Links in the broadcast audio chain
Rev into stereo—
With the remarkable new FP32 ENG Mixer.

Introducing the stereo version of our legendary FP31.
Stereo adds incredible dimension and realism to sports and news coverage. And Shure's new compact FP32 Stereo Mixer makes ENG and EFP applications easy and economical.

Consider these advantages:
- Three transformer-coupled XLR isolated inputs and stereo outputs, all switchable to low-impedance mic or line level.
- Dual mini and 1/4" stereo headphone jacks.
- Built-in slate mic and slate tone.
- Battery, phantom, and A/B power (no special power supplies needed).

Plus new stereo advantages:
- Full stereo capability with separate, detented stereo pan pots and monitoring capability.
- Full 48 volt phantom capability.
- Size? Only 2 5/16" x 7 1/4" x 6", comparable to our FP31.
- Weight? Just 2 1/2 pounds.
- Price? Hundreds less than you would expect. Stereo is here to stay. So is the FP32.

For complete information about our full line of field production gear, write or call: Shure Brothers Inc., 222 Hartrey Avenue, Evanston, IL 60202-3696. (312) 866-2553

The new FP42 Stereo Production Mixer — the stereo counterpart to our M267. Four channels with independent center detented pan pots and cuing. Headphone amplifier. Adjustable limiters.
The DIP5-270 Time Base Corrector.

The Last Word in Time Base Correction.

Well Actually, Here’s the Last Word... $2,995.

THE DPS-270 Time Base Corrector. True S-VHS Y/C component processing – at a more than affordable price. The DPS-270 offers S-VHS Y/C and NTSC composite inputs and outputs, as well as a 5.5 MHz bandwidth. This makes the DPS-270 compatible with any 3/4” VTR that accepts external sync and subcarrier. And the unit also provides Y/C to NTSC encoding and NTSC to Y/C decoding.

A Quasi-infinite window shuttling circuit gives you a stable picture during tape shuttle and horizontal and vertical Y/C delay controls compensate for the Y/C offset inherent in some S-VHS recorders.

The DPS-270 also offers many available and affordable interface options. Like automatic field correction, chrominance noise reduction and remote control.

So for those of you as concerned about value as you are about quality, remember...one last word...$2,995. As always backed by Midwest.

For more technical and sales information contact your nearest Midwest office.

Circle (3) on Reply Card
IMPROVING YOUR AUDIO PRODUCT:
The quality of broadcast audio never has been more important. Radio and TV stations today are competing with alternative entertainment media that offer consumers superb technical performance. For broadcasters to compete effectively, stations must ensure that their systems are up to par. We examine the state of the audio art this month with the following articles:

26 Control-Room Monitoring Systems
By Brad Dick, technical editor
Control-room monitor speakers must be carefully integrated into a room's overall design.

42 Using Close-Field Monitors
By Jeff Blenkinsopp, audio consultant
Small speakers can provide big advantages in studio monitoring.

56 Planning for an Audio Routing Switcher
By David L. Bytheway, BTS
Audio routers can increase productivity and minimize problems.

OTHER FEATURES:

90 Managing Satellite Operations
By Richard Maddox, Muzak
To effectively manage a satellite operation, you have to stay on your toes and keep everything at your fingertips.

100 Setting Standards for the Future
By Don McCroskey, BE consulting editor
Standards: Are they friend for foe?

ON THE COVER
The audience is always watching. It's also listening. Today's listeners have been exposed to a broad spectrum of audio quality. They've heard the best, and that's what they expect from your station. If missing links in your audio chain have undermined the sound of your station, it will not go unnoticed. Take time now to examine your audio systems and make improvements. Our cover shows the post audio suite at HBO Studio Productions. (Photo by Bill Buchner.)
It takes plenty of guts to back our products this solidly.

At QEI, we back our products — and our customers. Our power tubes, for example, carry the best warranty in the industry: 15,000 hours or 2 years. And only QEI includes a FREE comprehensive spare parts kit with every FMQ transmitter, exciter and remote control. Experience shows that you may never use more than 2 or 3 of these "guts". But since we can't be certain which 2 or 3, our kits include ICs, transistors, lamps, diodes, fuses — everything you're unlikely to need.

24 HOUR SERVICE HOTLINE
Giving you the most complete spare parts kits in the industry is just the first step in a customer support program that lasts as long as your QEI transmitter. If you need expert advice on installing a spare whatever, call us any time at 609-726-2020, day or night. And if you ever need factory parts support, we can deliver — fast. We're just 1/2 hour from Philadelphia International Airport, not out in the middle of nowhere.

MAXIMUM EARNING POWER
You can count on it with every QEI transmitter, because we design them to stay on the air. And as a fully integrated company dedicated to RF and transmission products, we're able to build in quality and reliability — and still maintain our value advantage.

No wonder stations in both large and small markets have been using QEI products as long as we've been making them — since 1971. During that time we've put over 1300 exciters, more than 450 transmitters and over 1000 modulation monitors in service.

GET THE FACTS
When it comes to standing behind our products — and our stations — we're way ahead of the competition. That may make other manufacturers nervous, but it makes QEI customers very satisfied. Call us at 800-334-9154, toll-free, for all the facts on the transmitters that deliver a solid return on your investment: the QEI "New Reliables."

Quality • Engineering • Innovation
QEI Corporation • One Airport Drive, P.O. Box D
Williamstown, New Jersey 08094
Toll free 800-334-9154 • Fax 609-629-1751

Circle (4) on Reply Card
By Paula Janicke, staff editor

NAB takes position on lottery proposal

The National Association of Broadcasters has stated its opposition to the FCC proposal to use a lottery system in the selection of applicants for new broadcast stations. The association suggested that the commission reform its comparative licensing process instead.

Expressing concern that a lottery system would leave the selection of licensees to a “roll of the dice,” NAB said the modifications that already have been enacted or proposed for the license application form would be enough to eliminate sham applications and reduce the backlog. The association fears that a lottery system, which would allow preferences only for diversity of ownership and minority ownership, would “handicap daytime-only licensees, local residents and female applicants.”

According to the NAB, the lottery procedures should not apply to pending applications, including Docket 80-90 cases, because of the adverse effect they would have on existing applicants.

Waiver urged for reducing interference

In response to an FCC notice of rulemaking proposing acceptance of “contingent applications” filed by co-channel or adjacent-channel AM stations, the NAB has urged adoption of a waiver policy. In such an application, a station would agree to expand or reduce service in conjunction with another’s application. Although the association agrees with the commission’s goal of reducing interference on the AM band, it says that the interference problems would be better solved by a waiver policy, not rule changes.

NAB also reiterated its opposition to “negotiation of interference rights,” whereby service area size and station-to-station interference patterns would be determined by broadcasters rather than by the commission. If it took the proposed waiver approach, the commission would accept and process only certain AM “contingent applications” meant to decrease interference. The agency would be required to make a full public interest evaluation, assessing the amount of AM interference to be reduced as well as how the levels of broadcast localism would be affected by the granting of contingent applications.

The association recommends that the applications be reviewed by the commission on a case-by-case basis, and only when one of the applicants proposes to cease broadcast operation.

Megapower short-wave transmitter goes on air

The world’s most powerful, privately owned short-wave transmitting station, completed as part of a turnkey project in Cypress Creek, SC, has been turned over to operations by co-channel or adjacent-channel AM stations, the NAB has urged adoption of a waiver policy. In such an application, a station would agree to expand or reduce service in conjunction with another’s application. Although the association agrees with the commission’s goal of reducing interference on the AM band, it says that the interference problems would be better solved by a waiver policy, not rule changes.

NAB also reiterated its opposition to “negotiation of interference rights,” whereby service area size and station-to-station interference patterns would be determined by broadcasters rather than by the commission. If it took the proposed waiver approach, the commission would accept and process only certain AM “contingent applications” meant to decrease interference. The agency would be required to make a full public interest evaluation, assessing the amount of AM interference to be reduced as well as how the levels of broadcast localism would be affected by the granting of contingent applications.

The association recommends that the applications be reviewed by the commission on a case-by-case basis, and only when one of the applicants proposes to cease broadcast operation.

The world’s most powerful, privately owned short-wave transmitting station, completed as part of a turnkey project in Cypress Creek, SC, has been turned over to operations.
Leader meets the standards of so many, because we set such high standards in design.

Equip your bench with our standard test equipment as required by manufacturers. Leader continually consults manufacturers and their service facilities to determine what products and features you’ll need. The unique features on Leader equipment help you work smarter and increase efficiency.

You’ll find hard-to-beat capabilities and value throughout the Leader line.

See all there is to Leader’s leadership, and benefit from our more than 34 years of experience. Phone now to discuss your equipment requirements, for a copy of our catalog, and for the name of your nearest “Select” Leader Distributor. All Leader equipment is backed by a TWO-YEAR WARRANTY, and factory service on both coasts.

Circle (5) on Reply Card for Product Demonstration
Circle (6) on Reply Card for Product Information

1. LCG-400S NTSC Pattern Generator
2. LVS-5850B NTSC Vectorscope
3. LDC-823S 250-MHz Frequency Counter
4. LMS-238 TV Stereo Generator
5. 3216 AM/FM Stereo Generator
6. LHM-80B High Voltage Meter
7. LSW-333 TV Sweep Generator
8. LAG-126S Audio Generator
9. LMV-185A AC Millivoltmeter
10. LFM-39A Wow & Flutter Meter
11. LDM-171 Distortion Meter
12. LTC-906 Transistor Checker
13. LDM-853A Digital Multimeter
14. LPS-152 DC Power Supply
15. LPM-800 Laser Power Meter
16. LBO-2050 CRT Readout Oscilloscope
Managing the future together

Trying to stay ahead of broadcast technology is like running in front of a moving freight train — pause for a second, and you get run over.

Broadcast engineers face a formidable challenge today in maintaining their technical skills. As broadcast technology advances, so too must the abilities of those who install, repair and manage the system. Without continued education, the engineer does not learn how to deal with today's equipment.

Unfortunately, the need to refresh one's skills and perspective sometimes falls a distant second to just keeping the station on the air. It now requires a major effort for many engineers and technical managers to keep abreast of the constantly changing state-of-the-art. The Society of Broadcast Engineers recognized this problem years ago and has worked hard to develop programs that help its members keep up with technological advancements.

For the past three years, the SBE has held a national convention, a major part of which is the highly successful Broadcast Engineering conference. At this year's convention in Kansas City, MO, the BE conference again will offer attendees the opportunity to expand their knowledge and improve their engineering management skills.

The seminars will cover both radio and TV issues, ranging from automation to video, and they are designed to address the key issues facing today's engineers. Attendees will receive practical and useful information that can be applied immediately at their stations. Because the radio and TV sessions are scheduled concurrently, attendees will have more presentations to choose from than at previous SBE conventions. Also, the seminars are scheduled so as not to conflict with exhibit floor hours, meaning attendees don't have to choose between participating in seminars and visiting exhibits.

Another component has been added to this year's convention. The Ennes Education Foundation is sponsoring a series of special workshops to be held Wednesday, Oct. 4, the day before the convention opens. The workshops are designed to meet a long-standing need for equipment-specific, hands-on training.

The daylong workshops will be conducted by broadcast equipment manufacturers and others who are familiar with what engineers and technical managers need to know to perform their jobs. The workshops provide what, until now, has been missing from other conventions: hands-on factory training on broadcast equipment. Attendees will receive the same kind of training they would get at a manufacturer's technical school.

And, as if that weren't enough, the 1989 SBE convention will mark the society's 25th anniversary. It's the perfect opportunity to celebrate! A festive silver anniversary party is planned, including a special dinner speaker, live entertainment and even a present for everyone who attends.

The convention committee has assembled a winning combination of educational and fun-filled events for the celebration. Combine business and pleasure by attending the 1989 SBE Convention and Broadcast Engineering Conference, Oct. 5-8 in Kansas City.

Brad Dick, technical editor
The Audio Processor Classic.
And the one that endures.

In the arduous two-year development project that produced the 8100A OPTIMOD-FM®, there was always one overriding principle:

While providing competitive loudness where needed, the processor must have an utterly natural, musical sound that not only attracts an audience, but holds it.

Processing artifacts that cause listener fatigue and tune-outs were simply unacceptable. Loudness at the expense of good sound is never worth the price. (A listener can compensate for loudness by simply adjusting the volume control. But there is nothing the listener can do to make a dirty signal sound clean again, except change to another station!)

The development project resulted in a classic. The most popular FM processor ever. The processor that helped build audience and ratings for thousands of stations. The processor that was the unchanging, indispensable core of countless customized processing setups. The processor with impeccable quality and rock-solid reliability. And the processor backed up with uniquely responsive Customer Service.

Today, OPTIMOD-FM has evolved into a complete system capable of serving any processing goal, and of fitting into any STL environment, thanks to OPTIMOD-FM's accessories. While other processors have come and gone, OPTIMOD-FM's audio quality has yet to be equaled by anyone, regardless of their bells, whistles, or flashing lights. It's the right choice for any station — because it's the one processor that you won't throw away.

OPTIMOD-FM 8100A/1. The Audio Processor Classic. The one that endures.

Call your Orban Broadcast Dealer for our new OPTIMOD-FM brochure, or call us direct.
A/B cable switch requirement imposed

By Harry C. Martin

Beginning Nov. 1, cable TV operators must notify their subscribers that cable systems are legally required to make available an input (A/B) switch that will permit subscribers to choose between cable programming and off-air television.

The A/B switch rule was adopted several years ago as part of the package that included must-carry rules for local TV signals. The must-carry rules, however, were struck down as unconstitutional in December 1987 by the U.S. Court of Appeals, Washington, DC. In its decision, the court remanded to the FCC the issue of whether the A/B switch requirement, as well as accompanying rules requiring consumer education about the switching system, still should be imposed.

The A/B switch and related consumer education requirements are controversial because most dwellings do not have outdoor antennas. Citing this fact, commissioner James Quello dissented from the decision, saying that the switch requirements will not accomplish their purpose and will needlessly burden cable systems with an obligation that will not be effective in making local on-air signals available.

The commission also has revised its rules dealing with the way off-the-air broadcast programs are carried. Under the new rule, cable systems must carry in full all programs they pick up off the air. The previous rule, Section 76.62(a)(1), required that each signal carried by a cable system must be carried in full, without deletion or alteration.

Quello criticized this new rule also, saying the Court of Appeals ruling did not preclude the commission from imposing manner-of-carry rules for signals that are carried voluntarily by cable operators. He said the new rules would permit cable systems to "cherry pick" specific local programs, thereby creating a composite channel consisting of only the best programming from each local station.

EEO standards enforced

In a decision involving the renewal applications of an AM/FM licensee in Maryland, the commission imposed a short-term renewal, reporting conditions and a $15,000 fine because the stations repeatedly failed to comply with equal employment opportunity requirements.

The commission's rules require broadcasters to establish and maintain an affirmative action program reflecting positive and continuing efforts to recruit, employ and promote qualified women and minorities. To comply with these rules, stations must keep detailed records of their recruitment sources, and the race and sex of each person referred by each source. These records must be used to conduct self-evaluations of minority recruitment programs and to report the results of such programs at renewal time.

Stations who can show their recruitment efforts have produced a reasonable number of minority and female job applicants will be considered as having complied with the EEO rules, even if their employment profiles do not fully meet FCC guidelines. On the other hand, stations whose employment profiles do not meet the guidelines and who cannot show that they have tried to recruit minorities or women will face EEO reporting conditions, short-term renewal, fines or license revocation.

The Maryland stations subject to these sanctions operated in an employment area where 19.1% of the workforce was black. But the stations' annual employment reports (Forms 395) revealed an absence of blacks on the stations' full-time staffs. The reports also revealed that two blacks on the full-time staff in 1986 had left and that no other blacks had been hired.

In response to an FCC inquiry, the licensee indicated that it had used minority recruitment sources for only 14 of the 33 positions that had opened in 1987 and 1988. These contacts resulted in only two minority referrals and no minority hires. Further inquiry from the commission staff indicated that the licensee did not begin using minority recruitment sources until the last year of its license term. Because the station failed to seek minority and female applicants and did not engage in continuing self-assessment to evaluate its EEO program, the commission held that it has failed to comply with the affirmative action provisions of the agency's rules.

Based on the commission's action in this and other renewal cases, it is essential that all licensees with full-time staffs of five or more persons implement specific minority and female recruitment programs and keep careful records of the results.

Changes proposed to comparative process

In response to the commission's Jan. 30 proposal to abandon the comparative hearing process and adopt lotteries to decide among competing applicants for broadcast facilities, the Federal Communications Bar Association (FCBA) has proposed specific reforms that would eliminate many of the problems the commission says would be solved by lotteries.

The FCBA's comments on the lottery proposal included the following specific reform proposals:

- Unlimited settlement payoffs and non-party buyouts should be stopped for all future filings.
- In future comparative proceedings, the commission should award management "integration" credit on the basis of equity interests rather than voting power.
- The commission should apply its new Form 301 disclosure requirements to all pending AM, FM and TV applications. The new form, which will become available this summer, requires disclosure of integration plans, the source of financial commitments, and the identity of all equity owners (whether or not they are "passive").
- Comparative grantees should not be permitted to transfer their licenses before two years of operation.
- The commission should impose upon itself a limited time period for review of appeals in comparative cases. Presently, appeals from decisions of the FCC's review board often are not decided by the full commission for one or two years.
- Because of the announced departure of FCC chairman Dennis Patrick, as well as the other vacancies on the commission, action on the lottery proposal is not expected for many months.

Editor's note: For additional FCC information, IGO BPFORUM on CompuServe.
Championship Performance.

For a champion, being the best is not enough. You never stop trying to be just a little better. To move the standard a little higher. To make even the most difficult achievements seem easy.

So it is with the Model 300 production system, the recognized world standard. Now in more than 800 installations worldwide, the Model 300 continues to offer you more.

Full integration and centralized control of the Kaleidoscope Digital Effects System puts state-of-the-art, three-dimensional digital effects at your fingertips. Giving you the world’s most advanced and powerful production system. And, the easiest to operate.

When you own a Model 300 with built-in Kaleidoscope Digital Effects System, championship performances are almost effortless.

For details, contact the Grass Valley Group office nearest you.

The Model 300 Production System, integrated with the Kaleidoscope™ Digital Effects System.
VBI heats up

By Rick Lehtinen,
TV technical editor

Progressive telecasters long have looked to the vertical blanking interval (VBI) as a prime piece of "real estate" in which to package extra signals. VBI signals can ride for free, because the VBI always is transmitted, whether or not there are extra signals. Marketing the ancillary signals, however, has proved frustrating. Even though closed captioning for the hearing-impaired has been moderately successful, other forms of teletext seem to have suffered a slow start. This may be changing, however, because teletext producers have refined their techniques and capabilities so that they now can distribute valuable information in a timely manner.

Extravision

One pioneer on the teletext trail, KSL-TV in Salt Lake City, recently has begun acting as the program source for the entire CBS Extravision network. At this time, KSL's teletext system benefits viewers by accessing some of the power of the station's Newstar newsroom computer. International news briefs, for instance, are played back on teletext as quickly as the wire service dispatches them. Sports briefs are updated frequently. The S&P 500 stock issues, additional stocks of local interest and 32 key commodities issues are transmitted continuously. During elections, comprehensive results are transmitted as quickly as they are assimilated by the station's election system. The interface to wire information adds a dimension of timeliness to the teletext service, which is beginning to attract sponsor attention.

An additional market for teletext is "point-to-multipoint" data distribution. RS-232 ports on certain teletext decoders allow data transmission to either a printer or computer at the customer's location. A company with a message to transmit, such as a list of price updates or a list of bad-check passers known to be in the area, can dial into the teletext headquarters and transmit information via modem. The teletext system automatically transmits this information on special closed pages of the teletext magazine. Decoders in the field, modified to receive such messages in addition to regular teletext services, then deliver the data.

KSL is investigating a way to allow teletext decoders to receive the closed captioning transmitted as part of the Extravision teletext package, as well as the line-21 captioning used by National Closed Captioning Institute standard decoders.

For the viewer's convenience, the current decoders, which are manufactured by Samsung, include TV volume, channel selection and "on-off" controls. The decoders connect to the TV antenna and output to the receiver on channel 3 or 4. They also provide an audio and video output.

It is hoped that future versions will incorporate multichannel TV sound decoders, which would further increase viewer utility.

VBI pictures

The vertical blanking interval is thought of as a place without images, but Colorado Video, Boulder, CO, has come up with a way to transmit slow-scan television on an unused line in the VBI. Two current uses for the images are "distance education" and weather information.

For the distance education usage, Utah State University, in Northern Utah, transmits slow-scan representations of classroom lectures and blackboard notes to viewers in various locations across the state. In the transmitting classroom, a simple control panel switches one of two cameras onto the line. One camera monitors classroom notes on a copystand. The other monitors the classroom. A freeze button on the transmitter grabs the image when it is satisfactory. A transmit button sends the frozen image down the line. To prevent operator error, the freeze button is deactivated during transmission. It takes approximately eight seconds to transmit a 512x240 pixel image.

The receivers monitor the baseband video input, including the encoded slow-scan image, obtaining input from a TV tuner, microwave signal or satellite. The encoded lines are detected and gradually fill the video memories, which are scanned to feed monitors. As the memories fill, the image appears to wipe onto the screen. Multiple memories are available, so that one monitor can hold on blackboard notes while another is following the instructor.

More to come

As technology moves forward and more and more uses will be found for VBI and other "resources" in the broadcast signal, anything that increases the utility of the TV signal is good news.

Figure 1. Vertically swept slow-scan transmission system uses vertical blanking interval to transmit an image every eight seconds.
Not for amateur radio.

You're no amateur at this game, so why play around with amateur CD players in the studio? You've tried consumer models in the past, just to see if they'll work long enough to make sense. We can understand that. But in the long run, they don't make sense. And you know it. Even modified or beefed up versions have given you headaches... wrong levels, hi-fi connectors, too many buttons or the wrong ones. Not to mention skips, mutes and breakdowns. Why take chances playing around with an amateur deck in a pro application? Leave that home player at home where it belongs. Check out the Studer A727 and A730—pro players for radio pros.

A727 Thousands of A727's prove their reliability in radio stations all over the world—everyday. The A727 provides full 16-bit resolution with 4x's oversampling—plus powerful error correction circuits to protect against on-air problems from damaged or dirty discs.

A730 Designed for fast, creative production play, the A730 is the newest addition to the Studer line of Pro CD players. This machine can recognize 100 discs and store up to 3 start cue points per disc. Its die-cast aluminum transport is built for professional use.

Go ahead. Make the comparison.

Before those amateur machines break again, call your Studer Revox Full-Line Dealer, or contact us directly.

STUDER REVOX
Studer Revox America, Inc. 1425 Elm Hill Pike  Nashville, TN 37210  (615) 254-5651
Los Angeles, (818) 760-4234. New York (212) 255-4462.
In Canada, Toronto (416) 423-2831.
Circle (9) on Reply Card
Beyond the coverage map

By John Battison, P.E.

When clients tell the sales staff that they can't hear the station anymore, you can expect the engineering staff to get the blame. If you ran the radials mentioned in last month's "re: Radio" column and found poorer coverage or coverage vastly different than you anticipated, you should discuss it with the manager. Outline the cause for the problem, if you can find it. If you don't know the reason, roll up your sleeves and do some detective work.

Make some tests

Measure the antenna operating impedance. Remember the power formula is $P = I \times R$. This means that a small change in $R$ can make a big difference in $P$. A small change in $L$ can make an even bigger difference in the output power.

Has the antenna current changed without your knowing it? Check input power vs. output (antenna) power to see whether the efficiency is normal and reasonable. Sometimes meter calibrations change. Be especially careful if you have a remote-reading base current meter. It pays to have the base meter calibrated regularly or to at least borrow one to compare against yours.

Confirm that the antenna operating base impedance is still the same value that appears on your license. If you have a directional system, do the same for the common point.

By far the most satisfactory method of checking antenna impedances is by means of an operating in-line bridge (OIB). Beg, borrow or buy one, and insert it at the base of the antenna on the tower side of the base current meter. Turn on the transmitter at low power, and read the actual operating base impedance. A note of caution: be sure that both ground leads on the OIB are grounded. The meter gets RF hot if these leads are not grounded properly.

If you can't get an OIB, use one of the good old GR bridges. This will give you cold values rather than actual operating impedances. However, unless your system is extremely far out of tolerance, the difference should not pose a problem. After all, for years before the OIB was developed, we used the GR and a BC-221 oscillator with a sensitive receiver to do the job!

Even if you have a DA and must check the common point, the cold method generally is satisfactory, unless there is a component that changes value with power, hence heat. You can use a heat gun on suspect components in this case or even with an OIB to speed up changes.

Remember to check the bridge before use, and be sure that its own calibration is still good. If you can't find a standard resistor, a 1% or 1/2% composition resistor generally will suffice. There should be no reactance with the resistance measurement. If you have a standard capacitor, or one whose value you know, there should be no resistance reading on the bridge. Recall that the FCC accepts the OIB measurements, but the bridge must have a 2% calibration accuracy.

If you find the operating impedance has changed, and it remains the same after an overall check, you must file a new Form 302 with the commission. Provide the new values of impedance and current.

Read the line current at each end of the coax between the transmitter and the ATU. The current should be approximately the same at each end unless the line is very long or the line has a fault.

Top-loaded antennas

A frequently overlooked possible cause of poor radiation is broken or damaged top-loading. Today, top gun wires tied to the tower seem to be the most popular form of top-loading. The old capacitive, or top hat loading device with its crown of aluminum tubing, rarely is seen. However, if you have one, be sure to regularly check its condition and performance. Eyeballing is about the only way to check mechanical condition. Sometimes this means getting the tower inspected for electrical continuity or insulation. You could compare past with current performance, but if your station is like many others, you don't have records.

If the top-loading has changed, the base impedance will, of course, change too. A reverse situation occasionally occurs in which the top guy insulator breaks, thereby connecting the top guy to the antenna top. The result of this unplanned top-loading normally will be a rise in the operating impedance.

Misleading appearances

The transmitter then will have to struggle to maintain the licensed base current into a higher resistance. This would show up as lowered efficiency because, with the licensed antenna resistance and current, the output power would calculate to be the same. However, the output stage would have to work harder to produce the higher base current.

The system would appear to need more output stage power to produce the licensed power. This is a case in which apparent lowered efficiency in the final can mislead you, unless the antenna operating parameters are known to be correct. Of course, you would expect signal strength to increase in this case because of greater RF output.

Record the results

Designate monitor points in a list with number, distance, description, time of day, weather conditions and measured field strength. Make it a point to check these monitor points and to record the results every six months. If the levels are off in one direction, look for an increase in another. Then look at the area, and determine what has caused the change. It might be a new building, trees that have grown around the site, lots of metal objects near the antenna, or even a guy wire that has become grounded through insulator breakage and RF field distortion.

In any case, once you have made your checks by means of the field intensity meter, be sure to record them for posterity. Keep a complete file in a loose-leaf book with numbered pages. Log everything that was measured and the results of any tests performed. You'll thank yourself later, when it comes time to recheck the station's coverage pattern.
Varian EIMAC has taken the 3CX4500A7, with a proven performance record and by improving the design, developed the YU-148 hi mu triode—a 6000 W plate dissipation tube.

The YU-148 has been performance-proven and is currently in use in 10 kW FM transmitters. The YU-148 combines EIMAC's state-of-the-art technology, and cost-effective production, with a 5000-hour warranty—offering broadcasters the ultimate choice for their RF power requirements.

- Grounded Grid Triode Design
- Screen Supply Not Required
- Zero Bias
- No Need for Neutralization
- Efficient Forced Air Cooling
- Quick Warm-Up

These features, combined with EIMAC's reputation as the leader in electron tube development, plus 50 years of serving the broadcast industry, are the reasons you should specify EIMAC.

Varian EIMAC
1678 S. Pioneer Road
Salt Lake City, UT 84104
(801) 972-5000

varian®
eimac salt lake division
Sunspots affect communications

By Elmer Smalling III

Sunspots or solar flares are referred to simply as solar activity by astronomers. Solar activity is definitely predictable; the complete sunspot cycle lasts 22 years, and sunspot activity diminishes every 11 years, followed by a change in magnetic field polarity for the successive half-cycle.

Sunspots are caused by intense magnetic fields, which disrupt the normal convective flow of heat from within the sun to its outer surface. These highly magnetic areas, deprived of heat, cool by radiation into space and become dark spots or sunspots.

Three major types of sunspots occur:
- Prominences appear dark against the solar disk and bright against the dark sky. They occur in regions of the sun's surface where there are horizontal magnetic fields that prevent bursts of prominences from being pulled inward by the sun's gravitational field.
- Plages occur when strong magnetic fields change from horizontal to vertical polarity and solar material is swept up. Plages generally are brighter than prominences.
- Flares, the most spectacular of the solar activities, may last only a few minutes, but are much brighter than the plages with which they are associated. The source of solar flare energy is the magnetic fields surrounding sunspots. When these magnetic fields are twisted strongly, they set up currents that stabilize the twisted fields until they become unstable and jump to a lower energy level, producing flares. This process somewhat resembles the quantum physical effect of electrons jumping to lower levels and emitting photons.

Communications flare-ups

Solar activity has a significant effect on terrestrial communications, especially on the systems that bounce radio signals off the ionosphere, a region of ionized gas above Earth. The amount of refraction or reflection of this region varies with both the frequency of the radio signals and the degree of ionization occurring at the time.

