and switches can be particularly troublesome, and the distortion caused by these problems is by no means subtle.

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Circle (26) on Reply Card
Audio processor roundup

by Gary Breed, consulting engineer, D. L. Markley & Associates, Peoria, IL

When a broadcast station wants to improve the quality of its transmitted signal, often the first step is to upgrade the audio processing equipment. No longer is just being loud good enough to catch listeners' attention as they tune across the dial. A station must sound clean as well. As technology improves across the board, the improvements that can be made in a station's sound become smaller and more subtle. Some of the most subtle, yet powerful, components of broadcast audio occur as the audio is processed for presentation to the transmitter.

This audio processor roundup describes some of the available gain-control devices on the market. However, equalizers, reverbs or audio special-effects units are not included. The portion of the broadcast audio chain being dealt with is the program audio, as it is processed before the transmitter to provide the maximum performance within the constraints of bandwidth and modulation. Manufacturers are listed alphabetically and reader service numbers are provided for obtaining additional information.

ADM Technology Inc.
The 1320 Limiter Amplifier Module has up to 40dB of limiting with a 1ms attack time and a program-controlled release time (up to 8 seconds). A gain-reduction meter is included in the module. This is a single-function device, designed as an optional module for use with the ST Series II consoles.

Circle (203) on Reply Card

The 1320 Limiter Amplifier Module is designed for use in the ADM 800/1600/2400/3200 consoles, and has 30dB of gain control range with fast attack and program-controlled release times. A gain reduction meter is included.

Circle (204) on Reply Card

Applied Technology Corporation
The Discriminate Audio Processor III is a 3-band processor, with variable crossover points. Each band has an RMS response leveling amplifier with adjustable input and output levels, giving the user control over the relative intensity and amount of compression in the various parts of the audio spectrum. The unit has a useful bargraph display indicating the amount of gain reduction and the output level of each band. The unit also features a pot to equalize the unprocessed (proof) mode levels with the normal operating levels.

Circle (205) on Reply Card

The 1326 Limiter Amplifier Module, which was announced in March 1981. The digital circuitry in this peak limiting unit allows an instantaneous (or negative) attack and release time. If desired, a finite release time can be programmed into the unit. The unit does not have clipping or waveform overshoot, or the associated harsh sound. Control of the operating parameters is done via a front panel keyboard, designating the gain, positive and negative modulation limits, polarity, phase shifting, symmetrical or asymmetrical modulation, FM pre-emphasis, low and high pass filtering, release time and output level. A battery back-up is provided to maintain the operating settings for up to several days should a power failure occur.

Circle (206) on Reply Card

Audio & Design Recording Inc.
The Transdynamic Processor is a 3-band processor with 6dB per octave (standard) or 12dB per octave (optional) skirts between adjacent bands. A 30Hz input filter is provided for the elimination of subaudible noise, and 12kHz or 15kHz low pass filters are provided to prevent passing these high frequencies to the transmitter. The three bands have independent AGC action with output levels indicated on LED bar graph meters. The recombined signal is passed through a wide-band limiter and a "constant-current" clipper. The output level can be maintained with 0.5dB of the desired maximum level. For FM, 25, 50 or 75μs pre-emphasis response can be selected. Additional features include peak-reading LED bar graph input and output meters, an internal pink noise generator for setup and calibration, automatic bypassing in the event of a failure and a separate monitor output for making adjustments while the unit is in the bypass mode.

Circle (207) on Reply Card

The F600 Broadcast Limiter is an all-purpose feedback-type limiter with attack times adjustable from 10μs to 25ms, and release times adjustable from 25ms to 3.2s. Pre-emphasis of the processing response for FM use is optional. Control of the output level is within 2dB of the desired maximum. This basic limiter is used in combination with other units to make the following multifunction devices:

- E560 Selective Limiter. The F600 is combined with a single notch or peak equalizer section.
- F690 Music-Voice Ratio Limiter. In addition to normal operation, an added input is provided for a separate microphone feed with an adjustable sensitivity to override normal program material.

Circle (208) on Reply Card

The Gemini Easy-Rider is a straightforward, uncomplicated AGC unit with compression slopes of 2:1 to 20:1, attack times variable from 500μs...
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• TWO INDEPENDENT PROGRAM CHANNELS, FOR STEREO OR
  DUAL MONO PROCESSING.
• FIELD TUNABLE BAND-SPLITTING FILTERS (6 OR 12 dB
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  RELEASE AND RATIO FOR EACH BAND.
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Circle (27) on Reply Card
Gemini Easy-Rider

to 5ms, and release times adjustable from 4 ms to 4s. Two units can be coupled for stereo.

Circle (209) on Reply Card

The FM Stereo Ex -press Limiter is a compressor-limiter-expander in a single unit making this a 1-box FM audio processor. Variable attack or release time, or an automatic release time can be selected. Compression ratios of 1.5:1, 2:1 and 5:1 are selectable with a limiting slope of 20:1. After 10dB of compression, limiting occurs regardless of setting. There are three expander threshold settings. The single meter can be switched to read left, right or sum output, or gain reduction. A clipper is provided for maximum peak control. As an FM unit, the control circuits respond to selectable pre-emphasis of 25, 50 or 75µs.

Circle (210) on Reply Card

R. Barth KG

The Dynaset U311 has the unique feature of dual-slope compression. Levels below an adjustable threshold and those above are processed with different adjustable parameters. Levels from -12 to +12dBm are controlled as upper-band levels, with adjustable threshold, compression ratios to 20:1, and a compression hold gate (The gate is referenced only to the high level processor.) The compression slope of the lower level processing is adjustable in the same range as the upper, and has a threshold adjustable from 0 to 30dB below the upper level threshold. The result is smooth control of a wide range of levels, without pumping effects. The unit is packaged for modular installation in consoles or in a rack-mount unit.

Circle (213) on Reply Card

Audio Technologies Inc.

The Emph'a Sizer combines three functions in a single unit: input gate, compressor and equalizer. The input gate holds the gain control when the input level drops below the adjustable threshold level. This prevents the objectionable pumping that occurs when a compressor returns to full gain without gating. After the gating mode has been initiated, an adjustable delay begins, after which the compression will release to full gain. The release time is also adjustable. The compressor function uses a voltage-controlled amplifier (VCA) in a normal mode of slow gain riding. However, if the input exceeds adjustable attack and release time

Circle (212) on Reply Card

Emph'a Sizer

thresholds, fast-acting networks respond with attack time of 1 ms. Slope of compression is variable from 1:1 to about 20:1. The equalizer section is a 4-band parametric unit and may be inserted before or after the compressor.

Circle (212) on Reply Card
metrical operation can be selected. The limiting functions may be disabled for compression only or in the "proof" mode the unit functions as an amplifier only.

Nearly identical to the AM-400, the AM-500 Compressor Limiter Expander adds an expansion function: The unit operates with a fixed or centerline gain point, with compression reducing that gain and expansion increasing the gain to level off signals above the sensitivity threshold. When all audio drops below this threshold, the unit returns to centerline gain after about 17 seconds.

As in the AM-500, the FM-601 Stereo AGC/Limiter has expansion and compression functions that operate as described for that unit, except that there are ganged stereo channels. The companion FM-600 is a mono version. A 10µs attack time limiter follows the AGC section, with selectable 75µs, 25µs, or flat frequency response. Modes of operation include the previously mentioned frequency response, plus limit only and test modes (flat response only). These modes are remotely selectable by simple switch closures. The unit automatically is bypassed in case of power interruption or internal failure, to prevent down time.

Circuit Research Labs Inc.

The APP-400A Audio Preparation Processor is a 2-band AGC unit for AM use. Following a transformerless balanced input, the audio is made symmetrical via a "Harmonic Phase Rotation Network." The audio is then band-split into parallel AGC circuits with a slow gain-leveling action. These two bands can be strapped to provide wide-band AGC action.

The SPP-800 Stereo Preparation Processor is basically the stereo version of the APP-400A without the need for two separate boxes. As with the 400A, this unit has 2-band AGC and gating circuitry to eliminate pumping. Attention has been given to the strapping method to reduce audible cross-modulation between channels.

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Circle (30) on Reply Card
Audio processors

The SEP-400A Spectral Energy Processor is a 4-band processor, using proprietary control circuitry to automatically maintain consistent peak-to-average ratios. Input gating holds compression when audio drops below the threshold level and allows the user to determine the range of levels that activate the processor. Two units may be strapped for stereo.

Circle (219) on Reply Card

The PMC-400A Peak Modulation Controller is an AM limiter that uses multiband techniques and clipping to control peak levels. Controls are included for high and low frequency phasing, to compensate for transmitter responses, and for asymmetry. The asymmetry function has two controls for day and night operation, because a transmitter may have different modulation response at different power levels. A pre-emphasis circuit is available to compensate for the poor frequency response of the typical AM receiver and a low pass filter is included to keep the audio energy out of the stereo pilot in the stereo generator.

Circle (221) on Reply Card

The SMP-800 Stereo Modulation Processor is an FM limiter that includes a wide-band AGC circuit to allow the unit to be used for single-box audio processing. A pre-emphasis response limiter and the capability for multiband peak limiting allow for maximum modulation levels. The pre-emphasis may be selected between 25, 50 or 75μs. A low pass filter is included to keep the audio energy out of the stereo pilot in the stereo generator.

Circle (221) on Reply Card

dbx Inc.

The top of the dbx line of compressor/limiter products, the 165 Compressor/Limiter uses "Over Easy" compression, characterized by smooth operation with minimum audible effects. Attack and release times are adjustable from 1 to 400dB/ms and 10 to 4000dB/ms, respectively, or automatic operation may be used. Separate input level and compression level controls allow selection of calibrated compression slopes. Two units may be coupled for stereo operation.

Circle (222) on Reply Card

The 160 and 162 Compressor/Limiters are essentially the same, except that the 162 is a stereo version with two identical channels internally coupled for identical response, eliminating the need for separate channel adjustments and reducing the potential for errors. Time constants are factory preset and the only controls are input, output and overall compression level, plus metering selectors.

Circle (223) on Reply Card

Designed as part of the dbx 900 series mainframe and modules, the 903 Compressor operates much like the 165 unit, but with an LED bargraph meter instead of a standard panel meter.

