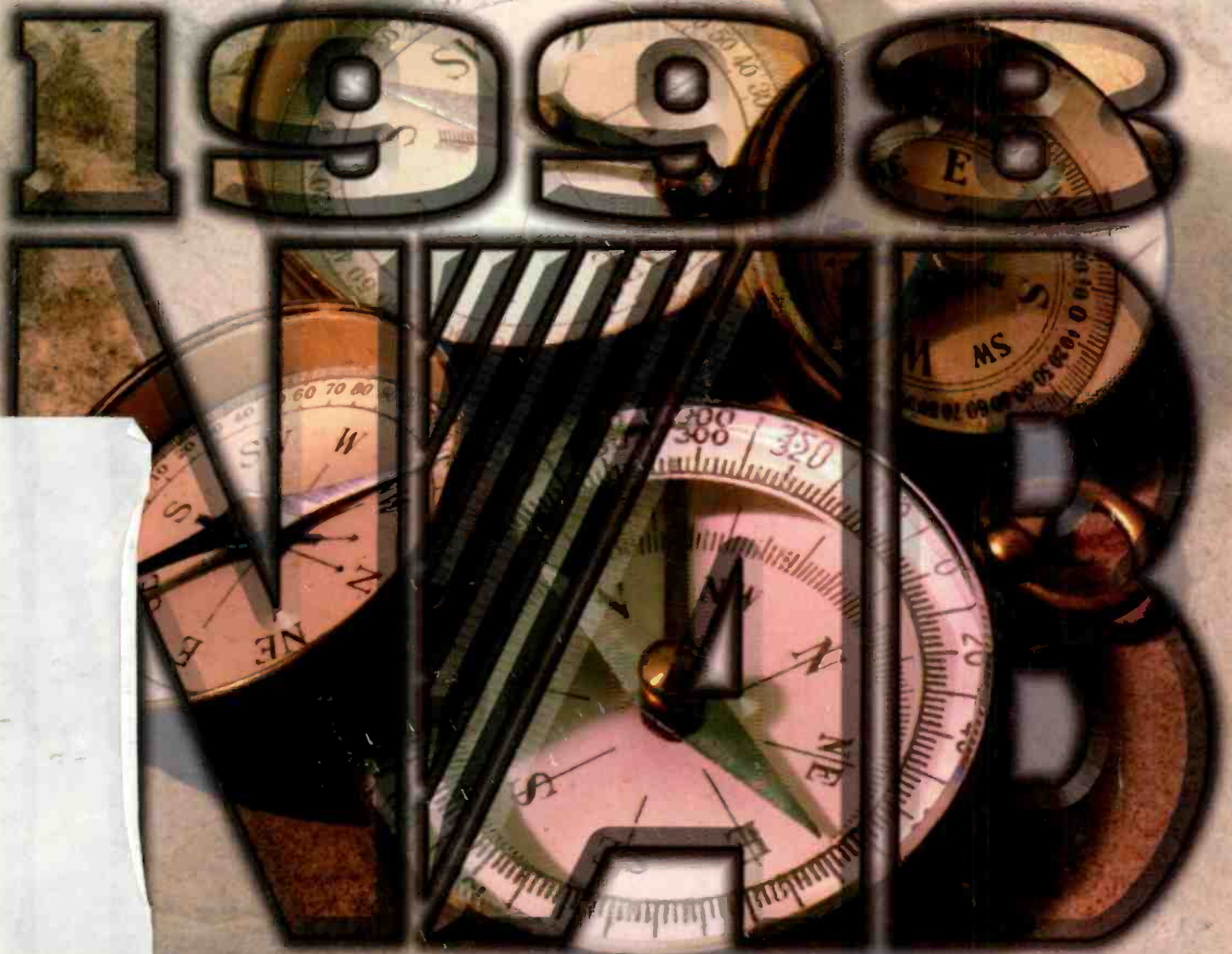


BE Radio

March 1998
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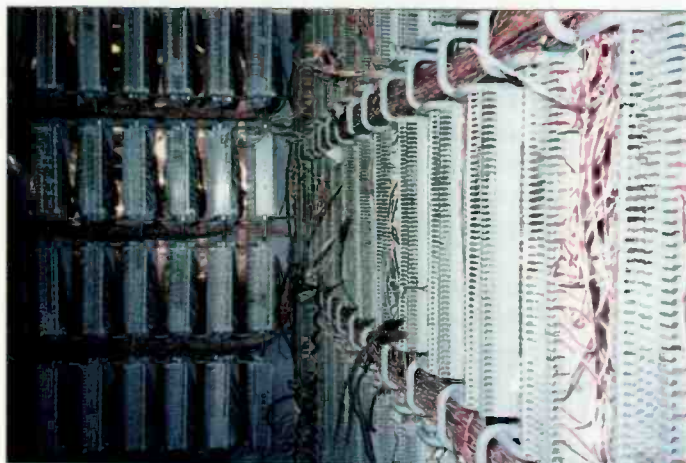
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ON THE COVER: Finding your way at NAB 98 needn't be expedition. All the tools you need for a successful visit are here. Cover design by Michael J. Knust.

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***Solutions for
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Death by imitation

Broadcasting provides a service model that is being followed by many new media startups today. Like moths to the flame, these newcomers are drawn to a media model that works — and has worked for decades. This is enviable status to such young contenders, for whom profitability is still a distant dream.

Shaping new media on old models is a time-honored tradition. Even Gutenberg's first fonts were patterned after the calligraphy of scribes. It wasn't until later that the printer's own typefaces evolved. In the best case, this modeling of predecessors helps the new entrant to its feet while searching for unique elements. But if, after a decent interval of grace, the newcomer fails to add its own value, it becomes cast as an imitator and is sent packing.



From today's vantage point, the reasons for broadcasting's success seem simple enough, but they weren't so obvious 75 years ago, when broadcasting itself was the new kid. What we call radio today is a form that has been substantial-

ly honed and refined (some would say sequentially reinvented) over time. In its early years, radio broadcasting was an interesting technology, but nothing more than a novelty, and certainly not a viable engine of commerce. It was almost by accident that broadcast pioneers stumbled upon the radio advertisement as a fiscal foundation for the industry that it subsequently spawned.

This device, in turn, was modeled on the classified advertising of newspapers: Individuals paid a small fee to the station in return for having their announcements read on the air. It wasn't long before merchants realized the commercial value in this process, and the rest is broadcast history.

Today the mimicry continues, with many in the on-line, cable, telco and satellite industries trying adaptations of broadcasting's recipe, hoping to add their own secret sauce to arrive at an equally successful result. Statistics predict that most will fail, giving broadcasters good reason to count their blessings. But history also tells us that when the successful new formula is finally discovered, its impact on the earlier model can be swift and devastating. For this reason, broadcasters should put themselves among the modelers, in an attempt to find yet

another reinvention of their own industry that will thrive in the new millennium.

A frequent allusion to this "killer ap" among today's new-media cognoscenti is the so-called convergence model. It implies that the ultimate solution will take on the attributes of "fusion" among media types, whereas just the opposite appears to be true. Combining

"The crow that mimics a cormorant gets drowned."

— Japanese proverb

broadcasting with computers actually has opened up a large number of new possibilities, all of which pursue divergent, rather than convergent, courses.

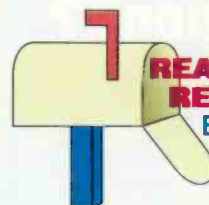
This "fission" is nowhere more apparent than at the annual NAB Convention. Each year a growing number of different industry segments attend, converse and exhibit at the show. They all meet at the crossroads of electronic media, but each heads in a separate direction from there.

While this is great for the trade association itself, and for most attendees, what does it mean for the radio business? Are existing broadcasters under the lens of new media moguls' scrutiny, or will new media markets be leveraged by broadcasters for repurposing of their existing assets? Who is the predator and who is the prey?

Whatever your persuasion, NAB is the place to see and be seen. It's clear that the modeling of successful past practice will continue, and NAB is the primary runway — in both the fashion and the aeronautical senses — for such observations and departures. The Las Vegas gaming environment also presents a behavioral metaphor that cautions of being beaten at one's own game. In this atmosphere of risk and remodeling, we are left to ask: Will radio be eclipsed by new media, or will it become one?

A handwritten signature in black ink that reads "Skip Pizzi". The signature is fluid and cursive.

Skip Pizzi, editor-in-chief



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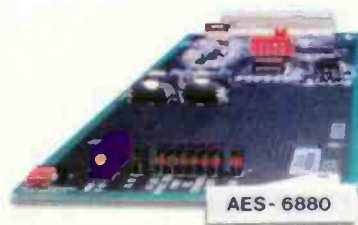


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An 'E' for effort

The topic of DAB in the United States is showing its face again. As we prepare to embark on the annual trek to the desert for the NAB, you have probably made some notes about sessions you want to attend — including any on DAB. If you have not been following the progress up to now, you should take a moment and see what is happening.

I understand that for most engineers, the topic may not be of the greatest importance. After all, it doesn't pertain to your daily routine of keeping the station on the air. Spending time considering how you will do your job (if you still have your job) in 10 years means nothing compared to a noisy microphone, a last minute remote, or an automation lock-up.



The work on DAB continues. At one time, there had been several groups taking a stab. But the field has narrowed to two front-runners in each of the two areas of development — satellite and IBOC. I am not going to go into the current status of each system here. We'll save that for another day.

I recently received an announcement from CEMA, the Consumer Electronics Manufacturer's Association, regarding the results of their evaluation of several DAB systems proposed in the United States. It's good that there is interest in DAB from several sides. This kind of participation should result in a system that will meet the needs of a wider variety audience. It may not fill everyone's needs exactly, but that's what a cooperative effort is all about.

The CEMA report goes into the evaluation process used to obtain their results, which they submitted to the FCC in early February. When all the dust settled, the report stated that the best system for use in the U.S. is the Eureka 147/DAB because of its audio quality and signal robustness. These two factors are important in the selection process and will determine the success of a final system. The problem, though, is that there is currently no Eureka 147 work being done in the U.S.

The report goes on to detail why other systems would not work, making these basic points for three other systems: an In-Band, Adjacent-Channel (IBAC) system would not be acceptable because of interference within the band; the In-Band, On-Channel (IBOC) systems that were presented showed poor audio quality and coverage

problems; the S-band system (VOA/JPL) had poor coverage because of signal outages from obstructions.

This is all wonderful information, but the problem is that the report does not reflect the current work being done.

There are two licenses for satellite S-band delivery already out there. The IBOC camps are forging ahead and show full confidence that their systems will do the job. No one is working on Eureka 147 in the United States.

It is unfortunate that the United States may adopt a standard that is incompatible with the rest of the world. Implementing a working DAB system is a great idea, but if the driver goes into Canada or Mexico, or the headset radio is taken to Europe, it will be useless. This is not to say that all the current work should stop. The IBOC proposals provide a means for current licensees to take part in a DAB future. The satellite licenses have already been auctioned by the FCC. Perhaps we can join with the rest of the world on a DAB standard one day, but for now, the work goes on.

CEMA did not advocate a system last spring, pending some further tests from the IBOC teams. Now they appear to advocate a system that has no support. Their findings are too little, too late. Getting involved to adopt a standard is a worthy cause, but advocating a system with no support can only serve to impede progress of the other systems and show poorly for the advocate.

A handwritten signature in cursive script that reads "Chris Scherer".

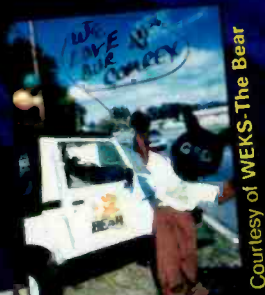
Chriss Scherer, editor



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Courtesy of WEKS-The Bear

"People thought the interview was being done in the studio!"

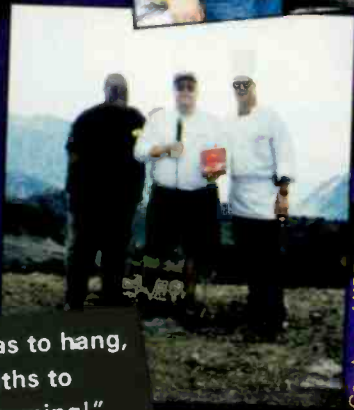


Courtesy of KTNN

Courtesy of Middleburg Broadcasting Network



"I didn't have to do my usual routine of pulling a muscle contorting my radio antenna to avoid (RPU) interference."



Courtesy of KBEE-Big Steve Kelly Show

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Circle (15) on Free Info Card

Test equipment: How much do you need?

by Mark Manolio

Let's face it, radio broadcasting is changing rapidly. Not only are we faced with changes in audio technology with the move from analog to digital, but we also have to deal with the marketplace changes and the consolidation that goes along with it. Modern test and measurement equipment is progressing with these changes, and what was once more than adequate may be lacking greatly in performance, accuracy and efficiency today.

The basics

Most stations have access to the basic line-up of traditional test gear. A Simpson 260-style VOM for the transmitter site, and a digital multimeter with sample-and-hold and true RMS features for the bench, are staples. The oscilloscope is also hard to do without. A conventional 20MHz dual-trace scope is adequate for most applications, but portable digital LCD scope-meters are now available for the bench, as are real-time digital scopes. Many service manuals for common equipment like CD players assume access to a meter and scope, and thus show photos of right and wrong waveforms along with tables of voltages. These, along with a good set of tools, a power supply or two, and an audio generator/analyzer form the basis of most shops.

A clamp-on ammeter accessory for multimeters, an AC plug-in checker or volt-pen to make sure those grounds and neutrals are in the right place, a capacitor/inductor analyzer for troubleshooting at the component level and a frequency counter for RF and audio use are all popular and helpful pieces of equipment. Their availability approaches necessity. Furthermore, a wattmeter with plenty of slugs, a small dummy load and a tap for feeding a direct low-level signal to a receiver or monitor are requirements for working on excitors, RPU, STL and two-way gear. A telephone butt-set is likewise very handy, along with a battery-powered tone generator for ringing out, identifying and testing pairs. If you do

a lot of remotes, a battery powered mic/line tester is extremely useful as is a battery tester. Don't forget about test CDs for setting levels (some have special test signals that can use the output of the CD player as a handy sub for an audio generator or other, more specialized type of test signal) and test tapes for aligning analog machines. Lastly, a good set of headphones or a bench amplifier and speakers are a must. Sometimes one good listen is worth a lot of time and trouble.

The digital revolution

Far from just a buzzword these days, digital audio technology is here to stay. It brings with it a whole new set of problems requiring new test equipment. The audio test set is the staple that illustrates this best. The limiting factor in any measurement situation should be the device under test, not the test equipment.

Traditional test sets have some major drawbacks even if they can measure what were once considered vanishingly small levels of noise and distortion. Today's 16- to 24-bit digital audio systems can have a noise floor well below -100dB. One reason for measuring this low concerns dither.

When converting to 16 bits from a high-resolution signal processed at 24 bits, a noise signal called *dither* is often added. This is a very low level hiss that is added to reduce quantization noise (the fluttery distortion generated when a higher bit signal is simply truncat-

ed). If improperly applied or applied too often, the dither noise could become audible, especially when later processing is used. In addition to quantization noise, other new, digital-only aberrations like jitter and bit error rate must be measured. Sample rates and the presence of status bits in the AES3 serial data stream must be detected. The ability to generate and analyze within the digital domain (to avoid multiple A/D and D/A conversions) will become increasingly important as your plant becomes filled with digital



Digital signals need digital test equipment. Specialized test gear must be used for some of the newer technology. (Photo courtesy of Prism Media)

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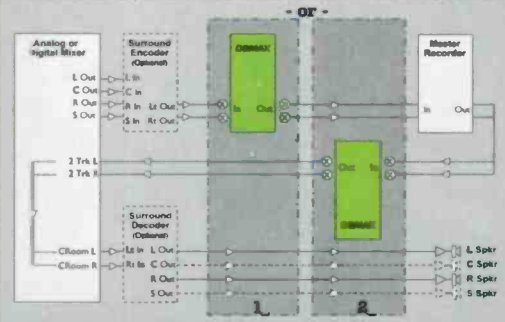
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Contract Engineering

"spaghetti." These are all capabilities of the new digital and hybrid analog/digital audio test sets.

The transmitter site

In addition to a VOM and scope, you should have a good set of tools at the site. You may not have time to stop at the shop when there is a problem at the transmitter. Keep in mind that the modulation monitor is a piece of test gear too. It has to drive the analyzer when proofing the transmission system. Again, the test gear needs to outperform what is being tested. It is now possible for your audio to stay in the digital domain all the way from the studio to the modulator in the exciter. That old monitor with .3% distortion and 70dB signal-to-noise ratio just won't cut it anymore. For AM stations, an operating impedance bridge is handy to have around, especially for DA's.

The "C" word

There are advantages and disadvantages that come with consolidation, most of which we won't get

regular measurements that are needed to keep the transmission system and studio gear in top shape. Performing an audio proof with conventional test gear can take hours, assuming you can get the down time from the PD.

It's possible to run a good set of basic measurements, like frequency response, phase, stereo separation and distortion, in less than half a second using automated or PC-controlled test sets. This can be run much more often than an old-style proof, and the data can be tracked for trends signaling a developing problem. Shared resources could be an advantage to a station that could not previously afford the more expensive pieces of test gear. One audio test



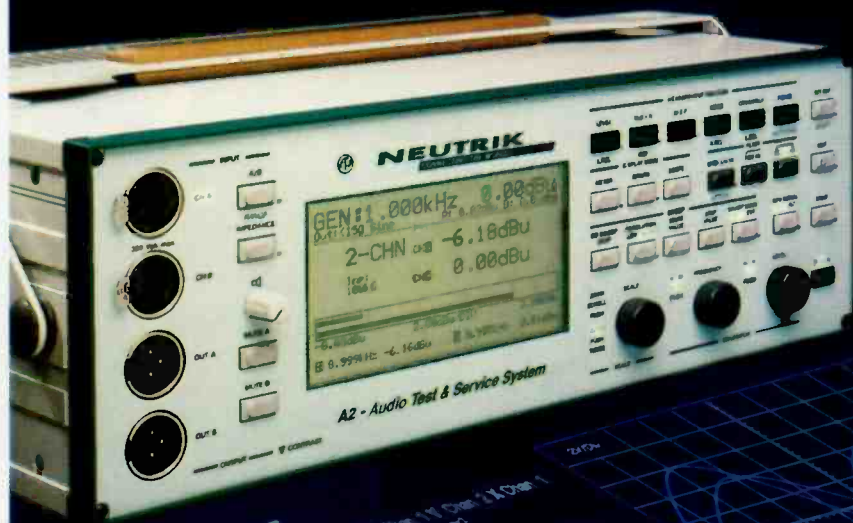
Digitally based test equipment can save lots of bench time. (Photo courtesy of Audio Precision)

set, one spectrum analyzer, etc. could be purchased by the group and shipped to each station on an into here. With less engineers per station than ever before it is difficult to find the time to do the

set, one spectrum analyzer, etc. could be purchased by the group and shipped to each station on an

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Contract Engineering

as-needed basis. For smaller, educational or non-group stations, most big-ticket test gear can be rented or borrowed as the need arises.

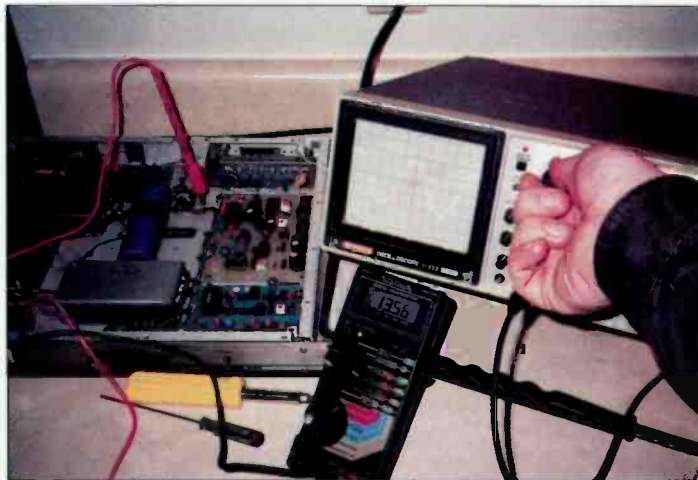
Computers

Many broadcast engineers are also maintaining the studio and office computers, and possibly the network. While sophisticated network analyzers are probably beyond the needs of most stations, there are some necessary tools. A static mat and grounded wrist strap for the bench are obvious needs when servicing computers and other digital gear. Not generally thought of as test equipment, but extremely handy if you are taking care of a lot of machines are a spare monitor, keyboard and mouse for the bench. These, along with a nearby network port and a phone line for

testing modems, can save time and trouble. Try to keep a box for small PC parts handy. How many times

of a good utility program is invaluable when working on an ailing PC, as is a clean boot disk with any network or CD-ROM drivers that might be required to get a machine back up after a crash.

As you can see, the amount of test equipment you need depends on many things in this ever-changing industry. With proper planning, a good balance can be struck for your facilities. Fortunately there is plenty of gear out there to choose from to keep your station or stations competitive, reliable and



An oscilloscope and DVM are two basic tools for the bench.

have you searched for that case or card screw only to steal one out of another machine? You'll be surprised to find what accumulates in there over time. Spare cards and larger parts for swapping out are also valuable when working on PCs.

On the software front, a shop copy

sounding great.

Mark Manolio is assistant chief engineer at WGAR-FM, Cleveland, and chief engineer at WCSB-FM, Cleveland.

FOR MORE INFORMATION

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The ADA in a broadcast facility

By Barry Thomas, CSRE

The Americans with Disabilities Act of 1990 (ADA) is quickly becoming an issue with radio stations who are building or remodeling. Local governments are becoming increasingly aware of the purposes and need for regulation in this area and are, as a result, stepping up enforcement of the federal law. Understanding, planning and consideration can reduce a station's liability risk and help ensure a friendly and accessible workplace for everyone.

The ADA was enacted to prohibit discrimination by employers and businesses based on physical or mental disabilities. A disabled person is defined in this case as an individual that has a physical or mental impairment that substantially limits a major life activity or anyone *perceived* as having such an ailment (Source: Public Law 101-336; 42 U.S.C. 12101). The act is divided into five major parts. Engineers will primarily be responsible for only one or two portions, but some awareness of the other sections is important to understand the intent.

The letter of the law

- **Title I — Employment:** This section expands on the Civil Rights Act which ensures equal employment opportunity regardless of race or nation of origin. The ADA adds the provision that discrimination based on a disability is also illegal, and that "reasonable accommodation" must be made to allow a disabled individual equal employment.