Four basic layers or regions of the ionosphere exist:
- The D region is the lowest of the four layers, at about 70 miles above Earth. This layer usually is highly absorptive, reducing long-range communications. The D region, when present, is a daytime phenomenon.
- The E layer, another daytime phenomenon, depends on the sun's ultraviolet radiation, and its greatest density is directly under the sun. It is located about 100 miles above Earth and varies with the seasons.
- The F1 layer is another daytime phenomenon, averaging 200 miles above Earth. It also tends to follow the sun. At sunset, the F1 layer rises and merges with the highest layer, the F2.
- The F2 layer exists in both daytime and nighttime. Solar heat causes it to vary in height, so it is higher in the winter. Unlike the other three layers, the F2 layer is influenced by the Earth's magnetic field.

Ham radio operators know that these layers can bounce radio transmissions back toward Earth one or more times. Hams depend on this "skip" effect for long distance (DX) communications. Layer ionization is normally a function of the sun's ultraviolet light emission, but particle radiation from sunspots, cosmic rays, and meteor activity also can cause ionization. A period of excessive solar noise can directly affect terrestrial radio communications.

Microwave effects

Because the upper frequency for propagation via the ionized zones is in the low VHF band, microwave and satellite transmission, which does not depend on natural signal reflection, will not be disturbed by the ionizing aspects of solar activity. However, during periods when the solar activity is high, galactic noise, generated mostly by the sun, extends from 15MHz to 100GHz. It is limited by ionospheric absorption on the low end and atmospheric absorption on the high end.

Under normal "quiet sun" conditions, the galactic noise probably is lower than the receiver noise at microwave and satellite communications frequencies and goes unnoticed. During a period of high solar activity, however, the galactic noise can exceed 295°K, and extend up into the millimeter bands.

This year of high solar activity should produce problems for those microwave systems whose paths generally are aligned where the sun passes through the receiver boresite during its arc. Microwave systems located in the northern areas of the country, where the sun's angle is shallow, may experience more outages than those closer to the equator, where the sun's arc steepens. Solar noise will cause prolonged periods of satellite sun outage when activity is at its peak. Broadcast engineers would be wise to keep a close watch on the radio propagation prediction charts over the next few years.
The cart machine with bells and whistles your audience will never hear.

Finally, a cart that delivers the creature comforts that other Otari audio machines have offered for years! And not only does Otari's CTM-10 make your job easier, it also delivers outstanding audio performance, so your output sounds more like a CD player than a cart.

You get extensive metering, including dedicated metering for the cue-track. (Now you can verify the cue-tone before you go on-air!) And for adjustments to program length, there's a true vari-speed control.

You'll also find a record azimuth adjustment system with phase display for when you want to make the best recording possible.

But the CTM-10 is not all just bells and whistles. It's the only cart you can buy with HX-Pro.* That means that you can get a really hot signal off the tape, and still keep those high frequencies where they need to be for that crisp, clear sound.

And some things we keep real cool, like we don't use solenoids for our pinchroller because they can generate excess heat. You'll also appreciate the CTM-10's fast start time—it lets you cue up tighter without worrying about wow.

And, of course, we give you choice. There are stereo and mono record/play decks, and a mono/stereo play-only deck.

Call us at (415) 341-5900 for more information about the CTM-10. The cart machine we built for perfectionists.

*HX-Pro is a trademark of Dolby Laboratories Licensing Corporation.
ISDN to bring better service

By Gerry Kaufhold

An entirely new type of telephone service, the Integrated Services Digital Network (ISDN), is scheduled for on-line access in the United States by 1991-92. It already is used in Japan, Germany and France, with Great Britain to follow. An all-digital telephone service, ISDN provides a variety of transmission speeds over existing phone lines and dramatic improvements to today's phone service.

Probably the most important aspect of ISDN is the extremely wide data-transmission bandwidth, which will allow feasible distribution of high-definition television (HDTV) by landlines. For example, wide-bandwidth ISDN links between the studio and the transmitter site could replace existing microwave STLs, easing the current problem of spectrum saturation. However, this capability means that ISDN could be used to distribute HDTV to the home, which makes ISDN a natural threat to broadcasters. Therefore, it is important that broadcast engineers understand what ISDN is and how it works.

Basic-rate ISDN

For distribution of signals to subscriber homes, ISDN provides basic-rate services over existing twisted-pair telephone lines. This service provides two digital channels, called B channels, each with a data rate of 64kb/s. Because a single voice channel takes 64kb/s, ISDN can provide each subscriber with two independent telephone audio lines over the wire pair that currently supports only a single analog channel. (See Figure 1.) A third channel, the D channel, operates at 16kb/s. This channel always is active and sends call-control information for billing and other data, such as home security or energy-management information.

The total data rate for the two B channels plus one D channel of basic-rate ISDN service is 64 + 64 + 16 = 144kb/s. Using the two B channels, a subscriber could engage in a voice telephone conversation while sending or receiving faxes, participate in a slow-scan TV videoconference. Meanwhile, the background D channel could be sending home energy-management control data to the power company, and the central office would be monitoring usage of the two B channels, accumulating charges for each service provided.

Primary-rate ISDN

For businesses that require more data bandwidth, the primary-rate services provide for some combination of 64kb/s B channels, plus one or two 64kb/s D channels. For example, a credit card clearing house might have 23 B channels and one D channel, for a data rate of 1.536Mb/s.

Note that the primary-rate D channels operate at 64kb/s because more control data must pass between the business subscriber and the central office.

Figure 1. An overview of ISDN interconnects.

Here are several key definitions for parts of ISDN. Please refer to the figure.

- **U interface**: The circuitry, wires and software used to transport data between the central office and the home (basic-rate) ISDN subscriber.
- **Network terminator 1 (NT-1)**: The junction box and circuitry that terminate the U interface at the entrance of the subscriber's residence.
- **T interface**: The circuitry, wires and software that connect between the NT-1 junction box and several NT-2 junctions in the home.
- **Network terminator 2 (NT-2)**: The junction box and circuitry that connect between the T interfaces and the S interfaces.
- **S interface**: The circuitry, wires and software that connect between each NT-2 and each terminal adapter. The equivalent of the twisted-pair wires and modular connectors of existing in-home telephone wiring.
- **Terminal adapter**: The junction box and circuitry that connect between each S and R interface.
- **R interface**: The circuitry, wiring and software that connect between each terminal adapter and the serial data port of an ISDN terminal.
- **Terminal equipment (TE)**: Typically an RS-232-C serial port of a personal computer or all-digital telephone set.
- **LAPB (link access protocol for B channels)**: The definition of each bit and byte of a B-channel signal. Can support digitized audio for voice or can be direct digital information such as a fax machine or personal computer.
- **LAPD (link access protocol for D channels)**: The definition of each bit and byte of a D-channel signal. Supports passage of control information between subscriber and central office switching system, as well as background data such as home energy management or security system information. Similar to a typical local area network.
Orban's 222A Stereo Spatial Enhancer is a powerful, new, on-air processing weapon that gives your station a more competitive "leading edge" sound.

Hundreds of stations of widely varying formats have already pleased their audiences with an attractive, magnified stereo spatial image, and have gained noticeable improvement in brightness, depth, and transient definition as a bonus.

But, they haven't experienced the traditional curses of stereo image enhancers—increased multipath distortion, unnatural exaggeration of reverberation, mono incompatibility, and homogenization of the stereo image due to the 222A's new, patent-pending approach.

Here are a few user comments about the 222A:

Frank Foti, Consultant (formerly WHTZ/Z-100, New York, NY/WMMS, Cleveland, OH): "Sublime on some material, very dramatic on others. Retains natural quality of music. A device to keep the competition guessing at a very affordable price."

Bill Ruck, KFOG-FM, San Francisco, CA: "Wow! On-line, pre Optimod 8I00A, set at maximum enhancement. Sounds very dramatic. Management loves it; I love it!"

Bob Leembruggen, KLOS-FM, Los Angeles, CA: "Sweet separation with center channel power."

John Alan, KLOL-FM, Houston, TX: "Unit works well; no additional multipath, even in Houston!"

Egidio Giani, WLR South East Radio, Waterford, Ireland: "Nice overall stereo sound which does not sound enhanced when in fact it is."

Unnamed Source (at user's request), Columbus, OH: "Good job at a great price. Subtle intensity!"

Whether your station is protecting top ratings or striving to provide a more pleasing product, the 222A can give you that extra edge by naturally enhancing your existing stereo spatial image.

The 222A delivers a sound that is crisp, natural, and well-defined for just $995—\text{—}a cost that is within reach of any station, small or large. Ask your Orban Dealer for a demo, or call today for more information on the 222A—your next audience-pleaser and ratings booster.

Orban a division of AKG Acoustics, Inc.
645 Bryant Street, San Francisco, CA 94107 USA
Telephone (415) 957-1067 or (800) 227-4498 Telex: 17-1480 FAX: (415) 957-1070
CD troubleshooting

By Brad Dick, radio technical editor

Before you open up that CD player for repair, stop and think. Are you sure the player is the problem? Many of the problems encountered with the use of CDs can be traced to the disc. Let's take a closer look at the construction of the compact disc.

The compact disc is a marvel in technology, capable of providing excellent performance. The price for such high quality is the requirement for extremely tight mechanical tolerances. Compared with the precision required for reliable CD reproduction, aligning an analog tape recorder is child's play.

Figure 1 shows some of the important dimensions of a CD. The overall diameter is 120mm (a little less than five inches). The program area occupies a band 33mm wide between diameters of 50mm and 116mm. If you include the lead-in and lead-out areas, this dimension increases to 35.5mm.

To appreciate how compactly the information is stored on the CD, consider the following. The track pitch, the distance between the centers of two adjacent tracks, is 1.6µm. The pits stamped in the disc have a width of 0.4µm to 0.5µm. To get an idea of how small a CD track really is, consider that a human hair is approximately 50 times larger than one CD track and that 60 CD tracks could fit in the space of a single LP groove.

Unlike a floppy or hard computer disk, the CD track is continuous from the inside to the outside. Using a bit of math, you can compute the approximate length of this track:

\[
\frac{35.5 \times 1,000}{1.6} = 22,188 \text{ tracks}
\]

This represents the number of tracks crossing the 35.5mm radius of the CD. The length of the track can be computed this way:

\[
2 \times \pi \times \frac{117 \times 46}{2} \times \frac{1}{2} \times 22,188
\]

= 5.7km (more than 3.5 miles)

It's difficult to imagine, but a CD may contain six billion bits of information.

Manufacturing process

The CD manufacturing process is ultimately responsible for the quality available from the disc. Compact discs are manufactured through a process similar to that used for conventional records using injection-molding techniques.

A clear polycarbonate is injected under high pressure into a stamper, pressed and cured to cool. The process takes from 10 to 15 seconds.

Occasionally, stress occurs in the manufacturing process, resulting in disc warp or birefringence. Disc warp can affect the player's tracking ability. As the pits move up and down with the warp, the focus servo has to change. Depending upon the type and severity of warp, the focus servo may not be able to follow the changes. The result is mistracking or lost data.

Birefringence is basically a measure of the disc's optical quality. If, for some reason, the disc's molecular structure is degraded, birefringence may increase. The result then can be a reduction or change in the intensity or angle of the laser beam received by the optical pickup. All discs have birefringence, but it's the level that is important to the manufacturer and the consumer.

After stamping, the disc is coated with a layer of acrylic resin 30µm thick. The disc is allowed to cure under air or ultraviolet light. (Recall from last month's "Troubleshooting" that the cause of CD rot was suspected to be the use of air-dried lacquer.) The label is printed on the disc and cured again under UV light. The manufacturing process is now complete.

Each CD manufacturer now subjects the discs to various quality-control procedures. Despite these efforts, defective discs will reach the market. You may expect as few as 0.5% to perhaps 5% of the discs manufactured today to be defective when purchased. Considering the precision required to make a CD, that's really quite good.

Manufacturing defects

Because of the precision required, it's easy to see why even small variances in manufacturing or in player tolerances can cause problems. The CD manufacturer is responsible for maintaining the disc parameters as outlined in the standards, or the Sony/Philips "Red Book." This book contains the official CD manufacturing specifications.

We will discuss specific defects next month.

Acknowledgment: Appreciation is expressed to Laura Tyson, sales engineer; Denon America; Martin Ledford, quality control manager; Denon Digital Industries; and Dave C. Bowman, director of professional products, Studer Revox, for their help with this article.
NBC/New York needed a routing switcher for the 1988 Summer Olympics that offered 9 levels of switching and 182,464 crosspoints. They chose 3M. Later, they needed a routing switcher for their Visa Graphics facility in New York. Once again, they chose 3M.

For over 25 years, we’ve been surpassing the standard in the broadcast equipment business. Before you commit to any routing system, large or small, call us at 1-800-328-1008.

We’ll help you get where you’re going.
On being a leader

By Brad Dick, radio technical editor

Building a management team is crucial to effective leadership, especially in technical management. Using the concept of management teams within a broadcast station makes more sense today than ever before. The concept is especially suited to the engineering department, where technology changes so rapidly. It’s impossible for any engineer to be completely familiar with all the equipment used in a TV station. Even in the radio station, the complex digital hardware is treated as so many black boxes. No longer does the engineer have the luxury of knowing how each circuit works, much less have the skills to service every device.

The team is composed of several persons involved in completing similar tasks. If you’re a supervisor, you would be the team leader of the people you supervise. In a smaller operation, your team may consist of your peers in other departments. In this case, the team leader would be the general manager or station manager.

Building a team

Let’s look at some reasons for using management teams within your station. Remember, even if you don’t supervise a staff, the technique still can be employed. The difference is that you are a team member, not a team leader. Some of the reasons to use management teams are listed in Table 1.

In many situations, teams are determined by organizational structure. Look at your station’s organizational chart. The major teams that can be developed will be obvious. The engineering department is an example of a team. Additional teams, such as maintenance, operations or remote crew teams, can be developed from this group if needed.

In every case, there will be people who want to be a part of the management team and others who couldn’t care less. Even if some employees seem apathetic, it’s important to invite all of them to participate. Respect the wishes of anyone who chooses not to take part.

In some situations, however, you might apply a bit of pressure if someone is hesitant to become a part of the team. One instance is when the team is small, and another is if someone who possesses critical knowledge or skills doesn’t want to be a team member. In both cases, strongly encourage participation. It’s important to help employees understand their value to the overall team effort. Usually, that kind of approach is sufficient to get them to cooperate. When they finally agree, be sure you acknowledge their input and advice. Ignoring the comments of reluctant team members is a sure-fire way to get them to stop participating.

Manage the meetings

The effectiveness of the management team depends greatly on the skills of the individual members, especially the leader. It’s up to the leader to ensure that certain support activities are carried out. Minutes must be taken at meetings and distributed to team members. If you are in charge of the meeting, be sure it starts and ends on time. Develop an agenda before the meeting. If time permits, have it distributed along with the meeting notice.

This informs your team about the topics of discussion.

During the meeting, stick to the agenda. State your opinions and feelings honestly. Encourage similar participation by members. Use active listening techniques. There is perhaps no better way to ensure communication than to ask questions, then paraphrase the speaker’s answer. If you didn’t understand fully, the speaker can rephrase the answer or expand it so that you comprehend it.

Avoid disruptive communications and actions. Although the meetings should be pleasant, it is not a time to exchange the latest stories or jokes. The leader must move the meeting forward continually. When the group begins to go astray, direct it back to the agenda. Be sure the minutes convey the who, what and when of all job assignments.

Being a good leader

Being an effective management team leader is not easy. Good leaders must exhibit the following behavior:

- Avoid prestige-seeking.
- Encourage team members to become independent decision-makers.
- Become members, not simply group leaders.
- Refrain from making unilateral decisions at all costs.
- Find the appropriate balance between listening to others and contributing their own ideas.

One of the most difficult aspects of being a leader is to acknowledge the necessity of allowing the group to make decisions. For a lot of people who wear the title of supervisor or manager, it seems to go against the grain to let a group hammer out a decision. If you are a group leader who’s having difficulty accepting this approach, consider this: the best way to ensure support is to involve others. If you don’t seek the advice and counsel of your team members, you may be sawing off the branch you’re sitting on.

Table 1. Using the management team approach in your station has many advantages, some of which are listed here. A significant benefit is that the process helps team members develop support for the entire operation.

<table>
<thead>
<tr>
<th>The team approach:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- brings individual members to more closely identify with goals of the organization.</td>
</tr>
<tr>
<td>- helps members develop a better understanding of the station’s entire operation.</td>
</tr>
<tr>
<td>- provides members a feeling of greater control over their lives.</td>
</tr>
<tr>
<td>- satisfies the higher-level needs (Maslow’s hierarchy of needs).</td>
</tr>
<tr>
<td>- breaks down status barriers among team members.</td>
</tr>
<tr>
<td>- allows the leader to “exhibit by example” proper management behavior.</td>
</tr>
<tr>
<td>- results in well-thought-out decisions.</td>
</tr>
</tbody>
</table>

Building the management team

The engineering department is a major team that can be developed will be obvious. The engineering department is an example of a team. Additional teams, such as maintenance, operations or remote crew teams, can be developed from this group if needed.

In many situations, teams are determined by organizational structure. Look at your station’s organizational chart. The major teams that can be developed will be obvious. The engineering department is an example of a team. Additional teams, such as maintenance, operations or remote crew teams, can be developed from this group if needed.

In every case, there will be people who want to be a part of the management team and others who couldn’t care less. Even if some employees seem apathetic, it’s important to invite all of them to participate. Respect the wishes of anyone who chooses not to take part.

In some situations, however, you might apply a bit of pressure if someone is hesitant to become a part of the team. One instance is when the team is small, and another is if someone who possesses critical knowledge or skills doesn’t want to be a team member. In both cases, strongly encourage participation. It’s important to help employees understand their value to the overall team effort. Usually, that kind of approach is sufficient to get them to cooperate. When they finally agree, be sure you acknowledge their input and advice. Ignoring the comments of reluctant team members is a sure-fire way to get them to stop participating.

Manage the meetings

The effectiveness of the management team depends greatly on the skills of the individual members, especially the leader. It’s up to the leader to ensure that certain support activities are carried out. Minutes must be taken at meetings and distributed to team members. If you are in charge of the meeting, be sure it starts and ends on time. Develop an agenda before the meeting. If time permits, have it distributed along with the meeting notice.

This informs your team about the topics of discussion.

During the meeting, stick to the agenda. State your opinions and feelings honestly. Encourage similar participation by members. Use active listening techniques. There is perhaps no better way to ensure communication than to ask questions, then paraphrase the speaker’s answer. If you didn’t understand fully, the speaker can rephrase the answer or expand it so that you comprehend it.

Avoid disruptive communications and actions. Although the meetings should be pleasant, it is not a time to exchange the latest stories or jokes. The leader must move the meeting forward continually. When the group begins to go astray, direct it back to the agenda. Be sure the minutes convey the who, what and when of all job assignments.

Being a good leader

Being an effective management team leader is not easy. Good leaders must exhibit the following behavior:

- Avoid prestige-seeking.
- Encourage team members to become independent decision-makers.
- Become members, not simply group leaders.
- Refrain from making unilateral decisions at all costs.
- Find the appropriate balance between listening to others and contributing their own ideas.

One of the most difficult aspects of being a leader is to acknowledge the necessity of allowing the group to make decisions. For a lot of people who wear the title of supervisor or manager, it seems to go against the grain to let a group hammer out a decision. If you are a group leader who's having difficulty accepting this approach, consider this: the best way to ensure support is to involve others. If you don’t seek the advice and counsel of your team members, you may be sawing off the branch you’re sitting on.

Table 1. Using the management team approach in your station has many advantages, some of which are listed here. A significant benefit is that the process helps team members develop support for the entire operation.
NEW FROM
ARRAKIS
SYSTEMS
10,000 SERIES

For features, performance, price and reliability,
NOBODY BUILDS CONSOLES LIKE ARRAKIS.
Call (303) 224-2248

ARRAKIS SYSTEMS, INC.
2619 MIDPOINT DRIVE
FORT COLLINS, CO 80525
Improving your audio product

Consumers won’t settle for mediocre audio. Neither should broadcasters.

Today's audiences have access to a wide variety of alternative high-quality audio and video sources. Broadcasters must recognize that as the competition increases, the quality of the transmitted audio becomes even more important.

High-quality audio sources are available everywhere. The consumer now can buy a CD player for less than $150. Stereo TVs are available for about $250. Theater sound systems have been improved greatly in recent years. Audiences now expect high-quality audio to accompany the visual images. Ask yourself whether your listeners may be disappointed in what they hear from your station.

Consumers are more quality-conscious than ever before. This, combined with competing high-quality audio and video sources, requires the broadcaster to re-examine the entire broadcast audio chain. When was the last time you really considered the quality of your audio product? And I don't mean the last time you ran a proof of performance. Have you compared your broadcast signal against a CD or hi-fi stereo videotape recently?

The competition comes in many forms: CDs, videotapes, laserdiscs, movie theaters and cable. As your listeners experience the high quality available from many of these sources, they will come to expect your product to be equally good.

Unfortunately, many broadcasters are behind the times in this respect. Obsolete equipment or improper maintenance are frequent causes of poor-quality audio. Improving the quality of your audio need not be complex or even expensive.

When upgrading your station's audio, begin with the monitoring system. The first step in eliminating audio problems is being able to hear them. This month's feature section contains two articles on monitoring systems: "Control-Room Monitoring Systems" and "Using Close-Field Monitors." They will help you evaluate your current monitoring system and determine whether changes are needed.

A second important area within today's stations is signal routing and switching. Radio and TV stations have more sources and destinations than ever before. Properly routing these signals without degradation is critical to maintaining a high-quality audio signal. The feature article titled "Planning for an Audio Routing Switcher" will help you determine how to best take advantage of this technology.

A radio station's only product is sound. Television broadcasters know that without audio, video won't sell either. In today's broadcast environment, a smart, simple business plan is "Don't let your competition sound better than you." Broadcasting began with sound. Shouldn't we broadcasters be able to transmit it better than anyone else?

Brad Dick, issue editor
BVU stands alone. No other 3/4-inch system offers the beauty and power, the sheer thrill of controlling this Sony U-Matic SP™ video equipment.

We could tell you about features that are state-of-tomorrow's art. But that wouldn't really give you a feel for the amazing responsiveness and precision of BVU recorders.

Or we could tell you about the Dynamic Tracking® capability in the new BVU-920, giving you fingertip editing control of pictures from -1 to +3 times normal speed. And about the plug-in time-base corrector that lets you record the Dynamic Tracking® effect, and also brings you digital
THIS ENGINEERING HAS NONE.

noise reduction in both luminance and chrominance picture components.

We could go on about shuttle speeds up to 40 times normal, with visible picture. And BVU U-Matic SP™ (Superior Performance) picture quality, with 340 TV line resolution and Dolby® C noise reduction.

But these hot new BVUs must be experienced to be appreciated. Take the first step. Call Sony at 1-800-523-SONY.

Sony Communications Products Company. 1600 Queen Anne Road, Teaneck, NJ 07666. ©1989 Sony Corporation of America. Sony, U-Matic SP and Dynamic Tracking are trademarks of Sony. Dolby C is a registered trademark of Dolby Licensing Corporation.
Control-room monitoring systems

By Brad Dick, technical editor

Control-room monitor speakers must be carefully integrated into a room's overall design.

The sophisticated audio equipment used in today's broadcast control rooms is capable of excellent performance. Low distortion, wide frequency response and reliable operation are not only common, but expected. Can you say the same thing about your monitoring system?

Sometimes an engineer buys speakers, then simply hangs them on the wall or sets them on a shelf in front of the console. The assumption is that the overall acoustical quality will be determined by the speaker. The effects of improper mounting or poor room acoustics have not been considered.

However, even a superior-quality speaker system cannot perform properly when it is mounted incorrectly or used in an inferior acoustical environment. It's important to recognize that the speaker system and the room work together as a system. The integration of the speaker into the control room should be planned from the beginning — not treated as an afterthought.

Background noise

The first physical parameter you must consider when looking at a control room or studio is background noise. If the ambient noise is too high, no amount of post-signal conditioning can remedy the problem. If the air conditioner rumbles, it can affect everything you do in the studio.

Professional studios strive for a background noise level ranging from 25dBA to 40dBA. It's easy to measure the noise level in your studio. If you don't own a sound-level meter, borrow or rent one. Don't depend on your ears to detect the noise. Although low frequencies are difficult to hear, they can affect a room's overall performance. Use a sound meter, real-time analyzer (RTA) or TEF to measure the noise level.

A common cause of increased background noise is the air handler. Over time, the air handler belts become loose and begin to vibrate. Bearings wear and also cause vibration. These changes can increase the amount of background noise in your studio.

The only way to know whether this is happening is to make noise measurements on a regular basis. Noise has a habit of increasing over time, but small increases usually go unnoticed. In fact, you may not become aware of the additional noise until someone less familiar with your room mentions it.
Where digital and analogue meet
(to give you the best of both worlds.)

The AMS/Calrec Virtual Console System

AMS Industries plc

AMS Industries, AMS Industries Park, Burnley, Lancs. BB11 5ES
Tel (0282) 570111. Telex 63108 AMS-G. Fax (0282) 39542.
AMS Industries, USA, 3827 Stone Way North, Seattle, WA 98103 USA.
Tel (206) 633-1956. Fax (206) 547-6990.

Free assignment of faders for maximum flexibility.
Ergonomic layout with high resolution displays/controls.
Three RAM and multiple disc based memories.
Instantaneous memory reset of all functions.
1 inch fader nodules permit a large console to live in a small space.
High performance, proven audio circuitry.
Diagnostic self test for ease of servicing.
Orders now being accepted for the Post Production version of the VCS with moving fader automation.

STOP PRESS... Systems currently under construction for Turner Broadcasting, NRK, BBC TV Outside Broadcast, BBC TV Centre and Channel 4 Television... STOP PRESS
Sometimes you unwittingly cause the noise increase yourself. Perhaps you added a couple of tape machines. Did the machines have fans? Did you add a power amplifier with forced-air cooling? Has that old power amplifier developed a bit of power-supply transformer buzz or hum? It is important to record any acoustical measurements you make. That’s the only way you’ll be able to see whether the noise level has changed over time.

Interactive system

Once you know the room is quiet, you still must consider other critical elements before installing the monitoring speakers. Broadcast engineers used to think that the key to a good monitoring environment was a dead (reflectionless) room. After all, a dead room would eliminate troublesome reflections, thereby allowing the speakers to produce optimum sound, right?

That notion was far from correct, as shown by the design principles used in today’s studios. A good acoustical monitoring environment should not add coloration or other effects to the sound produced by the speakers. That doesn’t mean you need a reflectionless room.

Reflections are only one of the important acoustical phenomena to consider. Complete removal of the room’s influence is impossible. Early attempts at removing the room’s effects centered on different ways to control reflections. Combinations of absorbent panels, curved surfaces and traps were tried. Each of these techniques helped, but was not totally successful. If you want to get an idea of how these treatments were used, find a 15- or 20-year-old book on acoustics. You’ll probably see several photographs of early attempts at reflection control, most of which required much more floor space than typically available today.

Despite the advances in technology, controversy still rages on how to best control these reflections. Combinations of live (reflective) and dead (reflectionless) surfaces often are used. The difference in the acoustical quality depends greatly on how effectively and correctly both types of surfaces are applied.

Uniform distribution

The sound system should be tuned to provide a broad sound distribution. In other words, you want the sound to be evenly distributed throughout the room. In one studio, the monitoring system was optimized for only one spot. If you moved three feet in any direction, significant changes in the sound occurred.

It’s impossible to provide optimum monitoring conditions in every area of the room, but be sure that the important locations are covered. This may mean that only the mixing and producer positions have the best sound. Even so, strive to make these areas as wide as possible.

One good way to check the room’s performance is with pink noise and a 1/2-octave RTA. You can use other devices, some much more sophisticated, but the RTA will give you an idea of what’s going on in the room.

The amplitude of pink noise decreases 3dB per octave. That’s what you want, because on a 1/2-octave RTA, the result appears as equal SPL in each band.

Figure 1. Relationship between RT, volume and absorption. The formula for developing RT is described in the text.

\[
V = \frac{0.16V}{A}
\]

Where:
- \( V \) = volume in m³
- \( A \) = total room absorption in m²

The absorption properties of different materials vary widely with frequency. This means that RT is frequency-dependent. In most control rooms, the low frequencies are less well-absorbed, and the reverberation times are longer.

Calculating the total room absorption may not be as difficult as it at first appears. Armed with a good reference book, you should be able to get approximate absorption coefficients for the various materials used on the walls, ceilings and floors. Plug the values into the equation, and develop an estimated value. The graph in Figure 1 will help you to estimate your studio RT. Some consultants suggest an RT design target of 0.25s for broadcast studios.

It may be easier to use a sound meter to measure RT. The monitors are driven with either white or pink noise or a burst signal. The sound level must be high enough to allow for significant delay.

The sound-level meter measures the decaying SPL of the sound field in the control room. If you want to know the RT at different frequencies, an octave or 1/2-octave filter can be used.

If a burst is used, it may not be possible to get RT directly. It can be developed by using the measured information from the sound meter and some calculations. An advantage of the burst method is that it is easier, and perhaps more accurate, results are possible than with the noise/cutoff method.
Everything you always wanted in a tube camera. Except tubes.

LDK 910 CCD Studio Camera

What you've always wanted in a tube camera is the best picture possible. But now you get the best picture in a CCD Camera — the new BTS LDK 910. And you'll never miss the tubes. Because the LDK 910 meets or beats the picture quality of tube cameras with a new CCD sensor that employs over 800 pixels per line, and over 406,000 total picture elements.