Circle (224) on Reply Card

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Circle (31) on Reply Card

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Circle (32) on Reply Card
**Dorrough Electronics**

The Discriminate Audio Processor (DAP) is a 3-band unit with separately controlled expansion and compression on each band and gain control metering on the front panel for each band, as well as on the output level meter. All the controls for compression level and relative output from each band, the limiter circuit, and for AM, the symmetry control, are internal trimpots, making this a "set and forget" unit. Master input and output level controls, plus an output meter range and input level range switch are the front panel controls.

Circle (225) on Reply Card

**Gregg Laboratories**

Gregg's 2530 Tri-band Audio Processing Amplifier is an FM/TV processing unit with 3-band AGC. The AGC control of each channel has adjustable attack and release times, wide or narrow range of levels, switchable interband level reference to prevent excessive gain control in any single band, and gated gain control. Audio inputs are balanced transformerless, as are the outputs, and are RF suppressed. Input conditioning filters prevent subaudible low frequency noise from affecting the processing functions. Pre-emphasis is applied before processing, and de-emphasis afterward. Gregg recommends a peak limiter using clipping alone because the audio processing in the 2530 is pre-emphasis-based.

Circle (226) on Reply Card

Gregg Laboratories also has the following units:

- 2561/2562 Mono/Stereo AM multi-band processor
- 2511/2512 Mono/Stereo Broadband Gain Controller
- 2650 FM Peak Limiter.

Circle (227) on Reply Card

**Harris Corporation**

The AGC amplifier of the MSP-90 series is a 3-band unit with up to 24dB of compression and 12dB of expansion, each with selectable attack and release times. LED indicators show the gain reduction level and the output level. The AM limiter consists of a fast IC circuit, providing up to 15dB of limiting with less than 40us attack time and selectable 1.3 to 7.5s release times. Control of the asymmetry is included, as is a phase reversal network using zero-crossing switching for inaudible changes in polarity.

The FM limiter is a 2-band processor, splitting at 400Hz. The high frequency band is pre-emphasized and limited, then recombined with the low frequency portion. The final sum passes through a protective clipper to avoid peaks in the low frequency material or peaks from the combining process.

Circle (231) on Reply Card

Beaveronics, Inc.

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Circle (33) on Reply Card

August 1981  Broadcast Engineering  43
Audio processors

in either STL or same-site applications.

Circle (232) on Reply Card

One of the most complex units on the market is the MSP-100 Audio Processor combining 3-band AGC, limiter and "protection" or fast limiter/clipper circuitry, all with adjustable operating parameters, automatic response or manual settings and a total of five meters to monitor operating functions. In the AGC portion, bandwidths, thresholds and attack/recovery times are user-adjustable. The limiter, a broadband peak type, reduces transient and summing error peaks. Fast or slow response times are switchable, or automatic program-controlled action may be selected. The AM protection module has zero-crossing polarity reversal, followed by a fast limiter and clippers, with symmetry adjustment. The type and amount of protection is adjustable. The FM protection circuit splits high and low frequencies, with the highs receiving processing from the limiter/clipper, then the recombined audio finally being checked for peaks by a broadband clipper.

Circle (228) on Reply Card

The 215 is a multifunction broadcast audio processor with a gated AGC amplifier with selectable input high

Inovonics Inc.

The MAP-II is an 8-band audio processor for AM use. The input audio first encounters a high pass filter with cutoff frequency selectable at 50, 70 or 100Hz. Next is a slow, gain riding AGC with gating during program pauses, then the multiband compressor. Each band uses "open loop" or feed-forward AGC, providing a gradual transition in gain levels. This, along with coupling between adjacent bands, keeps the processed result smooth with minimal phase errors between different bands. Following AGC, the recombined audio goes through phase rotation to keep the maximum peaks in the positive direction. The peak limiter is conventional, but is combined with a hard clipper to maintain as much control as desired. A selectable low pass filter ends the chain of audio signals through the unit. A pink noise generator is included for easy initial setup.

Circle (228) on Reply Card
ARRI HMI® LIGHTS:

HMI is the first new light since quartz halogen. ARRI HMI lights are also new: specifically designed to make the most effective use of the HMI bulb's efficiency.

By now it's common knowledge that a 4K HMI bulb puts out 102 lumens per watt at 5600 degrees Kelvin; whereas a tungsten bulb, filtered for daylight balance, puts out between 15 and 20 lumens per watt.

That's astounding efficiency. But that's the bulb's output. How much of that light gets onto the subject depends on the efficiency of the lamp-head. How many watts are drawn depends on the efficiency of the distribution system.

HMI bulb efficiency has made it worthwhile to overcome the drawbacks — notably flicker. ARRI began on that early. We've been making motion-picture lighting equipment since the Thirties. In the Sixties, we began experimenting with HMI's forerunner, Radium street lights. In 1972, we pioneered the use of HMI for filming, at the Olympic Games.

But at the Olympics we were still plugging the new HMI bulbs into conventional lamp-heads designed for tungsten point sources. (HMI, of course, is an arc.) As Osram perfected the HMI bulb, one thing became obvious: Since efficient output was the HMI bulb's claim to fame, the delivery system must, above all, be as efficient as possible. That meant new lighting designs.

ARRI's engineers didn't have to adapt. Their new lamp-head designs take maximum advantage of the HMI bulb's characteristics. The ARRI 4K, for example, has a 19.7 inch diameter Fresnel lens. Most other 4K HMIs use a 14 inch.

Peter Edwards is Supervising Lighting Director at CFTO-TV in Toronto; and he is Chairman of the Society of Television Lighting Directors, Canada. He has won two Emmy Awards for lighting. He ran side-by-side tests for CFTO of the ARRI HMI 4K and two other brands of imported HMI 4K lights. "At 40 feet and full flood position, the best of the other two measured 150 foot-candles; the ARRI measured 200 foot-candles," says Mr. Edwards.

ARRI HMI lights are available in the four standard AC configurations: 575W, 1200W, 2500W and 4000W, plus a 200W battery-powered unit. Shown here: the 4000W.
Audio processors

Audio processors pass filter, a program-controlled RMS compressor and either an AM or FM peak limiter. The AM limiter has phase rotation circuitry and a feedback limiter/clipper combination. Adjustable asymmetry and selectable low-pass filter roll-off are additional features. The FM peak controller has selectable flat, 25µs or 75µs pre-emphasis response functions and also uses a limiter/clipper combination.

Circle (229) on Reply Card

The 201 Limiter has selectable attack and release times and contains an average-responding limiter, plus a peak "ceiling" limiter. This general-purpose gain controller may be used in studio recording as well as in program line applications.

Circle (230) on Reply Card

Kahn Communications Inc.

Intended to be placed after AGC and limiting equipment and before the transmitter input, the Non-Symmetry-Mod enhances positive peaks to achieve 125% peak modulation. The device does not use clipping, but circ-

Non-Symmetry-Mod

Kahn Communications Inc.

3320

Modular Audio Products

Modular Audio Products packaged as an optional plug-in unit in the console, the 3320 Compressor Limiter is a general-purpose gain controller with a fixed 20µs attack time and an automatic variable release time for fast, but smooth response. Up to 30dB of compression may be used with a minimum threshold for the beginning of AGC action of -50dBm.

Circle (236) on Reply Card

McMartin Industries Inc.

McMartin Industries Inc. The monaural BFM-1515R and the stereo BFM-1514R processors are usable for FM or AM, depending on whether flat or pre-emphasis processing response is selected. In the flat mode or in the low frequency band of the pre-emphasis mode, the limiter has 20µs attack time and adjustable 20 to 25ms release time. The pre-emphasis limiter has 50µs attack time and

BFM-1514R and BFM-1515R

BFM-1514R and BFM-1515R

THE 6403 ACTIVE EDITOR INTERFACE

A horizontal wipe which stops halfway, creating a split-screen; a bordered square insert which opens up from one of the corners (instead of the middle) and stops at a pre-determined size — that is what the 6403 makes possible. The 6403 is an active editor interface for Crosspoint Latch switchers. It's internal control generators can be triggered from any editor to perform frame accurate effects and mixes (1-1000 frames). It controls the position as well as size of patterns.

The 6403 is flexible. With an optional editor module it can be fully controlled from the editor keyboard, accepting instructions such as pattern size, duration times, etc. Without the module it can still accept trigger pulses from even the simplest editor, and still perform programmed effects.

Ask your dealer for details, or call us directly.

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Circle (36) on Reply Card
Orban Associates Inc.

The Optimod-AM (9000A) is a 1-box unit for AM audio processing, containing eight signal processing blocks:
- Input filter passing 100–11kHz
- Broadband gain riding compressor
- Program equalizer to tailor frequency response
- A 6-band limiter
- A silent acting phasing circuit
- A "smart" clipper to limit peaks not caught by the 6-band limiter
- Transmitter equalizer, to compensate for inaccuracies in response of the transmitter, especially an older one
- An output filter to limit the occupied bandwidth of the transmitted signal. Gain reduction metering of the broadband AGC, the six bands of limiting and the peak clipper is on the front panel, along with a multimeter measuring various system parameters.

The BA-146A Limiter Amplifier for AM radio use features inaudible FET-controlled action. Limiting action occurs at 1μs per decibel of compression. Release time is selectable from 0.2 to 5s. Release time is variable in relation to program content within the selected time. Either symmetrical or asymmetrical action is possible. Noise rating is 70dB minimum for 20Hz to 20kHz spectrum with frequency response of ± 1dB. Harmonic distortion is 1%. Up to 50:1 compression ratio is available.

The BA-147 Limiter Amplifier for FM and television differs only in inclusion of a 75μs pre-emphasis time constant from the B-146A.

The BA-150 Digital Overshoot Control Processor (DOC), for use with any FM exciter/stereo generator maintains 100% modulation without overshoot. Shaped, bi-level clipping provides control on high frequency peaks. The resultant ringing is controlled through a dc gated aperture control loop. Non-linear phase response is also handled by a 6-section active delay network. Signal-to-noise ratio greater than 75dB covers a response range of 20Hz to 15kHz. Attack time is 50μs; harmonic distortion is less than 1%. System crosstalk is rated at less than -46dB.