- **Title II — Public Services:** This portion addresses access to public transportation and mandates that all state and local government services be accessible by disabled individuals.

- **Title II — Public Accommodations and Services Operated by Private Entities:** This section will be the prime focus of a broadcast engineer's involvement, particularly during any sort of construction or remodeling. It addresses architectural barriers and company policies which might deny equal access to a building.

- **Title IV — Telecommunications:** Engineers may be peripherally concerned with this section dealing with access to telecommunications resources by hearing-impaired and speech-impaired persons. In most cases, standard phone system manufacturers have considered the requirements and have built their systems to comply.

- **Title V — Miscellaneous Provisions:** This is the catch-all section which outlines the scope of the law with respect to other similar provisions in other acts. It also outlines the procedures for arbitration and curing a situation of non-compli-

ance. The section has an important codicil which allows that a disabled individual is not required to accept an accommodation if he or she does not choose to.

Equal access

Enforcement is the key to ADA and how it will affect your facility and your job. The general scope of the act is fairly broad and provides significant room for interpretation. Additionally, the act states that if there is state or local law that pertains to disabled access issues, the more stringent of the laws will apply.

At the heart of interpretation is the term *equal access*. Cities and building inspectors often apply strict interpretation to the definition applying the concept of non-discrimination. For example: It's required, of course, that buildings provide a wheelchair-accessible entrance. This often means that there is at least one door with a ramp and sufficient width to accommodate a wheelchair. Some cities are requiring that ALL doors be accessible to eliminate the impression that disabled persons are "second-class citizens" who must be forced to use back doors and unusual entrances. The logic and concern is valid but can drive design and construction costs through the roof without proper planning and approvals ahead of time.

Be very mindful of ADA requirements at the beginning of the project and make sure your architects and contractors are experienced in local interpretation of ADA and the laws that may apply. Making informed choices and understanding the local atmosphere is critical to reduce design delays, construction problems, hindrances to obtaining occupancy certificates, and even lawsuits from persons who feel they have been discriminated against. The stakes are high, so it is in your best business interest to understand your ADA responsibilities as well as your ethical duty to accommodate the disabled worker.

Applying the law

Let's consider a new construction project of a multi-station facility that includes studios, offices, engineering spaces and parking. You will work on a space plan that meets your needs with the architects and your staff. You will make every effort to comply with the law when you can, but there are

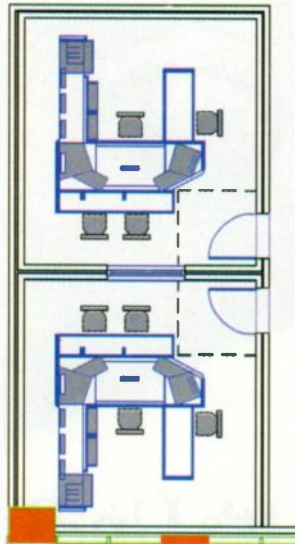


Figure 1. The allowance in the furniture for the "ADA No-Man's Land" at the doorway is shown by the dotted line.



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things you can do at the outset of the planning process to ensure a smooth ADA inspection. As soon as the space plan is done, start building the furniture and equipment plan. Your architects will build the huge stack of prints to submit for permits. Licensed architects and contractors will normally design for ADA compliance in the office area. Studio and engineering area details are often left out of these documents because the information is not ready and most general designers are unsure of the specifics of the broadcast needs. You should make an effort to have your rough furniture and equipment layouts in place for this process to allow the preliminary permit inspection to catch any potential ADA violation issues. Discuss with your designers considerations regarding local enforcement.

Familiarize yourself with the basic concepts and your responsibilities as technical manager of a broadcast facility. There are texts available on ADA compliance ranging from copies from the Federal Register Vol. 56, No. 144:

ADA Accessibility Guidelines for Buildings and Facilities to primers and texts which explore the case histories and precedents nationwide. Ask your designers for a recommendation of materials to review. That way you are operating from the same knowledge

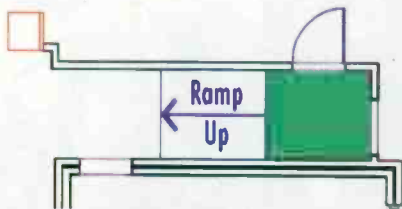


Figure 2. Note the doorway landing space shown in green. This ramp leads to a six-inch rise.

base and can be consistent from design, construction and operation of the facility.

Studios are a complicated area for ADA compliance. Most music-oriented radio stations are installing stand-up-height furniture which provide a myriad of advantages to engineering and programming. The problem with these studios is that the counter-height is not ADA compliant. They are too tall and the counters are too

deep. If you have designed stand-up studios, you are required to have accessible studios for disabled staff from which to broadcast. This often means that production studio furniture must be designed to comply with table-height, reach and knee-space limits, and that production studios can be used for on-air work when necessary. You may be required to demonstrate how this is done or write a statement describing the procedure of accommodating a disabled individual in the studio area. Removable platforms might be acceptable to resolve the counter-height problem, but only if they are easily available and the local inspectors are amenable.

Acoustical design and storage requirements in studios provide other challenges for ADA compliance. Many construction designs do not show wall treatments for sound attenuation, cart/CD racks and similar industry-specific items used in broadcast stations. Whenever possible, coordinate these items as part of the architects plans. The thing to remember is the



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protrusion limits and how they affect your furniture design. If there are three inches of sound-attenuating foam on the walls, (even if it's only from chair-rail to the ceiling) the furniture clearances must be measured from the sound treatment, not the sheet-rock wall. Cart and CD racks cannot protrude from the wall more than four inches if they are mounted more than 27" off the floor. Including these items in the permit diagrams can demonstrate how your station complies.

Many know of the requirements for wheelchair ramps but aren't aware of how specific those requirements are. Studio installations with raised floors must have ramp access if the rise is more than 1/4". Low-rise ramps — 1/4- to 1/2" — require a 1:2 ratio where there are two inches of ramp for every one inch of rise. Higher ramps — up to 30" — should have a 1:12 to 1:16 ratio. Don't forget the hand rails. If the rise is more than 1/2" there should be landings of 60" or more. If there is

a turning landing, the requirement is 60"x60", as is shown in Figure 2.

Door specifications are just as detailed regarding clearance space, wheelchair turn-around room, and even door closer tension (for those with the mega studio doors). Figure 1 shows a dotted line marking a five-foot square around a door in the direction of the swing. In this case, the architect has drawn this square to indicate an "ADA No-Man's Land" where no furniture or stationary objects can be placed. This type of marking can be helpful as a reminder during the process.

Signage requirements specify standard heights and locations for directional and emergency exit signs in both Braille and raised-letters. Your architect and/or sign contractor should be able to specify these locations.

When construction is done, it will be time for the moment of truth — and the inspection for the certificate of occupancy. This is when you realize all the savings from planning and preparation and the time you spent with your designers to resolve disability issues. An inspector will typically travel the space and evaluate compliance on a host of issues, ADA being one. I know of at least one case where the building inspector is himself in a wheelchair, which provided the strictest of tests for compliance but, once passed, provided the strongest of cases that the company has made reasonable accommodations. Problems at this stage can be serious, causing delays in occupancy permits, expensive changes in construction, and a waiting period for a re-inspection.

Proper planning and an understanding of the spirit of the Americans with Disabilities Act can protect your station from costly delays, expensive change orders, and ugly legal battles. Arming yourself with the proper information and consultation with knowledgeable professionals provides the best means to achieve that protection and provide a positive work environment for your employees regardless of the physical or mental challenges.

Barry Thomas, CSRE, is director of engineering at KCMG-FM/Chancellor Media, Los Angeles.

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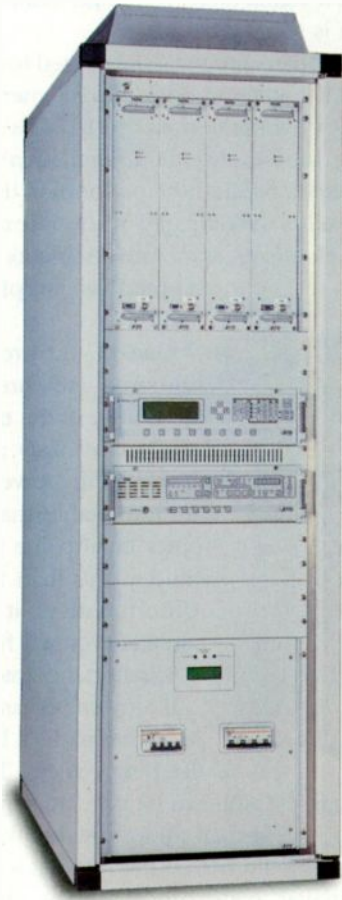
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FM proofs of performance

By John Battison, P.E., technical editor, RF

There is a great deal of difference between making an AM proof and an FM proof. Not only are the FCC's requirements different, but because of the vastly different electrical and propagation characteristics of FM, a completely different measurement technique has to be used when making an FM proof.

When making an AM proof, within quite broad limits there is little or no change in the field strength measured if the field intensity meter (FIM) is moved three or four feet in any direction. That is assuming of course, that there are no re-radiating structures in the immediate vicinity of either measuring location. On the other hand, when measuring FM field strengths, a small change can make an important difference in the measured value.

This difference is due to the much shorter wavelength of the FM signal. At 1000kHz (1MHz), a wavelength is about 984 feet. At 100MHz, a wavelength is about 10 feet. Therefore, it can be seen that a movement of only a few feet can radically change the measured value of an FM signal. Incidentally, the fact that a half wave in the FM band is pretty close to the height of a human being makes examination of the FM RF environment very important.

It follows from these considerations that it is not possible to make fixed FM measurements whose locations can be accurately determined from a topo map in the same way that an AM measuring location can be established. Hence the FCC's different measuring technique. However, it is probable that uses of the new GPS system units that are becoming so common will modify the method before long. With GPS, extremely accurate ground locations can be identified.

Terrain can have an effect on measurements, especially local shielding and obstructions. The time of day has influence on field intensity measurements, and is generally greatest in the region of the radio horizon. Again this distance is affected by the height of the transmitting antenna, assuming that the receiving antenna is at the recommended height.

Why measure?

Sometimes the radiation pattern of an FM antenna is suspect. Perhaps an anticipated area is not adequately serviced, although theory says it should be. Maybe there is a blank, or low signal area on a single azimuth, or the vertical pattern is suspect.

Aircraft or helicopters are sometimes used to prove the circularity of an FM antenna. Such measurements are not usually made for submission to the FCC for purposes such as hearing data because the Commission's rules do not provide specific methods of performing these measurements, as well as the difficulty of accurate measuring point location. However, such measurements are often accepted as supplementary data.

One of the problems of airborne measurements is the stability of the measuring platform. Obviously, a van driving around the tower site will be more stable than a helicopter or airplane bouncing around at less than 1000 feet.

Unfortunately, it is most unlikely you will find a road encircling the antenna.

If airborne measurements must be made, a helicopter is the best vehicle. The aerial path can be accurately plotted on a map and, provided the wind is

not too strong, it should not be too difficult to maintain an accurate circular pattern around the antenna. A hovering helicopter allows an easier ground position determination than an airplane, which cannot allow enough time to make precise measurements.

With a helicopter, vertical radiation pattern measurements can be made at different elevations, and azimuth readings can be plotted in the form of a vertical slice. It is very difficult to calibrate the FIM installation in a helicopter. There is also a potential for signal modulation by the blades. Great care has to be taken to avoid getting the blades between the signal source and the FIM antenna.

Play by the rules

Examination of Part 73.314 of the rules provides the Commission's requirements for normal FM field mea-



The Potomac Instruments FIM-71 field intensity meter — a familiar sight at FM proofs.

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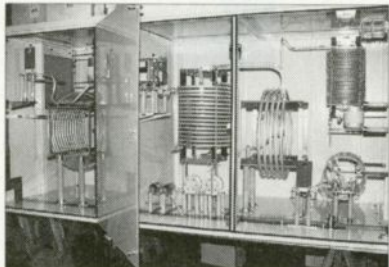
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RF Engineering

surements, certain conditions of which are worth discussing.

FM field intensity measurements are normally made with the equipment *in motion*, with the FIM antenna wobbling at the top of a 30 foot (nine meters) telescopic mast attached to the measuring vehicle. A run of at least 100 feet (30 meters) is made while recording the FIM output on a strip recorder.

The 30-foot height is used because that is the height of an average home antenna.

An antenna height of seven feet (2.13 meters) is often used for spot measurements. This is because the height of a man holding the field intensity meter, plus the elevation of the antenna approximates this height. This hand-held method is often used for unofficial measurements.

Before making FM field strength measurements, be sure to read Section 73.314 of the rules very carefully — there are two different methods of making measurements depending on their ultimate purpose. If measurements are to be submitted to the FCC, the method of Paragraph A is used. For other purposes such as coverage information, Paragraph C should be used. In some cases, it can also help to have some training in statistics when preparing material for submission to the FCC.

To prepare for an FM field survey, radials are drawn on a topo map at approximately equal angles from the transmitter site. The Commission likes these radials to pass over representative types of ground, i.e. flat, hilly, rough, etc. Another difference from AM proofs is that there is no specific required number of radials — merely enough to meet this condition and provide enough data to develop the desired antenna radiation pattern. Starting at 16km from the transmitter a mark is made at three kilometer intervals on each radial going out as far as is deemed necessary. The next part is often difficult to accomplish — the rules require the selection of roads aligning with each radial as closely as possible to each kilometer marker.

These radial/road intersections are

known as the *measuring locations* and it is along these roads that the measuring runs are made. Each measuring run must be centered on the radial/road intersection so that there is an approximately equal distance on each side of the radial.

The worst aspect of this type of measurement is the danger of electrocution through contact with overhead power lines. Several highly experienced engineers have been killed through antenna contact with unnoticed power lines. It is tragically easy to miss such things while concentrating on the measurements.

If overhead obstacles prevent a run, at least five cluster measurements must be made. The same must be done if it is discovered when orienting the antenna, that the strongest signals don't come from the direction of the transmitter. These cluster measurement must normally be made within 60 meters of the first one. These fixed measurements must be made at nine meters above ground so as to be consistent with the remainder of the mobile measurements. As their name implies, the objective is to obtain a group of measurements that are reasonably close and show the mean field intensity in that area.

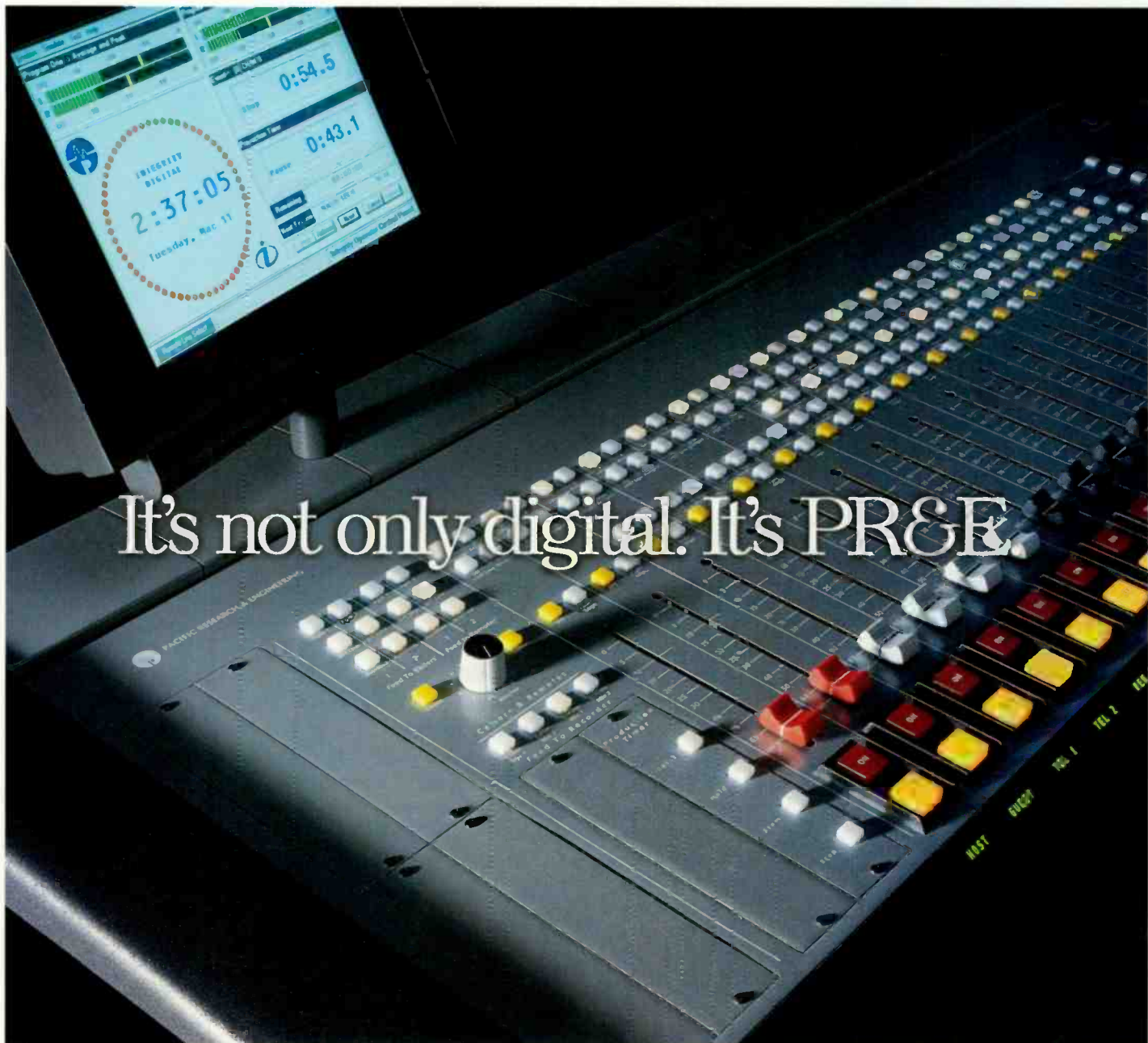
Taking measurements

The well-known FIM-71 makes use of a simple, calibrated dipole antenna, although a vertical non-directional antenna can also be used. It will work with any strip recorder using a one mA calibration. The recorder most engineers are probably familiar with is the rugged Esterline Angus.

FM field strength measuring equipment is more expensive than that for AM. Most stations that need to measure only a few transmitters will find it more economical to rent the equipment from one of the many equipment rental sources. Today's greatly changed radio environment with groups owning hundreds of FM stations may find it cheaper to own equipment outright.

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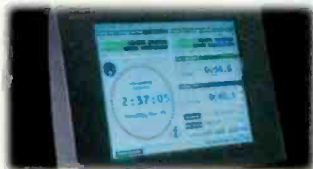
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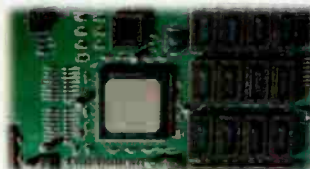
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Digital signal routing

By Chriss Scherer, editor

How many digital audio sources do you have in use at your facility right now? You may not actually be using any, but you certainly have them available. CD players, DAT machines and that digital editor all have an AES3 outputs on them. The truth is, we are getting closer to a completely digital facility every day. And while there are few facilities that have taken the plunge, there are many that are starting their transition.

Routing analog audio signals is relatively easy when you think about it. There are some concerns about ground loops and bridging or terminating inputs, but for the most part, all you have to do is plug it in and go. This is still true with digital, but how many times have you taken a split from an analog feed with a distribution amp or isolation pad? Many times this works fine for analog. Digital signals are less forgiving.

Getting around in analog

Signal management in analog used some very common elements. In a given signal chain you could find a distribution amp, a patch bay, a routing switcher and, probably, a line tap. These signals were spread throughout your facility. There can be feeds into the control room, production, news room and master control/TOC. Extensive lengths of wire were needed to route these signals. Routing switchers helped eliminate much of the physical wiring by centralizing the sources and routing only the audio that is needed.

As was mentioned before, one advantage to analog is that it is rather forgiving. If you don't have any audio wire available in a pinch, you can use zip cord, paper clips and coat hangers. You may not get the exact same audio quality, but I'll bet it's pretty good. These analog shortcuts won't work in digital.

While the signal won't be affected the way analog is by

some EMI and other interference (within reason), there is one thing to look out for — the *digital cliff*. As a signal degrades in analog, it sounds worse and worse, picking up noise or losing frequency response. Eventually, the result is just too poor to listen to. The digital cliff is something that is of concern with any digital signal routing. As the signal quality degrades, the error correction will be called upon to do more and more. A point will be reached, however, when there is not enough usable information to correct. The signal will just mute. Instead of a slow, graceful curve, the DSP compensates, usually transparently, and then the signal is suddenly gone.

Routing

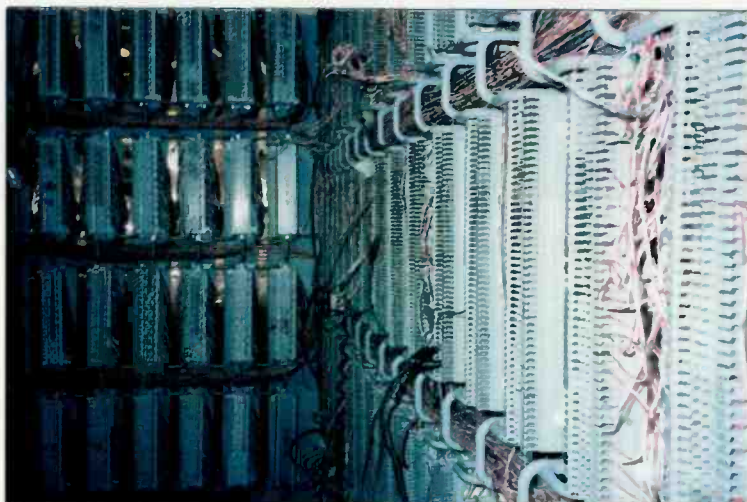
One of the most common ways to route analog audio is with a patch bay. These have been used extensively in some installations. Even though they can present their own concerns and problems with loose or dirty connections, they are one of the easiest ways to route and re-route analog audio. AES3 audio is an impedance specific standard, and a patch bay is not. Even one pass through

a half-normalled jack can change the impedance.