In addition to excellent resolution, the LDK 910 has a high signal-to-noise ratio, high sensitivity and accurate colorimetry. Along with a few other things you don't get with tubes. Such as BTS's frame-transfer technology, which eliminates smear. A high dynamic contrast range without blooming or burn-in. And excellent dynamic resolution enhanced by advanced electronic shutter control. It's also ready to shoot when you are — no waiting for warm up.

And here's another reason you won't miss the missing tubes. Not only is the LDK 910 priced competitively with tube cameras, but it costs less than you'd probably spend replacing worn out tubes over the life of a studio camera.

But of course, big ideas also come in small packages. The LDK 91, a lightweight, easy-to-handle ENG/EFP camera, is the LDK 910's portable companion. Singled out by Broadcast Engineering magazine as one of the ten "Pick Hits" of NAB '89, it has the same CCD sensor and the same top picture quality as the LDK 910.

Together, these fully compatible CCD cameras will make your old ideas about picture quality go right down the tubes. For complete information and technical specifications on the new LDK 910 and LDK 91, call BTS at 1-800-562-1136, ext. 11.

BTS is Broadcast Television Systems, a joint company of Bosch and Philips. P.O. Box 9016, Salt Lake City, UTAH 84116.
Case example

One example of the effect of room acoustics on a control room is shown in Figure 2. The upper graph is the drawing from an oscilloscope showing the decay of a 92.9Hz tone in a small (8' x 8' x 9.5') control room. The sound decreases at an exponential rate. This means the SPL decreases at a constant rate. The middle graph shows the same display with an excitation tone of 99.7Hz. This is the type of decay that would be expected in a room of this size.

The room has two resonant modes of 92.8Hz and 99.8Hz (close to the excitation frequencies). Even so, when played separately, the two tones do not excite the nodes, and the sound decays properly. However, when a 96.7Hz tone is used, each room mode is excited and decays at its own characteristic rate. The resulting decay produces a beat that sounds like a vibrato when heard in the room. Imagine

---

Figure 2. The decay of sound pressure in a control room. The upper two graphs show normal exponential decay. The lower graph shows what happens when two room modes are excited by a driving frequency. The resulting beat creates a vibrato effect within the listening environment.

Figure 3. Boundary effect. In (a), the level of the point-source acoustical radiator in free space is measured at a point X. Placing a relatively large boundary behind the radiator (b) increases the SPL by 3dB (half-space loading). In (c), two boundaries perpendicular to each other result in a 6dB increase in SPL. Three perpendicular boundaries (d) produce a 9dB increase in SPL.
Cablewave Systems delivers everything you need and expect from Rigid Coaxial Transmission Line performance...superior quality, plus optimum mechanical and electrical specifications.

To achieve this, Cablewave Systems fabricates high conductivity, hard-drawn copper tubing with precision machined, pin-type Teflon dielectric insulators. Standard 50 ohm transmission line is offered in sizes from 7/8" thru 9 3/16"; 75 ohm in 6 1/8" and 9 3/16". All utilize EIA bolt type flanges and inner connectors compatible with EIA standards, MIL specs and international IEC recommendations. Aluminum outer conductor 50 and 75 ohm transmission lines are available on special order.

To complement our full line of Rigid Coaxial Transmission Lines and accessories, Cablewave Systems also manufactures a complete line of semi-flexible air and foam dielectric coaxial cables and connectors.

For a copy of our 48 page Rigid Coaxial Transmission Line catalog and information on other broadcast and RF communication products, contact Cablewave Systems.
how music might sound in such an environment.

Solving such a problem requires a sophisticated knowledge of acoustics and good test equipment. The example does point out how important studio design is to the overall sound of a control room. It also shows that, without adequate test equipment and expertise, problems may go undetected.

**Surface interaction**

Before continuing the examination of the room's acoustics, let's review why a speaker operates as part of a system, and not alone. Figure 3(a) shows a speaker mounted in a free space. Assume the measured sound pressure level is 0dB SPL at a reference point X. Next, place the speaker against a large, flat surface, such as a wall or floor. Note that the sound pressure level, measured at the same distance, increases by 3dB. See Figure 3(b).

In Figure 3(c), the omnidirectional sound source (speaker) is placed in the corner of two perpendicular boundaries, as would be the case with two walls. The sound pressure level is now 6dB above the freespace level. Then the speaker is mounted at the junction of two walls and a ceiling, as shown in Figure 3(d). The sound pressure level is now 9dB greater than originally measured in the free-space environment. Why?

In each case in which an additional boundary is added, more of the omnidirectional sound is folded back toward the measuring point. In Figure 3(a), the single boundary prohibits the speaker from radiating its power into the entire environment. The speaker's power is confined in half as much space. This is called half-space loading. Continuing the process, the ceiling-corner location results in 8th-space loading and increases the SPL by 9dB.

The loading is, in theory, present at all frequencies. However, speaker design and physics result in the low frequencies being more omnidirectional than the high frequencies. The higher frequencies tend to be more direct, primarily because the speakers themselves rely on cones or horn drivers. The boundaries, therefore, have less of an effect on the high frequencies.

This causes the boundary effect to be frequency-dependent. You can detect the effect simply by placing a speaker against a wall, then moving it several feet away from the wall. Note how the low frequencies appear to decrease as the speaker is moved away from the reflecting surface (wall). If you remain in relatively the same location, you may not notice any change in the high frequencies.

A related problem occurs when speakers are mounted next to walls and ceilings. Figure 4 shows a speaker mounted next to a wall. As the sounds reflect from the wall (or ceiling), they combine with the sound coming from the front of the speaker. Often, the result is phase cancellation, producing a comb-filter effect. Figure 5 shows the resulting frequency response of the speaker mounted against the wall.

Two solutions are to either locate the speakers near the monitoring position (close-field monitoring) or isolate the speaker from the effects of the walls. The first technique is described in detail in the article, "Using Close-Field Monitors," page 42.

With the second technique, the speakers are flush-mounted and isolated within the control-room wall. This isolates them from resonances and reflections that the wall might produce and reduces problems causing low-frequency reflections. If you adopt this method, be sure to properly isolate the speakers from the wall with damping materials.

**Room equalization**

A monitoring system often benefits from equalization. Although the process is called room equalization, it's really little more than a form of frequency predistortion. An equalizer is used to compensate for speaker and room deficiencies and interactions. Although the process appears simple, room equalization is a complex and difficult process, especially for the first-timer.

The irregular frequency response was produced by comb-filtering that resulted from wall-reflected sound combining with sound radiating from the front of the speaker.
HOW FAST IS FAST?

LISTEN.
“...this is so fast!”
“...wow.”
“I love this.”
“What do I do with my old Chyron’?”
“...I want this.”

THIS IS THE NEW ABEKAS A72 CG.
Not just digital. It’s all digital.
Know what that means?
Speed. As in Ferrari. We’re talking fast.

INSTANT CHARACTER SIZING.
Italics, drop shadows, outlines, embossing and bevels. Total creative expression. Digitally.
No waiting. No set up. Just do it and watch it happen.

SEE WHAT YOU COULD NEVER DO ON A CHARACTER GENERATOR.
Until now. Call Abekas to arrange a demonstration. Oh.
One concern. You may have to decide what to do with your old CG.
For details: (415) 369-5111

Abekas
A Carlton Company
Leading in Digital Innovation

Atlanta (404) 451-0637 Chicago (312) 699-9400
Dallas (214) 385-4544 Los Angeles (818) 954-8700
New York (516) 829-0820 San Francisco (415) 369-5111

*Chyron is a trademark of Chyron Corporation.
Circle (18) on Reply Card
More and more people are lining up for the Panasonic SVHS Pro Series.

One look is all it takes. And you’ll see why more and more people are lining up for the Panasonic* SVHS Pro Series. Because anyone in the market for a high-quality professional video production system, simply can’t afford not to look at what the Pro Series can do for them.

Take Cost-Performance. The Panasonic SVHS Pro Series delivers both. By combining the efficiency and systems flexibility of half-inch technology with the exceptional performance of Y/C component signal processing.

The result. A comprehensive video production system that provides two hours of operation on a single cassette. With over 400 lines of horizontal resolution. And signal integrity through five generations.

By now it should be obvious. The closer you look and the more you compare the Pro Series to historical video formats, the sooner you’ll line up for the Pro Series.

As a Panasonic SVHS Pro Series user, you’ll have direct access to Panasonic’s nationwide network of engineering, service and technical support specialists. And with over 300 professionally trained dealers, many of whom are self servicing, you’ll always get the most out of your Pro Series equipment.

Finally, a professional video format more and more people are lining up for. The Panasonic SVHS Pro Series.

For more information and your local dealer, call your nearest regional office.
Eastern Zone: (201) 348-7620 • Central Zone: (312) 981-4826
Southern Zone:
Dallas Region: (817) 685-1122 • Atlanta Region: (404) 925-6837
Western Zone:
Seattle Region: (206) 285-8883 • Los Angeles Region: (714) 373-7275
To assure excellent quality, support, service and professionalism, the Panasonic Pro Series is available through authorized dealers.

Panasonic
Professional/Industrial Video

Circle (19) on Reply Card
Continued from page 32
again. Before you quit, check the equalized response in several locations. Then, listen to the system. You may have to strike a balance between what appears correct on the RTA and what your ears tell you.

Speaker selection
So, what if you're faced with installing a new monitoring system? First, define your particular requirements. Don't plan on using a small bookshelf system to power a large studio. Conversely, the typical radio studio probably doesn't need a monster-sized set of monitors.

Second, look for a low-distortion, acoustically flat-response speaker system. Buy the most acoustically transparent system you can afford. Remember, no amount of acoustical treatment, equalization or post-installation fixes can make an inferior speaker system sound good.

Third, don't skimp on the amplifier. You stand a better chance of creating a low-distortion, low-noise system if the amp is conservatively oversized for the speakers.

If you really need top-notch sound, consult with someone who does this kind of work for a living. Don't be afraid to seek outside expertise. The resulting sound may be better than you could accomplish, and it will almost certainly be achieved in less time.

Bibliography

Acknowledgment: Appreciation is expressed to Bill Calma, sales manager, Tannoy, for his help with this article.

Figure 6. The solid line represents the frequency response when a speaker is installed on a control-room wall. The dotted line shows the response after the speaker is moved to a different position and room equalization has taken place.

The only way to upgrade your FM station
There is only one route to a complete FCC Class A FM upgrade. Continental. We have all the equipment you need to completely modernize your station and increase its ERP. Just check the list:

- Transmitters
- Transmission line
- Antenna and tower
- Remote control
- Studio transmitter link
- Studio equipment

Continental offers both an 814C 3.8kW solid state and 815A single tube 5.0 kW FM transmitter. Proven reliability and efficiency make our equipment the best available.

For the past forty years, Continental has been helping its customers get on the air. All transmitters are covered by Continental’s exclusive and standard two year warranty.

So get on the right track in your station upgrade. Call Continental. It is the smart thing to do.

Continental electronics division
P.O. Box 270879 Dallas, Texas 75227 Telephone: 214-381-7161 FAX: 214-381-4949

Circle (20) on Reply Card
Panasonic presents two very versatile, high-grade color monitors—the BT-D1910Y and the BT-M1310Y. Built for performance, these BT-Series monitors offer you the quality and reliability you’ve come to expect from Panasonic. Not to mention a wide array of features at an affordable price.

Our BT-Series provides you with the controls and connections necessary for studio applications—while serving a host of industrial, educational and professional video needs.

For maximum performance and versatility, both monitors offer complete, direct compatibility with the new S-VHS format—in addition to conventional signals. And video reproduction on the BT-Series is superb. As a matter of fact, the BT-M1310Y boasts a horizontal resolution of more than 560 lines, while the BT-D1910Y offers you greater than 550 lines.

What’s more, each monitor provides you with a full set of front panel controls. Like Line A/B split, S-Video input connectors, Blue signal-only switch, pulse-cross circuit, preset picture off/on, comb/trap filter selectable and normal/underscan switch, just to name a few.

So when you are looking for professional quality, but still need to keep an eye on your budget, look into the Panasonic BT-Series high-grade monitors. For more information, call Panasonic Industrial Company at 1-800-553-7222. Or contact your local Panasonic Professional/Industrial Video Dealer.
Using close-field monitors

By Jeff Blenkinsopp

Small speakers can provide big advantages in studio monitoring.

Photographs of contemporary recording studio control rooms usually show at least one pair of small speakers perched on the top of the console. These small speakers are commonly referred to as close-field monitors. Although they may look as if they were placed there as an afterthought, the speakers are often the primary listening source.

Close-field monitoring is not a new phenomenon, but it is a changing one. With this evolution, engineers are re-evaluating the strengths and weaknesses of this monitoring technique.

Reference standard

In TV production or recording studios, where a variety of people will be working, a standard listening reference is a necessity. Without such a reference, it is difficult to accurately evaluate the sound. That audio reference is often provided by the small close-field monitor speakers sitting on the console.

Close-field monitoring requires a speaker that can be positioned and selected by the listener and a listening point that is within the direct-sound field. Close-field monitoring reduces the effect of the room's acoustical anomalies (such as the boundary effect, resonances and reflections). The closer you are to the speakers, the more direct sound you hear, and the less the reverberant field affects the sound.

When wearing headphones, you hear only the direct sound. The room you are listening in has no effect on the sound. In a sense, it is this headphone effect that you are trying to achieve by having the speakers close to the listener.

It's important that the listener have control of the positioning. This may seem obvious, but it is a unique factor because the monitor selection and positioning can be controlled by the engineer — a detail that is often overlooked.

The acoustical power generated by the speakers also should be optimized so the room is not driven. Again, the desire is to reduce the effect of room anomalies and also to reduce the speaker distortion that can occur at high-output levels.

Speaker size also is a factor. If the monitors are too large, they become impractical, affecting the sight lines or interfering with the direct sound from the large monitors. Small speakers allow engineers and producers to easily bring in whatever reference system they think is most accurate for their style. The flexibility to bring in your own electro-acoustic ears is making close-field even more popular. The ability to reference any job or environment to your known standard is a great advantage.

Limitations

Despite the advantages offered by close-field monitoring, there are some drawbacks. The biggest problems are the lack of bass and undistorted acoustical power. Getting enough low end out of a small monitor cabinet is difficult, and if you don't know what is happening in those frequencies, your whole project could be ruined. For these reasons, large monitors are still important in the control room.

Also, getting the feel of the music is important, and sometimes, close-field monitors just will not give you that. A good example might be where you're recording a heavy-metal band or remixing a dance single. For these situations, rely on the main studio monitors.

Mounting and location

Close-field monitors usually are free-standing and are not mounted in soffits or against walls. However, even placing the monitors on the console can affect their sound. The acoustical coupling between the speaker and the console should be taken into account. The coupling may cause a slight increase in the low-end response, which often is desirable. Placing the speakers on small risers will reduce the effect.

As with the main monitors, the high frequencies will tend to splash off the console, causing coloration and affecting the stereo image. The degree to which this is a problem depends on the shape of the console and the position of the speakers. This is why it's important that the speakers can be repositioned to reduce the number of high-frequency reflections off the console.

The monitors should be matched pairs, and the manufacturers often mark the cabinets "left" and "right." If a component in one cabinet is destroyed, it is best to replace the same part in both cabinets simultaneously. The remaining good part can be kept as an emergency replacement.

It is important to follow this one
The AVS-2 from Utah Scientific represents a significant advance in the design of routing switchers. The exclusive use of surface-mount technology results in a dramatic reduction in the physical size of the switcher, allowing you to put more crosspoints in your existing rack space. The AVS-2 is controlled by our existing range of control panels and accessories — the industry's best. And, of course, the AVS-2 is covered by our exclusive 10-year warranty.
ENG. It's full-on warfare—brutal, competitive, and sometimes downright dangerous.

To outshoot the competition, your crew needs an advantage. Give them a big one. Give them new CVR-200 one-piece camcorders from Ampex.

With battery, tape and the newly-developed ultralight Nikon lens, this camcorder is nearly three pounds lighter than an Ike HL79E camera!

It's compact and easy to handle, too. So your crews can move fast and maintain a low profile, even in explosive situations.

Low light is no problem either. Advanced CCD sensors deliver dynamite pictures, even in adverse conditions.

And if those conditions mean hard knocks, don't worry. Its rugged design, magnesium alloy chassis and weatherproof housing help keep the CVR-200 on the streets, and out of the shop.

But as good as it is, the CVR-200 is only part of the story. We can outfit you with a full arsenal of the most advanced Betacam equipment available:

- **CVR-35**—the portable VTR with the features news professionals ask for most.
- **CVR-22**—a low cost,
If you want to win the ratings war, you’re going to have to arm your crew with the best equipment available—and for equipment, service and support, there’s no better ally than Ampex.

Give Ampex a call at 1-800-25AMPEX today before the competition does.
The distance between the speakers should equal the distance from slightly behind the listener's head to the center of the cabinet. (See Figure 1.) The speakers should be the same height or slightly higher than the listener's ears. (When the listener is seated, that's a height of approximately 42 inches.)

**Wiring, powering and protection**

Don't skimp on the cable just because the speakers are small. Care should be taken that the cable termination at the cabinet is satisfactory. If the connector hole is too small for the wire to go through, don't cut the wire down. Instead, tin it and wrap it around the terminal. Spade adapters also can be used to fit around the binding posts.

Use high-quality amplifiers with sufficient headroom for transients. If the transient drives the amplifier into clipping, the speaker may be destroyed. For example, a 250W amplifier connected to a 50W cabinet often is preferable to a 50W amplifier that's operating continuously at or near its rated output.

The speakers used for close-field monitoring usually cannot handle a large power input. Yet, because it's common to connect them to high-power amplifiers, it pays to be modular.

---

**Figure 1.** Close-field monitoring requires careful positioning of the speakers. Fortunately, easy placement is one of the advantages of using small speakers.
Just as no performer can stay on top without innovation, no company can retain its reputation for performance without product innovation. The standards we've set with our broadcast cables are a reflection of our commitment to product innovation - something that continues today with Brilliance®.

Named for the sound and picture brilliance obtainable through product innovation and improved signal integrity, Brilliance products range from exciting audio/video cable assemblies to the four new cable products below:

**Soft, Flexible Microphone Cables.**
The debut of Belden's four-conductor microphone cable sets an industry standard. Featuring matte finish jackets in a wide range of colors, these new cables are designed to increase cable flexibility while enhancing performance.

**High-Flex and CL 2 Rated Precision Video Cables.**
To solve the problems of rack installations and CCTV systems, Belden has developed a new 75 ohm precision video cable. High-Flex combines Belden® 8261 electrical performance with improved flexibility and longer flex life.

**Audio Snake Cables.**
Belden now offers a line of multi-pair snake cables. Featuring individually jacketed and shielded pairs, Belden snake cable provides maximum protection against signal loss. Features include loose tube construction and a non-reflecting black matte finish.

**Audio and Video Composite Cables.**
For systems combining audio and video, Belden has specifically designed cables for ENG and camera applications. They combine off-the-shelf availability with specialty design center technology and fiber/copper composition.

Call your local Belden distributor for our Broadcast Catalog, or contact us directly:

**Belden Wire and Cable**
P.O. Box 1980
Richmond, IN 47375
1-800-BELDEN-4
(in Indiana, call 317-983-5200)
**Figure 2.** It's important to protect the speakers from overload damage. In (a), a single fuse protects the system. In (b), separate fuses are used for the tweeter and woofer.

---

**Left Brain Specs. Right Brain Effects.**

*Two Views On ALTA's New Wideband TBC/Synchronizer.*

The left brain. It's analytical, technological, specifications-driven. And the right brain? It is a creative and colorful territory where great specs are just a means to great effects.

ALTA's new Cygnus 5.5 wideband TBC/Synchronizer is made for both. On the left, the impressive set of better-than-broadcast quality specs is unparalleled for the price. On the right, just look at the dazzling array of special effects. Picture freeze. Strobe. Variable colorization, mosaics and posterization.

With its left brain logic, right brain magic and modest $3950 price tag, the Cygnus 5.5 is another single-minded demonstration of ALTA's "Technology Of Value" at work. Call or write.

ALTA Group, Inc., 335 Race Street, San Jose, CA 95126, FAX 408/297-1206, TEL 408/297-2582.
WE'VE MADE DEAD AIR A DEAD ISSUE.

There are worse things in radio than dead air. But not many.

And if your CD players aren't built to resist tracking errors, you could find yourself listening to some very embarrassing silence.

Not with the new CD-701 from Tascam. Its unique disc clamping system is a technological triumph that virtually eliminates disc vibration. So you never hear the awful hush that means a tracking error has occurred.

What you do hear is the finest sounding CD unit you can buy, with the same proprietary "ZD Circuitry" praised by two of Japan's top audio magazines* for eliminating low-level digital distortion.

Then there's the optional RC-701 Remote Control with Auto Cue so you can cue to the music instead of the track (for even less dead air). Or you can add the Ram Buffer for true, instantaneous startup.

And with four times oversampling and 16-bit D/A converters in an extra-rugged chassis, the CD-701 is superbly designed for the broadcast environment.

Can a CD player really deliver this kind of performance, track after track, disc after disc? Only if it's a Tascam.

Contact us or visit your Tascam dealer for more information about the CD-701. And take the sounds of silence off your playlist.

TASCAM

©1989 TEAC America, Inc., 7733 Telegraph Road, Montebello, CA 90640, 213/726-0303.


Circle (25) on Reply Card
puts your signal in it's place!

If you need a quality antenna, you need: JAMPRO ANTENNAS, INC. The really experienced one for over 30 years.

JAMPRO is the world leader in custom-designed, directional, CP antennas:
- With over 1600 of our penetrators delivered, more stations have penetrated their market.
- Our custom-made directional antennas are operating world wide.
- Full-scale antenna measurements on JAMPRO's all-year, all-weather test range.
- We custom-make tower structures to duplicate your's, for optimum results.
- Ask about JAMPRO's low-power educational packages. Give us your requirements and see how fast we produce.

JAMPRO Antennas, Inc.
6939 Power Inn Road
Sacramento, CA 95828
(916) 383-1177 • Telex: 377321
FAX (916) 383-1182

Circle (26) on Reply Card

46  Broadcast Engineering  July 1989

the possibility of blowing the monitors is real. The speakers can be protected either by a fuse or electronic switch. The most common protection method is an in-line fuse located between the amplifier and the monitor, as shown in Figure 2(a).

The fuse should be a fast-blow type, AG series. The easiest way to determine the fuse rating is by trial and error. Start by installing a low-value fuse (typically 1A), then turn up the gain. If the fuse blows before the listening level is comfortable, replace it with the next higher value. Continue replacing fuses until you have enough level, but the fuse doesn't blow. This may sound unscientific, but it works.

Some studios install the fuses inside the cabinets. The woofers and tweeters can be fused separately, as shown in Figure 2(b). Mounting the fuse in the cabinet causes no problems if the cabinet is sealed around the fuse holders and the correct fuse values are used.

The type of fuseholder used also is important. The two basic types of fuseholders are screw-top and quick release. The screw-top fuses seem to be more reliable because they are mechanically stronger. Although it may take a little longer to change the fuse, it's well worth the effort.

The speakers also can be protected electronically. With electronic protection, the input to the speaker passes through a relay, and the circuitry senses the incoming power. (See Figure 3.) If the current is too high, the relay is tripped. Some consumer hi-fi speakers have these circuits installed internally. If the speakers are used in a professional setting, a low setting of the trip point can cause a lot of irritation. Because of this, the overload circuits often are bypassed.

It's also possible to help reduce the chance of speaker damage by filtering out the lower frequencies. Although the small speaker systems do not reproduce much audio below 40Hz-50Hz, the presence of these frequencies often can destroy the monitors. A low-frequency rolloff filter will prevent these frequencies from getting to the monitors. (See Figure 4.) This is an effective approach, providing the filter's effect is inaudible to the engineer.

Adding this protection to the speakers may seem like a lot of work. However, it is probably well worth the time, energy and cost to protect the monitors. Replacing drivers is both costly and aggravating. It is much easier and less nerve-racking to replace a fuse during a session than to hunt up a replacement speaker.

New approaches to monitoring

Because of the popularity of close-field monitoring, further development and improvement of this technology should be pushed. Speaker manufacturers continually are trying to develop new products that will improve the low-end frequency response and power-handling capabilities. Even so, perhaps the whole monitoring scheme needs to be re-evaluated. Here are some steps manufacturers might take with new speaker-system designs:

- **Bass or sub-bass systems**: One of the problems with close-field systems is the lack of bass response. It's possible to compensate for this by adding a separate bass system. Because the low end is not as directional as high frequencies, bass cabinets could be located away from the existing close fields — possibly under the console. The crossover system (probably electronic) would have to compensate for phase and time alignment, but the technology is available. Although the use of separate bass/sub-bass systems is common in live-sound systems and in home hi-fi designs, it has yet to find much acceptance in the studio. Also, it should be determined whether stereo bass is needed. It might be possible to use mono bass instead.

- **Multiple cabinets**: Use two close-field cabinets next to each other with each cabinet providing a different response and wired in such a way that the engineer can listen to one or both. One cabinet could be the standard reference; the other would have characteristics to compensate for the reference.

- **Multiple systems**: It is common in today's studios to have musicians, especial-
BREAKING THE SOUND BARRIER.

Control Your Audio Production with the Ease and Precision of Video

You've invested a small fortune in your video image. But what you have done about your audio image?

Manual setup of your audio mixer, edit after edit, has always been the barrier in sound production.

Now, FOR-A introduces an audio mixer that gives you computerized control of Audio For Video. And does it with a speed and a facility not possible with traditional consoles.

You'll program sources, levels, equalization, fades and pans with ease for totally automated editing. And actuate effects with ESAM II, GPI or even your PC. Recalling them with 100% repeatability whenever you need to.

The AFV-500 works perfectly with FOR-A's full line of production switchers, digital effects systems and edit controller.

And equally well with anyone else's. Most affordably.

FOR-A Corporation of America, 320 Nevada Street, Newton, MA 02160.

We're with you every step of the way.

FOR.A INNOVATIONS IN VIDEO and AUDIO TECHNOLOGY

If you're ready to break the sound barrier, call now. We'll send you a 24-page booklet that tells the whole story, and arrange your test flight.

Boston (617) 244-3223
Chicago (312) 250-8833
Los Angeles (714) 894-3311

Circle (96) on Reply Card
ly keyboard players, working in the control room. To be effective, this practice requires more than one monitor system. Although it's rare that a second or third pair of monitors is used, there is really no reason multiple systems can't work in tracking sessions, especially if the overall levels are not saturating the room.

- **Hi-fi systems**: The use of a home hi-fi cabinet as an engineer's own personal monitor is not uncommon. Yet, the use of these cabinets in the control room seems to have been dismissed without an in-depth evaluation.

- **Control room environment**: Close-field monitoring opens a whole new range of studio-design options. For electronic production, the division between control room and live room can disappear. This would allow the control room to more closely resemble a home hi-fi environment. The result would be a more comfortable, flexible and cost-effective studio.

Close-field monitoring can solve many of the problems created by poor monitoring room acoustics. It is an inexpensive, high-quality approach to the need for an accurate acoustical monitor.

Figure 4. Low-frequency components are responsible for most of the damage to small speakers. A low-frequency rolloff filter, passive as shown in (a) or electronic as shown in (b), installed before the speaker prevents these frequencies from damaging the speakers.

Videotek's, new, compact VSG-21 sync generator provides four test signals, balanced audio tone and continuous blackburst.

Videotek's done it again—packed more features for less money into a single product—our new VSG-21. It's equipped with four selectable NTSC test signals, SMPTE color bars, Multiburst and 10-step modulated stairstep or 10-step unmodulated stairstep.

That's just one example. Look at our full line of feature-rich sync generators, all engineered for zero defects. The VSG-201 has 6 blackburst outputs, audio test tone and “textbook” accurate SMPTE color bars and can be genlocked with guaranteed SC/H Phase regardless of input phase. With our Times Six Plus, at the touch of a button, you can synchronize and automatically time six devices regardless of various cable lengths or equipment drift. And our Times Six allows manual centralized control of six devices.

Get them all at a price that's in sync with your budget.
There are two worlds of audio... analog and digital. These two domains share many basic attributes but when it comes to audio testing, they're distinctly different.

Until now custom hardware was needed to test digital audio devices in their own domain.

Now the System One Dual Domain combines both analog and digital testing capability in one unit.

ANALOG audio testing with System One Dual Domain is even more comprehensive than before. Data acquired can be further analyzed using the Digital Signal Processor, which adds harmonic analysis, waveform display and FFT spectrum analysis to the already extensive list of System One’s capabilities. New version system software supports color VGA graphics and on-screen cursor function with numeric readouts.

DIGITAL audio testing directly in the digital domain is available for the first time. System One Dual Domain provides signal generation, analysis and Input/Output capability and also mirrors familiar analog measurement techniques, now implemented digitally. The multiple-DSP architecture supports both AES/EBU serial and two-channel parallel inputs and outputs at a variety of sampling rates.

Integrated analog and digital domain audio testing... only from Audio Precision.
Remote applications

By Brad Dick, radio technical editor

Close-field monitoring need not be limited to the production studio. Remote broadcasts are challenging enough without having to try to design high-quality monitoring systems. This is where close-field monitor speakers can be effective.

Stations often rely on old pairs of junk speakers (after all, they're going to get beat up anyway) to provide audio for the DJ or engineer. In some cases, the same speakers are used to provide ambient sound for the audience. Such an installation provides poor acoustical monitoring. This makes mixing decisions difficult and compromises the sound received by the radio audience.

**Dual systems**

A better approach is to rely on dual monitoring systems. Use a pair of close-field monitors for the DJ or engineer and a separate system for the audience. This allows the mixer to work in the direct-sound field, where the effects of ambient reflections, echoes and noise are reduced greatly. In addition, the audience feed can be optimized as desired.