RCA Broadcast Systems

The BA-145 AGC Amplifier for use in AM, FM and TV or recording studios uses an insulated gate FET for gain control, swish-up, eliminating thumps and pumping. A meter and LED indicators show compression (to 24dB), expansion (to 16dB) or level hold. Selectable compression attack times from 0.2 to 30ms and release times from 10 to 40s are supplemented by expansion attack times from 5 to 30s with release of 4 to 10s. Frequency response of .5dB, 20Hz to 15kHz and less than 1% harmonic distortion for the range on input signals from -12 to +30dBm, develops an output level of +18dBm with compression or +26dBm amplifier maximum. The unit is field convertible for stereo: the BA-145S. Two of these units may be synchronized for use in quad installations.

Thomson-CSF Broadcast Inc.

The Monaural 4440A and Stereo 4450A Audimix units are proven-design AGC amplifiers with ± 10dB of gain control about a center gain setting. Audio within the 20dB window is either boosted or attenuated to provide a constant output level. A gain holding gate reduces the pumping effect often found in AGC units and,
Audio processors

after 10 seconds of silence, returns to the center gain level. The gate has an adjustable threshold for various formats' requirements. Front panel adjustments are input and output level controls, control and test switching, and gain control metering.

The Volumax 4300 AM Limiter uses fast limiter and output clipping for modulation control and silent-acting phase reversal circuit that actually fades between phases, during pauses in program material. The resulting output is free from clicks or thumps present in some phase reversal networks.

The FM Volumax is a stereo FM split-band peak limiter with frequency division above and below 5kHz. (The FM Volumax 4101 is mono.) Low frequencies are controlled by a moderately fast limiter, then the signals are split into two bands. Both bands are pre-emphasized for processing by the proprietary Dynamic Frequency Compensator circuitry. Following recombination, a final safety clipper catches any peaks before de-emphasis and output to the transmitter/stereo generator.

UREI (United Recording Electronics Industries)

Designed for AM use, the BL-40 Modulator combines RMS limiting of medium speed with peak limiting in one unit. Attack and release times of the RMS limiter are program dependent. High average level material will cause the limiter to respond more slowly than will short duration peak levels. Phase optimization circuitry reverses phase for maximum modulation. Metering is provided for RMS limiting, peak limiting and the output level. Asymmetry and the RMS to peak limiting weighting controls are available with input and output level controls behind a front panel.

An AGC unit with up to a 20:1 compression ratio, the LA-4 Compressor Limiter uses optically coupled attenuators for smooth response. The response is RMS, another smoothness factor. The threshold of compression and the compression ratio are adjustable. Two units may be strapped for stereo.

The 1176LN/1178 Peak Limiter features selectable 4:1 to 20:1 compression ratios, variable attack and release times of 20 to 800 µs and 50ms to 1.1s, respectively. The front panel meter can be used for input or output level indication or to monitor gain reduction. Two units may be coupled for stereo (1176LN) or the 1178 stereo unit may be used.

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"Gene Wright, Vice President of Engineering, Turner Broadcast Systems

24 HOUR NEWS

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RCA Broadcast Systems, Bldg. 2-2, Camden, NJ 08102.

Circle (40) on Reply Card
Coax transmission line leak repaired

A. J. Martin
Translator maintenance engineer
KDLH-TV3
Duluth, MN

Someone shot a rifle at the lower sidelights on a KDAL-TV* translator tower and hit the 1-5/8-inch coax transmission line instead. By the time the leak was discovered, quite a bit of moisture had worked its way into the transmission line, even though it was constantly pressurized by an air dryer. The moisture resulted in breakdown within the line and this effect could be seen as flashing in the transmitted picture signal.

After the line was repaired, the lower coax connector was removed, the moisture shaken out of the lower end of the coax and dry air was blown into the line until it appeared dry. By the next morning, flashing was again occurring in the picture, so the whole drying process was repeated. The line evidently had quite a bit of moisture in it, and this would migrate down and collect in the low end during the day. Because the translator site was about 30 miles away, it wasn't convenient to open the line each day, and I didn't want to have a tower man make climbs to open the line for purging. Just having the line filled with dry air wasn't enough. The dry air would saturate with moisture, and because there no longer was a leak in the line the moist air stayed in the line.

I decided to purge the line of moist air by letting it breathe. This was accomplished by drilling a small hole (#58 drill) in the lower end of the line. The moist air would slowly bleed out of the line, and when the pressure dropped sufficiently, the air dryer would quickly refill it with dry air. The line was left this way for about a week, at which time the small hole was filled with silicone bathrub sealer, and it has been working fine ever since.

Weather alert detector

James Lunacek
Broadcast technician, KUOM
University of Minnesota
Minneapolis, MN

In our geographical area heavy thunderstorm and tornado activity is of great concern. To alert station personnel to potentially dangerous weather conditions, we use a business band FM receiver tuned to the local National Weather Service station. The output of the receiver feeds a signal splitter for monitoring and re-broadcast if conditions warrant. A tone decoder with delay is set up to detect the 1kHz NWS

The next best thing to the real thing
Emergency Alert tone.

The tone decoder portion of the system is shown in the accompanying schematic. The 567 tone decoder IC, two transistors, an SCR and an IC voltage regulator along with the required capacitors and resistors were assembled on a small circuit board and enclosed in an octal-based relay case. The only external components are the alarm relay and the reset push button. We found space for the decoder and relay on the FM receiver chassis.

When the 567 decoder detects a 1kHz signal its output goes low, causing Q1 to remove the short across C1. C1 charges in a short length of time (determined by R1), fires the UJT (Q2) and provides a pulse to turn on the SCR (Q3). In our system, Q3 operates an external relay that unmutes the control room speaker.

Because the decoder seemed to work reliably, we decided to extend the system to pre-empt all the normal monitor audio in the station. The station monitor distribution system consists of three FM closed-circuit modulators feeding an existing CCTV house distribution system. Individual offices are equipped with home-type FM receivers.

This system was chosen because

of the physical separation of the station offices and because of the already installed CCTV system. The first modulator normally provides an off-air signal, the second provides the network program and the third provides weather information. When an alert is detected, the weather receiver output is transferred to modulators 1 and 2 and continues on modulator 3. This increases the chances that station personnel within range of a monitor will become aware of the bulletin. The operator on duty resets the decoder circuit after the bulletin.
National Spanish television airs in Arizona

K4OAC, Channel 40, Tucson, AZ, became the SIN National Spanish Television Network's 79th affiliate recently when it installed a 1kW

UHF translator.

The Channel 40 system relays the signal from KTVW, Channel 33, Phoenix, to carry SIN's daily schedule of Spanish language programming throughout most of Arizona. It is estimated that Channel 40 will reach a Spanish-speaking population of 120,000, bringing KTVW's total coverage to 500,000.

The translator, installed by helicopter, is operated off diesel generators because of its remote location. Total power consumption is less than 6 KVA during black picture conditions.

SIN currently reaches more than 3.5 million Hispanic households throughout the United States. SIN, which has been on the air for 20 years, began broadcasting 24 hours daily in April 1980.

Editor's Note: For reference purposes, the translator selected by Channel 40 for its operation is the Acrodyne single-tube T-2400 V/U, which was introduced at NAB '80 in Las Vegas. It features a gain stabilized solid-state modular driver, plug-in wide-band RF circuits and status display for low maintenance costs.

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Hundreds of stations worldwide—in every format—now process with OPTIMOD-AM. An integrated system design makes OPTIMOD-AM ideal for all formats: it guarantees uniform audio quality and uncanny definition on typical AM radios—regardless of uneven operator gain riding or inconsistent source material. And our system standout—the "Smart Clipper"—listens to clipping distortion like a human ear to definitively solve the long-standing conflict between music loudness and voice distortion.

Regardless of format, you can adjust the field-proven, stereo-ready OPTIMOD-AM system to give you the sound you've always wanted. Call us Toll Free (800) 227-4498, in California (415) 957-1067 for the name of the Orban broadcast dealer nearest you.

Orban Associates Inc., 645 Bryant Street, San Francisco, CA 94107
Because of its remote location, the translator was installed by helicopter.

The translator installation permits relays of the signal from KTVW Channel 33 Phoenix to carrying SIN's daily schedule of Spanish language programming to most of Arizona.

If you're like most broadcasters, you're looking for an equalizer that's both an effective creative tool and a powerful problem-solver. The "constant-C" Orban 622B Parametric offers the flexibility of stereo, four-band Parametric EQ and infinite-notch filtering all in one unit. The same equalizer can both "sweeten" program material and notch out hum or whistles in low-quality sources like remotes. It's this combination of functions which has made the 622B the world leader in Parametric EQ.

When the 622B is used on-line to tailor your sound to your exact requirements, switch-bypass ability makes proofs convenient. When it's used in the production studio, it can make spots, promos, and effects really special!

For the demanding professional, the 622B offers excellent noise and distortion performance, rugged construction, extensive RFI-proofing, stability, and the reliability and support you've come to expect from Orban.

Contact your local Orban dealer to find out more about the cost-effective, world-class leader in Parametric EQ—the 622.

Orban Associates Inc., 645 Eryant St., San Francisco, CA 94107 (415) 957-1067

Circle (42) on Reply Card

August 1981  Broadcast Engineering  53
Friesen's credit omitted

In the March issue of BE, the story “KEYN Takes on a New Look,” described the new facilities in Wichita, KS, under the ownership of Jim Long, former president of TM Productions, and Charley Pride, famous country singer.

In the course of preparing this article for publication, one of the authors, Orin Friesen, was inadvertently omitted from the credit lines. During the preparation of the article, Friesen was chief engineer at KEYN and was responsible for the redesign of the station. He has since left KEYN to take a position with KFDI in Wichita, but keeps in close contact with Larry Waggoner and station KEYN, where he was chief engineer for eight years.

The authors are shown posing with Charley Pride during the remodeling of KEYN.

There's no business like dough business.

The business of making money.
It's all very exciting.
But without the ability to lay out a large amount of cash, you can't take advantage of the financial opportunities that come your way.
And venturing all your money without savings in reserve can be dangerous. Because savings are the base of any financial plan.
One of the surest, easiest ways to save some dough is joining the Payroll Savings Plan and buying United States Bonds. You'll never miss the little taken out of each paycheck.
Meanwhile, the Bonds grow up to play a part in your future.
Of course, with Bonds you're sure of the ending. But then, there's nothing wrong with a happy ending.