Balanced AES3 signals are a data stream with a characteristic impedance of 110Ω , and there is wire designed for AES3 routing that has a consistent impedance. Many times, at least for short runs standard shielded, twisted pair audio will work, although it is on the low end of the impedance tolerance. The AES3 specification calls for

$110\Omega \pm 20\%$ (88 to 132Ω). Typical balanced analog audio wire (shielded, twisted pair) has a characteristic impedance of less than 60Ω . Table 1 shows a relative comparison of common audio wiring types.

Not all digital audio needs to be balanced. The AES3 standard also defines an unbalanced format that uses 75Ω unbalanced coaxial cable. Routing of coax is something



Analog signals can be passed through several punch blocks without problems. However, digital signals can only tolerate one or two passes before encountering problems.

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already well understood by broadcast engineers. The same considerations hold true for unbalanced digital audio on coax as for RF. Splitting can be done with impedance matched splitters. Some of the digital audio routers are also capable of handling 75Ω connections on BNC connectors.

There are also standards for S/PDIF and some other formats that were introduced in consumer equipment, but they are seldom used in a professional audio environment.

Routing systems

Instead of a patch bay for digital signal distribution, a router is really the way to go. Patch bays introduce changes into the characteristic impedance of the line. Even a single jack in the signal path can be enough to cause problems.

Routing systems have come into a price range that most stations can

afford. The installation can take longer than a patch bay, and the capital outlay greater, but the lifespan of the router makes it a clear choice. Once installed, most routers will run for a significant time without any problems.

The primary function of a router is to switch an input to an output. This simple, straightforward act can be done in analog with little effort. With digital streams, the audio engineer has to start thinking like a video

not be synchronized to the same clock and slight differences in timing will result in an audible click or pop when the source is switched.

One solution to this is to synchronize all the machines in a facility to a single clock. This practice is common in TV facilities, but radio engineers are not rushing out to install a master synchronizer. To handle differences in sampling rates, most equipment is available with sample rate converters

built in. Even with this conversion being used, a switch can still result in a pop because of frame and phase differences between the two signals.

Some audio routers are using

smarter circuits to perform the switching with quieter results. The incoming signal can be buffered and then internally synchronized within the router. This will get the two signals

Manufacturer	Model	Impedance (in Ω)	Digital Replacement
Belden	8451	38	1800A
Clark Wire & Cable	SPA22GS	50	801
Gepco	61801	53	5524
West Penn	452	48	GAC-2AES

Table 1. Various impedance ratings for standard wire types, typically used for analog audio. Balanced AES3 signals call for 110Ω cabling. The digital cable shown on the right is the recommended replacement.

engineer.

The digital audio data is sampled at a specific frequency. The stream from a CD player and a DAT machine may both be set for 44.1kHz, but they will

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Next Wave

lined up so the switch is not a hard crash from one stream to another, possibly in the middle of a data word.

To go one step further, even more transparent switching can be done by not switching at all. The function of "this and now this" is open to problems. Instead of a hard switch, a very fast crossfade, on the order of milliseconds, is done. This fluid change increases the probability of a quiet change every time.

Consolidation of equipment

As digital consoles are being accepted into more and more stations, a unique consolidation of equipment is occurring. Some of the new digital console designs are using an audio router as the heart of the system and the "console" is just an enhanced controller, like a keyboard on a computer. This approach has some interesting possibilities.

Digital audio delivery for music and commercials has made great strides into the station already. Most often, their control centers are located in one central location within a facility, like the technical operations center. The simplicity of installing a router/console eliminates the infrastructure needed to tie a control room into the routing system and playback system. Less cabling will be required from the control room. The integrated function also makes any source in the router available for on-air use by simply assigning it to the appropriate output. With a centralized location for the two systems, even further integration is possible.

High-speed data

Other kinds of digital data streams are being distributed around a facility as well. High-speed POTS and ISDN modems, digital telephone sets, various serial communications streams, and the computer network can all share similar paths. When laying out a routing plan, keep this in mind and try to plan for the future. Put in CAT 5 cable for data and remember that some of the short cuts that worked for analog will cause problems in digital.

A common short cut is to use some spare conductors within a data cable. There are installations where the digital PBX is only using one pair of the four in the cable, and a POTS modem line has been added on pair four. You may be able to get away with this sometimes, but higher modem speeds and some digital phone signals do not mix well. The result is usually slower connect speeds.

More and more serial data is being used within a facility as well. The same precautions apply as the data rates get higher. Some of the existing analog wiring will be acceptable for many of these signals with lower baud rates, but as the speeds increase, so must the capability of the cable. Again, CAT 5 cable or better is certainly better to install now, before you need it for a future upgrade.

Any new installation should be planned for future compatibility if possible. If you think only in terms of what you will need today, you will certainly suffer for it tomorrow.

The bottom line is to be smart about routing any digital signal. The industry has moved away from some of the quick-and-dirty tricks that worked in the past. Don't split or bridge digital signals and make sure you use the right wire for the job.

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150 radio settlements filed

By Harry Martin

On or before February 2, 1998, over 150 settlements among competing applicants for radio stations were filed with the FCC. These settlements cover over 600 pending applications filed since the 1993 freeze on processing comparative applications. The February 2 settlement deadline was included in the Balanced Budget Act of 1997, which ordered the FCC to waive its settlement cap rules in order to encourage resolution of pending mutually exclusive applications prior to the imposition of auctions.

It will take approximately six months for most of the settlements to be approved and for new construction permits to be issued. In February, the FCC accepted for tender the applications which will be approved through the settlement process. Acceptance for tender starts the 30-day time period within which technical and other amendments to an applications may be filed as a matter of right. After the conclusion of the amendment window, applications will be accepted for filing and made subject to petitions to deny. For the approximately 150 radio applications to be granted as a result of settlements, the acceptance/petition process may be concluded as early as May or June. Then, the Commission will begin reviewing and acting upon the applications and the accompanying settlement agreements. Uncontested applications could be approved as early as August or September.

The Commission's staff advises that the agency may issue its auction rules and procedures for radio and TV by May 1998. If this is the case, auctions involving post-June 30, 1997 mutually exclusive applications, which were not eligible for settlement cap relief, and the pre-July 1, 1997 applications which were not involved in settlement, may begin by year's end. The Commission also will consider in its auction rulemaking proceeding whether to decide through some means other than auctions those 20 cases which already had been adjudicated, but not finally decided, at the time the 1993 freeze was imposed. Among those cases is that of Zebulon Lee, discussed below.

Comparative permittee reinstated

The celebrated case of Zebulon Lee and the loss of his Asheville, NC, market FM station has experienced yet another turn-around as the U.S. Court of Appeals for the D.C. Circuit ordered reinstatement of Lee's company's construction permit for the station.

In a long and complicated FCC comparative hearing proceeding, Lee's company, Orion Communications, Inc.,

was granted a construction permit for WZLS(FM), Biltmore Forest, NC. That grant was appealed to the Court of Appeals. During the appeals process, in the case of *Bechtel v. FCC*, the court overturned the FCC's comparative criteria whereby Orion had been awarded the permit, and the Biltmore Forest proceeding was remanded to the Commission for appropriate action in light of the *Bechtel* case.

In the meantime, Orion completed construction of the station and went on the air in August 1994. The remaining competing applicants petitioned the Commission to revoke Orion's operating authority. In 1996, the Commission urged Orion either to settle with Biltmore Forest Radio, a partnership of the competing applicants, or to join with the group in operating the station. Orion refused to do either. Accordingly, as of June 1, 1997, Orion was ordered to turn over the station to Biltmore Forest Radio, which would serve as the interim operator.

The Court of Appeals now has found that the Commission acted "arbitrarily and capriciously" in several respects in rescinding Orion's authority to operate the station. The Appeals Court found that the FCC had departed from its own recent precedent concerning interim operations without providing a reasoned explanation. The Court remanded the proceeding and took the further unusual step of ordering the Commission to reinstate Orion at once as the interim licensee.


This case has attracted significant attention from both the media and Congress. In particular, Sen. Jesse Helms (R, NC) has been concerned about the Commission's handling of the case. During FCC Chairman Bill Kennard's confirmation hearings, he extracted a promise that hearings, rather than auctions, would be considered in cases such as Biltmore Forest.

Harry Martin is an attorney with Fletcher, Heald & Hildreth, PLC., Rosslyn, VA. E-mail: martin@fhh-telcomlaw.com.

dateline

Commercial radio stations in the following states must file their annual ownership reports on or before April 1: Indiana, Kentucky, Tennessee, Texas, Delaware and Pennsylvania.

Towers in Connecticut, New Jersey and South Carolina must be registered during the period April 1-30, 1998.



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Finding your way at NAB 98

The broadcast industry is once again gearing up for its annual showcase of the latest broadcast and multimedia ideas available today, NAB. The NAB convention has grown to massive proportions, but don't be intimidated. Navigating your way through can be easy with the information in this issue of BE Radio.

The exhibit floor again covers the Las Vegas Convention Center (LVCC) and the Sands Expo Center with the latest tools and technology, and cruising the aisles for radio and audio equipment will be simpler with our show floor map. The Radio Hall is fully detailed, and there is also a listing of exhibitors showing radio products in the other halls.

On this NAB trip, will you be looking for a specific product, or are your interests more general? Either way, the FASTtrack lists all the NAB exhibitors with radio or audio interests and groups their booth numbers in product category listings to help you find them quickly. You can map out an effective plan by targeting the areas you need to see first.

You can get a sneak peek at some of the products that will be released at the convention with the NAB Extra. This entire section of new products will give you a glimpse, before you even leave home, of what's new at the show. Within the pages of the Extra you will also find some suggestions from the BE Radio reporters covering the show, industry leaders and perennial attendees on ways to make your NAB experience the best it can be. They lend their insight as to what's going to be hot, what's on the way out, how to make it through the week, and where to spend your time off.

The other half of the convention experience is the conferences. This year has 11 conferences covering all the aspects of broadcasting and more. Learn about some of the emerging technologies that are already shaping radio of tomorrow. We have organized the conferences into convenient timetables so planning your conference schedule will be easier.

If you can't attend, BE Radio has joined up with our sister publication Broadcast Engineering to present an online Show Daily to provide you with information on the latest NAB happenings. Check out all the latest from the show floor at www.broadcastengineering.com.

Our April issue will look at the scheduled sessions and the technology being discussed. In May, the show wrap-up will go in-depth to explore everything that is NAB 98, including the popular list of "Pick Hits of NAB 98" as determined by our panel of independent industry experts.

We hope your trip to Las Vegas is profitable — perhaps in more ways than one.

NAB Coverage Contents

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Radio FASTtrack

The BE Radio FASTtrack can help you plan your navigation of the exhibit floor. The exhibitors are broken up into categories to help find what you want even faster.

Audio Accessories

Kart-A-Bag	5159
Tally Display Corp. (TDC)	5453
Wireworks Corporation	5705
FM Systems	5711
ATI-Audio Technologies, Inc.	5720
Acoustic Systems	5749
ADC Telecommunications	6047
Acoustical Solutions	6815
Audio-Technica U.S., Inc.	6816
Whirlwind	7352
Neumann USA	7447
Sennheiser Electronic Corporation	7447
ADM Systems, Inc.	8115
Studer, Soundcraft, AKG, BSS	8343
OPAMP Labs, Inc.	10181
Benchmark Media Systems, Inc.	11067
Panasonic BDSC	11601
Graham-Patten Systems	11670
Group One Ltd.	12164
Wohler Technologies, Inc.	12178, S 2825
Beck Associates	12521
TASCAM	12962
Dorrough Electronics	13025
Techni-Tool	13235
Comprehensive Video Group	13535
Wenger Corporation	M 7359
Mackie Designs Inc.	M 8138
Denon Electronics	RL 1024
Yamaha Corp. of America	RL 1206
Videoquip Research Limited	RL 1302
Wave:Space, Inc.	RL 1322
Sonifex Ltd.	RL 1427
Circuit Research Labs	RL 1506
Radio Systems	RL 1818
Eventide, Inc.	RL 1619
Digigram	RL 1901
TimeLine Vista, Inc.	RL 1919
Symetrix, Inc.	RL 2019
Henry Engineering	RL 2318
Penny & Giles, Inc.	RL 2316
Potomac Instruments	RL 2412
SCA Data Systems, Inc.	RL 2418
Arrakis Systems Inc.	RL 2606
Alesis Corp.	RL 2725
TFT, Inc.	RL 2812
Pacific Research & Engineering	RL 3006
JBL, Spirit, Lexicon, Allen & Heath, dbx	RL 3012
	RL 3027
	RL 3519
	RL 3625
A.E.Q.	RL 3825
Studio Technologies, Inc.	RL 4019
RDL Radio Design Labs	RL 4022
Davicom Technologies	RL 4211
TC Electronic, Inc.	RL 4213
Ram Broadcast Systems	RL 4222
Roland Corporation U.S.	RL 4419
OMB	RL 4601
Genelec Oy(R)	S 1040

Audio Mixers-On Air

Harris Corporation	8309
ADM Systems, Inc.	8115
Studer, Soundcraft, AKG, BSS	8343
Zaxcom Inc.	9672
Lectrosonics, Inc.	10481
Radio Systems	RL 1818
Broadcast Electronics, Inc	RL 1810
Auditronics, Inc.	RL 2002
Fidelipac Corp.	RL 2006
LPB	RL 2021
Ward-Beck Systems Ltd.	RL 2200
Wheatstone Corporation	RL 2619
Pacific Research & Engineering	RL 3006
Logitek Electronic Systems	RL 3603
Autogram Corp.	RL 3802
Radio Computing Services	RL 4101

Audio Mixers-Portable

ATI-Audio Technologies, Inc.	5720
Shure Brothers	5813
Audio-Technica U.S., Inc.	6816
ADM Systems, Inc.	8115
NADY Systems	8121
Studer, Soundcraft, AKG, BSS	8343
Panasonic BDSC	11601
Group One Ltd.	12164
Micron Audio Products Ltd	13165
ProSource/BMI	13263
Systems Wireless, Ltd.	13270
The J-Lab Co.	13708
Mackie Designs Inc.	M 8138
AEV	RL 1420
Broadcast Electronics, Inc	RL 1610
Henry Engineering	RL 2315
Audio Developments LTD	RL 3025
Logitek Electronic Systems	RL 3603
A.E.Q.	RL 3825
RDL Radio Design Labs	RL 4022
Ram Broadcast Systems	RL 4222

Audio Mixers-Studio, Recording

ATI-Audio Technologies, Inc.	5720
Audio-Technica U.S., Inc.	6816
ADM Systems, Inc.	8115
Studer, Soundcraft, AKG, BSS	8343
AMS NEVE	9610
Zaxcom Inc.	9672
Otari Corporation	10341
Panasonic BDSC	11601
Graham-Patten Systems	11670
Group One Ltd.	12164
TASCAM	12962
Micron Audio Products Ltd	13165
The J-Lab Co.	13708
Digital Audio Research	M 7874
Mackie Designs Inc.	M 8138
Yamaha Corp. of America	RL 1206
AEV	RL 1420
Sonifex Ltd.	RL 1427
Radio Systems	RL 1818
Broadcast Electronics, Inc	RL 1810
Auditronics, Inc.	RL 2002
Fidelipac Corp.	RL 2006
Ward-Beck Systems Ltd.	RL 2200
Henry Engineering	RL 2318
Penny & Giles, Inc.	RL 2316
Arrakis Systems Inc.	RL 2606
Wheatstone Corporation	RL 2619
Alesis Corp.	RL 2725
Pacific Research & Engineering	RL 3006
Solid State Logic	RL 3325
Logitek Electronic Systems	RL 3603
Sierra Automated Systems	RL 3613
Harrison By GLW	RL 3619
Autogram Corp.	RL 3802
A.E.Q.	RL 3825
RDL Radio Design Labs	RL 4022
Calrec Audio Ltd.	RL 4208
Ram Broadcast Systems	RL 4222
Sascom Marketing Group	RS 3848

Audio Processing

beyerdynamic Inc.	5707
FM Systems	5711
ATI-Audio Technologies, Inc.	5720
OPTIONS International Inc.	5753
ADM Systems, Inc.	8115
Studer, Soundcraft, AKG, BSS	8343
AMS NEVE	9610
Benchmark Media Systems, Inc.	11067
Graham-Patten Systems	11670
Dorrough Electronics	13025
Modulation Sciences	13143
Digital Audio Research	M 7874
Antex Electronics	M13341

Denon Electronics	RL 1024
DB Eletronica	RL 1027
Yamaha Corp. of America	RL 1206
Videoquip Research Limited	RL 1302
inovonics, Inc.	RL 1401
AEV	RL 1420
Circuit Research Labs	RL 1506
Eventide, Inc.	RL 1619
Aphex Systems	RL 1622
TimeLine Vista, Inc.	RL 1919
Symetrix, Inc.	RL 2019
Audi-Cord Corp.	RL 2409
Orban	RL 2702
Alesis Corp.	RL 2725
Pacific Research & Engineering	RL 3006
JBL, Spirit, Lexicon, Allen & Heath, dbx	RL 3012
	RL 3025
Audio Developments LTD	RL 3325
Solid State Logic	RL 3402
Dan Dugan Sound Design	RL 3402
A.E.Q.	RL 3825
Studio Technologies, Inc.	RL 4019
RDL Radio Design Labs	RL 4022
Calrec Audio Ltd.	RL 4208
TC Electronic, Inc.	RL 4213
Roland Corporation U.S.	RL 4419
Sascom Marketing Group	RS 3848
Apogee Electronics Corporation	RS 4344
Axon Digital Design BV	S 1047
Kramer Electronics	S 3314

Audio Recording, Storage & Playback

ATI-Audio Technologies, Inc.	5720
Audio-Technica U.S., Inc.	6816
DRS Ahead Technology/CMC	6915
Gefen Systems	7652
ADM Systems, Inc.	8115
Studer, Soundcraft, AKG, BSS	8343
Zaxcom Inc.	9672
Otari Corporation	10341
Benchmark Media Systems, Inc.	11067
TASCAM	12962
Denon Electronics	RL 1024
Videoquip Research Limited	RL 1302
AEV	RL 1420
Sonifex Ltd.	RL 1427
Radio Systems	RL 1818
Broadcast Electronics, Inc	RL 1810
Digigram	RL 1901
TimeLine Vista, Inc.	RL 1919
Fidelipac Corp.	RL 2006
Symetrix, Inc.	RL 2019
LPB	RL 2021
360 Systems	RL 2026
Audi-Cord Corp.	RL 2409
Arrakis Systems Inc.	RL 2606
Alesis Corp.	RL 2725
Pacific Research & Engineering	RL 3006
Solid State Logic	RL 3325
Dan Dugan Sound Design	RL 3402
A.E.Q.	RL 3825
Studio Technologies, Inc.	RL 4019
RDL Radio Design Labs	RL 4022
Calrec Audio Ltd.	RL 4208
Ram Broadcast Systems	RL 4222
Prophet Systems	RL 4406
Roland Corporation U.S.	RL 4419
Sascom Marketing Group	RS 3848
Digidesign	RS 4744
Digital Audio Labs	RS 5547
Nagra Kudelski SA	S 2029
Sonic Solutions	S 2338

Audio Routing & Distribution

ATI-Audio Technologies, Inc.	5720
Audio Accessories, Inc.	5755
Pacific Radio	7462
Gefen Systems	7652

FASTtrack

Audio Routing & Distribution (continued)

Digipath, Inc.	7801
Connectronics Corp.	8102
ADM Systems, Inc.	8115
Studer, Soundcraft, AKG, BSS	8343
Leitch Incorporated	9941
Burst Electronics Inc.	10064
Benchmark Media Systems, Inc.	11067
Link Electronics, Inc.	12781
Modulation Sciences	13143
BAL Broadcast Ltd	13238
The J-Lab Co.	13708
AutoPatch, Div. of XN Technologies	M 6429
Inline, Inc.	M 8229
Burk Technology	RL 1215
Videoquip Research Limited	RL 1302
Radio Systems	RL 1515
360 Systems	RL 2025
Penny & Giles, Inc.	RL 2316
Switchcraft, Inc.	RL 2525
Arrakis Systems Inc.	RL 2606
Pacific Research & Engineering	RL 3006
JBL, Spirit, Lexicon, Allen & Heath, dbx	RL 3012
Logitek Electronic Systems	RL 3603
Sierra Automated Systems	RL 3613
Harrison By GLW	RL 3619
A.E.Q.	RL 3825
Studio Technologies, Inc.	RL 4019
RDL Radio Design Labs	RL 4022
Ram Broadcast Systems	RL 4222
NVISION, Inc.	S 2967
Kramer Electronics	S 3314

Automation Systems

Studer, Soundcraft, AKG, BSS	8343
LPB	RL2021
SMARTS Broadcast Systems	RL 2120
Pristine Systems	RL 2416
Orban	RL 2702
A-Ware Software, Inc.	RL 2800
Scott Studios Corp.	RL 3601
Dalet Digital Media Systems	RL 3610
Cartworks/dbm Systems, Inc.	RL 3727
Radio Computing Services	RL 4101
Computer Concepts Corporation	RL 4413
MEDIATOUCH	RL 4503
ENCO Systems, Inc.	RL 4525

Compression Equipment

Wegener Communications	10153
Group One Ltd.	12164
IRT Electronics Pty. Ltd	12825
Evertz Microsystems	13753
EDNET, Inc.	I11528
Telos Systems	I12118, RL 3606
RE America, Inc.	M 6425
Genesis Microchip	M 6729
Minerva Systems, Inc.	M 7232
Antex Electronics	M13341
DB Eletronica	RL 1027
Videoquip Research Limited	RL 1302
Circuit Research Labs	RL 1506
Digigram	RL 1901
MUSICAM USA	RL 1925
QEI Corporation	RL 2014
Symetrix, Inc.	RL 2019
Comrex Corporation	RL 2612
TFT, Inc.	RL 2812
Moseley Associates, Inc.	RL 3002
Audio Processing Technology	RL 3616
A.E.Q.	RL 3825
Intraplex, Inc.	RL 4216
ComStream Corp.	RS 5347
Axon Digital Design BV	S 1047
Nagra Kudelski SA	S 2029
IBM Corporation	S 2318
Kramer Electronics	S 3314
Optivision, Inc.	S 9925
Da-Lite Screen Company	S11537
Digital Transport Systems	S12145

Computers & Peripherals

Imagine Products, Inc.	4761
W. Clark & Associates, Ltd.	5041
Tally Display Corp. (TDC)	5453
Dubner International	6362