The close-field monitors should be the same speakers used in the production studio. Even though the outside environment will be quite different from the studio, the speakers can be the same. Knowing how the speakers sound in the studio eliminates much of the confusion resulting from the remote broadcast location. This will enable the DJ or engineer to better evaluate the quality of the mix.

A second set of speakers then can be used for PA applications. If you want to rely on regular PA speakers or whatever, fine. The audience probably won't know the difference or care. The advantage is that no matter what compromises you have to make in the audience sound, the mixing position still has a high-quality environment. With careful positioning, the quality of the PA sound will have no effect on what the DJ or engineer hears.

There is an additional advantage to using small monitors at the mixing position. It is sometimes difficult to control the levels of the PA mix and the monitoring mix separately. The monitor amps in remote consoles seldom have enough power to drive large PA speakers. This means the mixer has to rely on headphones for the mix and use a separate amp for the PA mix.

The close-field monitors usually can be powered by the console's internal amplifier. This permits the mixer/engineer to use speakers instead of headphones. It also allows a separate PA system to be used for audience feeds.

There are a number of advantages to using close-field monitoring for remote broadcasts. The next time you're faced with a remote, take along those little speakers. They may save you from lug-ging along big cabinets, separate amplifiers and a ton of wire. Besides, not having to wear headphones all day can save a lot of wear and tear on your ears. 

---

Shown Actual Size

CARVER

PROFESSIONAL

PM-100

Magnetic Field Power Amplifier

**ONE RACK SPACE. 360 WATTS.**

The ultimate single rack space amplifier. Unmistakably Carver. Ideal for station, stage or studio. See Carver Professionals' latest addition at your nearest Carver Dealer.

Carver Corporation, P.O. Box 1237, Lynnwood, WA 98046

For more information, or the dealer nearest you call 1-800-443-CAVR

Circle (29) on Reply Card

50 Broadcast Engineering July 1989
Distribution amps, at best, give you one or two inputs, up to eight outputs per channel and everything is hard wired. If your signal routing requirements change, as they often do, you're in for a major re-wiring job.

Unlocking the Possibilities.
With eight inputs and twenty-eight outputs, our Routing Distribution Amplifier is light years ahead of the pack. Because any input, or combination of inputs, can be easily distributed to any output, or combination of outputs, the RDA is justifiably a winner.

But the advantages don't stop there. Changing signal routing paths is simple. All you do is open the front panel, shift a few Berg jumpers and you're done. Level controls for each output are located adjacent to the selection jumpers.

Unequaled Audio Quality.
With a signal-to-noise ratio of 98dB below the clipping threshold, the RDA gives you exactly what you're looking for—transparency. Plus, the RDA's exclusive Optimum Level Control ensures the best compromise between headroom and signal-to-noise ratio.

Coarse matching the input level with four position dip switches and fine tuning with trimmer adjustment is visually aided with bi-color LEDs. The green light tells you that the RDA is operating at optimum level and the red light shows you that maximum level has been reached.

One More Critical Input.
To find out more about the most versatile distribution amp in the business, route your input to your Gentner distributor or give us a call.
BTS did not invent the TV dinner. The Swanson® Company did.  
But you’d be surprised at how many of the most revolutionary ideas in the history of video did come from BTS. In fact, because we look at things differently, the whole world looks at things differently.

We introduced the first 3-D computer animation system. The first CCD film scanner. The first software-based character generator. The B format for videotape recording. The modular routing switcher. And of course, the Plumbicon camera tube, for which we won one of our three Emmies.

BTS has been a technological innovator in the video industry for six decades. Our cameras,
switchers, videotape recorders and graphics equipment are among the best-engineered, highest quality and most reliable in the world. Our work in High Definition and CCD products is pacing an industry which faces the most sweeping technological advances since its beginning.

And we're as dedicated to better product service and support as we are to better products. So although BTS may not yet be a household word, here's a word to the wise. In the years ahead, BTS will continue to be more forward thinking, more responsive and more innovative in our approach to video technology than anyone else. Including the Swanson Company.

BTS is Broadcast Television Systems, a joint company of Bosch and Philips. For more information, please call 1-800-562-1136 or write BTS, P.O. Box 30816, Salt Lake City, UT 84130-0816.
to World Service Herald Broadcasting (WSHB), a division of "The Christian Science Monitor" syndicate. With 1,000kW of carrier power, the station is one of only a handful of short-wave stations in the megapower bracket.

Ordered by The First Church of Christ, Scientist, in Boston, the Cypress Creek station will be the most powerful, most modern religious broadcasting station in the world. In addition to news, religious programs will be broadcast in English and Spanish to Mexico, Central America and South America.

The station consists of two 500kW superpower, short-wave transmitters, manufactured by Asea Brown Boveri, that incorporate the feature of dynamic carrier control. The outputs are fed into phased, high-gain, short-wave curtain antennas. The transmitters are the newest generation of frequency-agile, fast-tuning, high-efficiency pulse step modulation (PSM) design.

Licensed in 1930, "The Christian Science Monitor" was the first religious broadcaster in the United States. Religious broadcasting has become the fastest-growing sector in international short-wave broadcasting, with spectacular growth in the United States, the Middle East and the Far East.

News from Europe
By John Blau, European correspondent

Commercial TV may come to Netherlands

The Netherlands might have two privately owned commercial TV stations as early as next year. The Dutch government has agreed, in principle, to the introduction of commercial television, but the issue still is being debated. Meanwhile, two broadcasting groups have emerged with plans to circumvent current restrictions by uplinking their services from Luxembourg.

One group, known as Radio-TeeVeronique (RTV), is scheduled to begin transmitting at the beginning of 1990, and will transmit via satellite to Dutch and Belgian cable systems. The other, TVIO, plans to begin broadcasting later this year.

A recent decision by the Ministers of the European Community forced the Netherlands to drop its controversial ban on foreign-based commercial television.

Applications filed for Greek commercial TV

More than a dozen applications have been filed for licenses to operate a private commercial TV channel in Greece. Deregulation of the Greek broadcasting system, announced in March by Prime Minister Papandreou, will require a change in the constitution. Until then, the state-run ERT is the only organization allowed to broadcast television in Greece.

BT experiments with optical fiber

The British Ministry of Trade has granted permission to British Telecom to experiment with optical fiber broadcasting. However, BT cannot legally establish an optical fiber network until 1990.
To learn more about the Sennheiser excellence in design and engineering, please call or write.

6 Vista Drive, P.O. Box 987
Old Lyme, CT 06371
Tel # 203-434-9190  FAX # 203-434-1759
Circle (32) on Reply Card

MICROPHONES • HEADPHONES • BOOM SETS • RF WIRELESS • INFRA-RED TECHNOLOGY

Manufacturing Plant: D-3002 Wedemark, Federal Republic of Germany
Planning for an audio routing switcher

By David L. Bytheway

Audio routers can increase productivity and minimize problems.

Does your station ever have stereo/mono compatibility problems? Would a stationwide audio-distribution system based upon a routing switcher help? The answer to the first question is probably yes, and the answer to the second is almost certainly a resounding yes. With the introduction of TV stereo, many broadcast engineers face the need to upgrade their audio-distribution systems. Radio stations also can benefit from centralized audio distribution.

The selection and configuration of an audio-distribution system presents many challenges. Let's begin our discussion by looking at two major points:

- A routing system can provide increased flexibility, if this feature is considered from the beginning.
- The sound quality of any audio system is directly dependent upon the performance of the routing switcher and distribution amplifiers. The reward for careful equipment selection is excellent sound quality.

What is a routing switcher?

Large patch panels can be used to provide easy signal interchange. However, as a broadcast facility increases in size, the number of patches and the resulting panel can become quite large. Switchers are designed to replace patch panels, especially for signals that are changed many times a day.

Audio switchers can provide signal performance that is equal to or better than that of the patchbay. The real advantage is the greatly increased flexibility. Audio switchers and distribution amplifiers together form the heart of an audio-distribution system. Today, it's possible to build audio-switching systems large enough to handle all the signals in a broadcast station.

Audio switchers usually are configured as an XxY matrix. That is, they have X number of inputs and Y number of outputs. Switchers come in many different sizes, ranging from a small 10x10 matrix, up to 300x300 and even larger. A broadcast-type switcher can be used to connect any of its inputs to any or all of its outputs. This capability eliminates patch cords, patchbay multiples and plenty of headaches.

A given signal source needs to feed only one input of the switcher to be capable of feeding all outputs. The distribution amplifier function is, therefore, automatic. This feature often can reduce the number of distribution amplifiers needed in a facility.

Routing advantages

When selecting a switching system, give some consideration to the use of mnemonics. If a switcher does not provide mnemonics, then separate labeling and look-up tables may be required so operators can find the signals desired.

Most systems allow the switcher control panels to be remotely located. One example of a common use for a switcher is to provide audio feeds to a given studio. Several outputs of a switcher could be connected to the studio. A control panel, located in the studio, then would have control over those several outputs. This permits the studio to have complete access...
Tektronix combines world-proven performance and up-to-the-minute technology in equipment to fit your operations, monitoring and maintenance requirements of the D-2 environment. Feature for feature, it's what you expect from Tektronix.

The 1730 D-2 Waveform Monitor features measurement quality D-2 decoding with Tek's own precision DAC. You get digital D-2 and standard analog input capability for NTSC applications. Both inputs can be viewed simultaneously. And decoded D-2 analog output can be displayed on-screen or routed from a rear panel connector to the location of your choice.

Also included are features that make the 1730 the world's most popular line of high-performance waveform monitors. Front panel recalls. Full line select. Dual filter, dual channel display. And add a 1720 Vector-scope for decoded D-2 vector display.

The TSG-170D Digital Composite NTSC Generator offers test signals and audio tone in digital and analog form, plus analog black burst for equipment synchronization. You get 12-character identification, tape leader countdown and digital genlock with output timing offset. All in a cost-effective package.

Get the full story. Ask your Tektronix representative for a demonstration.

Of course!

Circle (33) on Reply Card
and control over all the audio feeds within the studio.

Switchers usually provide a high degree of isolation between outputs. This means that the switcher’s outputs will not be affected by the output you are changing. A routing switcher eliminates the need for large numbers of buildout pads and splitters.

Switchers often improve the overall quality of the audio within a broadcast station. This is possible because well-designed systems are capable of reducing noise through high common-mode rejection. Switching systems also can be used as a stable-ground reference point. If all signals are sent through the switcher, they will be conditioned with common-mode rejection and correct impedance matching and will be highly isolated from other signals. The result is often overall improvement in signal quality.

**Stereo or monaural?**

When you plan your system, you’ll have to choose from a wide variety of options.

**Using separate switchers**

There is more than one way to build a stereo switching system. The most common method is to use a separate switcher matrix for the left and right channels. In some stations there also may be a matrix for time code and perhaps one for the second audio program (SAP) channel.

These separate matrices are called switcher channels or levels. In addition to these audio levels, a video level also can be accommodated by many manufacturers. Figure 1 shows this configuration. The use of identical switching systems for the two stereo channels helps ensure phase matching and minimum stereo degradation. Good phase matching does not require that both channels occupy the same matrix. The important thing is that both channels experience the same time delay as the signals pass through the system.

This configuration has the advantage of using the fewest possible crosspoints to implement stereo. Monophonic devices use only the left matrix. The number of inputs and outputs needed for the left matrix will be the number of left-signal sources plus the number of monophonic signal sources. The size of the right-channel matrix will be determined by the number of right-signal sources.

The disadvantage of this method is that there is no way to exchange left and right channels. If a tape has the channels re-
LOOKING FOR A UHF TV TRANSMITTER?

Don’t Call Us!

...CALL OUR CUSTOMERS FIRST!

For Example

Contact:

KNXT

Marvin Harrison  Steve LeBel
General Manager  Chief Engineer

(209) 488-7440

Quality UHF TV Transmitters 10kW to 240 kW

Astre Systems Inc.

500 N. Carpenter Rd., Modesto, CA 95351  Phone: (209) 575-1000  FAX: (209) 575-0322

Circle (35) on Reply Card
Figure 1. Standard switcher configuration. Each signal channel or level is a separate matrix. Tape machine channels are hard-wired to corresponding matrix level.

versed, the switcher cannot swap the channels. If a monophonic feed is desired, it will appear in only the left channel.

A variation of this method relies on identically sized matrices for both the left and right channels. The stereo signals are fed into the matrix as discussed. The mono sources feed both the left and right matrices in parallel. This configuration has the advantage that mono sources now can feed one or both channels of a stereo destination. Stereo sources cannot, however, feed mono destinations.

Another variation uses a monophonic matrix in addition to the left and right channel matrices. Stereo sources are connected to the left and right channel matrices in the conventional manner. Mono signals are connected to the mono matrix. In addition, some mono sources also are connected to the left and right channel matrices, and some stereo sources are connected to the mono matrix. Which sources feed which matrix is determined by the number of sources that feed destinations of a different type.

This scheme has the disadvantage of requiring a large mono matrix, which could be potentially much larger than either the left or right matrix. It also is not possible to interchange left and right channel feeds.
Rack up twice the performance in the same amount of space.

The Problem
How to upgrade and increase your microphone mixing capability without sacrificing your valuable rack space or your budget.

The Solution
The new ELX-1R.

Here's Why
The ELX-1R is a portable, four-channel microphone line mixer.

It's half the size of our nearest competitor, the Shure M267, and fits into a single rack-mount space. Think of it. By utilizing two ELX-1R's, you can double your mixing capabilities in the same amount of space it takes to mount one M267.

Also, it's less expensive than the M267 because our rack mount is standard—you have to pay for theirs.

And it offers you the kinds of features that theirs doesn't...

Like half the distortion. Or individual input LED clip indicators. Or a 10-segment, three-color LED PPM bargraph display. Or 1/4" auxiliary phone connections, as well as professional XLR input-output. Or positive action push-button switching.

And last but not least—better specs across the board and a two-year warranty opposed to one.

You Decide
Naturally, we don't expect you to take our word on this...you have to see for yourself. Contact your local EV dealer today. Ask for our comparison chart and an engineering data sheet. Better yet, ask for a no-pressure demonstration.

We think you'll be pleasantly surprised.

Circle (37) on Reply Card
The advantage is that even when mono or stereo signals are being fed, only one pass through a matrix is needed.

**Using a single, large matrix**

One way to solve this problem is to use a single, large matrix for all audio channels. Left, right and mono signals all feed to the same matrix. This switcher configuration is shown in Figure 2. The advantage of this method is that the left and right channels can be fed normally, reversed and mono sources can feed stereo destinations. Some switcher control systems require that you switch each signal individually, while others allow you to switch pairs or groups of outputs. In any case, this method of interconnection provides much greater flexibility in handling stereo/mono problems.

A disadvantage of this method is that it requires many more crosspoints than a separate matrix for each audio channel. To provide the capability to interchange left and right channels, two crosspoints must now be available to connect a left input to a left or right destination. The total number of inputs needed is the total number of left signals plus the number of right signals plus the number of mono signals.

**Figure 2.** A large, single-level matrix for all left, mono, right, SAP and time-code signals. This configuration provides increased flexibility by allowing complete channel swapping. A large penalty is paid in the number of crosspoints.

---

**The choice of the professionals...**

- **3108 PROFESSIONAL PHONO PREAMP/EQUALIZER**
  Interfaces magnetic phono cartridges for optimum calibration of audio systems. Available with balanced or unbalanced output.

- **PDR ANNOUNCER’S EARPHONE**
  Ideal for on-camera studio work and remote coverage.

- **680EL**
  Delivers sound excellence and stands up to back cueing, vibrations and mishandling.

- **Dynaphase 30MISR**
  A shoulder rest single cup headphone that provides the ultimate in convenience, comfort and superb sound quality. Made to rest on either your left or right shoulder, or shoulder rest can be detached and used as a single cup hand-held monitor.

- **500AL**
  For heavy duty on-the-air use with wide tracking force range.

Stanton is the company with a total commitment to quality and reliability—producing products for the Recording Industry, the Broadcast Industry and the Professionals in Audio.

**101 Sunnyside Blvd., Plainview, NY 11803**

Circle (38) on Reply Card
For your most demanding requirements, Boonton has just the instrument to generate or characterize audio signals with unbeatable accuracy. Whether you’re working on the bench or with an ATE system, they provide fast, low cost solutions to all your audio testing needs.

**1110 Audio Oscillator**
- High power output to +30.5 dBm
- 10 Hz – 150 kHz with ultra-low distortion (typically 0.001%)
- Resolution to 0.001 Hz
- Variable output impedance (50, 150, and 600 Ω)
- Swept frequency or level

**1120 Audio Analyzer**
- All-in-one source and analyzer, 10 Hz – 140 kHz
- Frequency counter
- AC/DC voltage

**1130 Distortion Analyzer**
- Distortion, 10 Hz – 140 kHz, with 3 mV sensitivity
- SINAD, frequency, and AC/DC level
- Programmable notch filter
- Standard and optional filters
- Ultra-low residual distortion and noise

All Boonton audio instruments feature non-volatile storage for up to 99 complete panel set ups. IEEE 488 interfaces are standard. Call your local representative today for a convincing demonstration.

**Boonton Electronics Corp.**
791 Route 10, Randolph, NJ 07869
Telephone (201) 584-1077

Circle (39) on Reply Card

---

Signal Generators  Modulation Analyzers  RF Power Meters  RF Millivoltmeters  Capacitance Meters and Bridges  Audio Test Instruments
The number of outputs is computed similarly. Because the number of total crosspoints in a matrix is the number of inputs multiplied by the number of outputs, the total number of crosspoints in such a matrix is many times more than for the standard configuration.

Re-entry

Another method of routing signals is called re-entry. This scheme, shown in Figure 3, provides for the interchange of left and right channels without the penalty of needing many crosspoints. The design relies on the use of tie lines between the left and right channel matrices, which are used in the conventional way. Some of the inputs and outputs of each channel are connected to the other channel.

If a left channel source is needed in the right channel matrix, the left matrix places this signal on one of the tie lines to the right matrix. Then the right matrix switches the signal from the tie line to the destination needing the signal. Some switchers provide outboard mono summing circuits and phase inverters in the tie lines. The signals are switched to outputs containing these circuits, which then are fed back into the switcher.

One disadvantage of the re-entry method is that the number of channel swaps, mono feeds or other functions that can be used is limited by the number of tie lines. Another disadvantage is that all signals so handled must pass through the system twice. The signal quality, therefore, is degraded slightly compared with the quality achieved with single-pass switching systems.

Problem solver

A better method of handling stereo/mono compatibility problems and channel-switching problems is to use small interconnection matrices located at the signal source. This method provides interconnection among all the audio channels and has the potential to solve a host of other audio problems. Figure 4 shows a system built on this concept.

The advantage of this method is that now any channel can be interchanged with any other. For tape machines, time code, left, right, mono and SAP signals now can be easily interchanged. A further advantage is obtained if these small local matrices have summing or mixing crosspoints. In this configuration, the left and right channels can be summed to derive a mono feed. This is helpful if you need to dub a stereo source to mono. If you need to record or produce a format that is different from the one found in the station switcher, you can use the small matrix at the destination to develop the format desired.

The scheme also solves playback problems such as phase inversion. Placing the various playback channels from a non-standard tape onto the proper output channels also is easy. The tape operator simply sets up the local switcher to place the correct signals from the tape into the correct channels of the main routing switcher.

This allows all signals in the main distribution system to remain in a standard format. Any source problems are corrected at the source. Any signal correction needs to be handled only once — at the source, not at the destination. All signals in the switcher will be in stereo, or dual-channel mono. Time code and any SAP or auxiliary audio always will appear where they belong. This greatly simplifies the entire routing process.

Some engineers design their own circuits to perform these tasks. Patchbays or passive switches also can be used to complete the channel-switching function. However, a dedicated switcher with mixing crosspoints and phase-inversion circuitry will provide much faster, more flexible correction of compatibility problems.

This routing method uses the fewest extra crosspoints and offers the most flexibility. It also provides features that no other method can provide. The disadvantage of this method is that all signals must pass through more than one crosspoint.

Control considerations

Switcher control is an area that deserves a lot of careful attention. Large switching systems need sophisticated control if they are to provide the flexibility needed in today's stations. Switchers usually are directed by remotely located control panels.

Some switching systems rely on a single coax or twisted pair of wires to connect control panels to the matrix. The cable may be routed in a star or series configuration between panels. Such a system represents a type of local area network (LAN).

The length of cable permitted between the control panel and matrix varies, depending on the type of control scheme used. Some remote panels can be operated only a few hundred feet from the control panel.
A NEW ERA IS ABOUT TO OPEN.
It's the dawn of a new era in television: the era of Sony System Solutions™. It means the introduction of revolutionary systems products that together will shape the future of broadcasting. Switchers. Digital effects. Digital audio. Stillstore. And our own dual-channel RAM recorder. All Sony products that have extended the most advanced technology into a total system. And it could only have come from Sony, the innovator in U-Matic® technology, CCD technology, Betacam® products. And ground-breaking
digital technology. Advances that set industry standards. Advances backed up by traditional Sony service and reliability.

Now, Sony is setting standards for the future. Because, for the first time, you only have to look to a single source for your system needs. For products that are reliable. Products that prove themselves superior—from the moment they're plugged in. Products that don't just give you system technology. They give you Sony System Solutions™ technology, the solutions you've been waiting for.
Announcing Sony System Solutions™ line of smarter switchers. A line with some of the most advanced features ever engineered. A line designed to meet a wide range of requirements and budgets. Take the DME-450. As Sony's most basic switcher, it comes with over a hundred digital effects including true 3-D, cut, mix, and more than one hundred-fifty wipes. Border and background color generators are also standard. Furthermore, no time-base correctors are required for any of the VCRs.
Then there's the BVS-3000 series. Ten inputs plus all the wipe patterns and key effects you'd expect from a compact production switcher. But it can also give you digital effects with its unique link capabilities. When hooked up to the DME-450, this compact combination results in unprecedented power.

They're all switchers that know how to work with your other equipment. So they can not only do more, they do it all better. From the moment they leave the box.
Systems Components and

Sony opens up new possibilities with advanced digital technology like Stillstore and the DEM-1000. As well as peripherals that enable this uniquely modular system to work at maximum efficiency today—and help you grow tomorrow.

Because the Sony Stillstore's optical storage is on Write-Once-Read-Many (WORM), and erasable Magneto Optical (MO) discs, its archiving capabilities and transportability are unparalleled. Additionally, the DNS-1000 distributed hardware is linked by a unique network-
ing system which lets each user take full advantage of all the resources on the network. Then there's the DEM-1000, a remarkable achievement in motion manipulation.

With its simultaneous read-while-write capability, the DEM-1000 RAM based video recorder actually gives you real-time slo-motion. It also provides stunt motion, which allows virtually unlimited manipulation of the video motion. You also get a host of other features—like instant recall, editor control, and two-channel simultaneous I/O.
DESIGNED TO WORK WITH YOU.
DESIGNED TO WORK TOGETHER.
DESIGNED TO WORK RIGHT
OUT OF THE BOX.

Sony System Solutions™. It works better because it comes from one source. Better because it comes with the reliability, compatibility, and service you've always expected from Sony. The number one name in broadcast.

To find out how you can open a new era right in your own station or facility, call (800) 635-SONY.
matrix, while others can be several thousands of feet away.

Some systems provide serial port control, which can be performed from a dumb terminal or a personal computer. Other systems provide a keypad-type interface where commands are made from a Touch Tone pad. Modem connections also are available. Some switches even can be controlled by an automation system. Switches then take place according to the event log contained within the system.

**Types of control panels**

The most common type of control panel is the single output controller. This panel usually is located at a signal destination point, where control is desired. Typical locations might include a VTR or a studio. One output of the switcher matrix is assigned to this location and operates under the direction of that particular control panel. This permits the desired signal to be accessed and routed to the proper location without any interaction with other signals.

A variation of this scheme is a control panel that provides access to a group of outputs. This might be useful in a production studio where several switcher outputs are connected to an audio mixing console. Such a control panel could access several sources as needed by the audio console operator.

Another important type of control panel is the X–Y controller. This panel directs only one output at a time, but it can switch any input to any output. In this way, every crosspoint in the matrix can be switched

![Diagram of switcher configuration](image)

**Figure 4.** Switcher configuration using a small, 32-crosspoint switcher located at a tape machine. If a small switcher has mixing crosspoints, total stereo/mono signal interchange is possible.
by this panel. This type of control panel commonly is used in an engineering area where maximum versatility is needed.

Variations on these panels abound. Some control panels provide memories so that commonly used switch combinations can be selected quickly. Others provide unique control features, such as the ability to switch the left and right audio channels separately.

Control architecture and security
Switcher control architecture also varies in complexity, ease of reconfiguration and expandability. Some systems store mnemonic names in each control panel’s EPROM memory. Other systems permit the user to download mnemonics and preset information for the control system. Some designs concentrate the intelligence in central data concentrators, rather than in the control panels.

If your station is growing or constantly changing, consider a system that’s easy to reconfigure and expand. The best control systems will allow you to reconfigure your switcher as your needs change. They also may permit you to customize the control and human interface architecture to best meet the needs of your operators.

Security provisions can be implemented in many ways, one of which is to limit access to inputs based on the control panel. For instance, the permitted inputs are stored in EPROM. Any input mnemonic not stored in the panel is inaccessible. Other systems allow an output to be locked or protected so that no other control panel in the control system can take away a switch already made.

Some newer systems allow the use of passwords to provide access to inputs and outputs. Careful consideration should be given to these features, especially if the switcher has outputs that feed critical devices such as your transmitter.

Reliability and maintenance
Routing switchers also should be evaluated on their ability to handle power bumps and outages. Many systems permit battery-protected memory, which will retain the switcher status. When power returns, the switcher resumes the same configuration as before the interruption. Some stations may need to use uninterruptible power supplies to retain switching capability.

The reliability of today’s switchers is typically excellent. Most systems provide redundant power supplies and control cards with automatic switchover. In addition, power supplies often can be spread around the switching network so no single power-supply failure can bring down the entire switcher.

With a large routing switcher, it’s usually unacceptable to power down the entire system for maintenance. For this reason, many systems allow cards to be changed while the matrix is powered. Cooling fans, power supplies and control cards also may need to be changed if a failure occurs. Being able to replace matrix cards and control cards while the power is applied is a must for critical applications. This approach allows the card’s switching configuration to be re-established immediately so that all interrupted cross-points will be restored.

Audio performance
In the design of an audio routing system, one important question is sometimes never asked. How does the system sound? There are sometimes audible differences among the types of audio components used in routing switchers. And the higher-quality components do not necessarily cost more than lower-quality components. Careful component selection by the manufacturer can make a great deal of difference.

Continued on page 78
Fortunately, there is one tape company that's as demanding as you are.

In this business, people are always striving for perfection. Always raising their standards and expectations. At 3M, we share that commitment. Because we realize that you can't afford a tape problem. And neither can we. So when it comes to products and service, we have one primary goal: We won't be satisfied until you are.
THE LAST THING YOU NEED IS ANOTHER FORMAT.

Right now, you may be using 1-inch for program playback and network delay. 3/4-inch for news. There's even some two-inch quad and quad carts out there. And coming down the line, they're talking 19mm cassettes for programming and commercials and 8mm for ENG. Why does there have to be a different format for every application? In the field, in the studio, in the edit room? How many different machines can a technician learn to maintain and operate? Where's it all going to end?

Right here . . . with Panasonic's MII 1/2-inch videotape systems for today and tomorrow. A complete video recording system from cameras and dockable camera recorders to studio playback and editing. For news, programming, production, commercials and whatever else comes down the road. MII users, including networks, affiliates, independents, business and institutional users are already getting better pictures and counting the thousands of dollars saved in operations and maintenance costs.

When broadcasters and other users said they needed an analog format that would be a link to new digital format, Panasonic took them at their word.

Our composite digital format will be 1/2-inch. The cost of its cassette will be in line with today's MII cassette. It'll fit into your rack, your tape storage area and your budget.

When you think about it, Panasonic MII should be the last analog video recording format you'll ever need.
Continued from page 74

erence in the overall quality of a routing switcher.

It's important to evaluate the router's audio performance. This requires a close look at the listed audio performance specifications. The most common audio performance measurement is total harmonic distortion (THD). Other measurements used to help quantify audio performance include intermodulation distortion (IM), transient intermodulation distortion (TIM), phase linearity and slew rate.

Intermodulation distortion probes for non-linearities that produce new frequencies as a result of the beating of the two test tones. These generated frequencies usually are not harmonically related to the original test tones. The human ear is more sensitive to this type of distortion than it is to THD.

One type of distortion is not necessarily masked by another. It also is possible that two devices with identical harmonic distortion readings still will sound different from each other. This is because the actual harmonics measured may be different for the two devices, yet continue to produce the same reading on test equipment.

In addition, other effects such as bandwidth limiting, non-linear frequency response, group delay and transient distortion may not be reflected in the tests conducted. Distortion performance using traditional methods provides limited insight into actual system performance.

Study specifications carefully

When using specification sheets to aid in selecting a switcher, keep the following in mind. When comparing numbers, you must use the same units and measure-
TO FIND OUT WHY SONY'S STILL IMAGE SYSTEM CAN WORK FOR YOU, CHECK OUT ITS JOB APPLICATION.

Anyway you look at it, the ProMavica™ Still Image System from Sony can add color, excitement and economy to your visual communication needs.

In an instant, the Sony ProMavica System lets you capture and store full color still images from nearly any video source. Then present, transmit or even print your image of choice.

The Sony ProMavica Still Image System makes it easy. And each component provides the quality and reliability you expect from Sony, the people who invented still image technology.