Studio acoustics

The May 1981 issue of BE contained “The Basics of Studio Acoustics,” by Robert Nissen of Hubert Wilke Inc. Figure 7 on page 54 was missing some dimensions and STC values that should have been printed in color. The corrected graphic is shown here.

Error in pricing

To the editor:
This is with reference to the description of our character generator and graphics system, the VISTA 80, given on page 77 of the May 1981 issue of your excellent magazine.
We appreciate your inclusion of our product in your listings, but would like to correct the error in pricing to read as follows:
VISTA 80/216—$27,300
VISTA 80/116—$22,950
Again, thanks for including our products in your survey.

F.G.R. Warren
Vice President
Digital Products & Technology
MPB Technologies
Cablewave Systems offers Wellflex Transmission Lines designed to meet your most stringent electrical and mechanical requirements.

Highly reliable, the unique Wellflex construction provides a combination of strength and flexibility with optimum performance.

Outstanding electrical parameters include extremely low RF loss, smooth impedance coefficient, and conservatively rated power handling capability.

Wellflex is available with either air or foam dielectric with copper corrugated outer conductor, solid and corrugated inner conductor (depending on size), and with a tough, durable, corrosion resistance polyethylene jacket suitable for burial and prolonged life.

Air Dielectric Wellflex in smaller diameters, (1/2" and 3/8") offer a field proven, fixed helix design called Spirafil II—a single, continuous extrusion which locks the center conductor coaxially within the outer conductor, resulting in a near perfect impedance coefficient throughout the entire length of line.

Larger Diameter Air Dielectric Wellflex Cables, (1 1/8", 3", 3 1/2" and 4 1/2") feature a unique vertabra helix design to achieve optimum crush and tension strength. Its "pillar effect", using less volume of dielectric, provides lower loss and higher power handling capability due to the more rapid dissipation of heat from the center conductor.

Wellflex has it all: low loss, low VSWR, higher power handling, smoother impedance coefficient, and rugged, long dependable life.

Cablewave System's Wellflex is type accepted for sampling systems in accordance to FCC Part 73.68.

Cablewave Systems, Inc., 60 Dodge Ave., North Haven, Conn. 06473, Phone (203) 239-3311

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Complete in every detail, total information needed to plan, specify and purchase a complete system or component, plus complete engineering data and more!

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Preview of the NRBA Convention

The National Radio Broadcasters Association annual convention and exposition is scheduled for Sept. 13-16, at the Fontainebleau Hilton Hotel, Miami Beach, FL. NRBA '81 provides a chance to learn about the impact of new technologies (cable and satellite transmissions) and to find out how other stations are making and spending money.

Highlights of the convention include awards presentations and hospitality suite galas, as well as more than 30 workshops presented by industry leaders on subjects ranging from production and programming to management and sales roundtables. With more than 70 companies as confirmed exhibitors, the Exhibit Hall is bound to be an exciting showplace.

Agenda highlights

Sunday Sept. 13
Registration opens—10 a.m.
Exhibit Hall opens—Noon
Opening cocktail party—6:30 p.m.
Hospitality suite gala—8 p.m.

Workshops—8:30 p.m.
Programming Format Rooms
Free-form discussions and idea interchanges led by America's programming experts. Some formats discussed will be AOR/Cross-Rock, Adult Contemporary, Country, News/Talk, Urban/Black and Beautiful Music. The workshop also will include promotion by format. (Will be repeated Tuesday at 4:15 p.m.)

TV Spot Producers Circus
The leading producers of TV commercials for radio stations will show how and why those commercials are made.

Cable and Satellite Forum
Learn all there is to know about the changes in technology, systems and services that are reshaping the radio business.

Engineering Career Forum
A discussion on the effects new technology and regulatory changes will have on professional radio engineers.

Monday Sept. 14
Registration opens—7:30 a.m.
Exhibit Hall opens—8 a.m.
Opening session—9 a.m.
Keynote address by Cecil L. Heftel, Congressman from Hawaii and owner of Heftel Broadcasting.

Spouses Program—9:45 a.m.
Workshops—9:45 a.m.
Sales Motivation
Solutions to one of the most important and complex management problems given by a nationally recognized expert.

Financing Your First Acquisition
A panel of lenders, bankers and brokers will make it seem easy for prospective first-time owners.

Promotion Roundtable
An informative and stimulating dialogue led by the radio broadcaster recognized by his peers as one of radio's outstanding promotional leaders.

Programming Review
A panel of America's foremost programming experts will critique a variety of off-the-air tapes.

Engineering
Audio processing. Where have all the listeners gone? A roundtable discussion led by experienced radio engineers.

Coffee break—11 a.m.

Workshops—11:30 a.m.
Rate Card Revelations
The mysteries of rate card design and maintenance unraveled by a panel.

Small Market Sales Personnel
Finding, training, motivating and keeping salespeople in a small market is a big problem. This dialogue will provide some new answers.

Project Management
A case study that will detail and analyze the principles of good management. (Will be repeated Wednesday at 9 a.m.)

Promotion Spotlight
A revealing dissection of a typical radio market's promotional universe by an outstanding station promoter.

Audience Recruitment
Age Group 25-49
The new and increasingly important target group. Analysis, techniques and systems covered in a roundtable discussion.

Engineering
Coexistence—the impossible dream.
Understanding managers, understanding engineers.

Luncheon—1 p.m.

NRBA's Golden Radio Award to radio's living legend: Gordon McLen- don.
Open Afternoon—2:30 p.m.
Visit the Exhibit Hall and the hospitality suites.

Hospitality Suite Gala—6 p.m.

Tuesday, Sept. 15
Exhibit Hall opens—8 a.m.
Spouses program—9 a.m.

Workshops—9 a.m.
Sales Techniques Analyzed
Techniques reviewed by videotaping and playback of real-life sales situations.

The New FCC
Is the new FCC a different FCC? What can radio broadcasters expect to come out of Washington and how will they be affected by the transition? Use My Medium
Representatives of outdoor, print and television will tell you why you should use their particular medium to promote your station.

Programming for Lifestyles
An in-depth study of the kaleidoscope of this country's present and future lifestyle trends and their effect on your potential audience.

Engineering
Digital audio. The sound of the future.

Coffee break—10:15 a.m.

Workshops—10:45 a.m.
Large Market Sales Personnel
Finding, training, motivating and keeping salespeople is a major problem in any size market. This dialogue will provide some new answers, especially for broadcasters in larger markets.

Financial Overview
A panel of experts with radio station financing experience will answer questions about the intracacies of today's money markets and shed light on radio station prices today and tomorrow. Learn how to add to your group.

Promotion Superstars
Small- and medium-market broadcasters will be especially interested in this roundtable featuring the promotion superstars of the industry.

On-the-Air Personnel
This roundtable discussion, led by top programming management ex-
For the second year in a row, Scotch® 479 won the award for the best picture of the year in a test of one-inch video tapes.

We scored well in all of the twelve categories tested, but especially well in the categories that commonly represent picture quality: color dropouts, high frequency dropouts, chroma noise, signal-to-noise ratio and stop motion.

These were scientific, quantitative tests, conducted as you would conduct them yourself, with no room for brand bias. The meters didn't play favorites. The standards were the same for every brand tested. And we tested every brand.

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NRBA Convention

executives, will focus on recruiting, training, motivating and keeping on-the-air talent.

Engineering
Future trends—a look at supporting technology for new programming.

Luncheon—12:30 p.m.
Address by Mark H. Fowler, FCC chairman
Gabbert Award for Outstanding Service to the Radio Industry presented to Robert E. Lee, former chairman, FCC.

Workshops—2:30 p.m.
Promotion Circus
A presentation of promotional devices and systems that build sales as well as audience, by the leading suppliers.

Trade Press Symposium
A view from the trade press summit and how you can reach the trade press with your message.

Small Market Idea Exchange
Exclusively for small-market broadcasters. A freestyle, informal, information-packed bull session that has become an NRBA tradition.

Focus Groups
A programming pretesting technique that is gaining acceptance. A roundtable discussion led by authorities on the subject.

Engineering

Coffee break—3:45 p.m.

Workshops—4:15 p.m.
Sales Roundtables
Small groups classed by market size engage in idea and experience exchange. Voted last year's most popular and informative session.

Management Roundtables
Same as above except the subject is every phase of management.

Programming Format Rooms
Free-form discussion and idea interchange led by America's programming experts.


Superstar Showtime—9 p.m.
Miami Beach Theater of The Performing Arts. Shuttle buses from hotels will be provided.

Wednesday, Sept. 16
Eye-opener—8 a.m.
Special roundtable—9 a.m.
The Cuban Problem.

Workshops
Project Management
A case study that will detail and analyze the principles of good management.

Arbitron Advisory Council
An update on the rating service. Answers to your questions, solutions to your problems.

Engineering
Deregulation, regulation, unregulation, AM stereo and station proliferation to be discussed.

Reservations can be made through NRBA. It is recommended that you register early for preferred hotel accommodations. NRBA has arranged special low-cost air fares from many major cities. For more information or preregistration material contact: NRBA, 1705 De Sales St. NW, Suite 500, Washington, DC 20036; (202) 466-2030.

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Part II

PRC '81: A conference replay

By Brad Dick, chief engineer, KANU, Lawrence, KS

The second third of the seminar on FM transmission was addressed by Charlie Goodrich of McMartin Industries. Goodrich prepared a videotape showing the actual tuning of a McMartin transmitter to optimize performance in the stereo and SCA modes.

Goodrich said that tuning a transmitter for minimum AM noise was the most beneficial method to the total system performance. He began by tuning the transmitter for minimum AM noise and then checking various specifications of the system, such as SCA crosstalk and from the main channel, separation and frequency response.

By mistuning the transmitter final amplifier, the specifications change very little. Mistuning the driver caused noticeable effects on separation and crosstalk to the SCA channel. Mistuning the exciter even caused a slight increase in distortion from 0.15% to 0.25%. The effects of detuning the transmitter on frequency response was not measurable. Tests have shown that the IPA is the most critical in terms of obtaining maximum performance from the transmitter.

Goodrich said that engineers continually check the tuning of their transmitters, as an increase in incidental noise can cause a high level of picket fencing. Also, an antenna with a narrow bandwidth can make the tuning even more critical. Station engineers should know the bandwidth of their antennas and take steps to broaden them if necessary.