Systembase Ltd.	6957
Amco Engineering Co.	7309
Accom, Inc.	9367, S 2025
Leitch Incorporated	9941
A. F. Associates, Inc.	10221
Columbine JDS Systems, Inc.	10957
Panasonic BDSC	11601
Comprompter	11776
Magni Systems Inc	12462
Adrienne Electronics Corp.	12823
VDOnet Corporation	I11512
EDNET, Inc.	I11528
NEC Technologies	I13820
Diaquest Inc.	M 5929
Optibase, Inc.	M 6764
General Video Corp.	M 6774
Promax Technology	M 7068
Apple Computer, Inc.	M 7362
MicroNet Technology, Inc.	M 7628
Andataco	M 7659
Inline, Inc.	M 8229
Intel	M 8263
Audiomation/Sellmark	RL 1319
Register Data Systems	RL 2322
CBS/Custom Business Systems	RL 2615
TFT, Inc.	RL 2812
Pacific Research & Engineering	RL 3006
A.E.Q.	RL 3825
Prophet Systems	RL 4406
Roland Corporation U.S.	RL 4419
Digital Audio Labs	RS 5547
IBM Corporation	S 2318
Interlace Engineering Corp.	S 2552
Play, Incorporated	S 2918
Pluto Technologies Int'l Inc.	S 2938
Fast Electronic U.S. Inc.	S 2944
Discreet Logic	S 3006
Truevision	S 3432
MegaDrive Systems	S 3462
Microsoft	S 3510
Silicon Graphics	S 4125
Ensemble Designs	S 4132
NewTek	S 4732
Norpak Corporation	S 5015
Hewlett Packard	S 5426
Raytheon Semiconductor	S 5532
Optivision, Inc.	S 9925

Dealers, Distributors

Rorke Data, Inc.	6060
Harris Corporation	6309
Pacific Radio	7462
Chapman/Leonard Studio Equipment	7660
Mole Richardson	7844
Union Connector	7849
Richardson Electronics, Ltd.	7905
Television Equipment Associates, Inc.	8117
BI-Tronics	8120
Continental Electronics Corporation	8333
Jensen Tools Inc	9835
Broadcasters General Store	10061, RL 1922
Yale Electronics, Inc.	10071
Milestek, Inc.	10072
Multimedia Accessories, Ltd.	10171
Broadcast Store, Inc.	10176
EMCEE Broadcast Products	10350
Hi-Tech Enterprises, Inc.	10962
TecNec	11281
H. L. Dalis	12181
Techni-Tool	13235
Global Microwave Systems, Inc.	13257
BDL-Autoscript Inc.	13260
ProSource/BMI	13263
Systems Wireless, Ltd.	13270
Geneva Aviation	13280
BAF Communications Corp.	13718
United States Broadcast	13722
DSI RF Systems, Inc.	I13026
Soundscape Digital Tech.	M 8159, RL 1419
Synelec USA, Inc.	M 8273
Bradley Broadcast Sales, Inc.	RL 1601
Professional Sound Corporation	RL 1625
Broadcast Supply Worldwide	RL 1815
QEI Corporation	RL 2014
TERACOM Components	RL 2425
A.E.Q.	RL 3825
Audio Intervisual Design/DTD	RL 3923, S 1838
Ram Broadcast Systems	RL 4222
Avocet Instruments, Inc.	RL 4306
Coffey Sound	RL 4308

Sascom Marketing Group	RS 3848
Professional Audio Supply	RS 4945
B&H Photo-Video-Pro Audio	S 1507
Electrosonic Systems, Inc.	S 2325
Herman Electronics	S 2627
Preferred Video Products	S11838
Braintorm Multimedia	T 4867
Dawn Satellite, Inc.	T 4953
ATC/Antenna Technology	T 5156

Digital Audio Workstations

Studer, Soundcraft, AKG, BSS	8343
AMS NEVE	9610
Otari Corporation	10341
Systems Wireless, Ltd.	13270
Digital Audio Research	M 7874
Mackie Designs Inc.	M 8138
Soundscape Digital Tech.	M 8159, RL 1419
Videoquip Research Limited	RL 1302
AEV	RL 1420
Sonifex Ltd.	RL 1427
Radio Systems	RL 1515
Broadcast Electronics, Inc	RL 1610
Digigram	RL 1901
TimeLine Vista, Inc.	RL 1919
LPB	RL 2021
Register Data Systems	RL 2322
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Orban	RL 2702
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Solid State Logic	RL 3325
Scott Studios Corp.	RL 3601
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Studio Technologies, Inc.	RL 4019
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Ram Broadcast Systems	RL 4222
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Roland Corporation U.S.	RL 4419
MEDIATOUCH	RL 4503
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Digital Audio Labs	RS 5547
Sonic Solutions	S 2338
Play, Incorporated	S 2918
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beyerdynamic Inc.	5707
Audio-Technica U.S., Inc.	6816
Pacific Radio	7462
Telex Communications Inc.	9729
TecNec	11281
IRT Electronics Pty. Ltd	12825
COMTEK, Inc.	13172
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Vega	13538
Clear-Com Intercom Systems	13664
Denon Electronics	RL 1024
Sierra Automated Systems	RL 3613
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Studio Technologies, Inc.	RL 4019
RDL Radio Design Labs	RL 4022
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Schoeps/Posthorn Recordings	4739
beyerdynamic Inc.	5707
ATI-Audio Technologies, Inc.	5720
Shure Brothers	5913
Quickset International, Inc.	5916
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Audio-Technica U.S., Inc.	6816
Neumann USA	7447
Sennheiser Electronic Corp.	7447
Pacific Radio	7462
Mole Richardson	7844
R-Columbia Prod.	8049
Connectronics Corp.	8102
NADY Systems	8121
Countryman Assoc Inc	9727
Telex Communications Inc.	9729
Lectrosonics, Inc.	10481
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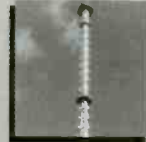
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13263	
Systems Wireless, Ltd.	13270
Vega	13538
RCI Systems, Inc.	M 7736
Videoquip Research Ltd	RL 1302
Wave:Space, Inc.	RL 1322
Audio USA	RL 1328
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Telect	5053
Wireworks Corporation	5705
FM Systems	5711
ADC Telecommunications	6047
Nucomm, Inc.	6660
Broadcast Microwave Services	7803
Mole Richardson	7844
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BI-Tronics	8120
Microwave Radio Comm.	8324
Studer, Soundcraft, AKG, BSS	8343
VEAM Div. Litton Systems, Inc.	9176
Telex Communications Inc.	9729
Allen Osborne Assoc. Inc.	9837
Advent Communications Ltd.	9872
Flir Systems	9883
Milestek, Inc.	10072
ETM-Electromatic, Inc. 10084, T	5569
TRON-Tek, Inc.	10185
EMCEE Broadcast Prod.	10350
Telecast Fiber Systems, Inc.	11484
IPITEK	12485
Nemal Electronics Inc.	12643
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IRT Electronics Pty. Ltd	12825
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Modulation Sciences	13143
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OEI Corporation	RL 2014
Henry Engineering	RL 2315
Kintronc Labs, Inc.	RL 2319
Comrex Corporation	RL 2612
TFT, Inc.	RL 2812
Moseley Associates, Inc.	RL 3002
Elenos S.r.l.	RL 3521
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Bext, Inc.	RL 3906
Intraplex, Inc.	RL 4216
Technosystem S.P.A.	RL 4416
JK Audio, Inc.	RS 5438
Force Inc.	S 1529
Vyvx, Inc.	S 2332
Fiber Options, Inc.	S 2656
Pulizzi Engineering, Inc.	S 2829
Kramer Electronics	S 3314
Trylon/TSF	S10301
Channel Master	T 4153
Ortel Corporation	T 4951
Dawn Satellite, Inc.	T 4953

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FM Systems	5711
Frezzi Energy Systems	5717
Walter Brewer Corp.	6656
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Pacific Radio	7462
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BI-Tronics	8120
PAG USA	8984
Lightning Eliminator & Cons.	9725

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Northern Technologies	RL 1325
Best Power/North Star Tech.	S 1526
Pulizzi Engineering, Inc.	S 2829
Equi-Tech Corporation	S10541

Radio Transmitters, Translators, Exciters & Antennas

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Systems With Reliability (SWR)	
	5909
Itelco	6043
Harris Corporation	6309
Jampro Antennas/RF Systems	6313
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Electronic Associates	9422
Allen Osborne Assoc. Inc.	9837
Dielectric Comm.	10225, RL 2306
Phasetek Inc.	RL 1001
OEI Corporation	RL 2014
LPB	RL 2021
KIntronc Labs, Inc.	RL 2319
Silicon Valley Power Amps	RL 3422
Crown Broadcast	RL 3816
Energy-Onix	RL 3901
Armstrong Transmitter	RL 3911
OMB	RL 4501
Broadcast Technology Ltd	S 10623

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Imagine Products, Inc.	4761
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Steenbeck, Inc.	5725
MSE Video Tape Services	5726
Sony Electronics Inc.	6332
Professional Label, Inc.	7262
Valentino Prod. Music Library	7315
RTI-Research Technology Intl.	8345
Milestek, Inc.	10072
JVC Professional Prod. Co.	10201
Storeel Corporation	10210
TecNec	11281
Maxell Corp. Of America	12031
Eastman Kodak Company	12549
Techni-Tool	13235
Optibase, Inc.	M 6764
MicroNet Technology, Inc.	M 7628
Sun Microsystems	M 7969
Denon Electronics	RL 1024
TimeLine V1sta, Inc.	RL 1919
Fidelipac Corp.	RL 2006
audiopak, Inc.	RL 2310
Dan Dugan Sound Design	RL 3402
Apogee Electronics Corp.	RS 4344
Storage Concepts, Inc.	S 1241
Sonic Solutions	S 2338
United Ad Label Co., Inc.	S 2529
Microsoft	S 3510
Electrorack Products Co.	S 5022
STUDIO FILM & TAPE INC	S 9818
Zonal Limited	S10645,
American Video Tape	S12142
Brainstorm Multimedia	T 4867

RF Feedline, Waveguide & Components and Towers, Services

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Communications & Power Industries	5904
ERI-Electronics Research	5907
Systems With Reliability (SWR)	
	5909
Toshiba	6443

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Nucomm, Inc.	6660
Micro Communications, Inc.	6713
Acoustical Solutions	6815
Myat Inc.	6913
Pacific Radio	7462
Thomson Components & Tubes	7726
Stainless Inc.	7805
Richardson Electronics, Ltd.	7905
Lightning Eliminator & Consultants	9725
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LeBlanc Broadcast Inc.	9861
Advent Communications Ltd.	9872
ETM-Electromatic, Inc.	10084, T 5569
Dielectric Communications	10225, RL 2306
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AVCOM of Virginia, Inc.	10961
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DB Elettronica	RL 1027
Altron Research Inc.	RL 1406
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Flash Technology Corporation	RL 2016
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TERACOM Components	RL 2425
TFT, Inc.	RL 2812

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Utility Tower Company	RL 3401
Hughey & Phillips, Inc.	RL 3403
GEC Marconi Communications	RL 3406
Magnum Towers Inc	RL 3419
Coaxial Dynamics, Inc.	RL 3423
Elenos S.r.l.	RL 3521
Econco	RL 3919
Penta Laboratories	RL 3921
Davicom Technologies	RL 4211
Svetlana Electron Devices	RL 4311
Technosystem S.P.A.	RL 4416
IRTE S.p.A.	S 2353
Pulizzi Engineering, Inc.	S 2829
Trylon/TSF	S 10301
Vertex Communications Corporation	T 4156
NTL	T 4862
Loral Skynet	T 5556

Elenos S.r.l.	RL 3521
MicroNet	RS 4348
ComStream Corp.	RS 5347
Miralite Communications	S 2329
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Pulizzi Engineering, Inc.	S 2829
General Instrument Corporation	S 4725
NII Norsat International, Inc.	T 3759
LNR Communications Inc.	T 3851
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Channel Master	T 4153
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Standard Communications Corp.	T 4351
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Tiernan Communications	T 5159

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ETM-Electromatic, Inc.	10084, T 5569
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Sure Shot Transmissions, Inc.	12821
IRT Electronics Pty. Ltd	12825
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Microwave Filter Company	13240
MCL, Inc.	13243
Global Microwave Systems, Inc.	13257
EEV, Inc	13557
BAF Communications Corp.	13718
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RF Technology, Inc.	13757
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DB Elettronica	RL 1027
NPR Satellite Services(R)	RL 3502

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River City Sound Productions	5158
Taber Mfg & Engr Co.	5342
Tally Display Corp. (TDC)	5453
Data Security, Inc.	5704
beyerdynamic Inc.	5707
FM Systems	5711
Telepak San Diego	5732
Dubner International	6362
FirstCom Music	6547, RL 3504
Walter Brewer Corp.	6656
Energetic Music	6856
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Winsted Corporation	7720, S 2928
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Network Music, Inc.	7732, S 2925
LE Nelson Sales Corp.	7749
Aircraft Production Music Libraries	7950
TRF Production Music Libraries	7953
Tentel Corp	8110

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Uni-Set Corporation	8122
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Nalpak Video Sales Inc.	12070
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Phasetek Inc.	RL 1001
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Rees Associates, Inc.	12346
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Kintronics Labs, Inc.	RL 2319
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Dan Dugan Sound Design	RL 3402
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The Austin Company	S 1249
Automated Weather Source	S 1265
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Bird Electronic Corporation	RL 1727
Shively Labs	RL 1806
Belar Electronics Lab Inc.	RL 2010
QEI Corporation	RL 2014
Gorman-Redlich Mfg.Co.	RL 2119
Delta Electronics Inc.	RL 2312
Holiday Industries, Inc.	RL 2407
Potomac Instruments	RL 2412
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Davicom Technologies	RL 4211
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Telect	5053
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TERACOM Components	RL 2425
Switchcraft, Inc.	RL 2528
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Technosystem S.P.A.	RL 4416
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Apogee Electronics Corporation	RS 4344
Rean Products	RS 5538
Evolving Video Technologies	S 1228
Ergo	S 3632
Marshall Electronics, Inc.	S 3633
Trylon/TSF	S10301
Channel Master	T 4153

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AKG CONDENSER MICROPHONES TAKE YOU FROM THE STUDIO TO THE STAGE

When you think of high quality microphones, your first consideration should be AKG. Since 1947, AKG has been the leader in condenser microphone technology. Our C1000S, C3000 and C535EB are great for professional and home studio engineers, as well as performing musicians.



- **Perfect for both studio and stage performance**
- **Rugged construction for demanding road work**
- **Shock isolation reduces physically transmitted noises**
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 Telephone: (01) 431866540
 Fax: (01) 43186654516

Web Site: <http://www.akg-acoustics.com> Circle (44) on Free Info Card



C3000

Features large gold sputtered diaphragm.

Capsule assembly creates two polar patterns.



C535EB

Characteristic of AKG's best studio condensers at a price you can afford.

Features integrated four position output level/bass rolled switch.



C1000S

Operates on phantom power or 9 volt battery.

Features Dual polar patterns that are ideal for live sound & recording.



A Harman International Company



What's the best thing about the NAB show? The conferences? The camaraderie? Those ice cream bars they sell on the show floor? Not even close. Everybody knows that the NAB convention is about new products. Do you have a need? Can you not get your signal from Point A to Point B quite as smoothly as you might want? Look around, the perfect solution is out there somewhere.

To help you find it, BE Radio has compiled the following list of products making their NAB debut from respondents to an editorial call.

PORTABLE ONE DUAL DOMAIN

Digital + Analog + Interface Audio Test



True Dual Domain Audio Testing at an Attractive Price Point

The Portable One Dual Domain is the complete portable test solution for analog and digital audio and the AES/EBU/SPDIF serial digital interface. As the first portable Dual Domain® audio analyzer, it includes separate and independent hardware for analog, digital and interface signal generation and measurement.

- Comprehensive analog audio analyzer
- True digital domain analyzer with -140 dB residual noise
- Independent analog & digital audio generators and analyzers
- Generate and measure interface jitter
- Digital interface analyzer
- View AES/EBU status bits

- Internal save and recall of 30 test setups
- Loudspeaker monitor for digital & analog audio signals

Audio precision

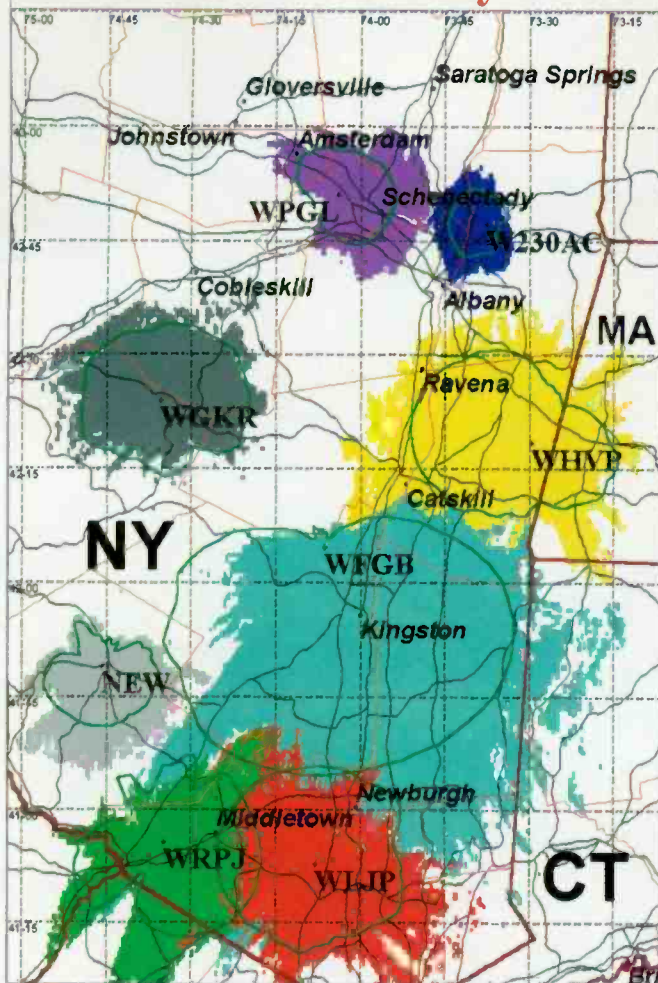
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Tel: (503) 627-0832 Fax: (503) 641-8906
US Toll Free: 1-800-231-7350
Email: sales@audioprecision.com

Our worldwide force of Audio Precision representatives will be pleased to demonstrate the many advantages of the Portable One Dual Domain

INTERNATIONAL DISTRIBUTORS: Australia: VICOM Australia Pty. Ltd., Tel: 3 9563 7844; Austria: ELSINCO GmbH, Tel: (1) 815 04 00; Belgium: Trans European Music NV, Tel: 2 466 5010; Brazil: INTERWAVE LTDA, Tel: (21) 325-5358; Bulgaria: ELSINCO Rep. Office Sofia, Tel: (2) 958 12 45; Canada: GERRAUDIO Distribution, Tel: (613) 342-6993; China, Hong Kong: A.C.E. (Int'l) Co. Ltd., Tel: 2424-0387; SAV Instrumentis Co. Ltd., 2833 9987; Croatia: ELSINCO Rep. Office Zagreb, Tel: 1 615 34 50; Czech Republic: ELSINCO Praha spol. s r.o., Tel: (2) 49 66 89; Denmark: nbn Elektronik aps, Tel: 86 57 15 11; Finland: Genelec OY, Tel: 17 813 311; France: ETS Mesureur, Tel: (1) 45 83 66 41; Germany: RTW GmbH & Co. KG, Tel: 221 70913-0; Greece: KEM Electronics Ltd., Tel: 1 6748514/5; Hungary: ELSINCO Budapest KFT, Tel: (1) 339 0000; Israel: Dan-E Technologies, Ltd., Tel: 3-647 8770; Italy: Audio Link s.r.l., Tel: 521 648723; Japan: TOYO Corporation, Tel: 3 (5688) 6900; Korea: BSP International Co., Ltd., Tel: 2 548-1457; Malaysia: Test Measurement & Engineering Sdn (Selangor), Tel: 3 734 1017; Test Measurement & Engineering Sdn, (Penang), Tel: 4 6422088; Netherlands: Heynen B.V., Tel: 485 55 09 09; New Zealand: AudioVideo Wholesalers, Tel: 9 779 7200; Norway: Lydconsult, Tel: 47-69-176050; Poland: ELSINCO Polska sp. z o.o., Tel: (22) 39 69 79; Portugal: Acutron Electroacustica Lda, Tel: 1 940 1785; Singapore: TME Systems Pte Ltd., Tel: 747-7234; Slovakia: ELSINCO Slovensko s.r.o., tel: (7) 784 165; Slovenia: ELSINCO d.o.o., (61) 133 62 79; South Africa: SOUNDUSION MFG., Tel: 11 477-1315; Spain: Telco Electronics S.A., Tel: 1 531-7101; Sweden: TTS Tal & Ton Studioteknik AB, Tel: 31 52 51 50; Switzerland: Dr. W.A. Gunther AG, Tel: 1 910 4444; Taiwan: R.O.C.: Double Advance Tech., Tel: 2-596 0596; Thailand: Massworld Company Ltd., Tel: 2-294-4930; United Kingdom: Thurby Tharctar Instruments, Ltd., Tel: (1480) 412451 (11-12-97)

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Simple to learn! Complete tools include:

- Latest Matrix Based Tiling Techniques
- Correct models for any Service including DTV
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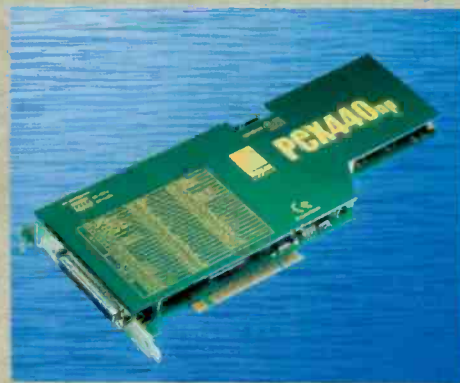
See the software perform at most major
Land Mobile and Broadcast Trade Shows!

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NAB Extra

Digigram
• Booth
RL1901

► PCXnp
Multichannel Cards:
800 and
PCX440np
cards use a
new driver
(np), operate on the
PCI bus in



master mode and take advantage of the enhanced performance of a new DSP that is more powerful than the previous generation; all cards are available with a complete set of development tools, Xtrack multitrack editor and a wide range of applications developed by Digigram OEMs; several versions of the cards are available with a range of features to fit the needs of any number of facilities; OEM applications shown elsewhere that incorporate Digigram technology will feature a "Digigram Powered" logo.