Capture Images Electronically In An Instant
A miniature 2-inch Mavipak™ disk can capture images from video cameras, VTR's, computer graphic systems or any device with standard video output. You can even use the innovative ProMavica Still Image Camera to take still pictures electronically of people, products, scenery or events.

Show and Tell Anytime, Anyplace
You can store up to 50 images, with audio, too, on the Mavipak disk for convenient retrieval anytime, anywhere. All you need is the ProMavica Player/Recorder and a monitor. There's even a sturdy portable unit that lets you take your show on the road.

Transmit Color Throughout Your World
What's more, the full color images you see in your office can be sent anywhere in the world over standard telephone lines. In just minutes, the ProMavica Transceiver can deliver high quality visuals for immediate review, approval, editing, presentation and more.

It's Not a Photograph, It's a Mavigraph Print
For the highest possible color hard copy prints from any still image or video source, look to the ProMavica Color Video Printer. Continuous tone Mavigraph prints are yours in as little as 65 seconds. With vivid color and exceptional clarity for previewing, identifying, publishing or just as a keepsake, you can even produce full color transparencies for use with overhead projectors.

So for whatever job application, the complete Sony ProMavica Still Image System or any individual component can work for you. To find out more, call 1-800-222-0878 and ask how we can help improve your image.
Now there's an easier, more efficient way to locate your video tapes...

...with NSI's PC based Video Tape Library System.

This new video tape archival and locating system was used by NBC Sports for their coverage of the 1988 Summer Olympics in Seoul, and now it's available for stations.

Consider this partial list of features:
- Runs on a single IBM (or compatible) PC in standalone mode or on a PC network for many users.
- Scans bar code labels on the tape to update the tape's location.
- Provides 11 search criteria with which you can specify a tape; use one or any combination of them.

(We will customize these criteria for FREE for your installation.)
- Provides a KEYWORD search facility which can be used in any of the 11 categories.
- It's FAST — on a PC we can search through 15,000 tapes and find 20 in 3 seconds.

Why spend large amounts of money for a system which is an add on to traffic or a newsroom system?

This system is cost effective NOW, and is compatible with most cart machines.

For more information call or write:
Nesbit Systems, Inc.

5 Vaughn Drive • Princeton, N. J. 08540 • 609-799-1482

Circle (43) on Reply Card

---

ments conditions. For the THD specification to be meaningful, it should be specified at a given frequency, load impedance, measurement bandwidth and signal level. If any of this information is missing, then an incomplete picture of the measured parameter is presented. Be careful when comparing specifications of systems when you have insufficient information.

The most linear systems have low distortion at all frequencies within the audio spectrum. The distortion usually remains low at all signal levels up to the maximum level the system can pass. High-quality audio systems usually have IM distortion at levels comparable to those of THD.

Noise

It's important to look at the noise specification of the equipment you're considering. Noise exists in all electronic circuitry, and only the best designs control it well. The practical limit on noise within a circuit is determined by the laws of physics. The best designs can reduce circuit noise to within a few decibels or a fraction of a decibel of the theoretical limit. This is usually specified as the noise figure. This states how many decibels of noise a device will add to a theoretical source impedance. Unfortunately, few manufacturers use this specification method.

In a system, if a signal is passed through two devices with the same noise levels, then the total noise will be 3dB greater than with either device alone. This is the case whether the noise is wideband white noise or of a non-coherent nature. However, if the noise is perfectly in phase and of the same amplitude, then the resulting noise will be 6dB greater. An example would be a case in which the primary noise is power-supply hum.

Different weighting curves have been developed to find a measurement that correlates with audible noise. Measurements made with different weighting curves are not directly comparable. When comparing noise specifications, note the bandwidth or weighting curve used, the reference level and the measurement units used. Without this kind of information, comparing noise specifications becomes an apples-to-oranges issue.

Crosstalk

Crosstalk is defined as the leaking of one signal into another. In audio, it is usually heard during silent passages or pauses in the audio. The ear is particularly sensitive to it because crosstalk usually manifests itself as a signal that is unrelated to the desired signal. Videotape machines operating in high-speed rewind are common sources of crosstalk. Many tape machines do not mute the audio during rewind, which allows the audio to come through at exceptionally high signal levels. These signals can be extremely troublesome and cause crosstalk injection. All the energy is concentrated in the high-frequency end of the audio spectrum, and it is at a level much higher than normally encountered.

Crosstalk typically must be attenuated 80dB to remain inaudible. If the signal leaving the tape machine is +20dB, the switching system must be capable of 100dB isolation between audio channels. Otherwise, the high-level rewind signal will leak into adjacent audio channels.

RF sensitivity

Radio frequency (RF) interference is another important performance parameter in routing systems. Well-designed routers can operate in strong RF fields, such as at transmitter sites, without picking up the transmitted signal.

Proper performance requires that the input stages and system grounding be designed to reject any RF before it gets into amplifier stages. If RF leaks into these stages, it may be rectified and cause in-
HEADSETS AHEAD OF THE GAME—IN MORE WAYS THAN ONE

For coaches and broadcasters alike—the pros pick Telex.

On the football field and in the broadcast booth high atop the stadium you'll find Telex Headsets are the choice of the pros. National Football League stadiums and major television networks use a variety of Telex Professional Headset models day-in and day-out.

Furthermore, thousands of colleges, high schools and local radio/television stations who have recognized the value of clean, clear, dependable communications are also using Telex. If you're not already using a Telex, we urge you to take a closer look next time you have a requirement.

A model for every purpose. Whether your need is communication, camera, sportscaster, studio announcing or inconspicuous on-camera listening, Telex has a model that will fit your requirements perfectly. No other headset manufacturer has the tremendous model variation Telex offers.

Lightweight, full cushion single sided or dual, boom mic or monitor headsets are all fully described in the latest Telex Headset Catalog. Full specifications are included and the catalog is free. Call or write today: Telex Communications, Inc., 9600 Aldrich Avenue South, Minneapolis, Minnesota 55420.

© 1989 Telex Communications, Inc.
terference. One solution is to limit the system’s bandwidth enough to prohibit RF interference, but not enough to affect the audio. If audio circuits can pass signals in the RF range, the RF signals eventually will find an amplifier stage or system where they will be rectified and appear in the desired signal.

Transformers
Another significant advancement in professional audio is the elimination of audio-coupling transformers. Transformerless equipment can be produced that has higher noise rejection, lower noise and distortion, less hum pickup and even better RF rejection than equipment using transformers. That’s not to say that transformers aren’t needed. Transformers still are needed where large common-mode voltages or large dc currents are flowing in loops (such as in telephone lines).

Entire facilities have been built without transformer-coupled equipment and provide excellent audio performance. Some early transformerless equipment was poorly designed and caused problems. However, today’s transformerless equipment is more advanced and performs much better than earlier designs.

Transparency
Audio engineers use the term transparency to describe the sound of an audio system. It is not something that can be measured by conventional test equipment. A device that is transparent allows the listener to hear into the sound, sort of a 3-D effect.

There are many sources of distortion that produce a veiling effect, like looking through cheesecloth. Coupling transformers, electrolytic capacitors in the signal path, intermodulation distortion, odd-order harmonic distortion and many other effects all can reduce transparency.

It is not enough to meet this goal for only one pass through the system. High-quality switching systems can pass signals many times through without serious degradation.

Digital performance requirements
The use of digital audio sources places special requirements on a routing switcher. A good rule of thumb is that all audio distortion, noise and crosstalk should be 75dB to 80dB or more below the standard operating level. Signal levels between 70dB and 80dB below listening level represent the threshold of audibility for noise, crosstalk and distortion.

In addition to this low noise level, 20dB of linear, distortion-free headroom should be available. Combined, these two numbers project a total dynamic range of 95dB. Obtaining this level of performance requires at least 16-bit digital audio. To maintain this quality level, each component in the switching system must be much better because noise, distortion and crosstalk, as well as bandwidth limiting, add directly.

Figure 5 is a graphical representation of dynamic range, digital noise levels and distortion levels. For example, if a signal must pass through four audio components in the distribution system, each must have a noise floor of –81dB of non-coherent white noise to achieve a –75dB noise level. Any power supply or 60Hz hum present in the devices will cause the resulting noise level to be even worse.

In a typical station, a signal might pass through the audio-distribution system three or four times between origination and final delivery to the end-user. This is why the performance of the switching system is so important.

Unbalanced circuits
It’s common to find high-end consumer equipment in a broadcast station. This type of equipment, which usually has...
Add new profit opportunities by starting your own high speed tape duplication department.

Increase production of your current tape duplication department by adding modules as you grow.

Save the money you're spending on cassettes now. Produce them yourself for only the cost of the tapes.

Telex is the leader in high speed audio tape duplication equipment with products ranging from the compact, economical Copyette series to the professional 6120XLP shown here.

The Telex 6120 series provides outstanding audio quality, unlimited expandability and profitable production capabilities. It's available in high production 16X speed or 8X speed for highly critical audio needs.

Hearing is believing
For full details including specifications and a free demo tape, call or write today.

Telex Communications, Inc.
9600 Aldrich Av. So.
Minneapolis, MN 55420

Call toll free: 800-828-6107

© 1989 Telex Communications, Inc.
unbalanced inputs and outputs, is sometimes difficult to interface with transformercless routers.

A more serious problem may occur when balanced and unbalanced audio devices are combined. It is always possible to feed a balanced input from an unbalanced output. If they are connected correctly, the common-mode rejection of the balanced input will be retained. It is not always possible, however, to connect unbalanced loads to balanced outputs.

The cause of this problem lies in the design of the output stage. Typically, two amplifiers are used to derive a balanced output driver. If an unbalanced load is connected to such an output stage, one side of this driver stage is connected directly to ground. This causes large currents to flow in the power supply and system grounds. The result is greatly increased crosstalk. In some cases, the output device may be destroyed.

If an unbalanced load must be connected to this type of balanced output driver, only the positive (plus) output terminal should be connected to the load. The load should be placed between the positive terminal and the ground terminal. In most systems this will reduce the level by 6dB. In many cases this drop in level actually helps the interface process because the consumer equipment usually has a reference level lower than that of gear used in professional applications.

Some transformerless equipment relies on a newer type of output stage, sometimes called a floating output driver. This unique circuit simulates the floating output characteristics of a transformer. Either side of the floating output can be grounded without causing loss of signal level or an increase in crosstalk. Cross-coupled feedback provides this unique automatic balancing action.

Sometimes this circuit requires a common-mode output trim to maintain balance. An added advantage is that if either side of the wiring is shorted to ground, the correct signal level still will be present.

**Level matching**

A related point to consider is that of reference level matching. Most consumer-grade equipment uses a standard reference level of -10dBu. This corresponds to 0.0775Vac equaling 0VU. If the station reference level is +8dBu, then there is an 18dB difference between the two levels. This can cause serious compatibility problems. Playback levels will be too low in level, and inputs to recorders may be overdriven.

It is always desirable to provide for the required gain and loss at each consumer machine. This keeps all signals in the distribution system at the standard reference level. Level-matching devices are available from several manufacturers and should be used as necessary.

**System reference levels**

At least 20dB of headroom should be available in any distribution system. Headroom is the difference between the standard system reference level and the maximum signal amplitude the system can pass. A minimum level of 20dB is required because of the dynamic nature of modern recording techniques and the advent of digital recording. Even the human voice can exhibit a peak to average ratio of up to 20dB.

Most digital systems set the standard reference level 20dB below the maximum level. If the plant reference level is +8dBu, then the maximum signal level is +28dBu (0dBu = 0.775V). Although many modern devices can reach this maximum level, it is not common.

If the equipment uses ±15Vdc supplies (common voltages for audio circuits), then

---

**AES**

brings you the world of audio

JOIN PARTICIPATE

Call: 212-661-8528
High Definition Stereo Audio
For the complete picture

The 310 Series Audio Production Console has been specifically designed to complement the latest audio and video technology. It’s the only console in its class, offering mono or stereo inputs with VCA sub-grouping, with or without equalization, output submastering, audio-follow-video capability, a comprehensive user-programmable logic system and a wide range of accessories for custom tailoring to your specific requirements. Call 1-800-638-0977 for further information.

Circle (48) on Reply Card

Auditronics, Inc.
3750 Old Getwell Rd.
Memphis, TN 38118 USA
Tel: (901) 362-1350
Telex: 533358
the maximum level usually obtainable is about +26dBu. A lot of the audio gear can provide only a maximum of +24dB. The best reference level for such equipment, therefore, is +4dBu. If this reference level is chosen, the 20dB of headroom is maintained, as well as a good S/N ratio.

Reference levels other than +4dBu can be used, and some equipment can be changed easily to these levels. Some stations use 0dBu as the reference standard. Although this provides more than 20dB of headroom, it also sacrifices noise performance. The reference level is 4dB closer to the noise floor than that of a +4dBu system. It is recommended that systems be operated at the +4dBu level.

Voltage matching

One of the most significant improvements to audio-distribution systems in recent years is the use of voltage matching. Simply defined, voltage matching operates the system at a constant voltage. This means that all inputs are high-impedance or bridging, and all outputs are low-impedance. The standard 600Ω terminations are not used. This differs from the techniques used in video-distribution systems, in which all source and load, as well as cable, must have the same impedance.

Recent research shows that the performance of voltage-matched systems can far surpass that provided by 600Ω impedance-matched systems. Most of the research shows that an optimum output or source impedance should be used throughout the system. The optimum impedance for a twisted-pair cable with foil shield is usually between 500 and 600Ω.

If a driving impedance lower than this is used, frequency peaking results. If the driving impedance is higher, then high-frequency rolloff can result. With longer cables, this effect becomes more pronounced. Voltage matching is effective for distances of 5,000 feet or more.

Voltage matching can be accomplished with transformer-coupled equipment. However, it is usually more successful with transformerless circuitry. This is because most transformers require precise source and load impedances to provide good frequency response. In a voltage-matched system, this can be accomplished if the correct terminations are placed on source output transformers and all the loads driven are high-impedance. Transformer-coupled bridging inputs can be built, but they require special high-input impedance transformers.

Long lines

The requirement to drive long audio cables often is overlooked. All output stages have a limited amount of available current. Most output stages are designed to drive a 600Ω load. Although few devices actually have a 600Ω input impedance, the capability to drive this impedance is usually needed.

The load formed by the capacitance of the interconnecting cable easily can be 600Ω or less at high frequencies. Most 600Ω outputs can feed standard audio cables of lengths up to 500 feet. Longer cables have enough capacitance to cause current limiting in standard output stages.

For cables up to 5,000 feet, a driving current of up to 100mA may be needed, regardless of the load connected at the far end. Output stages capable of driving a 150Ω load to full output voltage can deliver this amount of current. If your station has some long lines, be sure your switching and distribution equipment can handle the task.

Choosing a routing switcher is not easy. The wide variety of switching and control options makes the decision even more difficult. The key is to first define carefully your particular needs, for both today and tomorrow. Next, identify systems that meet those needs while providing the level of audio quality you desire. Look for a system that meets those needs most cost-effectively.

Bibliography


Buff, Paul C. "Perceiving Audio Noise and Distortion." Recording Engineer/Producer, June 1979, pp. 84-85.


Aphex Makes Everyone Happy!

Stations that want to attract and keep a loyal audience realize audio quality is as important as programming. That's why sophisticated broadcasters avoid loudness wars and have gone to the state-of-the-art in signal processing . . . the Aphex Audiophile Air Chain™. This combination of the highly acclaimed Aural Exciter™ Compellor™ and Dominator™ delivers a signal that is competitively loud, yet doesn't sound processed, retaining a natural openness.

The Aphex Audiophile Air Chain will give your station a competitive edge in quality audio that sounds good on virtually any radio or high end audio system. And that covers all formats. KTWV-FM The Wave (Los Angeles), WHYI Miami-Ft. Lauderdale Top 40's, KKGO America's Jazz Station, KABC-TV Los Angeles, and WQXR New York's Premier Classical Station are representative of the different formats using the Aphex Audiophile Air Chain.

The best signal processing is also economical. The Compellor and Dominator will not only save your audio, they will save your budget. AM, FM, TV, cable, or satellite uplink . . . rock to Bach or talk, the Aphex Audiophile Air Chain offers the best signal processing at any price. Contact your local Aphex dealer to arrange for a demonstration today. Be happy!

APHEX SYSTEMS LTD.
11068 Randall Street • Sun Valley, CA 91352 • (818) 767-2929
© 1988 Aphex Systems Ltd. All Aphex products are designed and manufactured in the U.S.A.

FREE! The Aphex Experience Videotape. Send $5 to cover shipping and handling to our address in this ad. Be sure to include your name, address and phone number. Allow 4-6 weeks for delivery.
Managing satellite operations

By Richard Maddox

To effectively manage a satellite operation, you have to stay on your toes and keep everything at your fingertips.

Rarely are today’s audiences captivated by a news story read from the set. They expect to see live pictures from the scene. Many times a market exclusive can be obtained if a station can react more quickly and decisively to news events than its competition can. Being able to react fast requires coordination among several departments. The news department originates the request, engineering and technical services departments move satellite dishes and tune receivers, and the operations department loads up the machines and starts the tapes rolling.

To coordinate these various activities is the job of the satellite operations manager, also known in the business as the news feed coordinator, satellite traffic manager, satellite news coordinator, remote supervisor or EFP (electronic field production) supervisor. Regardless of the title, the duties remain the same—to manage what is coming into, and sometimes going out of, the station’s satellite dishes.

Job prerequisites
That satellite communications are important to today’s broadcaster is demonstrated by the fact that 99% of all U.S. TV stations are able to receive C-band transmissions, and more than 70% have both C-band and Ku-band reception capabilities. The majority of programming from out-of-house, be it news, sports, syndicated, network or advertising, now is being delivered via satellite.

For this reason, satellite communications managers need to know satellites—how to book time on them, how to coordinate feeds on them, and how to get signals into and out of them through the equipment at the station and on the road. These managers must be well-connected. They should be able to thumb through their Rolodexes and find the right contact at almost any station or uplink across the country.

At this time, there is no formal course of study to become a satellite communications manager. The position is typically filled by a technically astute individual who has grown into the job by being a quick study and having a background in broadcast technology. Engineers often make good candidates.

Who, what, where
With more than 100 video transponders operating at C-band and another 50 on Ku-band at any one time, it would seem to be an easy task to get time for a short insert for an evening news program. But the aspiring satellite communications manager quickly learns that a number of factors determine whether you can get a feed into your station at a desired time:

- Time of day. Because most news broadcasts run between 4 p.m. and 7 p.m., it follows that early afternoon is a hot time for feeds. Couple this with a big story, the regular business teleconferencing and syndicated programs, and you'll find that trying to get a 3:45 p.m. EST time slot is as easy as juggling transmitter tubes.

- What the receive dish can see. Some stations cannot move their receive dishes to hit every satellite. Some have only C-band available. A feed on a satellite you can't receive won't do you any good at all.

- What satellites the uplink can hit. Some uplinks are fixed on one bird, and you have no choice. On the other hand, asking the SNV (satellite news vehicle) to hit a satellite behind a building is not advisable.

- Who you know. Satellite brokers usually can get you time on any satellite, but to get you time in the next half hour is a different story. Most have direct booking on only a few satellites. The rest are cross-brokered, which means the broker has to call somebody else to arrange time for you. Again, it boils down to who's in your Rolodex.

For network affiliates, getting satellite time is pretty easy. If you're an NBC affiliate, you call up Skycom control and let them know when you want a feed and for
FEW THINGS ARE AS FLEXIBLE
AS AN EDIT WITH ADC’S S-9 PATCHMATE.

You know the problem...you have a complex edit to do and not enough ports in your editing computer to handle all the devices you need. Not only is it frustrating, but it can cost you a lot in wasted time.

Fortunately, there is a flexible solution to the problem...an S-9 PatchMate from ADC. It’s a dependable, convenient way to patch various RS-422, 9-pin serial machine control devices to your editing computer.

Once your RS-422 ports are connected to the D-subminiature jacks on the rear of the S-9, machine control routing is quick and convenient using PatchMate patchcords on the front jacks. And with bifurcated gold contacts, mistake-proof keyed plugs and a lifetime guarantee, your S-9 will perform flawlessly...patch after patch after patch.

Don’t let complicated editing get you bent out of shape. For more information on the flexible S-9 PatchMate, or the name of your local ADC distributor, call us at:

(612) 893-3126 (east of the Mississippi)
(612) 893-3119 (west of the Mississippi)
how long. The satellite choice is predetermined, as is the price — $14 per minute — so it's a pretty cut-and-dried operation. For CBS (Newssnet) and ABC (ABSat) the process is similar, but the satellite (GStar II) and cost ($8 per minute) are different.

For non-affiliated stations, syndicators and teleconferencers, this procedure is not so cut and dried; dozens of options are available. For these type of operations a satellite broker is essential. (See the related article, "Call Your Broker.")

**How to get there**

It's one thing to order up some time on a "bird," then issue memoranda directing underlings to receive and transmit it. It is quite another to arrange for a successful satellite feed. What separates the "stars" from the "saps" is a thorough knowledge of the microwave and fiber interconnects that will get a signal from its origination point to the satellite uplink and, at the receive side, from the downlink to the tape recorder. This is where a firm background in broadcast engineering can be helpful.

It is incredibly frustrating for satellite technical personnel whose managers haven't the slightest idea of what it takes to get the job done. For instance, many large cities are cursed with such a high amount of electrical and RF interference that satellite receive stations must be located in the surrounding countryside. Often the receive capability of the downlink outstrips the number of signal paths back to the station. This problem is readily understandable for engineers, but it can be baffling to non-technical people. Failure to master the links and paths inside a city may result in the writing of feed orders that technicians can't service.

**Satellite limitations**

Satellites can't do everything. Being aware of the limitations of the satellite system can prevent a lot of problems.

It is important to know the footprint for every usable satellite. The footprint is a map of the amount of energy that hits the ground from a given satellite. Footprints vary among satellites across the country. Areas such as Alaska and Hawaii have limited satellite access because most satellites are aimed at the continental United States. Service to these areas is provided either on special satellites properly positioned for the purpose or on certain transponders that are aimed toward these areas. (See Figure 1.)

It also is important to know the causes and predicted times of sun outages. It is no good booking feeds that the station cannot receive. It also is inexcusable. Predicted sun outage periods for most satellites are available well in advance.

Weather is a factor, too. Raindrops are about the same size as one-fourth of a Ku-band wavelength, so they'll absorb the Ku-band signals. Looking at a Ku-band satellite near the horizon (K2, for instance, from the West Coast) means there is more rain to go through, hence more attenuation, possibly leading to noisy pictures. A thunderstorm near the satellite news-gathering truck also can cut power up to the satellite so much as to render the pictures unusable. If the feed drops, where do you go for backup? The satellite operations manager has to have the answers.

**Scheduling and budgeting**

Satellite operations management, especially at stations with SNVs, entails much more than booking time and coordinating feeds. There's also scheduling of the truck and crews. It is important that drivers keep logs, and that their trip hours don't exceed the Department of Transportation's regulations. Truck engine maintenance also must be scheduled, as well as maintenance of the transmit and receive electronics.

Somewhere along the line, the costs for incoming and outgoing feeds surely will be scrutinized, so the operations manager must maintain adequate logs of which department ordered feeds and what the material was used for. The accounting department won't understand why you spent time sending another station a feed at no charge, unless you show that it was in exchange for a piece you used and weren't billed for. So be sure to log the freebies as well.

**Satellite time charges**

Do not go gently into that "good night." It may cost you a lot of money. Among the other intricacies of satellite communications, there is the matter of protocol for billing purposes. When a feed is finished, it is important that someone tells the uplink, the leaseholder (loosely called the "owner") of the transponder used, and perhaps the operators of the paths used to get feeds to and from the uplink and downlinks. This sometimes can be accomplished with a phone call, sometimes with a "good night" super placed over color bars. The procedures vary by satellite and by uplink. The satellite communications manager should establish the drill and leave instructions for doing it. Otherwise you may one day find yourself the not-so-proud purchaser of eight hours of Continued on page 94
If you haven't heard JBL's new generation of Studio Monitors, you haven't heard the "truth" about your sound.

TRUTH: A lot of monitors "color" their sound. They don't deliver truly flat response. Their technology is full of compromises. Their components are from a variety of sources, and not designed to precisely integrate with each other.

CONSEQUENCES: Bad mixes. Re-mixes. Having to "trash" an entire session. Or worst of all, no mixes because clients simply don't come back.

TRUTH: JBL eliminates these consequences by achieving a new "truth" in sound: JBL's remarkable new 4400 Series. The design, size, and materials have been specifically tailored to each monitor's function. For example, the 2-way 4406 6" Monitor is ideally designed for console or close-in listening. While the 2-way 8" 4408 is ideal for broadcast applications. The 3-way 10" 4410 Monitor captures maximum spatial detail at greater listening distances. And the 3-way 12" 4412 Monitor is mounted with a tight-cluster arrangement for close-in monitoring.

CONSEQUENCES: "Universal" monitors, those not specifically designed for a precise application or environment, invariably compromise technology, with inferior sound the result.

TRUTH: JBL's 4400 Series Studio Monitors achieve a new "truth" in sound with an extended high frequency response that remains effortlessly smooth through the critical 3,000 to 20,000 Hz range. And even extends beyond audibility to 27 kHz, reducing phase shift within the audible band for a more open and natural sound. The 4400 Series' incomparable high end clarity is the result of JBL's use of pure titanium for its unique ribbed-dome tweeter and diamond surround, capable of withstanding forces surpassing a phenomenal 1000 G's.

CONSEQUENCES: When pushed hard, most tweeters simply fail. Transient detail blurs, and the material itself deforms and breaks down. Other materials can't take the stress, and crack under pressure.

TRUTH: The Frequency Dividing Network in each 4400 Series monitor allows optimum transitions between drivers in both amplitude and phase. The precisely calibrated reference controls let you adjust for personal preferences, room variations, and specific equalization.

CONSEQUENCES: When the interaction between drivers is not carefully orchestrated, the results can be edgy, indistinctive, or simply "false" sound.

TRUTH: All 4400 Studio Monitors feature JBL's exclusive Symmetrical Field Geometry magnetic structure. which dramatically reduces second harmonic distortion, and is key in producing the 4400's deep, powerful, clean bass.

CONSEQUENCES: Conventional magnetic structures utilize non-symmetrical magnetic fields, which add significantly to distortion due to a nonlinear pull on the voice coil.

TRUTH: 4400 Series monitors also feature special low diffraction grill frame designs, which reduce time delay distortion. Extra-large voice coils and ultra-rigid cast frames result in both mechanical and thermal stability under heavy professional use.

CONSEQUENCES: For reasons of economics, monitors will often use stamped rather than cast frames, resulting in both mechanical distortion and power compression.

TRUTH: The JBL 4400 Studio Monitor Series captures the full dynamic range, extended high frequency, and precise character of your sound as no other monitors in the business. Experience the 4400 Series Studio Monitors at your JBL dealer's today.

CONSEQUENCES: You'll never know the "truth" until you do.
A convincing argument for Type C from a company that invented D2.

We didn't spend five years pioneering the world's first D2 composite digital recorder just to win technology awards—selling D2 machines is one of our top priorities.

But another and even more important priority for us is to make sure that the video professionals we serve have appropriate equipment for their jobs. And that they continue to look to Ampex

"...business more than tripled this year using Type C..."

Bill Stokes, Bill Stokes Associates

for the straight story about that equipment and its applications.

A case in point is the question we recently asked several of our customers who purchased Type C after we introduced D2.

"With the introduction of D2, why did you purchase Type C?"

We think the answers we got may interest you if you're considering the purchase of any video machine.

Bill Stokes (Bill Stokes Associates in Dallas), came right to the point. "My business has more than tripled this year, and I'm using Ampex Type C machines. Is there any better reason to buy more? With the new TBC-7 or the Zeus processor they make perfect pictures. Besides, I like the service I get from Ampex."

Jerry McKinzie with Cycle-Sat Communications Network in Forest City, Iowa, (a satellite courier,
production, and post-production business), thinks it's important to be able to update easily as his business changes. "The hardware and software upgrades Ampex makes in their equipment allow me to keep my facility current, and to always give my customers the newest look. I like that, and my customers demand it."

Darrell Anderson, whose company Anderson Video in Los Angeles, recently purchased several VPR-3s, pointed out that the Zeus port allows interface with D2. Darrell believes that, "Type C and D2 will co-exist successfully in a well-managed facility. Type C business is readily available." We were gratified to hear that he, "bought the best Type C machine he could find."

Consider your purchase decision carefully. When the excitement of a new equipment introduction passes, and you've put the pros and cons down on paper, Type C may be exactly the right machine for your application. After all, it's still the world's broadcast interchange and distribution standard.

"...hardware and software upgrades keep my facility current..."

Jerry McKinzie, Cycle-Sat Communications Network

And it is obviously the perfect choice for facilities that are moving up from ¾ inch.

We’d like to be involved in your decision-making process, and we’re as close as your telephone. Call Ampex at 1-800-25AMPEX for some real help with a difficult decision.
Continued from page 90
non-refundable feed time, after the fact. And that time may not come cheap. The owners of Ku-band satellites have enjoyed the proliferation of SNVs over the past four years. It has meant that Ku-band time, which at one time could be had for a song, is now commanding top dollar on the spot market. Today you'll pay about 33% more for bulk Ku-band time (in 30-minute to 1-hour increments) than for the same time at C-band.

Most C-band satellite time is booked in 30-minute increments. If you go one minute past, you've just bought yourself another 30 minutes, or you've just gotten cut off. Using one of the Ku-band networks, such as Conus or Newsbeam, which book in 5-minute increments, can mean a 5-minute feed can be had for as little as $40, compared with $175 for a C-band feed of the same length.