The engineers can easily check the AM noise of their systems during normal programming. The AM noise should not increase with modulation, so adjustments can take place during the day, avoiding the midnight maintenance routine.

The final portion of the seminar on FM transmission performance was presented by Rick Knowles, senior technical officer for audio, Canadian Broadcasting Corporation (CBC). Knowles began by outlining the basic size of the CBC, which includes more than 1000 owned-and-operated transmitters and 38 production houses across Canada. The network has adopted guidelines and standards for much of the audio field after many years of research. Knowles said he felt that these standards had resulted in a vast improvement in the sound of the total system and provided the producers with a tool most US producers of programming did not have. That tool is the predictability of the audio processing to be used at the final broadcast station.

As Knowles said, “Anyone who owns a 4-inch speaker immediately becomes an audio expert,” and several magazines are directed to audio topics. Even so, Knowles said that the audio industry was putting out a great deal of misinformation about audio.

Knowles made three major points. First, he said that broadcasting is entertainment. Therefore, if it is entertainment, it is not work, and the listener should not have to continually adjust the volume control to hear the program. This means that the station must produce a program in which the listener has to do no work. He said that the constant volume used by popular music stations was one reason for their success.

Second, he said that there was not an audio processing box that did a perfect job. No matter what the manufacturer claims, there is simply no way a single box can provide all of the audio processing necessary or the amount of aesthetic treatment required to perfectly correct audio problems.

Finally, he said if the above two statements are truisms, then perhaps, as an industry, we are attempting to tackle the problem in the wrong way by attempting to make all adjustments in audio processing at the final output (the transmitter).

The CBC has closely studied the problems surrounding audio processing and listener environment. From that research, Tables 1 and 2 were developed, showing that the usable dynamic range may vary from 35 to 100 dB. The reason for the 20 dB reduction in dynamic range is based on the fact that a minimum of 20 dB is needed to retain intelligibility of low level signals. The reduced figure could be called usable dynamic range. Therefore, instead of having an FM transmission with a signal-to-noise ratio of 65 dB, we really have only 45 dB of usable S/N. And an AM transmission system that supposedly has a signal-to-noise ratio of 60 dB has only 40 dB.

Table 2 shows the average noise levels for several typical listening environments and these noise levels become important to the broadcaster.

Using the two tables, one can see...
Love at first sight...

but it's the performance that counts.

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**Common Mode Rejection:** Greater than 60 dB, 50-400 Hz

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**Differential Gain and Phase at 5 MHz:** 0.1%, 0.1° max.
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Table 3. Maximum acceptable dynamic ranges

<table>
<thead>
<tr>
<th>Service</th>
<th>Period</th>
<th>Time of Day</th>
<th>Maximum Dynamic Range (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM Stereo</td>
<td>Monday-Friday</td>
<td>7 a.m.-9 a.m.*</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 p.m.-7 p.m.</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>other times</td>
<td>35</td>
</tr>
<tr>
<td>AM</td>
<td>Monday-Friday</td>
<td>7 a.m.-9 a.m.*</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 p.m.-7 p.m.**</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>other times</td>
<td>25</td>
</tr>
<tr>
<td>TV Sound</td>
<td></td>
<td>5 p.m.-7 p.m.**</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>other times</td>
<td>30</td>
</tr>
</tbody>
</table>

*Most listening done in automobiles or at home during meals.
**Television being listened to during supper.

That a maximum dynamic range of 45 dB could be transmitted on FM for those people listening in a good environment. A more realistic figure would be about 35 dB. Therefore, if one were to play an orchestra piece to listeners in an automobile in rush hour traffic with the car windows down, the dynamic range would have to be reduced to only 15 dB in order to retain the listener.

Table 3 shows the Maximum acceptable dynamic ranges to be used by the CBC stations. For many broadcasters, the figures may seem like music heresy, but the data are based on a great deal of research by the CBC.

Knowles said that if broadcasters were not willing to make the necessary reductions in the dynamic range, then the listener had only two alternatives: make his own volume corrections or change stations. Neither alternative is in the best interests of the broadcaster.

**SCA/Stereo Laboratory**

The SCA/Stereo Laboratory seminar was of interest to those stations currently engaged in SCA operations. The program was presented by John Kean of National Public Radio. Kean received a grant from the Corporation for Public Broadcasting to assemble a test lab to test and adjust FM transmission systems for maximum performance to benefit SCA systems.

The portable equipment that is taken to stations for use includes a QEI modulation monitor, Hewlett-Packard 141T mainframe, low frequency and high frequency spectrum analyzer modules, X-Y plotter and a Boonton 102D FM Signal Generator. Also available are a Moseley SCA Generator and FM limiter.

The equipment allows Kean to test stations to determine nonlinearities of the transmission system that would affect the proper performance of a stereo and SCA system. For example, one useful test is to look at the VSWR of the antenna system vs. frequency. The combination of the Boonton generator and a VSWR bridge allows an easy plot of the VSWR, or, in effect, the antenna bandwidth. Most engineers do not know how their VSWR changes in relation to frequency because their only method of measurement is the transmitter meter.

One of the lingering problems with stereo and SCA transmission is that of "birdies" in the stereo signal. Kean addressed the problem by showing the output of several types of receivers on a spectrum analyzer with stereo and SCA signals applied. The reference
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Photos courtesy Wolf Coach (Models A, C, D) Shook Electronics (Model B)

A-10: 10'-11' production area, 1-2 cameras, 1 portable VTR, audio mixer, video switcher, audio cart recorder, and ancillary equipment
B-14: 12'-14' production area, 2-3 cameras, 1 studio VTR, audio console, production switcher, audio cart and reel/reel recorder, intercom, and ancillary equipment
C-16: See illustration to right 16'-18' production area, 2-4 cameras, 1-2 studio VTR's, other equipment similar to B-14
D-22: 18'-24' production area, 3-6 cameras, 1-3 studio VTR's, A/V routing switcher, 2 audio cart recorders, telephone system, other equipment similar to B-14

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PRC '81

circuit was from an older receiver using a discrete stereo decoder.

The ratio detector of the receiver had outputs filtered by series resonant traps at 67kHz to prevent the SCA signal from being coupled to the stereo decoder. This circuit was compared to the phase-locked loop decoder of a more modern receiver, one usually having no coils or tuned circuits. The circuit relies on RC time constants to control the operation. The output of the PLL is fed to a stereo decoder similar to the stereo decoder used in the older receiver.

By feeding a 19kHz pilot signal and a 67kHz SCA signal into both stereo decoders, it was possible to compare their performance. The PLL stereo decoder always had a cleaner output than the discrete decoder, and the interference level was about 25 dB less. When modulation was added to the SCA signal, the sidebands caused the 9kHz "birdie" to twitter, or create the familiar sound from older receivers.

Kean then moved the SCA to 76kHz. Tests show that using the same decoders as before, the interference could be even worse. This is caused by the resulting audio birdie being lowered in frequency (from 0Hz to the peak deviation of the SCA channel), plus the fact that the benefit of de-emphasis is lost. Furthermore, some older receivers have traps at 67kHz, and moving the SCA to 76kHz would make those traps useless. This resulting interference signal can be characterized as an audio "buzz."

The next step was to move the SCA to 84kHz. This did not reduce the interference because 84kHz is about the same distance from 76kHz as 67kHz and the resulting "buzz" is the same. Also, by moving the SCA higher into the baseband, the old tuner traps at 67kHz are useless.

The SCA was then moved to 92kHz and the test repeated. The resulting beat frequency was now 16kHz, much higher than before. Because this beat tone is so high in frequency, the ear is less sensitive to it. In practice, the interference signal can be measured, but it is not audible.

Kean suggested the following performance specifications for a 67kHz SCA system: **frecquency tolerance, ±500 Hz; injection tolerance, 9% ±1%; modulation, ±5kHz for 100%; audio response, ±1.5 dB 50 Hz to 7kHz measured at 50% modulation; audio distortion, 2% maximum for 50% modulation; hum and noise, 50 dB below 100% modulation using 150 microsecond deemphasis; crosstalk, from main or stereo to SCA, 47 dB below 100% SCA modulation; and subaudible telemetry, maximum of 40 Hz tones used, no less than 18 dB below 100% modulation. Harmonic distortion of tones should be ≤-35 dB.**

Kean said that these specifications were important to the proper operation of a good SCA system, but that most transmitters were not capable of meeting the 47 dB crosstalk specification. In his experience, grounded grid transmitters were better at meeting the crosstalk specifications than others. Parallel transmitters were even more difficult to tune to meet the SCA specifications, and he suggested that stations not operate in parallel but, rather, alternate the operation of the two transmitters.

Kean is currently conducting experiments on WETA by operating an SCA at 95kHz along with the regular 67kHz SCA. The 95kHz SCA is in addition to the modulation of the main channel and the 67kHz SCA, so a total modulation of about 110% is being used. No reduction in main channel modulation or SCA injection was done to accommodate the new SCA carrier. So far no problems have been noted by the local golden eare. However, in one case, a particular model of Yamaha receiver interpreted
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GATES BC500T - $375
GATES FM-250 - $300
GATES FM-1B - $450
RCA BTA18, BTA16 - $400
RCA BTA18, BTA16 (Main or Teaser) - $750
RCA BTA10H (Main or Teaser) - $1900

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GATES BC1 Series - $550
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Broadcast Engineering August 1981

P.R.C. '81

The additional SCA as a reduction in field strength and showed the station to be operating at about half power. Apparently the field strength meter looked at the signal in the upper part of the base-band and misinterpreted the 95kHz signal as a reduction in signal strength.

Satellite Operating System (SOS)

For several years, NPR has been in the process of designing an operating device referred to as Satellite Operating System (SOS). This system would interconnect with a data channel on the NPR transponder and provide NPR stations with various control and information functions.

The SOS is composed of two subsystems, DACS (Date Access Communication System) and Machine Control. The DACS system allows NPR to transmit printed information to stations on an immediate basis and permits the grouping of stations so messages can be targeted. Advisory alarms are a part of the system, and any of four alarms can be activated at all stations—including EBS, Engineering, Programming or Management. The feature provides a method whereby the appropriate department can be alerted to important upcoming messages.