703-875-9100; fax 703-875-9161; e-mail

input@digigram.com

Circle (201) on Free Info Card



Chip Morgan, President, CMBE, Inc.,
Sacramento, California, USA

What is going to be hot at NAB98?

Digital consoles, PC based audio measuring systems, audio processing, IBOC, radio network solutions.

What was hot last year that is on the way out this year?
Nothing comes to mind

What will you be looking at/for at NAB98?

We'll be looking for new products that integrate well into our studio and RF systems.

What will you be looking at for an imminent purchase?
All RF and studio products

Recommended hangouts and hotspots away from the show:
Ferraro's for Italian food.

What changes should be made for NAB98 from last year?

Since the show is spreading out, a more logical arrangement of products would be nice. Sections for RF, audio, video, etc.

Suggestions for first-time attendees:

Wear comfortable shoes and clothing, visit the vendors and booths you don't recognize.

My view of the Radio Broadcast Industry:

Consolidation will lead to regional and national networks, then "boutique" operators will regain market share. Expect major growth in program suppliers with home-based studios.

Any other thoughts?

It's a great time to be in the radio business.

Service you thought no longer existed.

In this day of self-service, ATMs and "get-it-yourself" attitudes, one place still offers full service – BSW.

Our knowledgeable sales representatives have real-world broadcast and studio engineering experience to offer expert help with your equipment purchase. And our comprehensive inventory, representing over 200 manufacturers, is on-site so we can quickly turn-around your order. Best of all, we offer low prices on all audio and broadcast equipment.

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<http://www.bswusa.com>



operation, unit permits a radio affiliate to receive multiple network audio feeds from the same receiver and to record and play commercials, liners, PSAs, IDs and even short-format programs.

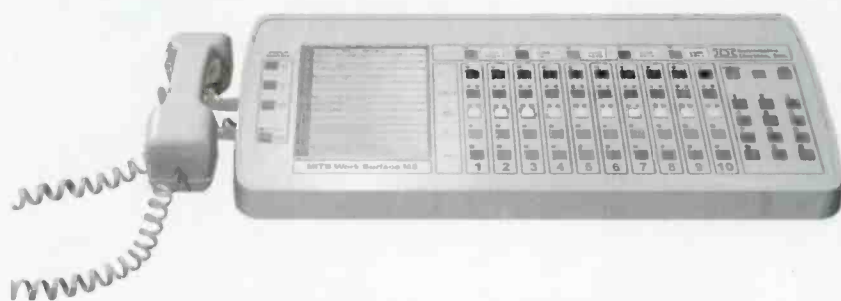
800-598-6270; fax 219-294-8329

Circle (202) on Free Info Card

◀ **DR2000:** offers built-in, solid state flash memory for store and forward applications; multiple stereo MPEG audio decoders and mixer/faders are also included; features bit rate-agile tuners (BPSK/QPSK) operating from 64kb/s to 45Mb/s; in

Consolidation... Multi-Studio?

You can have it all at your fingertips



See us along-
side the best in Digital
Consoles from Logitek,
NAB 98 Booth #3603

Talkshow Concepts

- Integrated Software & Hardware
- No Extra Monitor or Computer to Buy
- Intuitive Screener/Host Transfers
- Display for Time on Hold, Time on Air
- Keyboard Input on each Work Surface
- Take your show on the road!

Keyboard Concepts

- Single Key per Function
- LED for each Function
- Super-fast Operation
- User Definable Action Keys
- User Friendly Design
- No Function Sequences

Network your Studios and share phone lines to reduce costs without sacrificing line integrity.

The talkshow is integrated into the system and so is the display.

Fast, slick operation that you can even take on the road.

Take control of your phones! CALL:

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Innovative Devices, Inc.

Circle (30) on Free Info Card

Gepco International Booth 6360

▼ **5526EZ:** this 26-gauge, single-pair digital audio cable features an overall foil shield, a wrapped PVC jacket carrying an NEC (UL)-type CM rating,



characteristic impedance of 110Ω, and a mutual capacitance of 13.5pF/ft; includes two 26-gauge, tinned-copper, color-coded conductors and a 26-gauge drain wire.

312-733-9555; fax 312-733-6416

Circle (203) on Free Info Card

Logitek • Booth RL3603

• **ROC-5:** five-fader control surface for Logitek's digital audio engine is ideally suited to studios with a limited number of inputs needed at any one time, such as news booths or automated stations.

• **VMIX:** with either a touchscreen or mouse, unit is a PC-based control surface designed for remote use and/or where a console is not desirable.

800-231-5E70; fax 713-782-7597;

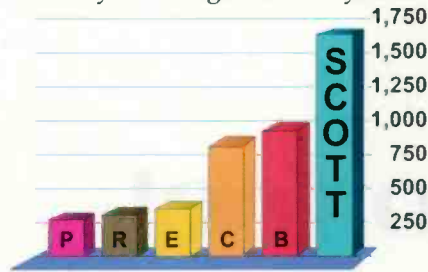
e-mail info@logitekaudio.com;

www.logitekaudio.com

Circle (204) on Free Info Card

The Best Digital Systems

More radio stations choose Scott's than any other digital audio system!



It's a fact: 1,600 radio stations use 3,600 Scott digital workstations, including *major* groups like CBS, Chancellor, Disney/ABC, Clear Channel, Emmis, Jacor and Citadel. More Scott stations win Air Personality of the Year Marconis and are Arbitron's highest rated in their formats!

Scott is the only U. S. supplier with:

- 47 digital employees, with
- 600 years Radio experience,
- 367 years Digital experience and
- 3 systems: Good, Better and Best!

Good Spot Box



Scott's new digital Spot Box triple-deck "cart" replacement delivers *true* CD quality sound. And Spot Box is the *easiest* digital system to use! There's only one screen, so jocks always know what's happening. At left, three players count down and flash End-of-Spot signals.

At right, there's a "Wall of Carts" that lets you pick and play any recording by number or name. Or, number keys at the bottom load your cut quickly.

Starting at \$5,000, Scott's Spot Box includes a recorder and touchscreen. Options include two triple-deckers and easy log imports from traffic computers.

8:15:38A Copyright 1997 Scott Studios Corp.

Air 3:57	How Do I Live Leann Rimes :11/4:05/F HIT HM0105 8:15:47 #1 for 3 Weeks in Oct '97	Shotgun Jingle :03 4	Fast Jingle :08 4	Medium Jingle :12 4	Slow Jingle :14 4	Long Jingle :17 4
Start 3	Something About the Way Elton John :17/4:13/F HIT HM2608 8:18:40	Legal ID :11 4	Morning :09 4	Oldie Jingle :08 4	PSA Bed :30 4	Promo Bed :31 4
Start 3	Contest Promo Bed Instrumental :00/Q:30/F PRO TO2214 8:22:42	Weather Open :40 4	Weather Close :04 4	Slide Whistle :02 4	Sports Bed :60 4	News Bed :12 4
Start 3	Short Jingle Q-102 :00/Q:06/F JIN TO2215 8:23:02	Gorg SFX :03 4	Drum Roll :00 4	Rim Shot :01 4	Traffic Bed :31 4	Weather Bed :13 4
Start 3	Help! Beatles :00/2:45/C 101 DA1234 8:23:08	Rooster Crows :04 4	Jugle Reveille :06 4	Woman Yawns :02 4	Contest Bed :59 4	Winner Bed :59 4
Start 3	McDonald's 2 for \$2 Q: ...may vary. :00/C:30/F COM DA4315 8:25:53	Don't Go There :02 4	Song SFX :03 4	Happy Birthday :32 4	Applause :08 4	Wow! :01 4

Auto Reals Preview Record :07 More Opt. Hot Keys Songs Spots

Here's the user-friendly new Scott NT System, with 30 sets of 30 hot keys, phone editor, and all songs and spots on line for instant play! It delivers uncompressed digital audio at compressed prices!

Better AXS



AXS (pronounced ax'-cess) is radio's premier digital audio system for satellite or news/talk formats and CD automation. AXS gives you instant play Hot Keys, log editing, Power Fill, satellite jock substitution, link to NPR's SOSS, an easy Real Time Scheduler, unattended net catching and an optional production or phone recorder and editor in the air studio. Scott Studios offers AXS satellite systems as low as \$7,500 complete. Scott digital systems can send any voice tracks, spots, promos and songs to sister stations, near or far! Our Remote Recording Router transfers via modem, Internet FTP, ISDN, WAN or Frame Relay Cloud.

Best Scott NT System



The Scott NT System is the first with a true 32-bit PCI digital audio card that plays *four uncompressed* stereo channels *with overlap* from one card *while recording!* It's radio's top-of-the-line system for digital music on hard drive. Scott's Voice Trax lets jocks record a great 4 hour show in context in about 15-20 minutes!

Scott also offers an *Invincible* seamless redundancy option and other exclusive self-healing fail-safes. Regardless what happens, your spots and songs just keep on comin'!

Good, Better, Best. Scott Studios' three digital systems can be tailored to *your* needs and budget. Call or visit www.scottstudios.com.

Scott Studios Corp.
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Dallas, Texas 75234 USA
(972) 620-2211 FAX: (972) 620-8811
800 726 8877
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628 Digital Voice Processor It Takes Requests & Doesn't Need Coffee!



You've received over a dozen requests in less than 15 minutes and the phones still ringing! If that isn't enough, your program director wants the presets changed & needs your voice on a cart "ASAP." All this and you haven't even had your first cup of coffee! The day's just starting... You may not be up to speed, but the Symetrix 628 Digital Voice Processor is! Made for broadcasting, live performances and recording studios.

The Symetrix 628 Digital Voice Processor provides a quick way for talent or producer to make those speedy changes without running frantically to the equipment rack! The 628 offers instant quality on-air capabilities. A simple turn of a knob selects any of 119 user resonalized presets or one of 8 factory presets.

The Symetrix optional RC-1 remote enables eleven presets and includes a bypass function. All with only a touch of a single button.

The 628 is a transformerless & capacitorless mic preamp. Filters in the 628 eliminate RF interference and features like the switchable 15 dB pad, which prevents microphone melt downs are essential for quality end results.

Along with easy plug to play operation, independent metering process functions, microphone & line level outputs. The 628 provides AES/EBU and S/PDIF digital outputs. As well as 20 bit A/D & D/A converters.

The 628's parametric approach to equalization allows cuts & boost exactly where needed and provides sound signal processing every professional demands!

Better yet the 628 with onboard de-esser, expander/gate, compressor and processing power takes up only one rack space! Intervention & independence... that's what the Symetrix 628 Digital Voice Processor is all about. So go have your coffee!

**Harris Corporation
Broadcast Division**

U.S.: 1-800-622-0022

Fax: 765-966-0623

<http://www.broadcast.harris.com>



HARRIS

A new world of broadcast solutions

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Platinum Z Solid-State FM Transmitters.

"Here for future generations"

The Platinum Z may just be the eighth wonder of the world!

Phenomenal CD-quality sound is provided by true digital FM generation. The **Platinum Z** provides the reliability of solid-state digital technology, the performance of digital modulation, and the confidence of third generation solid-state amplifier technology.

Platinum Z transmitters also use innovative Z-plane combining, which enable seamless transmission during maintenance & enhances redundancy. If you remove a hot-pluggable RF module from a **Platinum Z** transmitter at any time, for any reason, the remaining modules will compensate to continue broadcasting at nearly, full power. Incredible RF module MTBF of 250,000 hours further ensures the reliable performance of **Platinum Z**.

Digital CD-quality performance...solid-state reliability & redundancy...with a price comparable to tube type transmitters.



Platinum Z features:

- Digit CD exciter (digital or analog input)
- Hot-pluggable RF modules
- Redundant IPA system
- Redundant power supplies
- Broadband design (N+1 capable)
- Life support backup controller
- Dual output power switching
- Built-in auto exciter switcher
- High/overall efficiency

If you're wondering how the **Platinum Z** will fit in your budget or how your listeners and your ratings will increase... Stop wondering and give us a call!



Harris Platinum Z Transmitters*.
Harris does not recommend stacking or leaving the Platinum Z out in the weather.
* Shown with optional second DIGIT CD™ exciter.

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NAB Extra

Comrex • Booth RL2612



800-237-1776; fax 978-635-0401;
e-mail info@comrex.com; www.comrex.com
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Auditronics • Booth RL2002

• **NuStar 3001:** digital console offers new 30-position mainframe, new color and styling with a long-wearing, durable control surface; unit is completely modular and features upgraded VU meters, large clock and timer displays, and a full 48kHz sample rate.

901-362-1350; fax 901-365-8629;
e-mail sales@auditronics.com; www.auditronics.com
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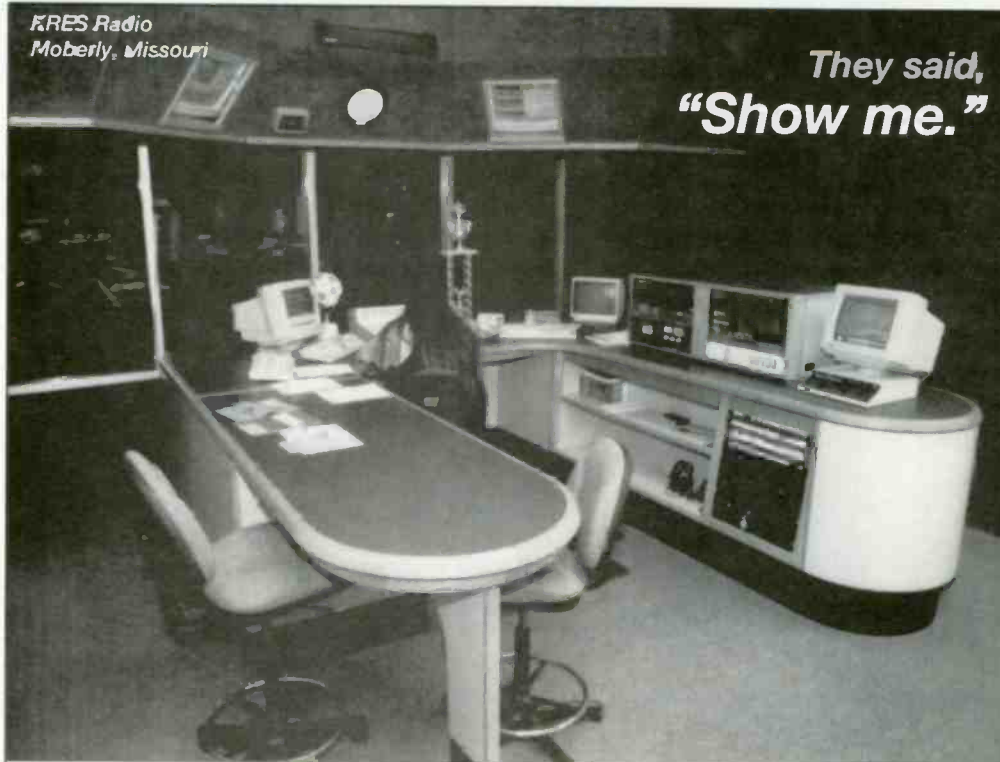
QEI Corporation Booth RL2014

▼ **Transportable RF Systems:** complete, self-contained transmitter site available in mobile, semi-permanent or permanent building designs; offers integral environmental controls



and are pre-wired and pre-assembled with new or existing equipment; allows solid state or single-tube power levels to 10kW and fixed-tuned or frequency-agile applications.

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We did.

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They paid for quality, and they got it.

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Wood Trim Corners • Passive Ventilation • Built-In Wireways • Multiple Access Panels • Ease of Installation

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Do THE MATH.

CATCH US AT NAB!
(RL3816 AT THE LVCC OR
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At Crown, we've been integrating technology since 1947. Our latest equation offers MPEG audio solutions for satellite radio network content delivery. We started with a bit-rate agile receiver. We added flash memory for store and forward use. We gave it multiple MPEG audio decoders and mixer faders. We put in Crown quality and reliability. It all adds up to the SpectraCast™ DR2000—an SCPC/MCPC receiver decoder.

For you, the sum total is a more efficient way of doing business. Now you can use one receiver for multiple network audio feeds *and* simultaneously record and play commercials, liners, PSAs, IDs, and even short format programs such as newscasts. In other words, you get the freedom of localization and all of the advantages of network programming—seamlessly—from one piece of equipment.

CROWN Audio SATELLITE RECEIVERS

- have *built-in, solid-state* flash memory for *store and forward*.*
- call for *spot rotations and playlists* under network or permissioned local control.
- allow for *spotcasting of regionalized commercials and local ad insertion*.
- offer multiple, stereo *MPEG audio decoders* and audio *mixers/faders*.
- include *bit-rate agile RF tuners* (BPSK/QPSK) operating from 64 kbps–45 Mbps.
- are *addressable* as individual units, as part of a group, or as part of a set of groups.



Phone: 800-598-6270 (or 219-294-8143)

Fax: 219-294-8120

Email: spectracast@crow.nintl.com; Web: www.crownsat.com

*Can we help you calculate
the possibilities?*

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* Patent Pending; SpectraCast is a trademark of Crown International, Inc.

NAB Extra

Neumann USA • Booth 7447



◀ **TLM 103:** transform-
less condenser mi-
crophone features a
newly developed cap-
sule, the K13, which
is based on the K87 used
in the U67 and U87
mics; exhibits an acous-
tically well-balanced fre-
quency response and
excellent attenuation
of signal from the rear
of the mic; features
extremely low self
noise (7dBA), a large
dynamic range (131dB)
and has the ability to
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sponse to 5kHz, with a wide
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Kevin McNamara, president, EXEgesis Technologies, New Market, MD

What is going to be hot at NAB98?

Data communications infrastructures supporting new formats will be a hot topic. The deployment of communications protocols such as DSL and ADSL by the various telephone companies will have an impact on our business. I would expect to see the introduction of more Internet and intranet broadcast products (i.e. webcasting). Implementing a company intranet for a cluster of stations can be an extremely efficient method to share company information and files among employees.

What was hot last year that is on the way out this year?

As the price for ISDN drops and availability increases, I would expect the need for the POTS codec to decrease, and the need for available ISDN solutions to increase.

Recommended hangouts and hotspots away from the show:

If you want to get away from the crowds, try the Sam's Town Casino. They have decent restaurants and not many people.

Suggestions for first-time attendees:

You can accumulate a lot of info. Unless you routinely lift weights, you'll want to mail it back to your home before you leave Las Vegas, or have the vendors send it to you after the show.

My view of the radio broadcast industry:

Consolidation is nearly complete in most major markets. The major group owners that were so active in purchasing stations last year, are now scrambling to find creative methods for servicing a debt, that by many accounts may be impossible. The high prices paid for these facilities, combined with the deployment of new emerging competitive media choices (i.e. DBS, Internet broadcast, etc) will make the next year will be a wild ride for people in this industry. The net result will be a loss of many good broadcasters to other industries.

New Problem Solvers From

Broadcast Tools

See these and other BTI products
at NAB Booths RL1815 and RL1922



SS 8.2 Stereo Crosspoint Switcher

This new generation of BTI's popular 8x2 switcher allows crosspoint switching of 8 stereo inputs to 2 stereo and 2 mono outputs, with any input to any output. Here is a sampling of its many features:

- Inputs can be programmed for overlap, mix, or interlock switching operation
- Electronically balanced inputs and outputs
- Internal stereo silence sensor with front panel LED indicators, adjustable alarm threshold and duration
- Front panel, multi-color LED VU meters
- Headphone amplifier with front panel output selection switch, headphone jack and level control
- Powered speaker output with front panel level control, output selection switch and mute control
- Multidrop addressable RS-232 and RS-485 serial ports allowing up to 8 units on one serial port
- 16 Parallel (status) Input Port (PIP)
- 8 relay status outputs and 8 open collector outputs
- Low-drift 60Hz clock/calendar with battery backup and sync input
- Power-up selection of inputs to outputs, mute or last selected channel
- Plug-in screw-style wire captive connectors

List \$729.00



Smart Silence Monitor

Smart enough to detect white noise, program audio or silence, the new Smart Silence Monitor is designed to monitor any stereo or two independent monaural sources. Check out some of its many features:

- Active balanced inputs with multi-turn trimmers
- Alarm sensitivity down to 40dB below program
- Precise time delay from 2 seconds to 93.5 minutes
- Stereo or independent dual monaural operation
- Alarm and activity LED indicators for each channel
- Two DPDT relays - may be used for audio switching
- Four open collector function outputs
- Remote opto-isolated and local defeat and reset inputs
- Screw-style wire captive terminals

List \$209.00

Check out our web site for product information, list pricing and a list of distributors!

Voice: 360 . 428 . 6099

Fax: 360 . 428 . 6719

Internet: www.broadcasttools.com

E-mail: bt@broadcasttools.com

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Skywave 2000



REPCO



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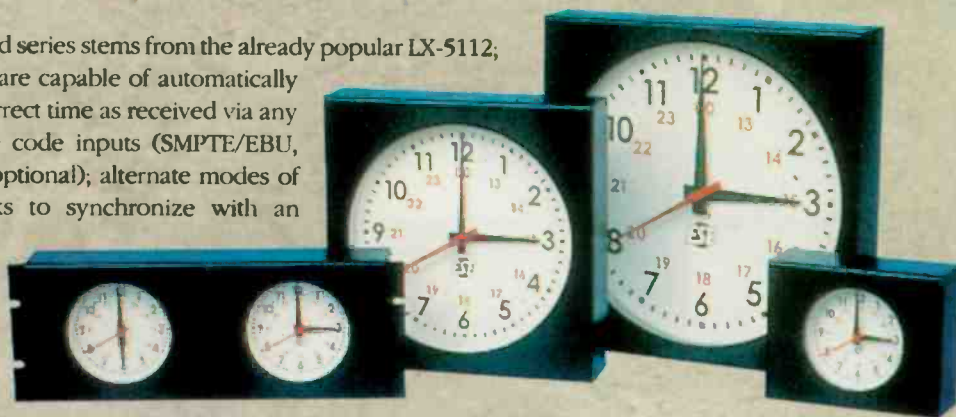
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NAB *Extra*

ESE • Booth 8130

► **LX-5100 Series:** extended series stems from the already popular LX-5112; smaller and larger versions are capable of automatically setting themselves to the correct time as received via any one of three different time code inputs (SMPTE/EBU, ASCII or ESE — IRIG-B is optional); alternate modes of operation allow the clocks to synchronize with an alternating 12- or 24V impulse signal, or to act as a stand-alone clock; sweep or step silent modes and time-zone off-set are user set via rear-mounted DIP switches; options for a lighted dial (with brightness control and rack mounting) are also available.