Using less popular satellites when backhauling sports feeds can help keep expenses down. Through the use of such a satellite, a 3-hour sporting event's transmission costs can be kept under $4,000 today, which is down considerably from what it was only a few years ago.

Satellite networks
Over the past 10 years or so, almost entirely because of satellites, an entirely new way of gathering news has developed. You no longer must be an NBC, CBS, ABC or PBS affiliate to gain access to taped footage of major and minor stories and human interest pieces.

Dozens of regional and national news-gathering networks have cropped up to feed the hundreds of non-affiliated stations with raw footage. Conus, Visnews, Satnet, ESPN, Hughes and CNN are but a few of these news networks. Each has regularly scheduled satellites and times that are used, and each usually bills by the story or by the minute of footage used.

Video news releases (VNR) and satellite media tours are areas that offer packaged footage via satellite. Most of the VNR times, satellites and transponders are listed in the Medialink newswire service, so coordination is pretty routine, unless several feeds are coming in at the same time. Often you can get a feed repeated — if you know who to talk to, that is.

Communications
Perhaps the most critical aspect of satellite operations is communication with the crew in the field. To be effective in a live situation, the talent must be able to hear not only the anchors on the set, but also the instructions of the producer and director. This means the satellite communications manager must be thoroughly acquainted with the inner workings of mix-minus feeds and interruptible foldback (IFB).

Briefly, mix-minus is an audio feed that includes everything going into the program mix (the mix), except for the talent's voice (the minus). Hearing their own voices, especially with a second or so of satellite delay, is dreadfully confusing for newspeople. IFB, on the other hand, is an override signal that interrupts the mix-minus feed, replacing it with verbal instructions, typically from the director or producer.

Many technologies exist to accommodate these audio requirements. Learn them.

Why we do the things we do
News is rarely cooperative. It never seems to break three or four hours before airtime; more often than not, it happens at the last minute. Being the first with the most requires managing your station's satellite resources for peak performance and a minimum of confusion.

Why should stations work so hard at news? The answers are many, and they often have to do with money. First, a
20 gets you 40. 40 inputs plus 8 subs for tracking, overdubbing or mix down means flexibility and control without re-patching at every step. Thanks to the flexibility of the WR-T820B, you can use the monitor section during mixdown to gain 20 extra inputs — over and above the WR-T820B's 20 input modules. So 20 really does get you 40!

The WR-T820B's performance and construction quality are every bit as remarkable as its design. Premium, high-speed IC's in the gain stages give it an open sound that does full justice to all those incoming signals. And our faders are rated at 300,000 operations — 20 times the life of a typical carbon fader. Just two examples of RAMSA's integrity in design and component selection.

See your RAMSA dealer for a complete demo. Or contact us for further information at: 6550 Katella Ave., Cypress, CA 90630, (714) 373-7278.
strong news presence shows a station's involvement in the community. Mention a station's call letters, and someone is likely to respond with the names of the 6 and 10 o'clock anchors. A popular news team means more revenue from the station's news products, and that pays the light bill. Second: Information is today's commodity. Today's audiences want to stay informed. Because station management often lives and dies by the ratings book, it's only natural they'd put their muscle where they can make a difference.

At your fingertips
Managers of satellite communications, whatever their local titles require a thorough understanding of the plan's input and output capabilities. Complete familiarity with the truck in use is a strong desire to keep accurate logs and records, and a broad knowledge of who's who in the industry.

Call your broker
Satellite brokers do more than simply book time on satellites. Most also can provide uplinking and downlinking equipment and coordinate syndication of special events, among other functions. Some satellite brokers even own one or more transponders.

Prices charged for broker services vary. Like broadcasters, brokers have rate cards that list their standard fees. For most, however, bargaining is a way of life. You'll need something to bargain with, such as wanting a large block of time on a less popular satellite.

Time charges vary according to the time of day requested, the satellite that is desired and how much time will be booked. If you need a Ku-band transponder, expect the cost to rise significantly. Typical hourly rates are running at $525 per hour for Ku-band time vs. $350 per hour for C-band time on the spot time market.

"Day of air" bookings, typically late-breaking news feeds and special events, can become coordination nightmares if the satellite operations manager doesn't know the station's capabilities inside and out. If it's a national or international story, hundreds of other satellite operations managers will be trying to get feeds in or out at the same time. Being flexible and tying in with other stations not only ensures you a feed but also can cut your costs.

McCurdy's affordable alternative to pricey audio distribution systems is the ADA-700. Compact and self-contained, this 1 Rack Unit high (1¼") stereo component, with individually adjustable outputs, offers excellent performance characteristics.

The ADA-700 can be configured as a stereo input with 8 stereo outputs, or as a single bridged monaural input with 16 individual outputs. Other features include a continuously variable -6 to +28 dB gain adjustment, isolated outputs and a quiet toroidal power transformer.

ONLY $460

McCurdy
McCurdy Radio Industries
108 Carnforth Road, Toronto, Ontario Canada M4A 2L4
Tel: (416) 751-6262
Tele: 06-983833 Telefax: (416) 751-6455
1051 Clinton St., Buffalo, New York 14206
Tel: (212) 772-0719

Circle (56) on Reply Card

96 Broadcast Engineering July 1989
MORE THAN CABINETS, WE OFFER SOLUTIONS.

Everything in consoles and racks for the video professional.

We've been designing and building high quality video consoles and racks for over 35 years. So we know the ropes. This experience can save you considerable time and money.

Preassembled, modular units make it easy.

You can choose from hundreds of video consoles, cabinets, racks, desks, EMI/RFI enclosures, and accessories in a wide range of hi-tech colors and styles.

Our consoles and racks are modular for future expansion and everything is preassembled for quick, easy set up.

Free design assistance.

If you like, our team of professional designers can help you design your own custom system. They'll work with you so you'll get maximum aesthetics, ergonomics, efficiency, durability, and economy.

Quality you can count on.

When you choose Stantron video consoles and racks you're choosing the highest quality.

Our years of experience assures you the very best solution whether it's simply a VTR/VCR rack or an entire room of custom consoles.

A full range of power panels and strips.

Get all the facts.

Fill out the coupon or Reader Reply Card. Or, just give us a call. We'll rush you our new Preplanner and Video Catalog.

Direct your inquiries to:

Stantron
Marketing Manager
6900-6918 Beck Ave.
No. Hollywood, CA 91605
Phone: (818) 841-1825 Fax: (818) 841-8892

Console and Rack Preplanner and Video Catalog!

Please rush me your Preplanner and Catalog.

Name __________________________
Title __________________________
Company ________________________
Address _________________________
City __________________ State ______ Zip ______
Phone __________________________

FREE
Setting standards for the future

By Don McCroskey

Standards: Are they friend or foe?

To most of us the term “standards” means the promotion of interchangeability of basic hardware. To others, it evokes thoughts of a slowdown of progress, of maintaining a status quo, perhaps for the benefit of a particular group. Each camp can cite examples to support its viewpoint, but no one can seriously contend that we would be better off without standards.

What is a standard?

One dictionary lists seven meanings for standard, but only one of these — “anything authorized as a measurement of quantity and quality” — seems to relate to the idea of a standard in the industrial area. The original idea behind commercial standards was indeed to be bound legally on units of weights and measure for fairness in trade. The “standards” under discussion here are really recommendations for users and/or manufacturers to adhere to basic specifications that allow operational interchangeability in the use of equipment and supplies.

Anyone concerned with interchangeability of equipment or products should be concerned with standards. A user hesitates to purchase equipment that does not conform to recognized interface standards for connectors, input/output levels and test specifications. A manufacturer may not be able to sell products if they are not compatible with other equipment.

Ask yourself the following questions: How do standards affect my life? Do they stifle progress? Do they prevent products from appearing on the market in a timely manner? Do they discourage alternative technologies that might be beneficial in the long run?

Many would respond affirmatively to one or more of these questions. But consider the upside. Standards ensure that the needs of the user are considered, that equipment from different manufacturers can be interconnected.

The standardization process

Standardization usually starts within a company as a way to reduce costs associated with parts inventory, design efforts and training of personnel. The next level might be a cooperative agreement, among firms that make similar equipment, to use standardized dimensions, parts and components. Competition, trade secrets and the NIH (not invented here) factor often generate an atmosphere that prevents such an understanding. Enter the professional engineering society, which promises a forum for discussion between users and engineers while downplaying the commercial and business aspects.

The professional society coordinates the documentation of existing and proposed systems with input from prospective users to effect a compromise between competing suppliers, and to ensure interconnectivity with the outside world. This recommendation might then be submitted to a body involving a larger circle of interested parties for further study and comment. (This second step is optional, depending on the scope of the project.) The document then is forwarded to the national standards organization. Again, interested parties (who may not have participated previously) are invited to comment and appeal. Only when this group has determined that all parties affected by the standard have been represented fairly is the document approved.

A recent example is the 1125/60 high-definition production standard (SMPTE 240M), which was generated from the documentation activities of the Working Group for High-Definition Television and its various subgroups. After a number of drafts and a high degree of cooperation among the equipment manufacturers, a consensus was obtained. The document then was forwarded to the Advanced Television Systems Committee for review and consequent submission to the American National Standards Institute (ANSI). Following further due process procedures, the standard was declared.

History of standards

In 1836, Congress authorized establishment of the Office of Weights and Measures (OWM) for the primary purpose of ensuring uniformity in customs house dealings. The treasury department was charged with its operation. As advancements in science and technology fueled the industrial revolution, it was ap-
This is one reason we sell more cart machines than anyone else.

The 99B series Master Recorder features a patented erase, splice-locate and azimuth-adjust system (ELSA).

And here are three more.

Our Authorized 3M Dealers

Allied Broadcast Equipment
800/622-0022

Broadcast Services Company
919/934-6869

Broadcast Supply West
800/426-8434

3M International Tapetronics — The World Leader In Cart Machines.

©1989, 3M Company
Circle (58) on Reply Card
parent that standardization of hardware and test methods was necessary to promote commercial development and to compete successfully in the world market.

The Industrial Revolution in the 1830s introduced the need for interchangeable parts and hardware. Wide use of steam railways and the cotton gin was possible only through mechanical standardization.

By the late 1800s, professional organizations of mechanical, electrical and chemical engineers were founded with this aim in mind. The American Institute of Electrical Engineers developed standards based on the practices of the major electrical manufacturers between 1890 and 1910. Such activities were not within the purview of the OWM, so there was no government involvement during this period. It took the pressures of war production in 1918 to cause the formation of the American Engineering Standards Committee (AESC) to coordinate the activities of various industry and engineering societies. This group became the American Standards Association (ASA) in 1928.

Parallel development occurred worldwide. The International Bureau of Weights and Measures was founded in 1875, the International Electrotechnical Commission (IEC) in 1904, and the International Federation of Standardizing Bodies (ISA) in 1926. Following World War II, this group was reorganized as the International Standards Organization (ISO). Today, approximately 54 countries participate on the ISO's 145 technical committees.

Due process procedures ensure that participation is open to all persons who are affected materially by the (standard).

The International Telecommunications Union (ITU) was founded in 1865 for the purpose of coordinating and interfacing telegraphic communications worldwide. Today its 164 member countries develop regulations and voluntary recommendations relating to telecommunications systems. A subgroup, the International Radio Consultative Committee (CCIR), is concerned with the compatible use of the frequency spectrum — including geostationary satellite orbit assignments — and standardized transmission formats to allow interchange of communications over national boundaries. The Advanced Television System Committee (ATSC) and SMPTE channel recommendations to the CCIR via the U.S. State Department and the FCC.

The ANSI coordinates policies to promote procedures, guidelines and the consistency of standards development. Due process procedures ensure that participation is open to all persons who are affected materially by the activities, without domination by a particular group. Written procedures are available to ensure that consistent methods are used for standards development and appeals.

Introduction of new technologies or changes in the direction of industry or engineering societies may require a mediating group to assign responsibility for a developing standard to the proper organization. The Joint Committee for Intersociety Coordination (JIC) operates under ANSI to fulfill this need.

Standards usually are changed only through natural obsolescence. Changes in basic quantities, such as units of length and volume, are extremely difficult for the general public to accept. In 1900 nearly all of the scientific, commercial and engineering community supported the change to the metric system. But the idea of changing ingrained benchmarks for weight and measure are as unpalatable as learning to speak a new language in another country.

Society engineering committees

The engineering groups that coordinate the work eventually presented to standardization bodies encourage participation from all concerned parties. Meetings often are scheduled in connection with major technical conferences to promote greater participation. Other necessary meetings usually are scheduled in areas where major research work is being done. No charges or dues are levied for membership or for attending meetings. An interest in these activities also can be served by reading reports carried in professional journals.

The wheels of standardization may seem to turn slowly at times, but the adoption of a standard...cannot be taken lightly.

Institute of Electrical and Electronics Engineers:

The IEEE, through its Broadcast Technology Society, traditionally has been involved with standards relating to transmission and recording systems. Presently available standards relate to definitions, measurement techniques and test methods. The Standards Coordinating Committees of IEEE publish books and documents covering definitions of electrical and electronics terms, graphic symbols and reference designations for engineering drawings and letter symbols for measurement units. These documents are available from IEEE or ANSI.

Society of Motion Picture and Television Engineers:

Organizations such as SMPTE, composed primarily of equipment users, are able to accomplish what is nearly impossible in the manufacturing community — to provide a forum where users and manufacturers can distill the best of current technology to promote basic interchangeability in hardware and software.

By about 1915 it became obvious that the rapidly expanding motion-picture industry needed to standardize the basic dimensions and tolerances of film stocks and transport mechanisms. After two unsuccessful attempts to form industry-based standardizing committees, the Society of Motion Picture Engineers (SMPE) was formed. The founding goals were to standardize the nomenclature, equipment and processes of the industry; to promote research and development; and to remain independent of, while cooperating with, its business partners. It is this independent quality of a professional society that enables it to mediate the strongly held opinions of business competitors.

By the late 1940s it was apparent that the future of motion pictures and television would involve sharing technologies and techniques. SMPE subsequently was expanded to SMPTE.

In comparatively recent times, SMPTE has been assigned more responsibility for TV standards. The recording and reproduction of TV signals has become the province of SMPTE standardization efforts. In the mid-'70s the society was successful
Our Network Ratings Are In.

Our clients have certainly appreciated the cost savings, and everyone has enjoyed the extra time satellite has provided us. Cycle-Sat has proven that satellite is a very viable method to distribute commercials.

—Dana Geiken, DMB & B

Our association with Cycle-Sat has been an exciting time for us. Cycle-Sat has made it easier for us to execute spot T.V. buys in multiple markets.

—Merle Welch, Foote, Cone and Belding

We have become accustomed to the ease and reliability of receiving commercial spots via satellite. We are also impressed with the flexibility of the system in regard to getting refeeds and special feeds. We look forward to a long working relationship.

—Karl Hagnauer, KPLR

Our experience at WGN-TV with Cycle-Sat has been quite positive. The system has been very reliable and the convenience of receiving the commercials in non-primetime has been helpful in scheduling our tape machines. Our equipment has been freed for production use during the prime hours.

—Robert Strutzel, WGN-TV

The quality and reliability of the hardware and software is outstanding. It’s error free in its operation, and the speed with which we receive commercial feeds saves us make-goods and lost time.

—Jim Martin, WOA-TV

If you haven’t already joined the Cycle Sat spot delivery network, check out the reception we’re getting from those who have. We guarantee network quality transmission of your spots, along with standardized traffic instructions. For service that’s out of this world... Call 1-800-274-2728.

©Cycle Sat, 1989

Circle (59) on Reply Card
SONEX CONTROLS SOUND.

With its patented anechoic foam wedge, SONEX absorbs and diffuses unwanted sound in your studio. And it can effectively replace traditional acoustic materials at a fraction of the cost. SONEX blends with almost any pro audio decor and looks clean, sharp, professional. Check into this attractive alternative for sound control. Call or write us for all the facts and prices.

SONEX is manufactured by Illbruck and distributed exclusively to the pro sound industry by Alpha Audio.

AlphaAudio
Acoustics
2049 West Broad Street
Richmond, Virginia 23220 USA
(804) 358-3852 FAX: (804) 358-9496
Acoustic Products for the Audio Industry

You can measure... with the best monitor and the most accurate test set.

The FMM-2/FMS-2 series monitors provide an even greater degree of precision measurement than ever before... You can measure S/N below 90 dB, You can measure crosstalk below 85 dB, You can measure separations of better than 70 dB, You can measure frequency response to better than 0.25 dB, You can measure distortions to lower than 0.01%, and much more... Our uncluttered panels and autoranging voltmeters make these measurements a dream.

BELAR
CALL ARNO MEYER (215) 687-5550
ELECTRONICS LABORATORY, INC.
LANCASTER AVENUE AT DORSET, DEVON, PENNSYLVANIA 19333

Call or write for more information on Belar AM, FM, Stereo, SCA and TV monitors.
The Harrison name is synonymous with consoles. There are thirteen models of Harrison console products for applications ranging from music recording, film, post-production, theatre and touring to radio and television broadcast, with six products relating to broadcast alone. These are:

The **Series Ten** puts more audio console power in the hands of an operator than any other console available anywhere, at any price.

The **TV-4** is a broadcast production console designed specifically for stereo television. Designed to minimize operational hassles, the TV-4 is available in a variety of mainframe sizes and module complements. The console can be configured to the operator’s specifications with optional accessories including: video switcher/editor interface, machine control panels, several different mixdown automation systems, clock/timer display, and other built-in options and accessories unavailable from other console manufacturers.

The **PRO-790** is a second generation production console designed from the feedback of the owners and users of its predecessor, the PRO-7. It has become the most popular Harrison product ever. This highly successful, versatile console is available in configurations with serial link to video editors as well as configurations for OB Vans (remote broadcast) or station level production studios.

The AIR-790 is in the control rooms of the top radio stations in America and private stations in Europe. Its standard features far outdistance those offered by other companies as options: dual stereo and dual mono program, clean feed for mix-minus, auxiliary send, clock, up/down timer, test oscillator with pink noise generator, and muting of monitor feeds with tally. Its unique on-off-audition pushbutton system reduces talent/operator errors. The AIR-790—the undeniable leader in high quality on-air consoles.

The AP-100 reflects the first application of Harrison's digitally-controlled attenuator in a small broadcast console. The AP-100's logic control system allows the operator to program the console to accommodate the remote control of virtually any playback device, as well as to set any input for use as either a microphone or line level input. These features are only a few of the revolutionary features of the new AP-100—yet the AP-100 is available at a very affordable price.

The TV-3 (not pictured) is one of the most comprehensive stereo teleproduction consoles in the world. Designed for world class facilities, the TV-3 has full 24-track routing and monitoring and eight stereo audio subgroups. A flexible stereo and mono program output matrix allows the TV-3 to tackle the most complex tasks with “push of a button” ease.

We’re committed to manufacturing, servicing and support of Harrison broadcast console products.
acoustics, electro-acoustics, shock and vibration and noise. Many of these standards are available through ANSI.

**National Association of Broadcasters:**
The NAB traditionally has been involved with standards involving audio equipment used principally by broadcasters. A disc recording pre-emphasis specification was developed circa 1940 to bring order to the chaos then existing in electrical transcriptions used for music libraries and program syndication. Again, in the 1950s, NAB was instrumental in the adoption of standard audiotape recording/playback pre-emphasis curves. Tape cartridge specifications are another example of the work done by the NAB standards group.

**International Standards Organization:**
ISO standards are concerned with audio quantities, units and symbols; cinematography; terminology; acoustics and information-processing systems.

*Case study: NTSC*

An example of standards development will illustrate how the process is conducted and what can result from industry cooperation. Standardization efforts for the black-and-white TV system used in the United States, and the compatible color system that followed, were well-documented.

- **NTSC I:**
  In 1936, the Radio Manufacturers Association (RMA), the forerunner of today's EIA, set up a committee to recommend standards for a commercial TV broadcasting service. In December 1937 the committee advised the FCC to adopt the RCA 343-line/30-frame system that had been undergoing intensive development since 1931. The RCA system was the only one tested under both laboratory and field conditions.
  A majority of the RMA members objected to the RCA system because of the belief that rapidly advancing technology would soon render this marginal system obsolete and, perhaps more important, would place them at a competitive disadvantage. (RCA was prepared to immediately start manufacturing TV equipment and sets.) Commercial development of television was put on hold.
  At an FCC hearing in January 1940, a majority of the RMA was willing to embrace the RCA system, now improved to 441 lines. However, a strong dissenting minority (Zenith, Philco and DuMont) still was able to block any action.
  The result was that the National Television Systems Committee functioned essentially as a forum to investigate various options. DuMont proposed a 625-line/15-frame/4-field interlaced system. Philco advocated a 605-line/24-frame system. Zenith took the stance that it was still premature to adopt a national standard. Not until June 1941 did the FCC accept the consensus of a 525-line/30-frame (60Hz) black-and-white system, which still exists today with minor modifications.

- **NTSC II:**
  During early development of commercial TV systems, even as early as the 1920s, it was assumed that color would be demanded by the public. Primitive field-sequential systems were demonstrated in 1929. Peter Goldmark of CBS showed a field-sequential (color filter wheel) system in the early 1940s and promoted it vigorously during the postwar years. Despite the fact that it was incompatible with existing receivers, had limited picture-size possibilities and was mechanically noisy, the CBS system was adopted by the FCC as the national color TV standard in October 1950.

  The engineering community felt

---

**YOUR SOLUTION TO CATHODE RAY TUBE REPLACEMENT!**

Video Display Corporation is the world's largest company dedicated to the cathode ray tube replacement market.

When you have a monitor down and the tube is bad, it is a comfort to know a dependable source of color or monochrome replacement tubes. From our inventory of our 250,000 tubes, most orders can be shipped the same day. Overnight if necessary. You will find the best in quality, price and warranty. Our sales engineers are the most knowledgeable in the industry. They understand your problems.

Some monochrome and color types are no longer available. Before you throw away that expensive monitor, check with VDC. In many cases our staff can custom engineer a replacement tube for you.

For occasional buyers, VDC now offers you the convenience of Visa Master-Charge.

**CALL TOLL FREE: 800-241-5005**

**VIDEO DISPLAY CORPORATION**
1868 Tucker Industrial DR. Tucker, GA 30084
(404)938-2080 800-241-5005 FAX (404) 493-3903

Circle (63) on Reply Card
Kansas City—known for its jazz legends, beautiful fountains, great steaks and Harry Truman. And, this year, host to the 1989 SBE National Convention and Broadcast Engineering Conference.

The broadcast industry is changing rapidly. To stay ahead today, you need to know where technology is heading. This year, in cooperation with major manufacturers, special hands-on training sessions will be available. It's your chance to be trained by factory engineers on the equipment your station uses. Other sessions allow you to learn the latest developments important to your job including satellite uplinking, HDTV, engineer licensing and new FCC regulations.

With technical sessions and exhibits specially designed to meet your needs, this is your show for '89.

So help us celebrate the silver anniversary of the SBE by attending the 1989 SBE National Convention and Broadcast Engineering Conference, October 5-8. Take in the show, and while you're in Kansas City, take in the sights!
betrayed (CBS excepted). Monochrome television, little more than three years old, had a base of 10 to 15 million receivers; broadcasters and the public were faced with having much of their new, expensive equipment become obsolete. The general wisdom was that color must be an adjunct to the 525/30 monochrome system so that existing terminal equipment and receivers could accept color transmissions.

Was the decision to accept the CBS color wheel approach a political one? Not entirely, because it was based on engineering tests presented to the FCC in early 1950. Contenders were the RCA dot-sequential, the CTI (Color Television Incorporated) line-sequential and the CBS field-sequential systems. The all-electronic compatible approach was in its infancy, and there were no suitable display devices. Thus, for a decision made in 1950 based on the available test data, the commission's move to embrace the color wheel system was reasonable.

CBS, however, had no support from other broadcasters or manufacturers; indeed, the company had to purchase Hytron-Air King to produce color TV sets (which also would receive black-and-white NTSC). Two hundred sets were manufactured for public sale.

Programming commenced on a 5-station East Coast network on June 21, 1951. Color receivers went on sale in September, but only 100 were sold. The last broadcast was on Oct. 21, 1951. The final curtain fell in November when the National Production Authority (an agency created during the Korean War) imposed a prohibition on the manufacture of color sets for public use. Some cynics interpreted this action as a design to get CBS off the hook because the production of monochrome sets was not restricted.

Meanwhile, the proponents of compatible, all-electronic color systems were making significant advances. RCA had demonstrated a tricolor delta-delta kinescope. Hazeltine demonstrated the constant luminance principle, as well as the "shunted monochrome" idea. GE introduced the frequency interlaced color system. Philco showed a color signal composed of wideband luminance and two color-difference signals encoded by a quadrature-modulated subcarrier. These and other manufacturers met in June 1951 to reorganize the NTSC for the purpose of pooling their resources in the development of a compatible system. By November a system employing the basic concepts of today's NTSC color system was demonstrated.

Field tests showed certain defects, such as sound interference caused by the choice of color subcarrier. This was corrected easily by the choice of a slightly different frequency, but at the expense of lowering the frame rate to 29.97Hz. RCA demonstrated the efficacy of unequal color-difference bandwidths. After further field tests, the proposal was forwarded to the FCC on July 22, 1953.

A major problem remained: the color kinescope. It was expensive and could be built to yield only a 9"x12" picture. Without the promise of an affordable large-screen display, the future of color television was uncertain. Then came the development of a method of directly applying the phosphor dots on the faceplate together with a curved shadow mask mounted directly on the faceplate. This breakthrough came from the CBS-Hytron company. The commission adopted the color standard on Dec. 17, 1953. It is interesting to note that the phase alternation line (PAL) principle was tried, but practical hardware to implement the scheme would not be available until 10 years later.

Those who suspect conspiracy behind every happening may still be heard suggesting that the field-sequential system was the best and that RCA forced an in-
The facts show that many of the prime features of the NTSC system were advanced by other research organizations. After 35 years, NTSC still has a remarkable aptitude for improvement and manipulation. But even with the advantage of compatibility for monochrome viewers, it took 10 years of equipment development and programming support from RCA and NBC before the general public started buying color receivers in significant numbers.

Are standards fair?
In a recent investigation by the Federal Trade Commission, only a small number of the almost 20,000 standards documents developed in the United States were found to arouse concern regarding equitable or fair trade practices. The voluntary development/voluntary compliance process does work. Standards are not developed by a self-serving group of people in secret.

Can the standards process be abused?
Of course, in the same way that any rulemaking organization can be swayed by a determined group of people, be it a social organization, a city council meeting or the U.S. Senate. The safeguards are the encouraged participation of a diverse group and due process procedures. In a widely publicized incident in the early 1980s, a committee in the mechanical engineering field generated a standard that was alleged to favor a particular group of manufacturers. Engineering committees must be vigilant to prevent such a possibility.

The best standards are evolutionary.

Food for thought
The best standards are evolutionary. Our basic TV standards came out of an industry-based committee in 1941. Color information was added to the system in 1953, but programs still could be received on existing black-and-white TV sets. Further additional features and minor specification changes continued to be appended to meet the needs of new recording and transmission systems, but never at the expense of rendering existing equipment obsolete. And yet we all know that there will be a juncture when an orderly changeover to a new technology must begin. This point in time is not likely to be universally identified. The numbers of players and observers are such that many conflicting agendas will work against a general consensus.

The standards process will, however, continue to be an important element in equipment design and use. Not because the industry likes standards, but because it needs them.

Bibliography

Editor's note: For additional information, contact the following organizations:
- Acoustical Society of America, 335 E. 45th St., New York, NY 10017-3483.
- Audio Engineering Society, 60 E. 42nd St., New York, NY 10165-0075.
- Institute of Electrical and Electronics Engineers, The Standards Office, 345 E. 47th St., New York, NY 10017-2394.
- National Association of Broadcasters, Office of Science and Technology, 1771 N Street, N.W., Washington, DC 20036.
- Society of Motion Picture and Television Engineers, 595 W. Hartsdale Ave., White Plains, NY 10607.
Board adopts licensing policy

By Bob Van Buhler

At its meeting during the NAB convention in Las Vegas, the SBE board of directors adopted a formal policy on the professional licensing of broadcast engineers. After reviewing each section of the policy carefully, the board edited and assembled the society's consensus on the issue.

Investigations by the board discounted the perceived crisis atmosphere, finding few accounts of enforcement. Where such actions do occur, the board policy instructs the national SBE to pursue modification of the statutes involved.

Board position

The society sees no rationale for state regulation of technical responsibilities of either employees or contractors at communications facilities. The board stresses that deregulation by the FCC is not analogous to surrender of authority.

The official policy recognizes the expertise of professional engineers. In addition, it discourages those who do not hold a state-regulated professional license from claiming expertise in the professional engineer’s domain by virtue of their involvement as broadcast engineers.

The policy affirms the validity of the titles of engineer, chief engineer and broadcast engineer, and recognizes the professional engineer’s right to protection of that title. It also discourages non-PES from calling themselves consulting engineers.

The legitimacy of the broadcast contract engineer’s duties is recognized by the policy. It lists many of the contract engineer’s rightful duties and services.

The policy statement declares SBE certification titles as valid, but such titles are in no way intended to imply competence in other disciplines. It is forbidden to use those titles to represent holders as being state-licensed professional engineers.

A copy of the policy statement was distributed to each attendee at the convention’s session on professional licensing. Additional copies are available from the national office in Indianapolis. Call 317-842-0836 to request yours.

Scholarships announced

Two students will receive grants totaling $2,250 from the Ennes Scholarship Fund and another $1,000 from the Ennes Foundation.