The second part of the SOS system, Machine Control, is even more complicated. The machine control aspect of the system provides the capability for a station to record programs from the network without relying on operators to start recorders. The control portion of the system will tune the satellite demods to the proper channel at the correct time, and start the recorder. The station operator enters a code identifying the desired program and loads a tape on the recorder. The SOS will monitor the data channel from NPR and determine when to activate the necessary steps to tune the demods and start the recorder. The unit continually checks itself and its program to ensure that no faults exist, and it has the capability to completely reload its resident computer program from the satellite at any time, automatically.

Options may include the capability of having the SOS control station routing switchers, matrix control for demodulator interfacing, and CRT data entry. Some stations have expressed the desire to interface the SOS to their own in-house computer systems. This feature would allow them to enter the desired record schedule into their computer and have the computer direct the SOS system to perform the necessary steps to record the programs, print out a schedule and tell the operator when and where to load tapes.

When finally installed, it will represent a giant step into the world of automated control and operation for many public radio stations. As far as is known, no commercial network has attempted such a sophisticated station-related project, and NPR stations are looking forward to its completion.

Final Comments

The Public Radio Conference had more seminars than can be included in this report. The topics were timely and particularly of interest to public radio stations. The information gathered by those attending will not only help make the participants better engineers, but will also allow the stations to present better quality radio to the listening public.

Next year's conference is tentatively scheduled for April 18-22 at the Hyatt Regency Hotel in Washington, DC.

NPR's DACS/NETCUE Receiver/Decoder, shown for the first time at PRC '81.
The technology that made Technics turntables the No.1 choice will make this Technics deck your No.1 choice.

You’ll choose Technics RS-10A02 tape deck for the same reason 85 of the top 100 radio stations choose Technics turntables: The performance and reliability of Technics' quartz-locked direct drive.

Like our turntables, the RS-10A02 gives you the precision of a quartz-locked direct-drive motor. But you also get Technics’ isolated loop tape transport system which optimizes tape tension to virtually eliminate signal dropout while reducing modulation noise and wow and flutter.

Studio pros will appreciate the RS-10A02’s full complement of ten front-panel controls. Like playback and recording EQ adjustments, bias controls, and playback and recording level calibrators. When used with the built-in test-tone oscillator, these controls will give you optimum recording performance no matter what kind of tape you use.

The RS-10A02 also has extremely durable SX Sendust heads, IC logic controls and just about everything else you could want in a professional 2-track deck.

So before you buy any reel-to-reel deck, audition the RS-10A02 and see why it’s your No.1 choice.

For more information on the Technics R&B Series, call 201-348-7470.

Circle (53) on Reply Card
new products

Broadcast mixer, amplifiers

Broadcast Audio Corporation has introduced four new products.

The Series II System 20 is an expandable modular broadcast mixer, which joins the previous systems 8, 12 and 16. DC switching allows quiet control of one of three inputs to each mixer. System 20 accepts different types of mixer modules to include panpots and equalizers. Output levels, to 32dBm maximum, are within 1dB from 20Hz to 20kHz. Noise is rated at -80dB or better, below a ± 8dBm output. THD is 0.25% or less; IM is less than 0.05% SMPTE-rated.

FET Monitor Amplifiers BA-235 and BA-435 provide two or four 35W output channels. Response of ± 0.1dB from 20Hz to 20kHz with THD and IM distortion of less than 0.05% complements a noise figure of -100dB. Phase shift is ± 10% over audio spectrum. Current limiting provides output protection.

The BA-205 phono amplifier includes passive equalization networks, yet yields a ± 8dBm rated output with a 7mV Input RIAA and IEC response of ± 0.2dB (20Hz to 20kHz). THD is 0.01% with an IM distortion of 0.006% SMPTE-rated enhancing a signal-to-noise ratio of 85dB. Rumble filtering is centered at 40Hz. A maximum of + 28dBm across 600Ω is available.

Modular broadcast color camera

CEI has introduced the CEI 330, a compact high performance video EFP color camera, which is capable of operating 2400 feet from its electronics unit. It is possible to operate the system at distances of 4400 feet by using the CEI remote control package.

In developing the 330, CEI consolidated many of the electronics of the 310 into a digital transmission system package that attaches to the 310. The CEI 330 weighs less than 20 pounds.

CEI 330’s signal transmission is via interconnect, full bandwidth RGB microcable. The CEI 330 may be connected to TV 81 cable. The 330 is also available in a studio package.

Modular character generator

A microprocessor-controlled modular character generator, the Scriptel "P," has been announced by Unitel.

The Scriptel "P" includes these features: hardware programmed character generator (EPROM), single keyboard for editing and control, coaxial wires from keyboard to electronic unit, preview and broadcast pictures, 16 rows of 32 characters each page, internal memory of 16 to 32 pages, optional floppy disc (250 pages per disc), static transfer from preview to broadcast—complete, part, subtile, character by character; and dynamic transfer—3-speed roll and crawl.

Several of the options available for the Scriptel "P" include disc memory, time counter, computer connection, multi-graphism (both PROM and RAM), automatic "Subtel" subtitler and "Graphtel" font composer.

Teletext system

Logica has introduced CONTEXT, a comprehensive range of teletext systems based on the BBC CEEFAX system.

Each CONTEXT system provides full facilities for the preparation, editing and transmission of pages of information to TV viewers.

Each CONTEXT system is supplied as a complete working package, including all hardware and software and training in its use.

CONTEXT’s capabilities include the simple creation of text and graphics, in color, for news stories, magazine features, advertisements or entertainment; and parallel editing and transmission.

CONTEXT also has a flexible subtitling facility. In addition, CONTEXT has a comprehensive library that can hold several thousand pages of information, not currently being transmitted.

M-16 console

Tascam has announced the availability of the M-16, a new 16-track console. The new mixer can be configured with 16 or 24 input positions. There are eight main program mixing buses with submaster faders, eight main board outputs, two independent stereo mixing buses, four auxiliary mixing buses, 16 meters switchable to read bus or external source, and 16 x 2 monitoring with eight assignable effects returns. The M-16 has stereo solo in-place for input, monitor, and effects returns. All inputs have pre-fader-listen capability. During remix, the solo logic permits instant comparisons between effects send/receive. The M-16 also
features 4-band 8-knob parametric (sweep type) equalizers that may be switch bypassed and three filters (two high pass, one low pass). Faders are conductive plastic with a 100mm throw.

Display monitor
TSD Display Products Inc. is offering a 9-inch display monitor that provides a high-definition, sharp image presentation.

Features of the display include a wide video bandwidth of 25MHz, uniform focus characteristics across the screen, and horizontal retrace time that is typically less than 7 ms. Separate horizontal drive, vertical drive and video signal inputs, as well as a composite video, have made it possible to provide simple interface circuitry.

Tracking vibration recorder
Scientific-Atlanta Inc. has introduced a tracking vibration recorder, model 2521, which is a predictive maintenance tool for measuring vibration responses of rotating machinery. A self-contained recorder provides permanent records analysis and fault identification. The tracking feature records transitory effects and, when used with a strobe light, allows the user to observe a particular vibratory motion of the machine under test. This unit will perform laboratory measurements on engines, motors and turbine under field conditions.

Portable generator
Victor Duncan Inc. has introduced a 70kW portable generator that is packaged in a conventional Chevrolet van. The generator has a 600A capacity that can be used to power conventional ac lights, HMI lights or arc lights. Control and monitoring functions are automated, and attention has been given to noise attenuation and cooling requirements.

Studio lamp
A high-output energy-saving Sylvania fill-light for film, theatrical and TV studio use has been introduced by GTE. Called the Brite-Arc studio lamp, the 4000W light source provides about 1021m/W; which is ap-
The AUTOMATIC Audio Test System
That Measures...

- Harmonic Distortion
- Intermodulation Distortion
- Volts
- dB
- Signal + Noise / Noise Ratio
- Wow and Flutter
- Stereo Phasing
- Differential Gain in Stereo Channels

MODEL AT-51
AUDIO TEST SYSTEM

Contact Us Now For Complete Details And Descriptive Literature.

New products

proximately four times more efficient than incandescent or tungsten-halogen studio lamps. A medium-arc-length light source, the lamp provides a 370% higher level of daylight illumination than a 10,000W tungsten-halogen lamp adjusted for daylight with standard theatrical filters at a balance color temperature of 5600°K. The lamp has an average rated life of 500 hours compared to 300 hours for 10,000W tungsten-halogen lamps.

Digital generator
Siemens has announced the DAK digital audio indicative generator, which allows digital storage of short, repeated audio programs such as signature tunes, chimes and brief announcements. Audio programs are stored via digital signals in long-life semiconductor memories.

The indicative generator has a modular construction. It can be adapted to customer requirements and may be modified subsequently.

Two systems are available. The simpler system with non-linear 8-bit resolution is better suited for intercom and electro-acoustic systems and the elaborate non-linear 12-bit system is for high-grade studio recordings.

Set-up charts
AaRLO Enterprises has introduced a book of set-up charts called Flip Charts, intended for ENG location use and CCTV Systems. There are five 9"x12" charts: an EIA resolution chart graded to 800 lines; an EIA-type color camera registration chart for 3-tube cameras; an RS-170 9-step logarithmic reflectance chart; an EIA-type linearity (Ball) chart; and a color-bar chart for subjective in-field color reference. All charts, except the logarithmic reflectance, are laminated.

Digital stereo generator
C. N. Rood B. V. of the Netherlands has announced the immediate availability of its new 200 Series stereo generators and ancillary equipment. The SC-200 series stereo generator uses a patent pending sinusoidal switching system.

Typical specifications of the SC-200 stereo generator are 70dB channel separation; 0.01% harmonic distortion; 95dB signal-to-noise ratio; and 5-50°C temperature stability. Complete built-in test equipment is available.
Pick a number from 9 to 52!

You've just chosen the ideal DC voltage to phantom-power these new ATM electret microphones.

Introducing four "universal" phantom-powered electret microphones. Designed to work from external power, internal regulation automatically handles any voltage from 9 to 52 VDC without adapters, switches or rewiring. Just plug in and enjoy. With current drain a mere 0.3 mA at 9 volts (4 mA at 12-52 V) a 9 V battery lasts thousands of hours, not just the 60 or 70 hours typical of other models.