310-322-2136; fax 310-322-8127

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beyerdynamic • Booth 5707

• **MCE 82:** stereo microphone for x-y recording is well suited for remote recording due to its compact and rugged metal housing; elastic suspension of the condenser capsules suppresses handling and cable noise, while a switchable bass filter eliminates wind noise and rumble; has two condenser capsules with cardioid polar patterns, which are mounted at an angle of +/- 45° of the microphone axis, thus allowing a wide recording range and an accurate reproduction of the sound source.

516-293-3200; fax 516-293-3288; e-mail salesUSA@beyerdynamic.com

Circle (210) on Free Info Card

Fairlight • Booth RL4409

• **Revision 14.3 software:** introduction for the MFX3plus and FAME systems provides significant improvements in audio resolution and connectivity, while offering enhanced recording and editing functions; supports audio in 18-, 20- and 24-bit formats.

310-287-1400; fax 310-287-0200;

www.fairlightesp.com

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Introducing the Front Access Patchbay Series... an exciting new reason to make Switchcraft your source for audio panels.

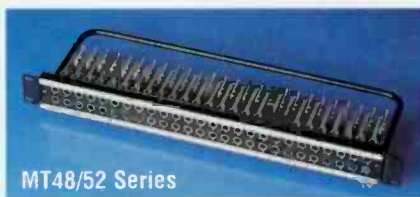
Our innovative front access patchbay gives you space where you've never had it before and convenience you've never dreamed of, in a quality package you've come to expect from Switchcraft. Our heavy duty slide-out tray gives you access to the 96 nickel-plated steel frame jacks **from the front** of the unit.

But that's only the beginning! See the photo above for all of the features and benefits, which make this panel

ideal for use in studios, tape editing rooms, mobile facilities and anywhere space is limited.

While you're at it, check out the patching products below. Don't forget our high quality patchcords, and industry-standard Q-G® microphone connectors.

Switchcraft is your one-stop shop for all of your broadcast interconnect needs. Call (773) 792-2700 ext. 243 today for a copy of our Audio Video Products catalog.



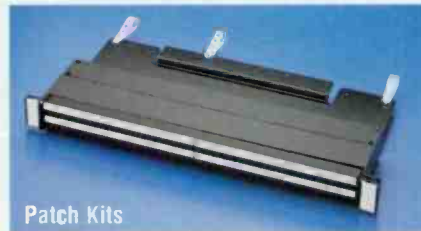
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- Extra wide labeling strips
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NAB Extra

Ward-Beck Systems • Booth RL2200



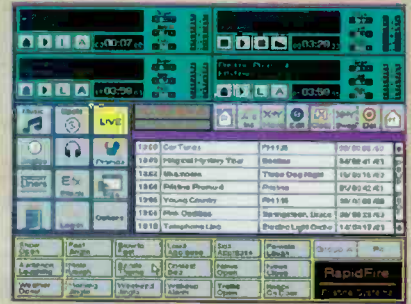
▼ **ABS-1 Audio Bit Splitter:** a companion to the ABB-1 Audio Bit Buddy, this portable, battery-powered audio monitor generates digital and stereo analog audio test signals that can be injected into the signal path when testing device performance or signal path continuity; generates AES3 digital signals of 1kHz or 400Hz, at 48-, 44.1- or 32kHz sample rates; unit can be synchronized to an external digital reference signal; digital signal levels of -20, -12 and 0dBFS are front-

panel selectable; stereo analog tones of 1kHz or 400Hz may also be selected at levels of -16, -8 and +4dBu.

800-771-2556; fax 416-438-3865; e-mail wbsltd@istar.ca; www.wbsltd.com

Circle (212) on Free Info Card

Pristine Systems Booth RL2416



▲ **RapidFire Line:** user interface and Quick Pick feature allow point-and-shoot additions and changes to on-air music, commercials and last-minute insertions.

310-670-7500; fax 310-670-0133;

www.pristinesys.com

Circle (213) on Free Info Card

Shively Labs • Booth 1806

• **Model 6017 Lindenblad antenna:** ideal for use on poles and small towers that cannot support the windload of a panel antenna, and on larger structures where minimum tower loading is desired; features excellent VSWR performance across the band, omni-directionality and power handling capacity.

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NAB Extra

Nagra USA • Booth S2029

▼ **C-PP:** high-performance ISDN codec/recorder/editor offers possibility for recording, playing and virtual editing of digital audio files using Flash PC Card memory technology as a storage media; housed in a 19" rack-mount frame, the unit is universally powered for 94- to 264VAC, 48- to 63Hz mains; unit may be programmed to automatically receive and record files on removable FLASH memory PC cards and to play pre-selected files each time a call is received; in manual mode, user may connect to another ISDN codec for transfer of digital audio files, while direct communications are possible using the units universal microphone and line inputs.



615-726-5191;
fax 615-726-5189;
e-mail mail@nagra.com;
www.nagra.com
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RCS • Booth RL4104

• **Master Control:** integrated control system for instant playback of all audio; Living Log, using Windows NT, allows all users to see the same log as it automatically updates; Real Feel voice tracking locally or across WAN for market-to-market updating.

914-723-8567; fax 914-723-2258;
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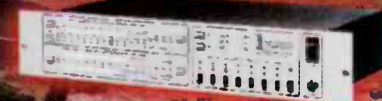
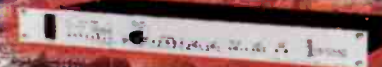
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www.inovon.com

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• Visit us at NAB '98 — Booth RL1401 •



TC Electronic • Booth RL4213

▼ **DBMAXII:** features 24-bit A/D and D/A converters among other hardware and software enhancements, including a hardware analog signal bypass function (allowing signal to pass through even if the unit is off, a new EQ with a



multiband clipper function, five bands of expansion, compression and limiting, a new adaptive gain controller — all combined with the ability to simultaneously insert multiple signal processing functions pre and post.

805-373-1828; fax 805-379-7578; tcus@tcelectronic.com; www.tcelectronic.com

Circle (217) on Free Info Card

SCA Data Systems • Booth RL2415

• **FM Subcarrier Data Broadcast Equipment:** three versions include a high-speed point-to-fixed-multipoint at 64kb/s using subcarrier space from 54- to 90kHz, hand-held high throughput at 28.8kb/s using the space from 60- to 90kHz, and full-mobile at 14.4kb/s using either 60- to 76kHz or 76-92kHz; features enhanced multi-mode VLSI demodulator with a computationally intensive coding technology while still operating at low-power levels; power-saving techniques developed in previous receiver generations will be expanded with a low-power radio section.

310-315-9930; fax 310-315-9530;

e-mail lkarr@scadata.com;

www.scadata.com

Circle (218) on Free Info Card

Svetlana Electronic Devices
Booth RL4311

▼ **4CX20,000B:** plug-compatible replacement power tetrode is used in pairs as class B modulators and as the class C high-level modulated RF power amplifier stage in AM transmitters;

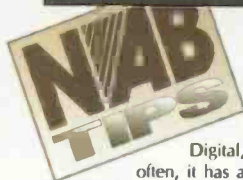


features a mesh filament ensuring mechanical rigidity and long-lasting concentricity.

650-233-0429; fax 650-233-0439;

www.svetlana.com

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Edward J. Miller, CPBE,
president, Society of Broadcast
Engineers, Cleveland, OH



What is going to be hot at NAB98?

Digital, digital, digital. We hear the word so often, it has already become a generic definition. Bandwidth may be a more accurate description of where the industry is going. Managing bandwidth, whether by Internet, PCS, broadcast or wireless will be the hot item(s) at NAB98.

What was hot last year that is on the way out this year?

I don't typically track what technology is disappearing. But, I have noticed a change for the better regarding multimedia. At NABs past, Multimedia was struggling with an identity crisis. What is/was multimedia anyway? NAB98 will crystalize the marriage between computers, video and audio in a way never before attempted. Truly, the item "on the way out" will be the confusion over the meaning of multimedia.

What sessions and conferences will you be attending?

Pretty much across the board of Radio, TV and Internet seminars. Webcasting is of special interest. Can't forget the basics of EAS, EPA and FCC regulatory issues. With the possibility of antenna displacement (due to HDTV tower loading concerns) tower site and construction issues will need some attention as well.

Recommended hangouts and hotspots away from the show:

All work and no play...well, you know how that goes. If your interests include the beauty of nature or man-made wonders, visit Red Rock Canyon, Hoover dam, or take a ride on the coaster atop the Stratosphere. If eating is your downfall, be sure to visit the *Pamplemousse French Restaurant*, or *Battista's Hole-in-the-Wall* for that Italian flavor. If steaks are on your must list, visit the *The Flame* or *Philips Supper House*.

What changes should be made for NAB98 from last year?

Some changes are already in-place. Since the show has become so large as not to fit in the Convention Center, the overflow involves the Sands Convention Center, Hilton, Bally's and numerous other venues. Improvement is needed in "people-moving" among the venues.

Suggestions for first-time attendees:

To maximize your visit, prepare in advance a detailed agenda for your daily activity. Have dates, times and location of all sessions you plan to attend. Pre-select the "must-see" vendors and budget your time accordingly. Once you have visited those manufacturers you NEED to see, everything else is a bonus. Your prepared "dance card" will be a life saver. If possible, team up with a veteran attendee to learn the ropes.

My view of the radio broadcast industry:

Radio broadcasting is at the verge of major change. We have seen some of it already, with multiple ownership, downsizing, and the introduction of new technologies. As never before, the radio professional will be required to relearn some the basics before moving forward. There is no better time to do that than right now.

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NAB Extra



360 Systems • Booth RL2025

◀ **Short/cut V2.0:** updated version of popular Short/cut audio editor offers new features, including support for an external Zip drive, allowing storage of more than seven minutes of linear audio information; can create a DigiCart/II Plus formatted Zip disk and then store audio files to the disk for playback on DigiCart/II Plus units; comes equipped with D-NET file transfer capability providing for the transfer of audio files and related information such as cut names and running times; allows instant access to frequently used cuts via Hot Keys; hard disk storage capability has been increased to four hours on an internal 3.2GB drive.

818-991-0360; fax 818-991-1360; e-mail info@360systems.com; www.360systems.com

Circle (220) on Free Info Card

Itelco • Booth 6043

• **TFMK Transmitters:** line offers 500W, 1-, 2-, 4-, 6-, 8-, 10-, 12-, 16- and 20kW models; frequency agile transmitters can be programmed for up to eight preset frequencies, or a frequency can be keyed in directly on the exciter front panel; distributed microprocessor allows for diagnostics of virtually every device in the transmitter, as well as remote control and monitoring via an RS232 serial port.

303-464-8000; fax 303-464-8770; www.itelco-usa.com

Circle (221) on Free Info Card

Henry Engineering Booth RL2315

▼ **Portamatch:** battery-operated version of Henry's Matchbox level and



impedance interface operates on two 9V batteries; converts unbalanced -10dBv audio to +4dBm 600Ω balanced lines; four independent amplifiers provide bi-directional stereo interface to convert unbalanced I/Os to balanced lines

818-355-3656; fax 818-355-0077;

www.henryeng.com

Circle (222) on Free Info Card

Kintronic Laboratories Booth RL2319

• **DAC-MOD-12:** menu-driven touch screen control features integrated pattern clock with battery back-up; field programmable via laptop computer; interface with any type of remote control; optional remote dial-up access via modem; requires reduced rack space compared to hard-wired controllers.

423-878-3141; fax 423-878-4224;

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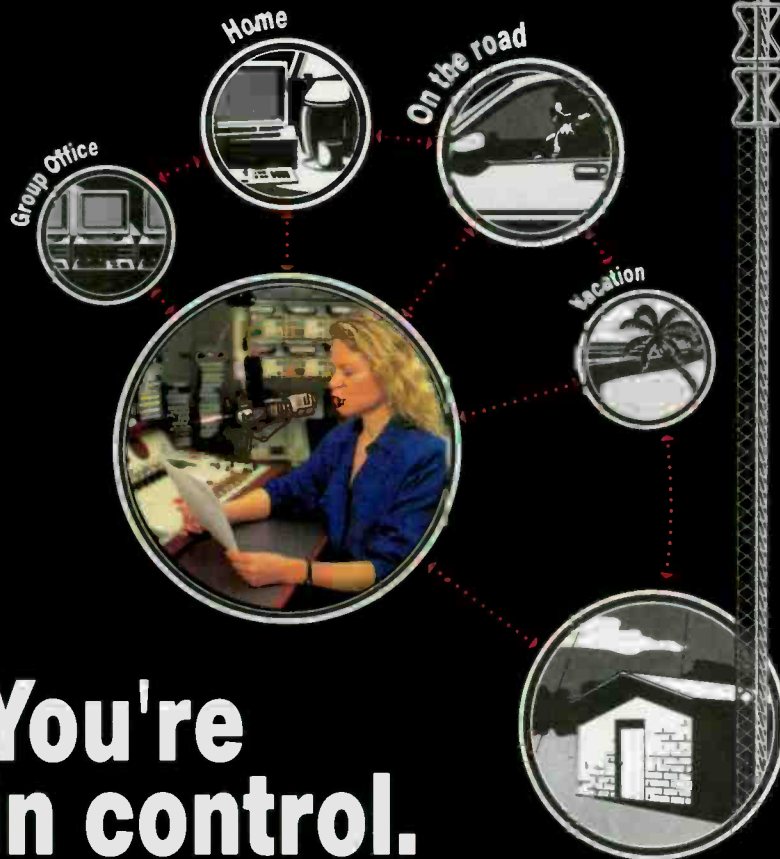
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NAB Extra

Otari Corporation • Booth 10341

▼ **Advanta Console:** uses a 40-bit DSP architecture and an ultra-fast communications network, and is scalable to handle all present and future formats up to 24-bit/96kHz; offers choice of dedicated or mapped control surfaces and 128 channels per position in a three-operator version; control



surface provides the user interface, faders, switches and display, connected over short or long distances via standard 100Mb Ethernet to a processing rack containing the digital engine, I/O processors and power supplies; digital engine has DSP cards, master computer and system sync card (SMPPI-Sony nine-pin/MMC); I/Os include digital (AES3, MADI, etc.) and mic/line amps with 24-bit DACs/ADCs, remotely controlled from the console.

650-341-5900; fax 650-341-7200

Circle (224) on Free Info Card

Electronic Associates, Inc
Booth 9422

• **Dataline Transmitter Controller:** operates using a dedicated data interface to a studio control point or as a stand-alone unit; includes a multipurpose interface which operates a dial-in channel using the RF-Manager Remote access program or using a touch-tone interface with speech responses; master unit has 16 inputs and 16 independent control channels; enclosed in a two RU chassis and includes a dedicated microprocessor and a high-quality graphical display LCD.

915-595-3103; fax 915-857-5261;

e-mail info@elecassoc.com

www.elecassoc.com

Circle (225) on Free Info Card

LBA Technology
Booth 3618

▼ **CoLoCoil:** new family of antenna site isolation inductors permits the installation of co-located communication antennas on AM broadcast

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towers, even in megawatt directional arrays; units incorporate coaxial transmission lines up to 3" and are available in pad-mount and weatherproof modular assemblies; more than a dozen coaxial, power and control cables can be isolated.

800-522-4464; fax 919-757-0279;

e-mail lbatech@lbagroup.com;

www.lbagroup.com/technology

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EXHIBITS: April 6-9, 1998 **CONFERENCE:** April 4-9, 1998

Las Vegas, Nevada USA



Sennheiser Booth 7447

◀ **HD570:** fully modular, dynamic, circumaural hi-fi stereo headphones offer high-quality sound reproduction, new BioNetic design, neodymium magnets for powerful dynamics, and detachable, kevlar-reinforced, single-sided cable; frequency response is 18- to 22KHz and SPL is 95dB.

860-434-9190;

fax 860-434-9022;

e-mail miclit@sennheiserusa.com;

www.sennheiserusa.com

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Enco Systems • Booth RL4525

• **DADpro32:** digital audio delivery system provides powerful Live Assist and automated on-air, production and inventory management for broadcast facilities; Global Wide Area Networking capabilities permit group-wide sharing of audio, scheduling and billing, and other associated data, as well as methods to integrate Internet capabilities.

248-476-5711; fax 248-476-5712; www.enco.com

Circle (228) on Free Info Card

Prism Sound Booth S1840

• **DScope Series III:** features high-quality analog and digital measurement and signal generation with sampling rates up to 96kHz; also offers jitter and related digital interface measurements, including display of the eye pattern; unit comprises interface unit, which occupies the same footprint as a notebook computer, and a native 32-bit software package which will run under Windows NT or 95.

+44 (0) 1223 424988;

fax +44 (0) 1223 425023;

e-mail sales@prismsound.com;

www.prismsound.com

Circle (229) on Free Info Card

Switchcraft Booth RL2525

▼ **TTP96:** audio patch panel series is available as a panel, patch kit with EDAC connector or in a front-access version; features corrosion-resistant,



nickel-plated jacks (0.13") with steel frames for superior life; offered in three jack configurations to meet exact switching requirements: full normal, half normal and open circuit; features gold switching contacts for long-term reliability in normal-through connections; cable tie-bar takes weight of cables off jacks, and extra-wide labeling strips provide maximum space for identification.

773-631-1234; fax 773-792-2129;

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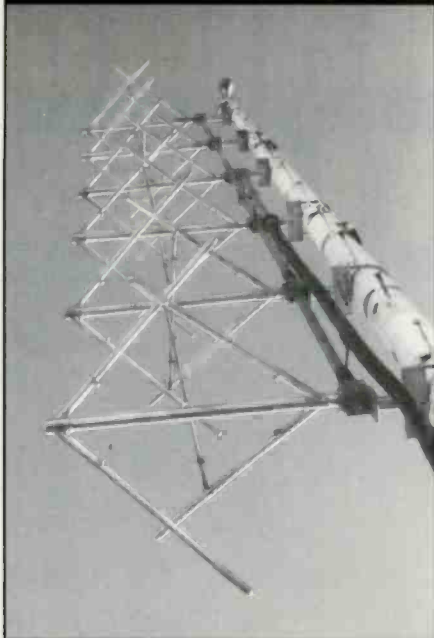
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NAB Extra

Benchmark Media Systems • Booth 11067

▼ **ADA2008:** bi-directional, four-channel, 20-bit audio A/D, D/A converter system with internal power supply is housed in a heavy-gauge, RF-tight, 1RU chassis; system is ideal for multichannel recording/monitoring and routing



switchers; offers THD+N of -108dB FS (0.0004%) measured at 1dB below full scale digital (20Hz- to 20kHz); CCIF intermodulation distortion is -128dBFS (0.00004%) with 19- and 20kHz tones input at -1dB FS; sample rates: 44.1kHz and 48kHz; also offers jitter-reducing dual phase-locked loop circuitry and choice of digital interface.

800-262-4675; fax 315-437-8119;
e-mail info@benchmarkmedia.com;
www.benchmarkmedia.com
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Stela Plumbridge,
digital media consultant,
SYPHA, London, England

What is going to be hot at

NAB98?

Webcasting (Internet broadcasting) tools, DVD, and fibre channel storage

What was hot last year that is on the way out this year?

The idea that Microsoft, Compaq and Intel can dictate the future of the broadcasting industry — well, we can hope that they listened to the feedback from last year's show.

What will you be looking at/for at NAB98?

Nonlinear editors, disk-based automation systems and portable recorders. Also Internet streaming technologies, tools for webcasting and updating websites.

What sessions and conferences will you be attending?

Any sessions in the Internet Technologies and Applications conference which don't clash with press conferences or exhibit opening times.

Recommended hangouts and hotspots away from the show:

The Hard Rock Hotel swimming pool, roulette tables with very low stakes.

What changes should be made for NAB98 from last year?

Bring all the exhibits back into one location. Impose noise limits on the exhibitors, especially those at the Sands. Basically, there are too many booths, too many visitors, and too many miles to walk — what can you do?

Suggestions for first-time attendees:

Although planning a list of booths and products is essential, allow time for browsing especially away from the main exhibitors — often you find interesting products and technologies on booths with no entry in the catalog and little or no signage. When you think you can't walk any further, or you are waiting in seemingly endless bus and food queues, try singing "I got you (I feel good)" by James Brown.

My view of the radio broadcast industry:

Digital audio broadcasting and the internet offer many new and interesting possibilities for radio broadcasters.

At NAB98 April 6th-9th Booth #RL4503 "The World Premiere"!

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INTRODUCES



The transition of the world's "Digital Original" OpLOG® to Windows™ is done, fully functional and ready for delivery. The simplicity of AIR functionality and high operational reliability of MediaTouch OpLOG® have been further enhanced with an impressive array of new live assist operational features. Come to Las Vegas, NAB98 Booth #RL4503 and experience the live assist AIR controller that everyone is talking about.

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April 6-9, 1998
Las Vegas, Nevada
Booth #RL4503

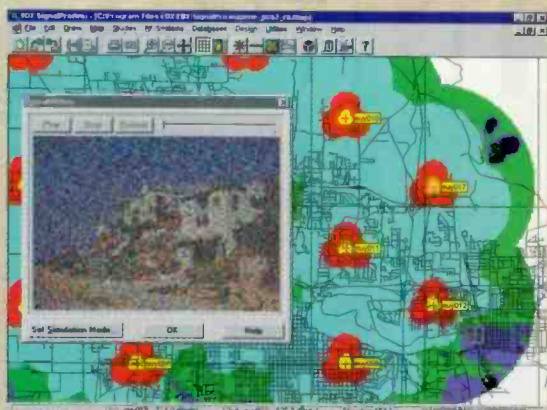
Watch our web site as details on OpLOG-2000® are released on the "Countdown to NAB98" at www.omt.net

Windows 95 and Windows NT are trademarks of Microsoft Corporation.

NAB Extra

EDX Engineering • Booth RL1725

▼ **Signal 4.0:** comprehensive, general purpose design tool for broadcast communication systems; uses advanced propagation models to perform coverage, inter-



ference, and detailed link analysis studies; system planning maps can be plotted along with terrain features, land use, roads, political boundaries, demographic and traffic data; new broadcast add-on modules allow users to have specialized study capabilities in a single application, creating a highly flexible product.