The largest award, $1,500, will go to Mark L. Nielsen of Lincoln, NE. Nielsen, a sophomore at the University of Nebraska-Omaha, is studying electrical engineering.

Nielsen works part-time in TV engineering to finance his education, and he has been employed as an operations supervisor at KUID-TV. He also works as an operating engineer for Multi-Media Production Group in Omaha.

Nielsen is SBE-certified as a TV broadcast engineer and has an FCC general-class license. He chairs the Eastern Nebraska and Western Iowa chapter.

A second award, of $750, will be made to Beverly L. Collette of Newport News, VA. Collette has worked in master control and tape operations at several satellite uplink facilities. She was most recently employed by WHROT-TV, Norfolk, VA.

Collette, a student at Thomas Nelson Community College, will transfer next semester to Norfolk State University to pursue a bachelor’s degree.

The Ennes Foundation’s $1,000 scholarship award will go to James A. Nelson of Madison, WI. A student at the Wisconsin School of Electronics, Nelson is a master control operator at WMSN-TV and is responsible for transmitter and satellite operation.

Scholarship applications are investigated and reviewed by past president Ron Arendall, Detroit.

“SBE Signal” editor to be hired

By formal resolution, the board of directors instructed the executive committee to select a paid editor for the “SBE Signal.” Two issues are to be published before the SBE national convention. The editor will be paid a fee for each issue produced, plus reasonable expenses for postage and telephone service.

Special Ennes workshops

Special engineering workshops will be provided by major equipment manufacturers on Wednesday, Oct. 4, the day before the opening of the national convention in Kansas City, MO. The workshops will be conducted free of charge by the following companies: Ampex, Broadcast Electronics, Grass Valley (Dubner), Harris Broadcast and Sony.

In addition, Mitchell Vo-Technical School will conduct an all-day seminar on satellite and uplink communications and operation. Consulting engineer Don Markley will coordinate a daylong session on AM and FM antenna systems. Under the auspices of the Cupka Corporation, WHO-TV director of engineering Sim Kolliner and BE technical editor Brad Dick will coordinate the workshop on engineering management.

Each of the manufacturer-directed sessions will be taught by factory instructors. These will be hands-on technical presentations, not sales demonstrations.

Seating at each of the sessions is limited to 50 and will be reserved on a first-come, first-served basis. Attendance is limited to those registering for the BE technical seminars, which run from Thursday through Sunday (Oct. 5-8) at the convention. Plan on attending these important sessions.

Continuing education units (CEUs) will be awarded to attendees at both the Ennes workshops and the BE conference sessions by Ferris State College. Remember, CEUs apply toward recertification points.

Convention update

This year’s national convention, which will be a celebration of the SBE’s 25th anniversary, will combine plenty of learning opportunities with plenty of ways to have fun.

Attendees can take advantage of a special SBE cab fare. Usually, the cab ride from Kansas City’s airport to the convention hotels is approximately $30. However, SBE has made special arrangements with the Yellow Cab company for reduced rates of only $7.25 per person. You must reserve your transportation in advance to take advantage of this discount fare. See the attendee mailing for additional information and toll-free telephone numbers.

Van Buhler is manager of engineering at KNIX-AM/FM, Tempe, AZ.

Editor’s note: For additional information about SBE activities, !GO BP FORUM on CompuServe.
Fifteen years ago, when we introduced the first color video noise meter there was a lot to make noise about. Today, with the advent of super tapes, super formats and CCD technology, measuring noise accurately has become an exacting science. Shibasoku's VN30A Series Color Video Noise Meters rise to the occasion with some improvements of significant note.

Little Windows.

New user defined measurement windows, easily constructed from the front panel, can be located anywhere on the screen. Create a spot window as small as a 4μs line segment and infinitely expand it up to full field. You can even place it in the vertical blanking interval.

Free Buss Rides.

Whether you've already automated testing, or plan to in the future, you get a GP-IB as standard equipment. That's right, standard. Not an expensive add-on afterthought.

And All The Extras.

The new VN30A Series gives you all the little extras like automatic sag compensation, auto level control and automatic memory for noise mode measurement. This means you can initiate a test quickly, in fact, at the touch of a single button. To help you isolate noise more precisely, the VN30A Series will let you measure even field, odd field or full field. And, the VN31AX will automatically select between NTSC and PAL.

To find out why, for price and performance, the VN30A Series is clearly the leading color video noise meter, contact us today.
INTRODUCING
OUR NEW
MODEL BP325
PORTABLE
USER STATION.
USER PROGRAMMABLE
WITH A POWERFUL
MICROPROCESSOR.
LIGHTWEIGHT
CONTOURED BODY.
AND GREAT
SOUNDING
CIRCUITRY.

WORKS ON ONE
OR TWO CHANNELS
AND INCLUDES
CALL SIGNALING,
MOMENTARY /
LATCHING SWITCHES,
PROGRAM INPUT,
CENTRAL-POINT
MIC TURN-OFF,
AND MUCH MORE.

MODEL BP325:
USER ACTIVATED
FOR OPTIMUM
PERFORMANCE.
PLEASE CALL
OR WRITE
FOR DETAILED
LITERATURE.

RTS SYSTEMS
INCORPORATED
THE FIRST NAME IN INTERCOMMUNICATIONS
1100 WEST CHESTNUT STREET BURBANK, CALIFORNIA 91506
PHONE 818 566-6700 FAX 818 843-7953

THE FACE OF INTERCOM AS IT SHOULD BE
USER ACTIVATED
Camera control system

Concept W Systems has introduced the CAMPLEX CP-201, which extends remote-control capability of video cameras to 5,000 feet on one coaxial cable. Signals transported on the cable include a blackburst signal to the camera, camera video, 2-way intercom, call/tally functions to the camera, mic/line audio, IFB/audio return and remote power. The camera adapter clips to a camera operator’s belt, and connects to the camera with a 14-pin VCR cable or BNC connection. Remote power to the adapter must be within 1,000 feet. The control unit, in a 1/2-width rack-mount or tabletop package, processes and produces necessary signals at the video control location.

Eight-track cassette

TASCAM has introduced the model 238 eight-track cassette recorder. The frequency response of 30Hz-16kHz at the standard cassette tape speed of 3.75ips is equivalent to that of a 1/4-inch eight-track transport running at 7.5ips. With dbx noise reduction activated, the S/N measures 90dB, while crosstalk is 70dB.

High-coercivity degaussers

Garner Industries has introduced the Eliminator 4000 conveyor-type degaussers that service the needs of video production centers using high-coercivity metal tape to 1,500feet. Generating a 4,000Oe degaussing force, erasure depth of metal particle tape is typically ~75dB on audio tracks, well into the noise level. A belt speed of 2.7ips provides an erasure time of 18s nominal.

Audio D/A converter

UltraAnalog has introduced the DAC D20200 dual 20-bit audio D/A converter. No external components are required for its use. Two independent channels, each with 20-bit resolution, operate at a 200kHz conversion rate, turning digital data back to analog audio signals. A dynamic range to 112dB is accommodated with this universal serial interface. When data of less than 20 bits is received, the device automatically inserts logical Os as the least significant bit.

Cable prep tools

Andrew has introduced EASIAX, cable preparation tools for use on 1/4-inch and 1/2-inch HELIAx coaxial cable. The pocket-sized devices include reversible, off-center cutting blades, which provide easy access to a spare cutting edge. A 3-step process readies the cable ends for connector attachment.

Broadcast monitoring

Standard Broadcast Service has introduced the National Supervisory Network (NSN). NSN uses very small aperture terminals (VSAT) to link information regarding conditions and operation of the stations’ transmitters, automation systems, EBS and other equipment by satellite to the network center in Avon, CO. Equipment readings are logged at 1/2-hour intervals; alarms, EBS tests and other events are logged upon occurrence. Restarting a transmitter that has timed out during a power failure can often be restarted without local station staff intervention. Weekly tests of backup equipment, power changes and many other functions are handled from the remote.

Calibration equipment

Bird Electronic has introduced the model 4029, a power sensor calibrator to be used in conjunction with the 4420 series RF power meters. The unit allows in-the-field calibration of the meters to ±3% of a known RF standard. The calibrator is used in conjunction with a CRT terminal or PC with serial port. The company also has announced the model 4024, an additional directional power sensor to the 4020 series Thruline RF sensors. The unit covers a frequency range of 1.5-32MHz at powers to 10kW.

Ku-band microwave system

E & M Development has introduced the PV104 series of bidirectional microwave systems for simplex video and audio transmission between a remote site and the station. A duplex order channel between the remote and fixed station is standard. A third audio channel can be added for stereo or reverse video, including S-VHS. The preassembled systems operate at 12.2-13.25GHz and include a 2-foot parabolic antenna, which will allow communications at distances to 20 miles line-of-sight. An automatic alignment system assists in link setup.

Guy protection

Hughey & Phillips has introduced the Guyline Guardian, a device that bolts around guyline preforms with self-locking fasteners. As a cover over the preform, the device prevents vandals from unwinding preforms. The shape of the device breaks ice sliding down the guy to avoid ice damage. The bolts can be used as a point for grounding.

Cable calibrator

Bird Electronic has introduced the model 4029, a power sensor calibrator to be used in conjunction with the 4420 series RF power meters. The unit allows in-the-field calibration of the meters to ±3% of a known RF standard. The calibrator is used in conjunction with a CRT terminal or PC with serial port. The company also has announced the model 4024, an additional directional power sensor to the 4020 series Thruline RF sensors. The unit covers a frequency range of 1.5-32MHz at powers to 10kW.
You Supply
The Nuts,

We'll Supply
The Bolts

Creative talent requires the best possible tools to make advertising copy come to life. That's where BSW comes in. For over 16 years we have been supplying audio equipment to stations, studios, and agencies all over America. Everything from microphones, consoles, multi-track recorders, to sophisticated audio effect devices. BSW sells the equipment that will bring out the best in your talent. Call for our free catalog.

Audio recorder interface
Audio Kinetics has introduced an additional ES 1.11 synchronizer interface. The addition serves the Otari MTR100 24-track audio recorder, which demonstrates a "tach rate" determined by the time-code standard in use. An MTR100 with the ES1.11 and an ES Eclipse controller provides full rehearsal facilities with normal remote transport control and autolocate functions.

Battery maintenance system
BatteryPro Centres has introduced the RAM recharging/analyzing maintenance system. Operating under a 16-bit microprocessor controller, charger cards, each with individual microprocessor, manage the charging operation with as many as 260 batteries in a fully expanded system. Five different programs are accessible from the front-panel keypad including instant charge, fast charge, exercise, recondition and standby. Data on each battery charged can be downloaded to a PC or printer.

Audio mixing interface
Benchmark Media Systems has released the CID-1 2-input mixing interface. The device is mounted on a 2-gang wallplate and provides two inputs with paralleled RCA and 1/4-inch TRS phone jacks. The interface requires 24Vdc to 36Vdc for operation, and accepts two audio inputs (a stereo pair or two monaural signals), and produces a monaural output for recording or for driving a monaural sound system.

Ready-to-assemble furniture
Bretford Manufacturing has introduced the No. 60979 entertainment center, which includes an audio compartment enclosed by tempered glass doors with a wireform storage tray for 39 audiocassettes or 78 compact discs. The upper video compartment provides space for monitors to 27-inch widths, and a VCR shelf with storage tray for 30 VHS cassettes. Slots in the back panels of the cabinet simplify cable management.
Audiocassettes

BASF Information Systems has introduced the Ferro Maxima I audiocassette. A microcoating technology and proprietary megadium iron oxide allows a maximum output level approximately 4dB greater than the previous Ferro Extra I formulation. Cassettes are available in C60 and C90 lengths.

Circle (363) on Reply Card

Plenum FO cable

Berk-Tek has introduced an improved plenum duplex fiber-optic cable. PT-DP provides two optical paths with increased flexibility, significant weight reduction, reduced attenuation and operation over a wider temperature range. The product uses flame-retardant materials in a zipcord design.

Circle (364) on Reply Card

LPTV multichannel antennas

Bogner Broadcast Equipment has introduced a series of multiple channel antennas for LPTV operators, which allow from two to five operators to use the same transmitting antenna. These antennas use a patented slot array design capable of an 84MHz useful bandwidth with several VSWR options. Omni, directional and custom pattern designs include null fill, beam tilt and integrated redundancy.

Circle (365) on Reply Card

Contact cleaner, lubricant

Caig Laboratories has announced an updated Cramolin aerosol product based on ozone-safe propellants, which deoxidizes, cleans, preserves and lubricates metal surfaces. The solution forms a protective, molecularly bonded layer to prevent contamination without reducing electrical conductivity.

Circle (366) on Reply Card

Ethernet transceiver

CaSat Technology has introduced the LANCAST ENT-4303, an ethernet transceiver, which includes a patented collision avoidance circuit. The unit complies to the IEEE 802.3 specification for medium attachment units and comes with a choice of three cable taps to serve a variety of network schemes. The metal packaging meets FCC Class A requirements.

Circle (367) on Reply Card

GLOBAL SUPPORT FOR GLOBAL COMMUNICATIONS

C-Band, Ku-Band and D.B.S. High Power TWT Amplifier Systems

For Video, Voice and Digital Communications

50-3000 Watt

Designed exclusively for satellite earth station use, MCL's High Power TWT Amplifier Systems meet the demand and discriminating stringent requirements for maximum signal purity and uncompromising reliability. All MCL amplifiers share commonality in operation, design and mechanical layouts to facilitate interchangeability and to minimize maintenance and repair. MCL equipment is designed to operate at optimum efficiency... even in the most remote, unattended locations and under the most adverse conditions.

MCL offers a host of C-Band, Ku-Band, and D.B.S. High Power TWT Amplifier Systems featuring:

- Double Drawer Amplifiers (300 to 750 W, Ku and D.B.S. Band)
- Single Drawer Amplifiers (50-300W Ku; 75-700W C-Band)
- Single Cabinet Amplifiers (2.5K-W; 3KW-C-Band)
- Special Tube/Helix Protection Measures
- Amplifier Performance Readout/Control
- High Voltage Component Protection
- Build-in "Remote" Capability

Turn to MCL for high quality, competitively priced satellite communications equipment of truly unequalled performance... guaranteed.

Technical specifications and details on the complete line of MCL C-Band, Ku-Band, and D.B.S. High Power TWT Amplifier Systems may be obtained by writing or calling MCL today. Simply request your complimentary copy of MCL's New, comprehensive brochure #6008.

MCL, INC.
501 S. Woodcreek Road
Bolingbrook, IL 60439
312-759-9500  TWX 910-683-1899


Circle (71) on Reply Card

July 1989  Broadcast Engineering 113
Switcher effects memory
Central Dynamics has introduced the SFX-MEM, a switcher memory system. Two Mbytes of memory store 120,000 panel commands compiled to discrete events. Events can be linked into sequences with sequences combined into routines. Auto Step allows a sequence to be "stepped through," allowing the operator to perform special functions. Wait commands control the delays before starting an event or sequence. The system is designed for the Strata-10 production switcher.

VTR automation and edit control interface
Connolly Systems has introduced the following products:
- The VTS-100 is an enhanced videotape sequencer system. With all hardware and software necessary to operate eight VTRs and an AFV switcher, the system supports on-air automation with titling and still-store functions. In conjunction with the PSS-100 PC-based program library and schedule system, direct access to a tape library including all transmission details allows advance generation of VTS-100 schedules and playlists for a Betacart system.
- The MEI-10 edit control interface has full edit control of Ampex VPR-2/2" VTRs from a Sony BVE series editor. Primarily for PAL standard operation, the interface provides time code, user bits and tape timer information on an 8-character, 7-segment display.

Visualization system
Cubicomp has introduced CADView, a computer graphics system for creating presentation material and animated graphics, which draws upon drawings developed with a CADKEY 3-D modeling system. After a 3-D model is imported into CADView, various surface attributes, such as color, texture, transparency and reflectivity, may be assigned. A CS/24 24-bit frame buffer generates broadcast-quality images, which may be ported to a video printer for slides.

Portable R-DAT
Digital Audio Technologies has introduced the STELLAVOX STELLADAT, a portable R-DAT recorder. Extended battery life is one of the varied powering capabilities of the system. Multiple standard and optional input and output plugs provide versatility, while the shock-resistant and waterproof construction can withstand almost any climatic extreme.

Time code and sync generators
Horita has introduced the FP-50 time-code system and BSG-50 sync generator. The FP-50 Field Pak is a portable time-code generator with "jam" mode and a window dub unit. When used for window dubbing, the device reads and inserts time code surrounded by a black mask into the video signal being recorded. The BSG-50 generator produces blackburst, composite sync and an audio test tone. Set for three blackburst and three composite sync outputs, internal jumpers allow the outputs to be reconfigured for H/V drives, composite blanking and subcarrier outputs.

Little Noisemaker.
This little gray box is about to have a big effect on the way you test your audio equipment.
No longer will you have to bother with individual tones to set proper audio levels. With Delta's SNG-1 Stereo Noise Generator you can make a variety of tests with true stereo noise, all at the flip of a switch.
You'll get a much more realistic view of what your equipment is doing. Whether you prefer white, pink, or USASI noise spectra, the SNG-1 provides it, in both continuous and pulsed output modes.
Say goodbye to hit or miss processor adjustments using varying program material. The award-winning SNG-1 spans the entire frequency range, so you'll cover the highs, the lows, and everything in between.
The external gate input permits an infinite variety of pulse shapes and durations so you can test your equipment to the absolute fullest. For standalone convenience simply switch to the internal pulse mode.
With the SNG-1 you'll always get an accurate and repeatable standard to base your measurements on. And for only $495, there's no bigger value.
To discover how the Little Noisemaker can help you in a big way, call or write today. And be sure to ask for your free copy of Delta's Noise Primer, "Employ Some Noise." Delta Electronics, Inc., 5730 General Washington Drive, P.O. Box 11268, Alexandria, VA 22312.
Phone: (703) 354-3350, FAX: (703) 354-0216, Telex: 90-1963.
Dubner K Series Character Generators

Whether you need a basic high resolution character generator, or one uniquely designed for broadcast facilities, Dubner has the smart choice for you.

From the low-cost 5-K, to the versatile 10 and 20-K, to the broadcaster's dual channel 30-K, K-SERIES character generators handle your real-time graphic needs. The 30-K's color preview and instant take-to-air make last minute changes a breeze. And each member of the K-SERIES offers anti-aliased fonts and color selection from a 16-million color palette to meet the most demanding post-production standards.

The K-SERIES is smartly priced, too. Options for camera capture, paint, presentation graphics and election reporting let you customize graphics without expensive modifications.

Discover the key to survival and growth in today's broadcast and production environment. Call your local Grass Valley Group sales office to explore the full series of Dubner character generators. You'll see why the K-SERIES is the only intelligent choice.

Dubner Computer Systems, Inc.
6 Forest Avenue
Paramus, NJ 07652-5214
Telex 62755706
A Grass Valley Group Company

Sales Offices:
New York (201) 845-7988
District of Columbia (301) 622-6313
Atlanta (404) 493-1255
Chicago (219) 264-0931

Minneapolis (612) 483-2594
Dallas/Fort Worth (817) 483-7447
Los Angeles (818) 999-2303
San Francisco (415) 968-6680
Jacksonville (904) 731-1127

Circle (73) on Reply Card
Editing system enhancements

Editing Machines Corporation has announced two enhancements to the Emc2 editing system. Discrete Cosine Transform (DCT) compression improves image fidelity as well as quadrupling disk storage capacity to four hours of raw video per drive. In addition, original material storage now uses erasable, removable magneto-optical disk drives from Sony.

Circle (373) on Reply Card

Autogram enhancement modules

Henry Engineering has introduced several enhancement modules. U.S.D.A. is a utility summing and distribution amplifier for combining and splitting audio signals for distribution. TELECART II operates with a cart machine to answer a phone line and play a recorded message, or as a line monitor to answer a phone line and feed audio to the caller. Update modules for Autogram consoles are improved versions of the MA-10 differential mic pre-amp, LA-10 line-input buffer, SA-10 servo-summing amplifier and OA-10 output program and meter amplifier.

Circle (374) on Reply Card

Video DA

Image Labs has introduced the FDA-30 video DA. Three separate amplifiers, each with looping inputs and two outputs, are housed within a single chassis. For distribution of RGB signals or three separate video signals, the unit operates from a 12V battery or 10.5-17Vdc, drawing 100mA.

Circle (375) on Reply Card

Engineering software

EDX Engineering has announced four engineering software packages. AMSW performs skywave propagation calculations for medium-wave frequencies. AMGW combines map conductivity, distances to groundwave contours and plotting of AM groundwave contours. TVSR performs a TV channel study for a new or changed full-power station. FMSR performs channel studies for new or changed FM stations.

Circle (376) on Reply Card

Headset with boom mic

Heil Sound has introduced the BMA series of boomsets. The microphone, using wideband or noise-canceling cartridge, is detachable from the headset. Model BMA-5 is a single-element headphone, while BMA-10 is a double-muff type. The units terminate in a ¼-inch stereo phone plug.

Circle (377) on Reply Card

Society of Broadcast Engineers
Chapter 22 Central New York

Seventeen Years in the Making

Come to one of the Most Successful Regional Broadcaster's Conventions in the Country!

—within a day's driving of most of the northeast

Friday, September 22nd, 1989
SHERATON CONVENTION CENTER
ELECTRONICS PARKWAY AND SEVENTH NORTH STREET
NYS THRUWAY, EXIT 37, LIVERPOOL, NEW YORK
9 AM - 5 PM

No admission charge for either papers or equipment displays
• Technical papers from the newest and sometimes controversial disciplines in broadcasting
• Equipment displays
• Manufacturer's representatives

Satisfy some of the basic needs of the broadcast engineering professional:
• Need to touch
• Need to feel
• Need to talk
• Need to listen

For more information, call or write the Convention Chairman:
John Soergel
25 Cotty Drive
East Syracuse, NY 13057
(315) 437-5805 or
Chapter 22 BBS
(315) 474-5070; 3/12/24; 8, 1, N

Circle (74) on Reply Card
Video titling system

G2 Systems has introduced ManuScript, an anti-aliased caption generator and video titling system. With an integral encoder and linear keyer, the system includes instant character resizing from a library of more than 2,000 type faces. Anti-aliasing produces an effective resolution of 10ns. Available for NTSC, PAL and CCIR-601 4:2:2, the system provides outputs in composite, RGB, component YUV and YC/S-VHS formats.

Videographics system

Getris Images has introduced VENICE, which offers paint tools with four superimposed images and linear keying, interactive 2-D animation of up to 11 anti-aliased actors, advanced 3-D animation and modeling with DGS2.1 software from Digital Arts, and mixing of computer graphics from different digital video sources. Based on 32-bit architecture, the system offers 4,096x4,096 pixel resolution with CCIR-601 inputs and outputs.

PA speaker systems

Galaxy Audio has introduced the Pro Spot 2 speaker systems for indoor or outdoor sound reinforcement. The system handles 200W 8Ω continuous input with a frequency response of 4Hz to 18kHz. The lightweight, wedge-shaped design is suitable for ceiling-mount or portable use. A speaker component of a 15-inch woofer and 1.5-inch dome tweeter is driven with a 1.3kHz crossover frequency.

Fader automation system

GML has announced Version 6 hardware and software for the series 2000 console automation environment. The version adds intelligent master machine control as well as Ethernet networking, extended editing and optional graphics display capability. Both 3.5-inch floppy and 40Mbyte hard disks are included in the system, while an external 8-inch drive is available to convert SSL and Necam mix data in the GML system.

Pro CD player

The EMT-981 professional CD player by Barco-EMT is available through Gotham Audio. The control and monitoring capabilities are suitable for broadcast or automated programming systems. All operating functions are accessed from large illuminated push-buttons or rotary controls with LED indicators. An EDIT mode serves setup, while ONLINE is the on-air mode. CUE provides precise cueing with repeatable segments. A ±10% variable-speed range, AUTO-CUE and AUTO STOP functions are standard features.

Frequency counter, color pattern generator and digital storage scope

John Fluke Manufacturing Company has announced the following products:

- The PM 9608 is a high-frequency input option for use with the Philips PM 6660 frequency counter series. Although the standard counter units have a range of 0.1Hz to 120MHz, the option extends the range to 1.3GHz. Digit blanking also is available for the counters to remove irrelevant display digit for improved reading accuracy.
- The Philips PM 5518 TXI pattern generator features operation from the front panel or through a GPIB/IEEE-488 interface. More than 70 test patterns and carrier frequencies can be generated in NTSC, PAL/N/M and SECAM transmission standards.
- The Philips PM 3308 digital storage oscilloscope is a portable package with a 100MHz bandwidth that features an electroluminescent screen, extensive arithmetic and analysis functions. It also features a 180kbyte RAM disk for storage of 100 waveforms or setup menus and is non-volatile with battery backup. It weighs 14.5 pounds, and the DSO displays four traces simultaneously, including Channels A and B with two mathematically calculated traces.

Equipment-mounting system

Kinetic Support Systems has introduced the VCM F189 vehicular equipment support. Flexibility in mounting is possible through the combination of multipurpose couplings and articulated assemblies with several lengths of pipe, which allow a camera or other equipment to be mounted in nearly any orientation inside or outside the vehicle.
A state of the art audio-for-vision editing suite usually requires considerable investment in equipment, but above all, the patience and dexterity of skilled engineers to manipulate several tape sources to VT and film. Miracles can be performed, but the editor is often constrained from creative experimentation by the limitations of both time and his facilities.

Solid State Logic conceived ScreenSound to put more creative power and time into the hands of the editor by eliminating logistical problems. Instead, we provide an entire editing suite in one integrated unit, with a simple pen and tablet control surface, enabling rapid editing, laying up and track-slipping, all with the digital sound integrity necessary to meet today's broadcast standards.

ScreenSound provides the first working environment built around the editor, not the equipment, leaving him free to use his creative skills on the final soundtrack.
Audio delays and compressor

Klark-Teknik has introduced two stereo delay units and a multicompressor system. The DN726 stereo delay supports two inputs and provides stereo, in-phase outputs over a frequency response of 20Hz-20kHz. The delay range of 0-1.3s is adjustable in 20μs increments. The DN775 stereo mastering preview delay response covers 20Hz-25kHz with a delay range of 0-5.55s, adjustable in 16μs increments. Both use 16-bit linear processing. The DN504 quad compressor-limiter includes switchable hard- and soft-knee compression for four channels in a single rack-unit package. Separate threshold, ratio, attack, release and output controls as well as separate LED gain reduction metering are provided for each channel.

Lightning protection

Lightning Master has introduced the TT-3S series lightning dissipation array that reduces and controls the static charge buildup that initiates a lightning strike. On tall towers, both top and mid-point dissipation bleed the charge slowly, making the structures less visible to lightning.

Fiber-optic links

Ortel has announced the following products:
- The 5515A and the 5515B fiber-optic links operate at 10GHz and 12GHz, respectively. The links consist of a 3515A/B laser transmitter using a 1515A/B laser module and 4515A/B receiver incorporating the 2515A/B photodiode. For analog transmissions, both systems operate beyond X-band frequencies.
- The 5601A broadband link is capable of transmitting 20 analog video channels on a single optical fiber to distances greater than 10km without repeat units. Fabry-Perot laser diodes without isolators and PIN photodiode receivers perform with low noise and distortion. Applications include CCTV, CATV or other broadband requirements.
Animation software

Mindware International has introduced PageSync, a software package interfacing the Commodore Amiga PC graphics with sound equipment including MIDI. The animation software synchronizes sound and video in animation. The program introduces interactive operation between the computer and MIDI equipment with either unit capable of controlling the other for effective animation production.

Video isolation transformer

North Hills Electronics has introduced the 1116UA and 1117UA 3-channel video isolation transformers. The multiple-channel configuration eliminates hum from video signals in RGB or composite installations. The 10Hz-5MHz bandwidth of 1117UA is compatible with NTSC, while a 20Hz-25MHz bandwidth of 1116UA is suitable for high-resolution video applications.

Mobile UPS system

Nova Electric has introduced Galaxy, a 1kVA rack-mountable UPS system. The 108-pound unit requires five inches of space in a 19-inch rack. Operating from shore power or field generators over an input frequency range of 45Hz to 65Hz, the output of the unit maintains regulation of ±1% from no load to full load, with a ±0.5% regulation of frequency.

Program timer, controller

Monroe Electronics has introduced the softkey control panel of the series 3000 program timer. It includes a 2-line, 40-character LCD display that is self-prompting. Sixteen open-collector outputs control program source equipment including satellite receivers, video recorders, IF switching systems or A/V relays. Optional modules for expansion with this 250-event minimum capacity controller are available.

Phono cartridges

Ortofon has introduced products in two phono cartridge series. The OM Super series features a cut-away stylus assembly for improved viewing of the stylus during cueing. A split pole pin technology reduces eddy currents in the pole pins for an extended high-frequency response. The X-Turbo series of high-output moving coil cartridges incorporate a finer grade of wire and a refined magnetic system for an output of 4mV.

Modular equipment cabinets

Precision Fabrication has introduced the medium-sized Mod-U-Desk rack cabinets. Technologies range from 12-to-22 inches high and 17-to-23 inches deep, while all accommodate standard 19-inch equipment chasses. The standard finish is royal blue. All the cabinets include adjustable mounting rails and permit panel modification with a knockdown construction design.
Video Services acquires Martin Audio Video

Martin Audio Video has signed a letter of agreement to be acquired by Video Services (VSC), Northvale, N.J. VSC is the parent of nine communications-related companies. Martin Audio will become part of VSC's A.F. Associate's unit. Martin, who founded his company in 1962, will continue to serve as its chief operating officer.