When your power supply isn't available, or isn't enough, use ours. The new AT8501 Dual Battery Supply holds two 9 V batteries. One to use, and one in reserve. Instant switchover and test LED eliminates guesswork, and spares are as near as the closest shopping center. Neat!

But convenience and versatility are just two of the advantages of the new ATM models. All-new electronics provide plenty of headroom inside the microphone with no more than 1% THD even when used in acoustic fields of 1-5 dB SPL. Which sets new standards for clean sound even close-up to big brass or inside a powerful drum kit.

And the sound you hear is wide-range and musical. Presence without peaks. Highs to 20,300 Hz but without a raspy "edge." Yet despite their responsiveness, these new ATM microphones have the "Road Tough" reliability served so often on stage and in the studio.

Before you add another microphone, compare our source, our convenience, our reliability, and our cost. Write for literature and list of nearby ATM microphone specialists. Get great sound...right from the start! AUDIO-TECHNICA U.S., INC., 1221 Commerce Drive, Stow, Ohio 44224. (216) 686-2300.

Circle (62) on Reply Card
Bentz named technical editor for Intertec's Broadcast Engineering/Spec Book

Carl Bentz has been named technical editor for Intertec Publishing Corporation’s Broadcast Engineering magazine and Spec Book. The announcement was made by Cameron Bishop, publisher of the Electronics Group.

Bentz holds an FCC 1st class license and joins the company with a solid background in TV engineering technology and cable engineering. He previously served as a staff engineer with KCPT-TV, Kansas City, MO, and performed functions including engineering maintenance, design and on-air programming.

As technical editor, Bentz will coordinate and advise all technical aspects of Broadcast Engineering magazine. Bentz makes BE the only publication in the field with an FCC 1st class licensed engineer on staff.

Bentz has also performed engineering operations and maintenance functions for five tower directional station KUDL-AM (now KCNW) and KUDL-FM. Bentz also directed engineering operations, productions and cable system maintenance for Telecable of Overland Park, KS, and served as a technical writer for aviation navigation electronics instruction manuals.

His background includes extensive tracking of FCC issues, record keeping for both the KCPT and KUDL stations, and editing and rewriting of sections of the FCC rule book pertaining to engineering.

Bentz is a graduate of the University of Kansas and Capital Radio Engineering Institute.

Mark Raduziner has been hired as marketing coordinator for Intertec Publishing Corporation’s Electronics Group which includes Broadcast Engineering, Radio y Television, Electronic Servicing and Video Systems. Raduziner joins the company with a strong background in publications, having previously served as a communications associate with McMartin Industries, a broadcast equipment manufacturer in Omaha, NE. As marketing coordinator, Raduziner will work on improving advertiser services and will coordinate marketing, sales activities and sales promotion functions for the Electronics Group. A graduate of the University of Nebraska, Raduziner holds degrees in journalism, speech and broadcasting.

3M has announced the appointment of Robert J. Youngquist as corporate scientist in its Professional Audio/Video Equipment Project. Youngquist is responsible for further advancement of digital audio and high-density digital recording technologies. He was research manager of the former Mincom Division, where he spearheaded development of the first commercially available digital multi-track recorder.

Rodger Winchell has been named national manager of federal government marketing for Sony Video Products Company. Winchell will coordinate sales of all products from the Sony Video Communications and Broadcast Divisions to the federal government and federally funded accounts.

The International Radio and Television Society Inc. "Broadcaster of the Year" award was presented to Phil Donahue during the 1981 IRTS Convention held in May in New York. Ave Butensky, IRTS president, presented the award.

During the 36th Annual International Conference of the Radio Television News Directors Association to be held September 10-12 in New Orleans, LA, Walter Cronkite will be presented with the 1981 Paul White Memorial Award. Cronkite previously received the award, a memorial to journalist Paul White, in 1970.

Michael C. Rau has been appointed to the newly created position of staff engineer for the National Association of Broadcasters. Rau, a graduate of Clarkson College, has served as a consulting engineer with Jules Cohen & Associates, was director of engineering for Rau Radio Stations, and has worked in the radio broadcasting industry in many positions from announcer and music director to chief engineer.

Skip Finley, president of Sheridan Broadcasting Network, Arlington, VA, replaces Thomas E. McKinney on the NAB Radio Board of Directors. Starting as a floor director in 1971, Finley moved through various broadcasting capacities before joining Sheridan Broadcasting as vice president and general manager of the Radio Division in 1979.

David Zandan has been appointed eastern regional sales manager for Edutron Inc. Before joining Edutron, Zandan was vice president of Fortel Inc., a distributor of Faroudja Laboratories products.

Arnold Taylor has joined Compact Video Systems as president of Compact Video Sales and also as group vice president of manufacturing. As group vice president, Taylor is responsible for Compact's three manufacturing divisions, Skippan Lighting, RTS Systems and Compact Video Sales.

Charles P. Coovert has been appointed general manager of the audio products group for the Ampex Audio-Video Systems Division. Coovert will be responsible for the development, manufacturing and marketing of all Ampex audio products.

Alpha Wire Corporation named the following district managers: Karl Rankin, Tom Sawyer, Charles Sims,
Bradford Coleman, Kevin McClure, Daniel Delavie, Wayne Eisel, Don Paton and Sean O’Callaghan. They are responsible for electronic sales in their districts.

BGW Systems Inc. has announced that two new regional sales managers have been hired by the firm. Jim Edwards is the new BGW regional sales manager for the Central region (based in the Chicago area). Gordon Hawks is BGW’s new regional sales manager for the South-Central region (based in the Dayton, OH area).

Richard J. (Dick) Lutz, former executive producer with WQED Pittsburgh, and special assistant to the president of Metropolitan Pittsburgh Public Broadcasting Inc., has joined Logica Inc. as US database manager for Prestel International. Lutz will select and support American providers of information for Prestel worldwide.

McMartin Industries has announced the appointment of three new Audio/SCA managers: James Starkloff, manager for the eastern region; Jay McMartin, manager for the western region; and Joseph Krier for the central region. Each manager is responsible for coordinating the efforts of McMartin’s Engineered and Commercial Sound representatives in his area.

William Park, to vice president, Marketing, Sony Broadcast, from national sales manager; Frank Brown, to vice president, Engineering, Sony Broadcast, from general manager, Engineering.

HM Electronics Inc. has appointed Robert W. Carr as marketing manager. Coming to HME with more than 30 years background in engineering and marketing functions at Shure Bros. Inc., Carr will be responsible for the expansion of marketing and product planning activities. R. Dale Scott will continue as national sales manager and John F. Kenyon has been promoted to assistant sales manager.

Sandra Palmer has been named general manager of Transportable Earth Stations Inc. Palmer will oversee the scheduling of the TES fleet of portable uplink earth stations and satellite broadcast facilities as well as supervise an aggressive sales and marketing plan, among other duties. Before joining the Burbank based firm, she served as president for a Vail, Colorado land development concern and also served for several years as an executive at Compact Video Trucks.

Effective early this year, John Walter is vice-president and general manager, Leitch Video Ltd. At the same time, Don Jackson was appointed vice-president, engineering.

Jerrold division of General Instrument announced appointment of Anthony J. Aukstikalnis as vice president, engineering, Subscriber Terminal Systems. Aukstikalnis was most recently manager of the advanced development program at RCA’s Astro electronics division and has held management positions in the defense meteorological satellite program and the missile satellite program.
new literature

Solid-state emitters
A 24-page product guide providing tabulated data and outline configurations for RCA's line of solid-state emitters has been released by RCA Electro-Optics and Devices, Lancaster, PA. The product guide, SSE-100, features an applications section depicting schematics of typical drive circuits for IR emitting diodes and injection lasers. Selection guides are also included. Copies may be obtained by writing to RCA, Box 3200, Somerville, NJ 08876.

Television technology
A new book, "Television Technology in the 80's," has been published by the Society of Motion Picture and Television Engineers (SMPTe). The 240-page book costs $30, less a 20% discount to SMPTE members, and is available from SMPTE Books, 862 Scarsdale Ave., Scarsdale, NY 10583. The new book contains 22 papers plus a panel discussion that were presented at the SMPTE Television Conference in February 1981 in San Francisco. It covers many areas of TV's developing technologies, including digital video recording, digital techniques, the completely digital studio, new camera technology and high definition television.

Capacitors
A 10-page, tab-indexed catalog of capacitors, published by KD Components Inc., contains information for the prospective user of KD's 125° to 300°C high and low voltage ceramic, chip and mica capacitors. The booklet is illustrated by photos, diagrams and a variety of size/capacitance/voltage tables.

Coaxial and RF switching relays
The revised "Coaxial & RF Switching Relays" catalog released by Magnecraft Electric Company contains information about various types of coaxial relays designed for minimum size and weight, ac or dc operation, with time delay, auxiliary contacts and mechanical latching and unshielded RF switching relays are also included. For a free copy or more information, contact: Al Cooper, Magnecraft Electric Co., 5575 North Lynch Ave., Chicago, IL 60630; (312) 282-5500 Ext. 422.

Engineering products
An engineering handbook from Kerrigan-Lewis Wire Products describes their film-insulated and yarn-covered magnet, litz and resistance wires. Also included are valuable tables covering resistance corrosion factors, temperature conversions and decimal equivalents. For more information contact: Kerrigan-Lewis Wire Products, 4421 W. Rice St., Chicago, IL 60651; (312) 772-7208.

Technical books
More than 300 technical books are described in the "1981 Catalog of Sams Technical Books." The catalog, which includes 23 new titles, covers these areas: audio and hi-fi; communications; computers; electronics; industry; motors, engines, electrical appliances; radio and television; reference and mathematics; and servicing and troubleshooting.

3M products
About 150 3M products, grouped by major segments of the communications industry, are described in a multipage, 4-color brochure. The products range from abrasives to videotape recorders.

Low-noise amplifier
A release by the International Microwave Corporation, titled "Low Noise Amplifier Bulletin," describes an amplifier designed for earth terminal use. The bulletin provides general information, a list of key features, a photograph of the amplifier system and complete specifications for different models. For more information, contact: International Microwave Corporation, 33 River Road, Cos Cob, CT 06807.
We promise to tell the truth
the whole truth and nothing but the truth.
So help us BPA.

As a member of BPA (Business Publications Audit of Circulation, Inc.) this magazine subscribes to the principle that it takes more than good faith to earn the business of advertisers. It takes good figures.