541-345-0019; fax 541-345-8145;
e-mail info@edx.com; www.edx.com
Circle (232) on Free Info Card

Crown Broadcast • Booth RL3816



▲ **Narrow band transmitters:** modeled after Crown's line of FM transmitters, these integrated exciters and power amplifiers provide reliability, efficiency and audio quality; available in 200-, 400- and 1000W power levels, these units are designed with dual redundant capability for applications that demand continuous on-air performance.

219-294-8050; fax 219-294-8222;
e-mail broadcast@crowntnl.com;
www.crowntnl.com
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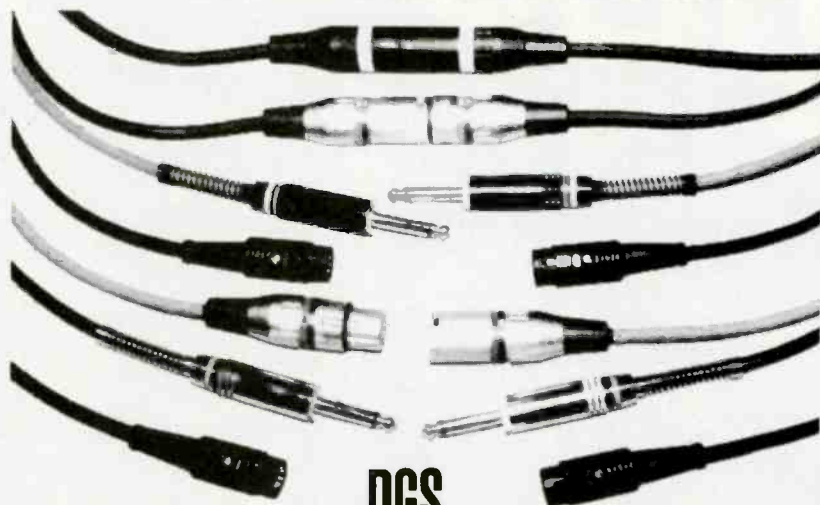
Inovonics • Booth RL1401

▼ **PBX Phone Switch:** allows up to seven modems or other dial-up devices to share a single telco line, remote controls, alarms and monitoring equipment at a transmitter site obtain central office dial tone on a first-come, first-served basis; outside calls incoming to the site are routed to the selected device with a touch-tone access and routing command.



408-458-0552; fax 408-458-0554;
e-mail info@inovon.com;
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See us at NAB Booth 5058

Prophet Systems
Booth RL4406

• **Audio Wizard V.8:** updated digital automation software allows multiple monitor operation supporting ease of use for varied live needs; enables multi-site groups to share talent efforts, production activities and files from one site to another.

800-658-4403; fax 308-284-4181;
www.prophetsystems.com
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EDUCATIONAL CIRCULAR SERIES

Model	Bays	Power	Gain	Price
MP-1	1	600W	-3.3	\$250
MP-2	2	800W	0	\$680
MP-3	3	800W	1.4	\$980
MP-4	4	800W	3.3	\$1,280
MP-2-4	4	2,000W	3.3	\$1,820
MP-3-5	5	3,000W	4.1	\$2,270
MP-3-6	6	3,000W	5.2	\$2,740

LOW POWER CIRCULAR SERIES

Model	Bays	Power	Gain	Price
GP-1	1	2,000W	-3.1	\$350
GP-2	2	4,000W	0	\$1,350
GP-3	3	6,000W	1.5	\$1,900
GP-4	4	6,000W	3.4	\$2,600
GP-5	5	6,000W	4.3	\$3,150
GP-6	6	6,000W	5.5	\$3,700

MEDIUM POWER CIRCULAR SERIES

Model	Bays	Power	Gain	Price
SGP-1	1	4,000W	-3.3	\$690
SGP-2	2	8,000W	0	\$2,690
SGP-3	3	10,000W	1.4	\$3,595
SGP-4	4	10,000W	3.3	\$4,500
SGP-5	5	10,000W	4.1	\$5,300
SGP-6	6	10,000W	5.2	\$6,100

The antenna gain may vary with the frequency. For powers up to 20 kW please, make the request to provide the specific configurations.

OMB also Manufactures:

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TV transmitters

FM and TV Links

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Miami, Florida 33122

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Fax: 305-4770611

Toll free: 888-OMB4USA

Problem:



I have a duopoly. I need back-up transmitters for my stations:

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Fax 518-758-1476
energy-onix @ energy-onix.com

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NAB Extra

Sierra Automated Systems • Booth RL3613



▲ **SAS 16000D**: digital audio routing switcher's 32x32 matrix is housed in a two RU chassis and provides alphanumeric controls on the front panel; unique monitor has been provided to allow the user to listen to the AES3 or S/PDIF digital audio input signals; unit is compatible with the complete range of SAS remote control panels, console and rack-mounted, with full alphanumeric or push-button capability.

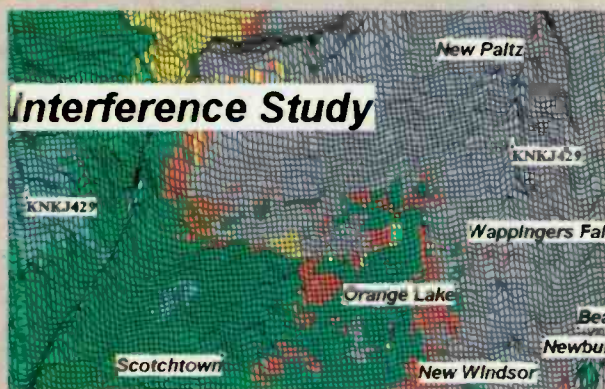
818-840-6749; e-mail sales@sasaudio.com

Circle (236) on Free Info Card

RadioSoft • Booth 6960

► ComStudy Coverage V. 2.0:

improvement to this analyzing and mapping software includes database management of transmitter lists and matrix studies, full implementation of



the new U.S. and international interference methods, and highly optimized 32-bit coding.

904-426-2521; 888-RADIO95; www.radiosoft.com

Circle (237) on Free Info Card

Broadcast Tools • Booth RL1815 & Booth RL1922

▼ **SS 8.2 Stereo Crosspoint Switcher**: accommodates eight stereo inputs with any input routed to two stereo and two monaural outputs

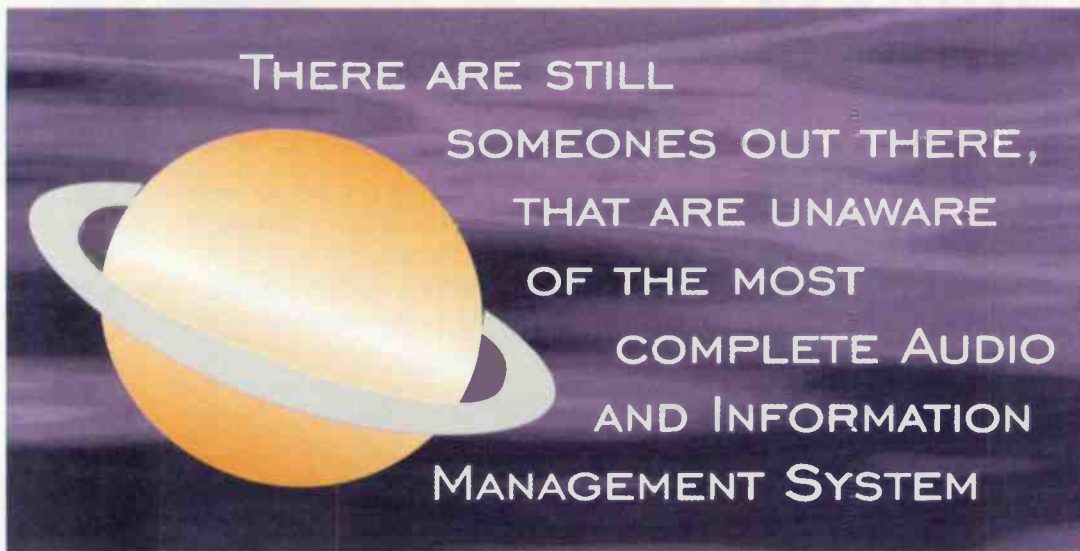


controlled via front panel switches with dual LED indicators; inputs can be programmed for overlap, mix or interlock switching operation; internal stereo silence sensor with front panel LED indicators, adjustable alarm threshold and duration; offers front panel LED VU meters; headphone amplifier with front panel output selection switch, headphone jack and level control; other features include eight relay status outputs, eight open collector outputs, and a low-drift (60Hz) clock/calendar with battery back-up.

360-428-6099; fax 360-428-6719; e-mail bti@broadcasttools.com;

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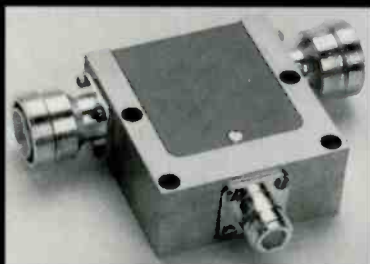
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NAB Extra

Canare • Booth 10976

► **BCJ Series:** family of digital audio transformers designed to allow the transmission of two-channel AES3 signals over standard 75Ω coaxial cable; provide excellent rejection of hum and noise and makes use of an extremely low-profile design, allowing them to be easily placed in-line with an I/O without creating an obstruction; compatible with SMPTE 276M and AES transmissions.



818-365-2446; fax 818-365-0479; www.canare.com

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Yasmin Hashmi, Partner,
SYPHA, London, England

What is going to be hot at NAB98?

Servers, fibre channel networking, MPEG-2. Digital broadcasting is imminent and manufacturers are responding to the potential needs of program makers and editors, who will need faster and wider access to material and more transparency between products.



What was hot last year that is on the way out this year?

The market is not that fickle. Digital technology was hot last year and will be again this year.

What will you be looking at/for at NAB98?

Anything nonlinear for audio.

What sessions and conferences will you be attending?

Anything which offers new insights into how nonlinear technology can be applied, new storage media or strategies, networking advances.

Recommended hangouts and hotspots away from the show:

Denny's for a full breakfast, but be prepared to queue!

What changes should be made for NAB98 from last year?

Generally move the dates so the show doesn't clash with the Easter weekend — trying to get flights is always difficult and more expensive.

Suggestions for first-time attendees:

The show is bigger than you think. Wear comfortable shoes, get a trolley for all those brochures and go, go, go!

My view of the radio broadcast industry:

Every room in my house has a radio, there is also one in the car, one in the office and one in my travel bag. Radio is alive and well, and always will be, whatever form it takes.

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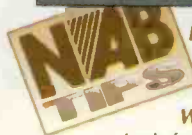
Broadcast Electronics • Booth RL1610

▲ **AudioVAULT V. 6.6:** now supporting Windows NT with the AVExplorer module, making the units Wide Area Network (WAN) compatible.

• **AirBoss:** networked copy management system allows the elimination of paper in a studio operation; live, commercial, sponsorship and community notes are accessible at the touch of a button or can be scheduled within integrated logs.

217-224-9600; fax 217-224-9607; www.bdcast.com

Circle (240) on Free Info Card



Dane E. Ericksen, P.E., CSRE, CSTE,
Hammett & Edison, Inc.,
Consulting Engineers, San Francisco

What is Going to Be Hot at NAB 98?

Look for more demonstrations of in-band on-channel (IBOC) digital audio radio systems. USA Digital Radio/Westinghouse Wireless Solutions has been working on revised AM/FM systems for two years now, and at least one of their published development calendars has system roll-out scheduled for 1998. Also look for demonstrations of a newly-announced system from Digital Radio Express, which has already hosted some in-house demos of a competing IBOC technology.

It will also be interesting to see if senior FCC staff attending NAB98 bring up RM-9208, which proposes to create a new class of microradio AM and FM broadcast stations.

What was hot last year that is on the way out this year?

Reed Hundt. Pirate FM stations (the new CIB Bureau Chief, a former Marine, has demonstrated that he understands what the 'C' in 'CIB' stands for. FCC/FAA EMI problems seem to be winding down.

What will you be looking at/for at NAB98?

Opportunities to encourage FCC action on the Hammett & Edison Petition for Declaratory Ruling regarding Section 73.315(b) of the FCC Rules (line of sight to community of license).

I'll be interested in seeing if Potomac instruments has come out with a rumored new field strength meter.

What changes should be made for NAB98 from last year?

Keep it all at the LVCC. Don't split up registration from the LVCC. Don't pack the chairs and tables in the session rooms too close together; then there are empty chairs in the impossible-to-get-into middle seats. A room with 100 seats that people can actually get to and use is much better than a room with 150 seats but spaced so close together that 75 of those seats remain vacant.

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Leitch, Inc. • Booth 9941

• **64x64 Family Routers:** configured up to 64x64, these routers are serial digital and analog audio capable, allowing users to mix formats and to feed in coax or fiber; modular routers feature hot-swappable power and logic cards, as well as backward compatibility to all Leitch products; all versions expand from 32x32 to 64x64 in a 4RU frame and to 128x64 in a 6RU frame.

800-231-9673; fax 757-548-4088;

www.leitch.com

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Gefen Systems • Booth 7652

• **M&E Pro Intranet:** this upgrade for the M&E Pro offers on-line sound effect and music searching, auditioning and transferring using Netscape or Microsoft Internet Explorer browsers; PC, Mac and UNIX compatible; offers reduced-bandwidth samples for auditioning of commercial CD libraries, and full-bandwidth audio downloading in any sound file format.

818-884-6294; fax 818-884-3108;

e-mail gsinfo@gefen.com;

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Audio Precision • Booth 3215

◀ **Portable One Dual Domain:** features a complete complement of digital interface testing and monitoring functions, including jitter generation and measurement, audio bit error rate, sample rate measurement and other interface functions; measures analog and digital audio signals in their native domain; includes high-performance analog hardware for analog measurements and digital hardware for digital domain and audio interface measurements, all in a rugged, self-contained package with integral display.

503-627-0832; fax 503-641-8906

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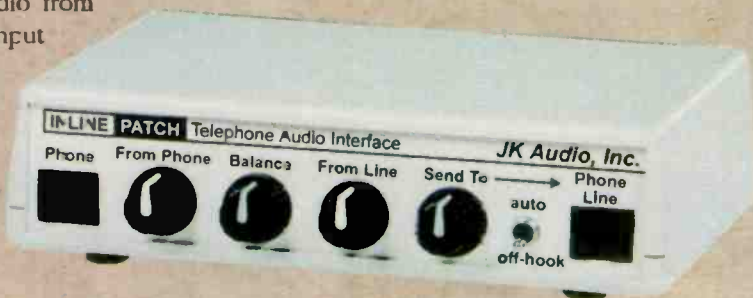
JK Audio • Booth RS5438

▶ **Inline Patch:** connects to the base of an analog or cordless telephone and the RJ11 wall jack and contains back-to-back hybrids for complete control of audio from both sides of the call; XLR and 1/8" audio input jacks allows the user to mix sound bytes or music into the conversation; one stereo jack provides one voice on one channel and another on the second; a second jack contains a mix of both voices; front panel controls for each output offer all necessary controls.

815-786-2929; fax 815-786-8502;

www.jkaudio.com

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Whirlwind Booth 7352

▼ **PressMite:** battery powered press feed system for distributing mic or line level audio with high amounts of



isolation; unit features a high quality mic preamp, a built-in headphone amp and level control for monitoring, and active transformer-isolated outputs (12 mic and two line).

716-663-8820; fax 716-865-8930;

e-mail sales@whirlwind.com;

www.whirlwindusa.com

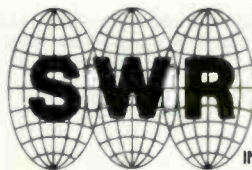
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The FM Series

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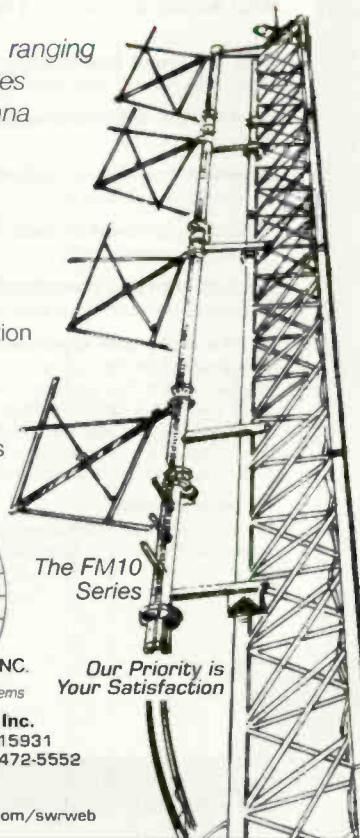
P.O. Box 856, Ebensburg, PA 15931

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Sales: 800-279-3326

E-Mail: swr@third-wave.com

<http://homepage.third-wave.com/swrweb>



The FM10 Series

Our Priority is Your Satisfaction

See us at NAB Booth 5909

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NAB Extra

Clark Wire & Cable
Booth 8972

• **SPA22GS and 800 Series:** single pair audio cable and 800 series digital audio snakes are now CM rated for assured reliability and safety.

• **Test Equipment:** Paladin Tools Audio Cable Tester is designed to test the continuity of most audio cables, including XLR, 1/4", phono (RCA), DIN, 3.5mm and Speakon connector cables up to 1000 feet; a clear LED display provides visual pass/fail diagnosis.

800-222-5348; fax 847-949-9595;

e-mail sales@clarkwc.com;

www.clark.com

Circle (246) on Free Info Card

Harris Corporation • Booth 6309

◀ **MixPak by Vortex:** created expressly for Comrex's HotLine POTS codec, MixPak adds a three-input mixer and a battery pack in a compact assembly that bolts directly to the HotLine; battery power is provided either from an external DC source or by six standard alkaline D cells; mixer provides three balanced XLR inputs; two



are at mic level and one is switchable between mic and line; each input has an independent level control; two mic inputs form the feed into the HotLine; headphone outputs are independently adjustable and provide local and return audio from the HotLine.

800-622-0022; fax 765-966-0623;

www.broadcast.harris.com

Circle (247) on Free Info Card



John Battison, P.E., technical editor, RF, Loudonville, OH

What is going to be hot at NAB98?

Digital operation, IBOC, data transmission, multiple modulations on AM carriers, AM antenna systems and multifrequency transmitters.



What was hot last year that is on the way out this year?
EAS

What will you be looking at/for at NAB98?
I'll be looking at new modulation systems and RF generation products.

What sessions and conferences will you be attending?
Anything RF oriented

Recommended hangouts and hotspots away from the show:
I never have enough time to!

What changes should be made for NAB98 from last year?
I would like to see the radio and TV conventions separated.

Suggestions for first-time attendees:
Wear very comfortable shoes, drink lots of water and carry a notebook. Beer will be free!

My view of the radio broadcast industry:
The industry is on the way up. We'll see a large increase in data transmission as a subsidiary service. SCA has been around for a while, but now there is even more interest in it as a secondary service. Multiple ownership will continue, which I don't agree with. This is against the original plans of the FRC and FCC. With the auction prices being so high, only large pocketbooks can afford the licenses. It's not broadcasting as we used to know it now, and as I first knew it 53 years ago.

Any other thoughts?
The NAB Convention is the biggest of all broadcast conventions. Make the most of it. If your situation calls for it, take advantage of the employment opportunities there.

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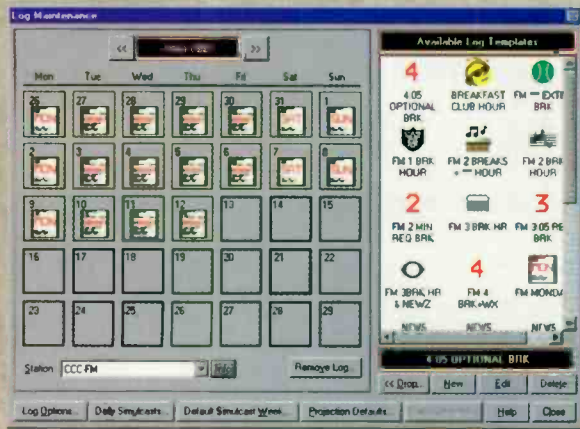
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Computer Concepts Corporation Booth RL4413

◀ **Maestro v.2.1:** full 32-bit software features improved recording capabilities and full satellite support; Windows NT allows Maestro to be configured at your location, allowing your system to grow as station or locations are added to your group.

• **Visual Traffic:** takes advantage of 32-bit technology to allow traffic for all group stations to be handled from one central site or from each individual location.

800-255-6350; fax 913-541-0169;

e-mail ccc@ccc-dcs.com; www.ccc-dcs.com

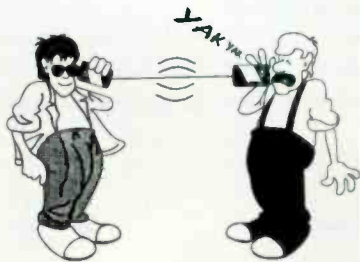
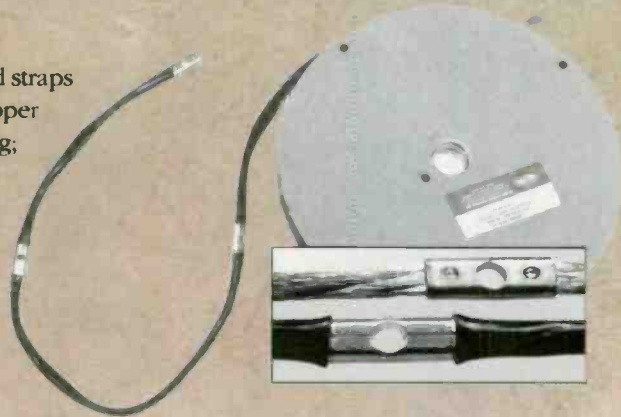
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EMC • Booth S1775

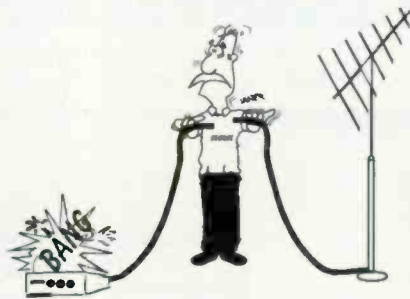
▶ **Microbond 2000:** cut-to-length, pre-terminated ground straps on a roll; tinned copper rope-lay cable with pure copper terminations offers flexibility in bonding and grounding; equivalent to a #6 AWG, Microbond has standard terminations every four inches, with 1/4" mounting holes; comes on a 25-foot roll, can be cut to length with scissors, and terminates like any standard connection; continuous loop eliminates need to stock lengths of wire, crimp lugs and tools.