Varian acquires W-J product line

Varian Associates, Palo Alto, CA, and Watkins-Johnson Company have reached an agreement in principle for Varian to acquire W-J's space communications product line. The product lines include high-reliability traveling-wave-tube amplifiers and power supplies for use in satellite-based space communications systems. The line will be assigned to Varian's Microwave Equipment Division in Santa Clara, CA.

BTS announces sales agreement with Barco

BTS Broadcast Television Systems GmbH, Darmstadt, Federal Republic of Germany, will cooperate with Barco n.v. (Kortrijk) in the area of broadcast monitors. The BTS product range has been expanded to include the master control color monitors CTVM 4 (with 14- and 20-inch diagonal screens), the CVS series control color monitors (14- and 20-inch) and the CVM color monitors (14- and 20-inch), as well as monitors from the HD series for HDTV. In accordance with market demand, the product range will continue to include complementary BTS monitors.

Brabury Porta-Pattern relocates

Brabury Porta-Pattern has relocated its entire operations to the Kansas City area. The new location is 15755 South Highway 169, Olathe, KS 66062; telephone 913-780-4822; fax 913-780-5144.

Carillon Technology sells dbx Pro Products to AKG

Carillon Technology, Sunnyvale, CA, has received a formal letter of intent for the purchase of the dbx Professional Products Division from AKG Acoustics, Stamford, CT, and it has been accepted.

Former COMSAT unit to be sold to IDB

IDB Communications, Culver City, CA, has executed an agreement for the sale of CICI, the international services division of Contel ASC, to IDB. CICI, formerly a subsidiary of COMSAT, is a provider of international transmission services for the data/voice and TV marketplace.

The acquisition will improve the use of resources in facilities, manpower and operating leverage. Because the joint traffic of both companies will consolidate onto fewer facilities, IDB will be able to access new routes/countries for expanded international video and data services using the IDB and CICI facilities made available as a result of the consolidation.

Neve links with Mitsubishi Electric

Neve, Bethel, CT, has been named the exclusive distributor of Mitsubishi Electric professional digital audio products in North America. Under the terms of the agreement, Neve will
be the exclusive North American distributor of the entire line of Mitsubishi Prodigii-format digital reel-to-reel tape recorders and ancillary equipment throughout the United States, Canada and Mexico.

Sonoteknoique, Neve's exclusive Canadian distributor, has been appointed the distributor for Mitsubishi pro audio products in Canada.

**SISCOM and NBC announce joint development project**

_Satellite Information Systems Company (SISCOM), Boulder, CO, and NBC News will jointly develop advanced news production control systems that use NBC's graphics display software._

Under the terms of the agreement, news automation products that result from the joint development effort will be marketed internationally by SISCOM as part of its existing NewsPro computer software. The agreement provides NBC with an option to acquire up to 5% of SISCOM's common stock.

SISCOM and NBC News will work together to modify and expand automation software that has been developed by NBC over the past four years.

SISCOM and Digital Equipment Corporation also have announced the signing of a System Cooperative Marketing agreement covering SISCOM's NewsPro electronic newsroom software.

The agreement, part of Digital's Cooperative Marketing Program, enables SISCOM and Digital to work jointly on providing broadcasters with cost-effective, technical solutions for their news gathering, editorial and production needs.

**Solid State Logic announces the formation of Audio Processing Technology**

_Solid State Logic (SSL), Oxford, England, has announced the formation of a subsidiary to develop and market a new digital audio compression system. Audio Processing Technology (APT), will have its sales, marketing and manufacturing operations based at SSL's headquarters near Oxford. Development and subassembly functions are located in Belfast, Northern Ireland._

APT will exploit digital audio compression techniques pioneered by Dr. Stephen Smyth of Queen's University, Belfast, and use SSL's development and manufacturing resources to produce hardware. Smyth and the university remain partners in the new company. apt-X is the first product of the subsidiary.

SSL also has formed Solid State Logic Japan K.K. The subsidiary company is headquartered in Tokyo and will coordinate all SSL's Far Eastern sales and service operations, with the exception of Hong Kong and the People's Republic of China.

**Sony inaugurates Advanced Video Technology Center**

_Sony, Teaneck, NJ, has inaugurated the Advanced Video Technology Center at San Jose, CA. The recently consolidated Technology and Engineering Operation incorporates the Advanced Video Technology Center, which will serve as the focal point for development of advanced video technologies, with emphasis on R&D for high-definition TV program production and post-production equipment._

HDTV-related products recently developed by the center include a digital HDTV framestore system for storing high-quality images from an HDTV source and an off-line edit system.

Sony Professional Audio Training Group in Fort Lauderdale, FL, has announced its 1989 schedule of technical service training courses and engineering seminars. The program is designed to educate the professional audio industry about changing technology and new products, and is aimed at sys-
tems designers and studio engineers, technical service personnel, dealers and users and engineering instructor and students.

The programs are held at Sony Professional Products Company, 1400 West Commercial Blvd, Fort Lauderdale, FL 33309. Courses can be conducted on-site at recording studios, video post-production facilities, dealerships or colleges. The Professional Audio Training Group also can give custom-tailored courses to fit specific requirements.

For more information, please contact Raymond Callahan or James Gayoso at 305-491-0825, ext. 186.

VTA purchases Steadi-Film

*Video Tape Associates* (VTA), Atlanta, GA, has acquired an interest in Steadi-Film, Nashville, TN, which specializes in the research, development, production and marketing of equipment for the video post-production industry.

Steadi-Film's founder, Wayne Smith, will remain as president of the new corporation, which is called VTA Steadifilm.

---

**Mic Sale!!!**

AKG
Audio-Technica
Beyer-Dynamic
Crown
Countryman
Electro-Voice
HME
Light Wave
Nady
Ramsa
Samson
Sennheiser
Shure
Sony
Stewart
Telex
Vega
Williams

*Prices so low... we promised not to print them!*

InStockNow!
Call Toll Free
(800) 356-5944
(608) 271-1100

Circle (85) on Reply Card

---

**PORTA-BRACE QUICK DRAW**

►This professional case is a convenient way to carry and protect your camera on the ground, in your car and in the air. With its hard shell construction and aluminum viewfinder guard, this padded nylon case means lightweight security for your camera. Call or write for information.

Circle (87) on Reply Card
Solve your intercom interface problems forever.

CLEAR-COM
TW-12B
System Interface

- Interfaces: Clear-Com to RTS
  RTS to Clear-Com
  Clear-Com to Clear-Com
  even RTS to RTS

- Easy, fast, accurate nulling —
  up to 40dB!
- Matches system levels — even between
  incorrect or multiple terminations!
- Transformer isolated/opto-coupled
  to eliminate ground loop hum,
  buzz and noise!

Call Clear-Com or your
local dealer for details

945 Camelia St.
Berkeley, CA 94710
415/527-6666

Circle (92) on Reply Card

John H. Babbel has been named director of engineering at Alamar Electronics, Campbell, CA.

Eric Heiberg has joined Alpha Audio, Richmond, VA. He is one of the company's hardware and software designers. He already has completed his first project, a retrofit time-code reader module for ¾-inch video machines.

Rupert Neve has joined Amek Systems and Controls, United Kingdom. He will develop an advanced range of equipment and make some circuit enhancements in the existing Amek range. The company will provide Neve with its full range of facilities, including an in-depth manufacturing capability and production design team.

Dan Lavry has joined Apogee Electronics, Santa Monica, CA. He will head up the design of high-performance A/D and D/A conversion systems.

Charlie Day has been appointed product manager of the apt-X 100 digital audio compression system for Audio Processing Technology (APT), Oxford, England. He is responsible for worldwide sales and marketing of APT products. He is based at the Begbroke offices of the parent company, Solid State Logic.

John R. Hickey has been named manager of the newly created international division of Best Power Technology, Necedah, WI.

James L. DeStefano, Raymond C. Kiesel and Stuart M. Kravitz have been appointed to positions with Comark Communications, Colmar, PA. DeStefano has been appointed to full-time position of vice president of international sales. He is responsible for all international sales of the company's products, working directly with foreign, governmental and other buying entities. Kiesel has been promoted to vice president of advanced development. He is responsible for the engineering and development of the air- and liquid-cooled Klystrode-equipped transmitter product line. Kravitz has been promoted to vice president of domestic sales. He is responsible for total sales for the comprehensive line of UHF TV transmitters in the United States, as well as its line of RF systems and components.

Chris Ficler has joined Klark-Teknik, Farmingdale, NY, as DDA product sales representative. He is headquartered in Los Angeles and is responsible for DDA studio consoles. Ficler concentrates on selling consoles to studios and post-production facilities.

Hugh R. Heinsohn and William V. Trowbridge have joined Gentner Electronics, Salt Lake City. Heinsohn is director of corporate development. He is responsible for researching acquisition and joint venture candidates, procuring patent rights and supervising management information systems. Trowbridge, chief operating officer, assumes product management responsibilities from the director of marketing development. He oversees this area in addition to his current managerial responsibilities.

Chips Davis, formerly of Chips Davis, LEDE Designs, is now a principal at Paoletti/Lewitz/Associates, Acoustical and Audiovisual Consultants, San Francisco, CA.
VINTEN AT YOUR SERVICE
Trust Vinten Dependability for:
• Factory Authorized Parts and Repairs
• Preventive Maintenance
— Loaner Program Available —
Vinten Broadcast Inc.
New York (516) 273-9750 California (818) 767-0306

Phone
Renée Hambleton
for
Classified Advertising Information
(913) 888-4664

TRAFFIC
NAPA VALLEY COLLEGE offers a 2-year telecommunication program with emphasis in 1-inch "C" format, TBCS, component and digital video. Call or write Gary Vann, (707) 256-3250 Napa Valley College, Napa, California 94559.

FOR SALE:
NAPPA VALLEY COLLEGE offers a 2-year telecommunication program with emphasis in 1-inch "C" format, TBCS, component and digital video. Call or write Gary Vann, (707) 256-3250 Napa Valley College, Napa, California 94559.

FOR SALE:
NAPA VALLEY COLLEGE offers a 2-year telecommunication program with emphasis in 1-inch "C" format, TBCS, component and digital video. Call or write Gary Vann, (707) 256-3250 Napa Valley College, Napa, California 94559.

FOR SALE:
NAPA VALLEY COLLEGE offers a 2-year telecommunication program with emphasis in 1-inch "C" format, TBCS, component and digital video. Call or write Gary Vann, (707) 256-3250 Napa Valley College, Napa, California 94559.

WE PLACE ENGINEERS
ALL CATEGORIES FOR TV, PRODUCTION, VIDEO, CATV (EXCLUDING OPERATORS)
America's Leading Source for a Decade
TV STATIONS, PRODUCTION FACILITIES, EDI/TV MFG. CATV.
For information phone or write Mark Kornish
478 Northampton Street
Kingston, PA 18704

ENGINEER. Applicants must be able to repair and install television cameras, audio and video magnetic recorders, and electronic racks, and large storage compartment. Call Fred Zimmerman at 305-795-2673.

FOR SALE:
NAPA VALLEY COLLEGE offers a 2-year telecommunication program with emphasis in 1-inch "C" format, TBCS, component and digital video. Call or write Gary Vann, (707) 256-3250 Napa Valley College, Napa, California 94559.

FOR SALE:
NAPA VALLEY COLLEGE offers a 2-year telecommunication program with emphasis in 1-inch "C" format, TBCS, component and digital video. Call or write Gary Vann, (707) 256-3250 Napa Valley College, Napa, California 94559.

FOR SALE:
NAPA VALLEY COLLEGE offers a 2-year telecommunication program with emphasis in 1-inch "C" format, TBCS, component and digital video. Call or write Gary Vann, (707) 256-3250 Napa Valley College, Napa, California 94559.

WE PLACE ENGINEERS
ALL CATEGORIES FOR TV, PRODUCTION, VIDEO, CATV (EXCLUDING OPERATORS)
America's Leading Source for a Decade
TV STATIONS, PRODUCTION FACILITIES, EDI/TV MFG. CATV.
For information phone or write Mark Kornish
478 Northampton Street
Kingston, PA 18704

ENGINEER. Applicants must be able to repair and install television cameras, audio and video magnetic recorders, and electronic racks, and large storage compartment. Call Fred Zimmerman at 305-795-2673.

FOR SALE:
NAPA VALLEY COLLEGE offers a 2-year telecommunication program with emphasis in 1-inch "C" format, TBCS, component and digital video. Call or write Gary Vann, (707) 256-3250 Napa Valley College, Napa, California 94559.

FOR SALE:
NAPA VALLEY COLLEGE offers a 2-year telecommunication program with emphasis in 1-inch "C" format, TBCS, component and digital video. Call or write Gary Vann, (707) 256-3250 Napa Valley College, Napa, California 94559.

FOR SALE:
NAPA VALLEY COLLEGE offers a 2-year telecommunication program with emphasis in 1-inch "C" format, TBCS, component and digital video. Call or write Gary Vann, (707) 256-3250 Napa Valley College, Napa, California 94559.
HELP WANTED

TV MAINTENANCE ENGINEER: KUVN-23 Dallas, TX is seeking a maintenance engineer. Prefer 3-5 years experience, first phone, SBE Certified, knowledge of UHF transmitter, VTRs, switchers, cameras, ENG. Good benefits, fast growing UNIVISION station. Send resume to Richard Craig, 3720 Marquis, Garland, TX 75042. EOE. 7-89-1t

LIBERTY UNIVERSITY ELECTRONICS DEPARTMENT needs a qualified audio visual technician with experience in 1/2" and 3/4" VCR and radio broadcast systems repair to component level. Technician must be able to maintain ITFS and closed circuit TV systems and be familiar with design and operation of digital control systems. Candidate must hold FCC General Class license or SBE Certification. Send resume to: Personnel Department, Liberty University-North Campus, P.O. Box 20000, Lynchburg, VA 24506, EOE. 7-89-1t

TELEVISION SALES PROFESSIONALS needed immediately for Tektronix Television Division. Openings in Dallas, Denver, Syracuse, and Long Island. Competitive compensation, company car, opportunities to grow are part of "total package." Requires engineering background in television measurement, previous sales experience and desire to join one of the most successful Fortune 500 companies, contact John Kelley, Region Sales Manager, Tektronix Inc., 393 Inverness Dr. South, Englewood, CO 80112, (303) 799-1000. Tektronix is an equal opportunity employer. 7-89-1t

50KW NON-PROFIT CHRISTIAN FM seeking Chief Engineer willing to do some on-air work and light maintenance. Resume and tape to Joe Emer, WAKW, PO. Box 24-G, Cincinnati, OH 45224. 7-89-1t

CHIEF ENGINEER: Fast growing CBS affiliate seeks leader with mobile KU/satellite truck experience. Proven supervisory, personnel and hands-on skills a must. Send resume to Frank Innes, General Manager, WCGB-TV, Columbus, MS 39703. No calls. EOE. 7-89-1t

ENGINEERS NEEDED: Maintenance Supervisor—5 years experience component level, 2 years supervisory, trade school or college technical degree preferred. SBE, NARTE, or FCC General or First Class License. Experience with Ampex, Harris, Grass Valley and Reganini required. Assistant Director of Engineering—5-8 years in TV broadcast engineering, excellent interpersonal skills, thorough understanding of broadcast systems a must. 2-3 years experience in management, familiarity with capital and operational budget process preferred. SBE, NARTE or FCC General or First Class License required. College degree or technical school also preferred. APPLY TO: Director of Finance, WYES-TV, P.O. Box 24026, New Orleans, LA 70184-4026. No Telephone Calls! WYES-TV is an Equal Opportunity Employer. 7-89-1t

SANTA MONICA, CALIFORNIA
Herbert A. Schiff
Telephone: (213) 393-9285
Telefax: (213) 393-2381

CHICAGO, ILLINOIS
Vytas Urbonas
Telephone: 435-2361
Telefax: (312) 922-1408

NEW YORK, NEW YORK
Diane Gottlieb-Klusner
Telephone: (212) 702-3404

OXFORD, ENGLAND
Nicholas McGeachin
Telephone: (0869) 38794
Telex: 837469 BES G

TOKYO, JAPAN
Mashy Yoshikawa
Telephone: (03) 235-5961
Telex: J-33376 MYORIENT

FREWVILLE, AUSTRALIA
John Williamson
Telephone: (08) 799-522
Telex: 08-799-522
FAX: 08 799-522

Classified

Advertising sales offices
<table>
<thead>
<tr>
<th>Company/Service</th>
<th>Page Number</th>
<th>Reader Service Number</th>
<th>Advertiser Hotline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abekas Video Systems</td>
<td>33</td>
<td>415/369-5111</td>
<td></td>
</tr>
<tr>
<td>ADC Telecommunications, Inc.</td>
<td>89</td>
<td>612/693-3010</td>
<td></td>
</tr>
<tr>
<td>AMS Industries</td>
<td>27</td>
<td>206/633-1956</td>
<td></td>
</tr>
<tr>
<td>ADX Systems — USA</td>
<td>121</td>
<td>800/444-4239</td>
<td></td>
</tr>
<tr>
<td>Alpha Audio</td>
<td>102</td>
<td>804/359-3852</td>
<td></td>
</tr>
<tr>
<td>Alta Group, Inc.</td>
<td>44</td>
<td>408/297-2582</td>
<td></td>
</tr>
<tr>
<td>Ampex Corp. (AVSD)</td>
<td>40, 41, 92-93</td>
<td>415/367-2911</td>
<td></td>
</tr>
<tr>
<td>Apnex Systems, Ltd.</td>
<td>87</td>
<td>818/765-2212</td>
<td></td>
</tr>
<tr>
<td>Arrakis Systems, Inc.</td>
<td>21</td>
<td>303/224-2248</td>
<td></td>
</tr>
<tr>
<td>Asaca/Shibasoku Corp. of America</td>
<td>109</td>
<td>213/827-7144</td>
<td></td>
</tr>
<tr>
<td>Astre Systems</td>
<td>59</td>
<td>209/575-1000</td>
<td></td>
</tr>
<tr>
<td>Audio Precision</td>
<td>49</td>
<td>800/231-7350</td>
<td></td>
</tr>
<tr>
<td>Audio Technologies, Inc.</td>
<td>54</td>
<td>215/443-0330</td>
<td></td>
</tr>
<tr>
<td>Audetronics, Inc.</td>
<td>85</td>
<td>901/362-1350</td>
<td></td>
</tr>
<tr>
<td>Belar Electronics Laboratory, Inc.</td>
<td>102</td>
<td>215/687-5550</td>
<td></td>
</tr>
<tr>
<td>Belden Wire and Cable</td>
<td>43</td>
<td>800/BEL-DEN4</td>
<td></td>
</tr>
<tr>
<td>Benchmark Media Systems</td>
<td>86</td>
<td>315/452-0400</td>
<td></td>
</tr>
<tr>
<td>Boonton Electronics Corp.</td>
<td>63</td>
<td>201/584-1077</td>
<td></td>
</tr>
<tr>
<td>Broadcast Supply West</td>
<td>112</td>
<td>800/426-8434</td>
<td></td>
</tr>
<tr>
<td>Broadcast Video Systems, Ltd</td>
<td>119</td>
<td>416/784-1584</td>
<td></td>
</tr>
<tr>
<td>BTS Broadcast Television Systems</td>
<td>29, 52-53</td>
<td>801/892-8000</td>
<td></td>
</tr>
<tr>
<td>Cablewave Systems</td>
<td>31</td>
<td>203/239-3311</td>
<td></td>
</tr>
<tr>
<td>Canare Cable, Inc.</td>
<td>86</td>
<td>818/840-0993</td>
<td></td>
</tr>
<tr>
<td>Carver Corporation</td>
<td>50</td>
<td>818/442-0782</td>
<td></td>
</tr>
<tr>
<td>Clear-Com Intercom Systems</td>
<td>124</td>
<td>301/527-6666</td>
<td></td>
</tr>
<tr>
<td>Comad Communications</td>
<td>122</td>
<td>800/387-4991</td>
<td></td>
</tr>
<tr>
<td>Conex Electro Systems</td>
<td>106</td>
<td>206/734-4323</td>
<td></td>
</tr>
<tr>
<td>Continental Electronics, Div. of Varian</td>
<td>36</td>
<td>801/431-7161</td>
<td></td>
</tr>
<tr>
<td>Cycle Sat</td>
<td>101</td>
<td>800/274-2728</td>
<td></td>
</tr>
<tr>
<td>Delta Electronics</td>
<td>114</td>
<td>703/354-3350</td>
<td></td>
</tr>
<tr>
<td>Di-Tech, Inc.</td>
<td>IBC</td>
<td>516/687-6300</td>
<td></td>
</tr>
<tr>
<td>Drake Electronics, Ltd.</td>
<td>82</td>
<td>800/343-0101</td>
<td></td>
</tr>
<tr>
<td>Dubner Computer Systems</td>
<td>115</td>
<td>201/845-7988</td>
<td></td>
</tr>
<tr>
<td>EDX Engineering, Inc.</td>
<td>74</td>
<td>503/345-0019</td>
<td></td>
</tr>
<tr>
<td>Electro-Voice, Inc.</td>
<td>61</td>
<td>616/695-6831</td>
<td></td>
</tr>
<tr>
<td>Fast Forward Video</td>
<td>84</td>
<td>714/852-8404</td>
<td></td>
</tr>
<tr>
<td>For-A Corp. of America</td>
<td>47</td>
<td>213/402-5391</td>
<td></td>
</tr>
<tr>
<td>Full Compass Systems</td>
<td>123</td>
<td>800/356-5844</td>
<td></td>
</tr>
<tr>
<td>Garner Industries</td>
<td>94</td>
<td>800/228-0275</td>
<td></td>
</tr>
<tr>
<td>Gentner Electronics Corp.</td>
<td>51</td>
<td>801/268-1117</td>
<td></td>
</tr>
<tr>
<td>GLW Enterprises, Inc.</td>
<td>103</td>
<td>301/731-5777</td>
<td></td>
</tr>
<tr>
<td>Grass Valley Group, Inc.</td>
<td>9, 42</td>
<td>916/478-3000</td>
<td></td>
</tr>
<tr>
<td>Intraplex, Inc.</td>
<td>123</td>
<td>508/486-3722</td>
<td></td>
</tr>
<tr>
<td>Jampro Antennas, Inc.</td>
<td>46</td>
<td>916/383-1177</td>
<td></td>
</tr>
<tr>
<td>JBL Professional</td>
<td>91</td>
<td>818/893-8411</td>
<td></td>
</tr>
<tr>
<td>Jem-Fab Group</td>
<td>84</td>
<td>516/867-8510</td>
<td></td>
</tr>
<tr>
<td>Jensen Transformers, Inc.</td>
<td>119</td>
<td>213/876-0059</td>
<td></td>
</tr>
<tr>
<td>K&amp;H Products, Ltd.</td>
<td>123</td>
<td>802/442-8171</td>
<td></td>
</tr>
<tr>
<td>LDL Communications</td>
<td>107</td>
<td>301/498-2200</td>
<td></td>
</tr>
<tr>
<td>Leader Instruments Corp.</td>
<td>5</td>
<td>800/645-5104</td>
<td></td>
</tr>
<tr>
<td>Leitch Video of America, Inc.</td>
<td>120</td>
<td>804/424-7290</td>
<td></td>
</tr>
<tr>
<td>3M Broadcast &amp; Related Products</td>
<td>48</td>
<td>800/328-1694</td>
<td></td>
</tr>
<tr>
<td>3M Magnetic Media Div.</td>
<td>19</td>
<td>800/328-1694</td>
<td></td>
</tr>
<tr>
<td>Markertek Video Supply</td>
<td>119</td>
<td>800/522-2025</td>
<td></td>
</tr>
<tr>
<td>McCurdy Radio Industries</td>
<td>58, 66</td>
<td>416/751-6262</td>
<td></td>
</tr>
<tr>
<td>MCL, Inc.</td>
<td>113</td>
<td>312/759-5900</td>
<td></td>
</tr>
<tr>
<td>Midwest Communications Corp.</td>
<td>1</td>
<td>800/543-1584</td>
<td></td>
</tr>
<tr>
<td>Nesbit Systems, Inc.</td>
<td>80</td>
<td>609/799-1482</td>
<td></td>
</tr>
<tr>
<td>Opamp Labs, Inc.</td>
<td>119</td>
<td>213/934-3566</td>
<td></td>
</tr>
<tr>
<td>Orban Associates, Inc.</td>
<td>7, 11</td>
<td>800/227-4498</td>
<td></td>
</tr>
<tr>
<td>Otari Corp.</td>
<td>15</td>
<td>415/592-8311</td>
<td></td>
</tr>
<tr>
<td>Panasonic Broadcast Systems Co.</td>
<td>76, 77</td>
<td>201/348-7336</td>
<td></td>
</tr>
<tr>
<td>Panasonic Pro Industrial Video</td>
<td>34, 35, 37</td>
<td>800/553-7222</td>
<td></td>
</tr>
<tr>
<td>Pesa Electronica S.A.</td>
<td>60</td>
<td>800/872-7372</td>
<td></td>
</tr>
<tr>
<td>Polyphaser Corp.</td>
<td>106</td>
<td>800/325-7170</td>
<td></td>
</tr>
<tr>
<td>QEI</td>
<td>3</td>
<td>800/334-9154</td>
<td></td>
</tr>
<tr>
<td>Ramsa/Panasonic</td>
<td>95</td>
<td>714/895-7277</td>
<td></td>
</tr>
<tr>
<td>RTS Systems, Inc.</td>
<td>110</td>
<td>818/843-7022</td>
<td></td>
</tr>
<tr>
<td>SBE — Chapter 22</td>
<td>116</td>
<td>315/437-5805</td>
<td></td>
</tr>
<tr>
<td>Sennheiser Electronic Corp.</td>
<td>55</td>
<td>203/434-9190</td>
<td></td>
</tr>
<tr>
<td>Shure Brothers, Inc.</td>
<td>11</td>
<td>312/866-2553</td>
<td></td>
</tr>
<tr>
<td>Solid State Logic, Ltd.</td>
<td>94</td>
<td>800/341-0101</td>
<td></td>
</tr>
<tr>
<td>Sony Communications Prod/Broadcast Div.</td>
<td>65-72</td>
<td>800/635-SONY</td>
<td></td>
</tr>
<tr>
<td>Sony Communications Products/Pro Video</td>
<td>24-25</td>
<td>800/523-SONY</td>
<td></td>
</tr>
<tr>
<td>Sony Corporation/Pro Mavica</td>
<td>79</td>
<td>800/222-0878</td>
<td></td>
</tr>
<tr>
<td>Standard Tape Laboratory, Inc.</td>
<td>119</td>
<td>415/786-3546</td>
<td></td>
</tr>
<tr>
<td>Stanton Magnetics</td>
<td>62</td>
<td>353/494-0235</td>
<td></td>
</tr>
<tr>
<td>Stanton/Unit of Zero Corp.</td>
<td>97</td>
<td>800/821-0019</td>
<td></td>
</tr>
<tr>
<td>Studer Revox America, Inc.</td>
<td>11</td>
<td>615/254-5651</td>
<td></td>
</tr>
<tr>
<td>Tascam Div. TEAC Corp. of America</td>
<td>45</td>
<td>213/726-0303</td>
<td></td>
</tr>
<tr>
<td>Tektronix, Inc.</td>
<td>57</td>
<td>800/452-1877</td>
<td></td>
</tr>
<tr>
<td>Telex Communications, Inc.</td>
<td>81, 83</td>
<td>612/887-5550</td>
<td></td>
</tr>
<tr>
<td>Utah Scientific, Inc.</td>
<td>39</td>
<td>800/453-9727</td>
<td></td>
</tr>
<tr>
<td>Varian</td>
<td>13</td>
<td>415/592-1221</td>
<td></td>
</tr>
<tr>
<td>Video Display Corp.</td>
<td>104</td>
<td>800/241-5005</td>
<td></td>
</tr>
<tr>
<td>Videotek, Inc.</td>
<td>48</td>
<td>602/997-7523</td>
<td></td>
</tr>
<tr>
<td>Ward-Beck Systems, Ltd.</td>
<td>BC</td>
<td>416/43-3865</td>
<td></td>
</tr>
<tr>
<td>Winsted Corp.</td>
<td>121</td>
<td>800/447-2257</td>
<td></td>
</tr>
</tbody>
</table>
Routing switchers are simple and efficient when all you need is a full AFV matrix. If you try reserving a few video only or audio only crosspoints, however, they can quickly become very clumsy and awkward. Now, you could play games moving switch cards around, tie up “spare” inputs with terminators, or rewire your router frames. But there is a better way.

Di-Tech’s virtual matrix control system, Model 9002, maintains a software map of your router’s hardware connections. This makes it easy to define single level crosspoints anywhere in a matrix, as well as preset breakaway switches. Special purpose routing – such as time code, RS422 or RGB – can be smoothly integrated into an 8 level master grid at any time.

Prepare for tomorrow with the company that can do it all today…Di-Tech.
More versatility! 
More important functions!

The D8212 Distribution 
Amplifier System just keeps on growing!

All of Ward-Beck's substantial investment in R&D is directed towards one single objective ... to bring you the very best professional audio systems.

That's why other manufacturers...who try to satisfy a wider range of audio and video applications, simply cannot match the performance and quality of Ward-Beck audio products such as the proven D8212 DA System.

Now Ward-Beck is proud to announce the addition of new modules for the D8212 System. These include the M8200 transformerless, remote sensitivity microphone preamplifier, a stereo DA and a test oscillator.

We invite you to ask for details on these and other high-performance products in the expanding D8212 family.

WARD-BECK SYSTEMS

Ward-Beck Systems Ltd.
841 Progress Avenue, Scarborough, Ontario, Canada M1H 2X4.
Tel: (416) 438-6550. Fax: (416) 438-3865.