BPA, an independent, not-for-profit organization, audits our circulation data to make sure that advertisers get exactly what they pay for: you.

Once a year, BPA auditors examine our circulation list to make sure it’s correct and up to date.

The audit makes sure you are who we say you are. It verifies your name, your company, your industry and your job title. This information enables our advertisers to determine if they’re saying the right thing to the right people in the right place.

It also gives us a precise picture of who you are and, therefore, a good idea of what you want as a reader.


We make sure you get what you pay for.
Even employees who have been with you for years can still learn something new.

Tell them about Direct Deposit. Their Social Security or other Government checks go straight to wherever they have a checking or savings account. It's never too late to make life easier for yourself. And to know your money's safe and sound.

DIRECT DEPOSIT

Even employees who have been with you for years can still learn something new.

Tell them about Direct Deposit. Their Social Security or other Government checks go straight to wherever they have a checking or savings account. It's never too late to make life easier for yourself. And to know your money's safe and sound.
Richard Brown thought he was too young to have a stroke. He wasn’t.

Because having a family, a good job, and a bright future doesn’t protect anyone from a stroke. In fact, nearly one million Americans — many with those assets — die of heart disease and stroke each year. And 200,000 of them die “too young.”

The American Heart Association is fighting to reduce early death and disability from heart disease and stroke with research, professional and public education, and community service programs. But more needs to be done.

You can help us support research and education by sending your dollars today to your local Heart Association, listed in your telephone directory.

Put your money where your Heart is.
HELP WANTED

WJBV-TV IS LOOKING FOR AN EXPERIENCED broadcast engineer. Applicants must have ENG maintenance experience and some transmitter experience would be helpful. Duties will include studio maintenance on RCA and Ampex equipment. An excellent opportunity to be with the most reputable station. Excellent salary and benefits. Send resumes to: Doug Moore, WJBV-TV, P.O. Box 1404, Augusta, GA 30903. An equal opportunity employer.

HELP WANTED

MAINTENANCE ENGINEER GO FOR GROWTH IN EAST TEXAS

If you have an FCC radio telephone 1st Class license, demonstrate your expertise with a growth-oriented TV broadcast facility in Lufkin, Texas. You'll maintain the station’s electronic equipment in accordance with mfr.’s specifications, the station’s high standards policy and FCC regulations. ENG equipment and transmitter experience with a definite plus. Starting salary commensurate with experience and ability. Send your resume or letter to:

Personnel Dept.
KTEP
P.O. Box 729
Lufkin, TX 75901

An Equal Opportunity Employer M/F

The Grass Valley Group, Inc.
A Tektronix Company

Field Service Engineers

The Grass Valley Group, Inc., a leading manufacturer of television broadcast equipment, is looking for people who want challenging professional positions. Openings exist in California, Indiana, New Jersey, and Georgia.

These challenging positions combine chances for U.S. travel plus marketing and engineering career opportunities. Individuals with experience designing and/or maintaining television broadcast systems are required to provide after-sales support for our wide variety of complex systems.

Interested and qualified candidates are invited to send a resume in confidence to Sylvia Smith, The Grass Valley Group, Inc., P.O. Box 1114, Grass Valley, CA 95945. An Equal Opportunity Employer M/F/H.

HELP WANTED


MISCELLANEOUS FOR SALE

VIDEO T-SHIRTS. TV DESIGNED, preshrink T-Shirts. Our four designs are "Reg. and Flag, Chart, "GLITCH", "RESOLUTION" and chart, and "VIDEOMAN" PEOPLE DO IT IN SYNC". $8.50 each and $2 handling. Send check or money order for at least 200 shirts to INTERPRET, 109 MINNA ST., SUITE 254, SAN FRANCISCO, CA 94105.

HELP WANTED

TRICOMM Productions - Hilton Head Island, SC

455-1514. Available immediately.

HELP WANTED

Paraphase Lemo Lenco Gates Gates Amsat


MICROPROCESSORS FOR SALE

RCA TR-76 camera with lens. Excellent condition, low hours. $24,000.00. 206-392-3011.

LATE MODEL SATICON equipped Hitachi SK-90 color camera, low hours. $24,000.00. 206-392-3011.

HELP WANTED

HELP WANTED

MISCELLANEOUS FOR SALE

HELP WANTED

HELP WANTED

LATE MODEL SATICON equipped Hitachi SK-90 color camera, low hours. $24,000.00. 206-392-3011.

HELP WANTED
HELP WANTED (CONT.)

TV STUDIO MAINTENANCE TECHNICIAN: Independent commercial VHF station in 14th market seeks Television Technician with valid FCC 1st class Radio/TV Operator's License, familiarity with latest broadcast equipment, minimum 2 years experience. Send resumes to Dept. BE, KCPO Channel 13, P.O. Box 98828, Tacoma, WA 98499. EOE. 8-81

VIDEO DESIGN ENGINEER: One of the largest manufacturers in video industry seeking aggressive persons with strong background in circuit design. Excellent salary and fringe benefits, including profit sharing. Send resume to: Dept. 542, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 8-81

Room At The Top

WGBH Boston has an immediate opening for an Assistant Chief Engineer—Maintenance and Design. Candidates for this management position must have a thorough understanding of both new and order equipment. Good salary and benefits. Send resume to: WGBH, Personnel (A-95), 125 Western Ave., Boston, MA 02134, Deadline: August 15, 1981. 8-81

WGBH

WGBH is an equal opportunity employer.

DIRECTOR OF ENGINEERING BROADCAST ELECTRONICS, INC.

Outstanding opportunity for a high technology oriented take charge professional with proven management skills to direct the engineering activities of rapidly growing equipment manufacturer. The ideal candidate will have a BSEE or MSEE with broad knowledge and recent experience in managing new product programs in radio or television broadcast products such as audio, digital and RF transmitters.

In addition to an excellent remuneration package, the overall benefit program includes a Profit Sharing Plan. Located in a pleasant mid-western city of 50,000 population, Broadcast Electronics offers an exceptional working environment in a modern headquarters engineering/manufacturing complex.

Please send resume in full confidence to: President, Broadcast Electronics, Inc.

INTERNATIONAL OPPORTUNITIES FOR AUDIOVISUAL SPECIALISTS

The King Faisal Specialist Hospital and Research Centre has current openings in its Audiovisual Department. The Hospital is a 250-bed specialty referral facility with a rapidly expanding Audiovisual Department. The following positions are available:

Television Engineer—B.S. degree in Electronic Engineering with five years practical experience in maintenance and repair of television and video equipment. Must have experience setting up and use of test equipment.

Television Technician—A.S. degree in Electronics or two years trade school with five years experience maintaining and repairing television and video systems. Both positions offer good salaries, 30-day annual paid vacation, transportation, furnished housing, bonus pay, and more. Interested candidates should send a resume to: Linda Higin, Senior International Representative, Hospital Corporation International, One Park Plaza, Nashville, Tennessee 37202. An Equal Opportunity Employer. 8-81

ARABIAN GULF OPPORTUNITIES

HAMAD GENERAL HOSPITAL—In the center of a health care for the people of Qatar—Qatar is an independent State, located adjacent to Saudi Arabia on a peninsula surrounded by the Arabian Gulf. The capital city of Doha, the new 660 bed GRAND GENERAL HOSPITAL, offers the following opportunities for experienced professionals.

CREATIVE WRITER/PRINT and AV materials knowledge of medical terminology and Arabic culture and language helpful but not necessary

VC PRODUCER/DIRECTOR will develop taped productions for public information and staff training

CHIEF GRAPHIC ARTISTIC ARTISTS/D Design and Production of printed material: graphics, titles and illustrations for audio-visual and TV productions

TV MAINTENANCE ENGINEER (P. A. L. System) must be able to set-up, troubleshoot and maintain state-of-the-art TV cameras, switches and related equipment; general AV maintenance also necessary.

HOSPITAL CORPORATION OF AMERICA offers

INTERNATIONAL (Hospital Corporation of America)

HOSPITAL CORPORATION OF AMERICA offers opportunities in the capital city of Doha, the new 660 bed GRAND GENERAL HOSPITAL, offers the following opportunities for experienced professionals:

CREATIVE WRITER/PRINT and AV materials knowledge of medical terminology and Arabic culture and language helpful but not necessary

VC PRODUCER/DIRECTOR will develop taped productions for public information and staff training

CHIEF GRAPHIC ARTISTIC ARTISTS/D Design and Production of printed material: graphics, titles and illustrations for audio-visual and TV productions

TV MAINTENANCE ENGINEER (P. A. L. System) must be able to set-up, troubleshoot and maintain state-of-the-art TV cameras, switches and related equipment; general AV maintenance also necessary.

*PORTFOLIOS REQUIRED AT TIME OF INTERVIEW*

Enjoy uncrowded beaches and the clear turquoise waters of the Arabian Gulf. Explore life in a different culture and advance in your health services career at HAMAD GENERAL HOSPITAL. Salaries are attractive, and benefits are excellent. Interviews will be held in the U.S. during the summer of 1981.

If interested, send complete resume with telephone numbers to: Mr. Richard Schippera, Chief Executive Officer, HAMAD GENERAL HOSPITAL, c/o U.A.I.H. (B), 390A Brookline Avenue, Boston, MA 02215.
HELP WANTED (CONT.)

SÉNIOR RADIO AND ELECTRONIC TECHNICIAN: $17,19-$18,596 beginning salary. To install, maintain, and repair radio and television equipment. Minimum of 3 years of experience in design and repair of solid state and tube type electronic circuits or combination of education and experience. TELEVISION ELECTRONICS TECHNICIAN: $15,254-$17,679 beginning salary. Experience in the installation, adjustment and repair of color and black and white television equipment, including repair of studio equipment. Closing date to file district application is September 11, 1981. Radio and TV Community College District, 1570 East Colorado Blvd., Pasadena, CA 91106. Telephone: (213) 578-7388. EOE/AA. 8-81-11

DESIGN ENGINEERS

Excellent career opportunities are immediately available with Broadcast Electronics, a fast growing radio equipment manufacturer. You will find the art design tasks exceptionally challenging and the working environment in a 50,000 square foot headquarters complex pleasant and stimulating. Excellent company benefits, including Profit Sharing Plan.

AUDIO ENGINEER

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