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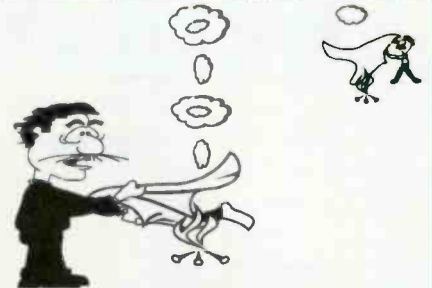
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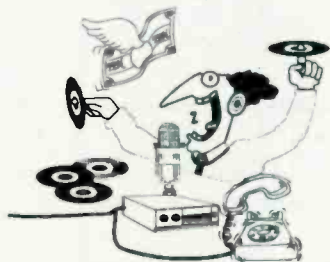
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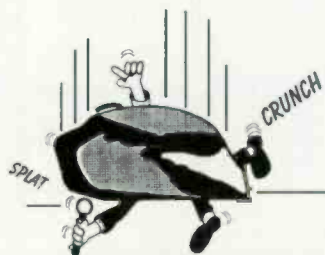
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Broadcast Engineering Conference

	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
7:00						
8:00						
9:00	8:30 - 12:00 Radio Boot Camp Part 1	9:00 - 9:30 Broadcast Engineering Conference Opening Keynote Address	9:00 - 10:30 NAB All-Industry Opening and Keynote Address	9:00 - 12:00	9:00 - 12:00 Hot Topics: Regulatory Issues in the Real World Part 1	9:00 - 12:00
10:00		9:30 - 12:00 Digital Sound Broadcasting: Worldwide Expectations and Progress	10:30 - 12:00 Consolidation: Engineering Management Perspectives	Internet Technologies for Radio	-Also- Computer Networking and Media Management	Data Broadcasting for Radio
11:00						
12:00					12:15 - 1:45 Technology Luncheon	
1:00	1:00 - 5:30 Radio Boot Camp Part 2	1:00 - 4:00	1:00 - 5:00	1:00 - 5:30	2:00 - 2:30 Hot Topics: Regulatory Issues in the Real World Part 2	
2:00		Digital Sound Broadcasting: Worldwide Expectations and Progress	Broadcast Towers: Managing Your Vertical Real Estate	Building the Digital Radio Station		
3:00						
4:00						
5:00						
6:00					6:00 - 6:30 Ham Radio Reception	

New Media Professionals Conference

	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
7:00						
8:00						
9:00			9:00 - 10:30 NAB All-Industry Opening and Keynote Address	9:00 - 10:30 NAB MultiMedia World Keynote Address		9:00 - 10:30 Regulatory Minefields: How to Protect Yourself on the Digital Frontier
10:00					10:30 - 12:00 Trends in Interactivity – What's Ahead?	
11:00						
12:00						
1:00	1:00 - 2:30 NAB MultiMedia Boot Camp: Part 1	1:00 - 2:30 DVD Market Opportunity Update	1:00 - 2:30 Videoconferencing for Training and Distance Learning	1:00 - 2:30 Thinking Interactively	1:00 - 2:30 What Will Win With Consumers? Analysts Picks	
2:00						
3:00						
4:00	3:30 - 5:00 NAB MultiMedia Boot Camp: Part 2	3:30 - 5:00 The Essentials of DVD-ROM Authoring	3:30 - 5:00 Great Graphics and Animation Don't Just Happen – They're Created	3:30 - 5:00 Writing for Interactivity – A Workshop	3:30 - 5:00 Investment Update: Where is Wall Street Finding Value?	
5:00						
6:00						

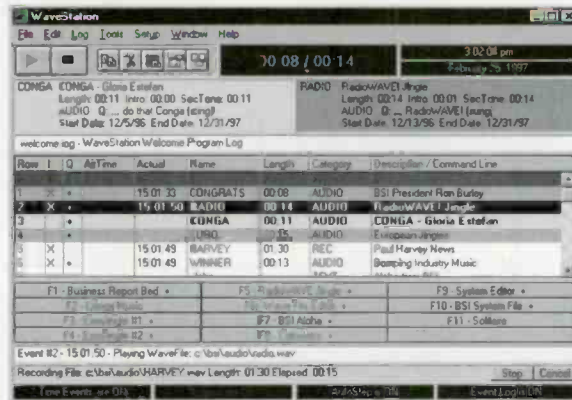


Conference Timetables

Telecommunications Strategies Conference

	Monday	Tuesday	Wednesday
7:00			
8:00			
9:00	9:00 - 10:30 NAB AI Industry Opening and Keynote Address	9:00 - 10:30 Fiber in Digital Production and Broadcasting: Niche or Necessity?	
10:00			
11:00		10:45 - 12:00 Moving Toward a Wireless Society	10:00 - 12:00 Distributing Broadcast Quality Audio and Video
12:00		12:00 - 2:00 Communications & Connectivity Luncheon	
1:00			
2:00	2:00 - 3:30 Evolving Telecommunications Technologies: Business at the Speed of Light	2:00 - 3:30 LEOs, MEOs, GEOs: The Future of Broadband Communications via Satellite	
3:00	3:30 - 5:00 Internet In The Sky: Connectivity for a Mobile Society	3:30 - 5:00 Wireless & Broadcasting: Where are the Synergies? Return Path? Marketing?	
4:00			
5:00			
6:00			

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Radio Management/ RAB Conference

	Sunday	Monday	Tuesday	Wednesday
7:00				
8:00				
9:00		9:00 - 10:30 NAB All-Industry Opening and Keynote Address	9:00 - 10:30 State of Radio Sales Address	9:00 - 10:30 Setting Your Web Site
10:00		10:30 - 12:00 Webcasting Ready for Prime Time?	10:30 - 12:00 The D.C.S. Dilemma	11:30 - 12:00 New Agency - New Clients - New Challenges
11:00				
12:00			12:00 - 1:30 NAB Radio Luncheon	
1:00		12:30 - 2:00 The Multiphase Manager	1:45 - 3:00 Special Events and Promotions - Marketing, Managing and Making Money	1:00 - 2:30 Radio Gets Results - Sensational Radio Success
2:00		2:00 - 4:00 Time Management for Radio Managers		2:30 - 4:00 The Amazing New Listening Statistics from Arbitron
3:00	2:30 - 4:00 Chart a Course Through the Exhibits			
4:00	4:00 - 5:30 Radio Opening Reception			
5:00				
6:00				

Broadcaster's Law and Regulation Conference

	Sunday	Monday	Tuesday	Wednesday
7:00				
8:00			7:30 - 9:00 FCC Chairman's Breakfast	9:00 - 10:30 Upgrading Your Radio Station: A Manager's Guide - Also - Avoiding FCC Fines - A Commission Rule Enforcement Primer
9:00		9:00 - 10:30 NAB All-Industry Opening and Keynote Address	9:30 - 10:30 Contests, Lottery and Casino Ads - What's Legal?	
10:00		10:30 - 12:15 News, Talk Personality and Internet Programming - Avoiding Libel and Privacy Problems	11:00 - 12:00 Diapoles, LPMs and Ownership Changes: Acquiring Stations While Avoiding Regulatory Traps	10:30 - 12:00 Political Broadcasting - An Update
11:00				
12:00				
1:00		1:00 - 4:00 The Internet & Broadcasting I: Entering Your Franchise	1:45 - 2:30 Special Events and Promotions - Marketing, Managing and Making Money	2:00 - 3:00 Broadcast Auxiliary Spectrum - Finding the Frequencies and Using them Efficiently
2:00		2:00 - 3:30 The Hits Keep Coming - Radio Music Licensing, Your Money and Managing Both to Win		
3:00		3:00 - 5:30 A Broadcaster's Artist Primer	3:30 - 5:00 Regulatory Dialogue	
4:00				
5:00				
6:00				



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Internet Technologies and Applications Conference

	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
7:00						
8:00						
9:00			9:00 - 10:30 NAB All-Industry Opening and Keynote Address	9:00 - 10:00 NAB MultiMedia World Keynote Address		9:00 - 10:30 Applets R Us: Dynamic Web Site Enhancements
10:00				10:30 - 12:00 Pushing the Envelope: The Coolest Sites	10:30 - 12:00 Digital Branding: How Well is Your Internet Identity Working?	10:30 - 12:00 The Web: Is It Really a Mass Media?
11:00						
12:00						
1:00	1:00 - 2:30 NAB MultiMedia Boot Camp: Part 1	1:00 - 2:30 The Internet & Broadcasting I: Extending Your Franchise	1:00 - 2:30 Integrated Marketing in Eyberspace	1:00 - 2:30 In the Pipeline: An Inside Look at Emerging Internet Technologies and Services	1:00 - 2:30 Interactive Advertising Success Stories	
2:00						
3:00		2:30 - 4:00 The Internet & Broadcasting II: Winning on a Global Playing Field				
4:00	3:30 - 5:00 NAB MultiMedia Boot Camp: Part 2	4:00 - 5:30 The Internet & Broadcasting III: Revenues, Expenses & Profits	3:30 - 5:00 Internet in the Sky: Connectivity for a Mobile Society	3:30 - 5:00 Electronic Commerce: Safe, Sexy and User Friendly	3:30 - 5:00 Webcasting: Visions of the Future	
5:00						
6:00						

BE RADIO editor-in-chief Skip Pizzi will be presenting a paper at the Broadcast Engineering Conference on "Building the Digital Radio Station," Tuesday 4/7. Skip's paper is titled 'Total Cost of Operations for Windows-based Radio Systems.' He will also serve as moderator for the Telecommunications Strategies Conference: "Distributing Broadcast Quality Audio and Video" session, Wednesday 4/8.

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Getting connected: Choosing an Internet service provider

By Chuck Poulton



Taking a behind the scenes tour of a prospective ISP can tell you a lot about them.

Selecting a service provider for your Internet and webcasting presence may at first

seem like being asked to buy a car without being able to kick the tires, start the engine, or take it for a test drive. Yet, unless you are willing to repeatedly change e-mail addresses, re-order expensive data circuits, and reconfigure servers, you won't be able to test-drive a provider connection before making what is likely to be a long-term commitment. However, by learning the important issues to discuss when evaluating a prospective provider, you can make an intelligent, informed choice.

Start as you would with any other major purchase. Ask for references. Talk to the other customers. Find out how long the ISP has been in business, if it's backed by a parent

Selecting an ISP for the station doesn't need to be difficult.

company, or if it's currently being bought out by another company. Do an on-line search for

ISP surveys and find out how it ranks. If it sells dial-up access, sign up for an account and try out the technical support — the closest you'll come to a real test-drive.

Determine if the ISP is able to provide the services you will require. Almost every ISP can provide web-hosting and e-mail access, but is the ISP willing and able to handle your special needs as a webcaster?

Pipe dreams

One of the most important issues for potential webcasters to consider is that of bandwidth, or overall channel capacity. Using today's unicast webcasting technology, each concurrent audio stream requires its

own continuous connection between the listener's player and your server. These connections each use up some percentage of the available bandwidth. A single stereo stream targeted at a 28.8kb/s modem user will typically use about 20- to 24kb/s of the bandwidth available on your server's Internet connection. This means that a standard T-1 connection at 1.54Mb/s can only handle 65- to 75 concurrent listeners, and that is without reserving any additional capacity for Web or e-mail traffic. Serving additional simultaneous listeners would require multiple T-1 circuits or even 45Mb/s T-3 circuits, which can quickly become very expensive. Pricing varies widely, but a single T-1 can cost between \$1000 and \$3000 per month (with T-3 costs at five- to eight times the cost of a T-1, albeit with 28 times the capacity).

One way to reduce the bandwidth costs is to avoid bringing that much bandwidth all the way to audio servers within your facility, and instead to either co-locate your own servers within the ISP's facility, or use an ISP audio server. In this case, you only need to feed an encoded stream from your location to the ISP, or perhaps even use an off-air feed, although a dedicated audio feed will yield better quality audio. This reduces the interconnect costs paid to the local telco, and you only pay hosting and bandwidth fees to the ISP.

Another important issue involves the ISP's connections to upstream providers. ISPs will often oversell their connections to the Internet backbone based on the fact that Web and e-mail traffic is bursty — a user connection will only be briefly busy while a user downloads a new webpage or sends an e-mail. An ISP can buy less connectivity to its upstream providers than it has sold to its downstream customers because it can predict that not all of the customers will be using all of their capacity simultaneously. The continuous nature of webcasting streams upsets this assumption. Make sure that your prospective ISP can reliably and continuously provide the bandwidth you require, particularly during peak-usage times.

Smaller ISPs often buy connectivity from mid-sized ISPs, who buy capacity from larger ISPs, who then connect directly in a peering arrangement with other large ISPs and/or connect into one or more shared major network access points (NAPs). The lower the number of connections, or *hops*, through each ISP network router from source to destination, the less likely that packets will be dropped along the way, and the less overall delay between sender and receiver.

The number and type of direct peering arrangements that an ISP has is also becoming increasingly important as the major NAPs become more and more burdened with an overload of traffic. This leads the NAPs themselves to often be a major source of packet loss across the Internet. The direct peering arrangements provide a way for ISPs to bypass the NAPs and share traffic directly. Since these connections are provisioned and managed by the involved ISPs, and usually

only carry traffic to and from the respective ISPs and their customers, they are less burdened and often provide better performance.

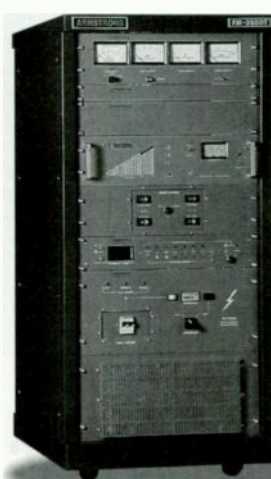
Traceroute

One way to get some idea about the performance of an ISP's networks and connectivity is to use the *traceroute* command. This command does exactly what its name describes — it traces the route to a particular machine on the Internet. In doing so, it returns the round trip time that it takes each probe packet to traverse to and from each hop along the way to the destination host. On a Windows95 machine, the traceroute program is accessed from a DOS box under the name "TRACERT." Type "TRACERT" and the host name you want to probe. You can also run a traceroute from Web servers located at various points around the Internet. You can find a list of these traceroute sites at www.boardwatch.com/ISP/Trace.htm.

As in broadcasting, redundancy and backup systems are also important in selecting an ISP. Ensure that your ISP has multiple NAP or peering connections that provide redundancy in case one or more of the connections goes down. Find out if these connections take disparate routes through the telco infrastructure, or if a single fiber cut could take them all down. Ask the ISP if it has backup power protection such as UPS systems and generators. If they have a hardware

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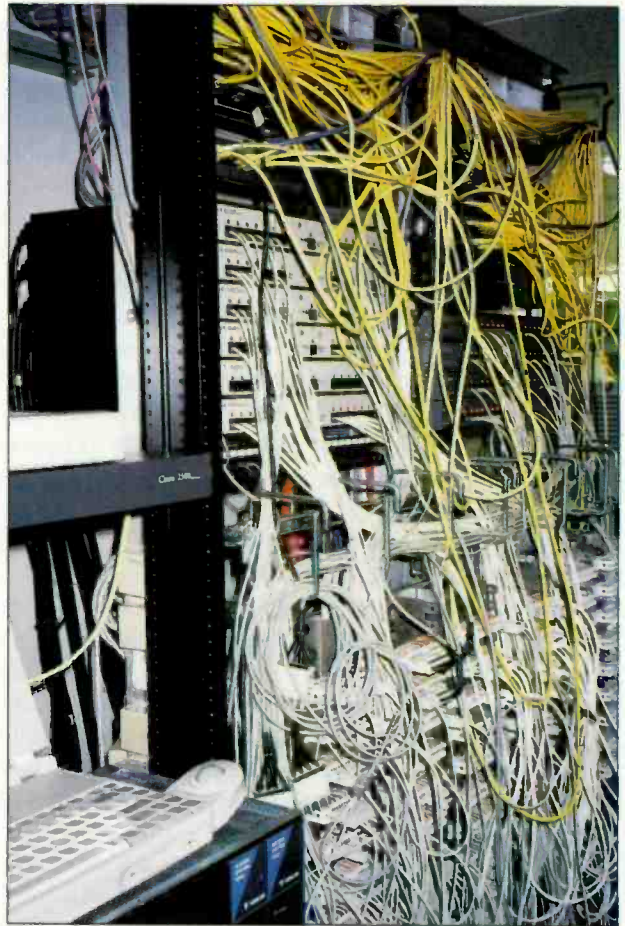
Getting Connected

failure, is backup equipment available to be brought on-line immediately?

Security and firewalls

You'll also need to determine what level of security the ISP can provide, especially if you plan to connect your LAN to the Internet (although even dial-in clients can be susceptible to attacks). Many ISPs will be able to provide a basic type of firewall implemented as a network level packet filter within their routers. This type of firewall works by checking the source and destination addresses of a packet, along with the type of service that the packet is destined for. A packet filter can be configured to, for instance, allow all outgoing traffic from your network, but only allow incoming traffic for your Web server and e-mail, blocking other traffic. The router-based packet filter cannot, however, provide detailed logs and statistics useful in determining if someone has been probing or trying to break into your site. It also cannot protect against weaknesses in the services for which you have permitted outside access, or protect against many of the most recent denial-of-service attacks that exploit weaknesses in the operating system network code itself.

A more sophisticated type of firewall, the *application level proxy*, works by blocking all direct traffic between the Internet and your network. Individual applications within the firewall act as an intermediary between



Connecting your LAN to the Internet gives your network users easy access to the Internet, but security precautions should be taken.

the outside and inside of the firewall, securely passing information without allowing direct access to the inside machines. These types of firewalls can perform sophisticated logging and monitoring — some can even perform virus scanning for e-mail and Web downloads on the fly — but the firewall may impact on the performance of the applications being screened. Furthermore, as new network applications come along, you will either need a

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plug-in for the firewall to support that application, or implement the less secure packet filtering for that particular service. It's a trade-off between security, convenience and transparency, and cost.

Finally, you'll want to investigate what level of customer service and support the ISP provides. Check to see if its Network Operations Center (NOC) is staffed on a 24-hour/seven-day-a-week basis. Find out what kind of network monitoring it has in place. For example, if there is a outage, will you have to find it and notify the NOC, or will it be automatically notified of the failure and fix it



It doesn't always need to be pretty to work well. This ISP has placed its equipment on tables instead of in racks, but still offers redundancy and many supplemental services.

before you notice a problem? Also, ask if it can monitor audio specific services on your behalf, even if the equipment, such as an audio encoder, is located at your site.

When choosing an ISP, you may want to consider a service provider that has previous experience providing webcasting services, especially if you want to serve a large number of simultaneous streams. Some of these ISPs can also provide specialized services such as turnkey system setup and stream splitting/mirroring to multiple geographically distributed servers.

Connecting your LAN

If you plan on connecting your LAN to your ISP, you'll need to decide what type of connection to install. Other than ordinary dial-up, which wouldn't be appropriate for webcasting applications or more than a very small number of LAN users, there are three types of connections typically used: ISDN, frame relay, and private leased line.

ISDN can be a good choice for lower-bandwidth, periodic-use situations on a LAN. It could also be used for sending locally encoded audio to remote servers, but unless you can buy fixed-rate ISDN service (without per-minute usage charges) in your area, you won't want to use ISDN for continuous feeds.

Frame relay, a less expensive alternative to private leased lines, works by connecting your LAN into a nearby

"frame relay cloud" shared by multiple users. Your ISP is also connected somewhere into the cloud. Data goes into the network on one end and comes out the other. With frame relay, you buy an average *committed information rate* (CIR) but can burst above that rate if the bandwidth is available. Unfortunately, even the CIR is not absolutely guaranteed, so it is possible to run into congestion if lots of people on the cloud send data at once. For ordinary e-mail or Web traffic, occasional delays can be tolerated. However, webcasters may run into problems with the congestion due to the real-time requirements of the audio streams.

A private leased line, such as a fractional T-1, T-1, or even greater data rates, are most often used and most appropriate for webcasting applications. This type of line is basically a fixed bit rate, point-to-point, permanent circuit between your facility and the ISP. Connecting to this type of line requires a *channel service unit/digital service unit* (CSU/DSU) which interfaces to the T-1 circuit and provides a serial V.35 datastream. This serial stream connects to a router, which translates your LAN's physical media topology, such as ethernet, to and from the serial connection. Ask the ISP to recommend equipment, and to assist with the ordering of the proper circuits and the installation of equipment.

Chuck Poulton is Systems Manager at WKSU-FM, Kent, OH.

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Reader Feedback



Saving the spectrum

Chriss, I wanted to thank you for your editorial comments in the January 1998 issue of *BE Radio* [Viewpoint, "There are 721 days remaining"]. You touched an important fact facing broadcasters. The loss of spectrum.

I realize that through downsizing and consolidation many station engineers don't have the time, luxury or, in some cases, funds to keep abreast of the changes in our medium. Unfortunately, station owners and managers, the same people that created this high workload, will be the first to complain when they can't do their remote broadcast due to loss of spectrum or

overwhelming interference to the channel.

Broadcasters are losing spectrum. 2GHz for television ENG, and 455MHz for radio and TV remote pickup. It's all because the FCC has learned the value of auctions. There is revenue in spectrum, and the Federal Government is looking for methods to take advantage of this golden goose.

What can we do? Right now we don't know. We have had meetings with the FCC in attempts to reclaim lost frequencies, but it was clear the FCC was under pressure to continue identifying more potential auctionable spectrum. SBE is attempting to assist the FCC in locating replacement spectrum. But it ain't easy, and usually presents more problems. Not to mention the additional retuning or replacement costs broadcasters will have to absorb. As frequencies become more scarce, look for more complications. I wish I had a magic wand.

Rick Edwards, CPBE

Board of Directors, Frequency Coordination Committee chairman, Society of Broadcast Engineers

It's true that there are many issues facing everyone in broadcasting in general, not just in radio. With so many items taking up time during the day — issues with consolidation, keeping the plant running at top efficiency, and who will own the licensee tomorrow — it's easy to look at a news item and think that it does not apply to your own situation. Unfortunately, sitting on the sidelines too long and not speaking up as the events unwind means not being able to shape the outcome. Actually, sitting and watching does shape your future, only not in your favor. Hopefully, the FCC will not find any more auctionable spectrum that will affect broadcasters (not that I wish ill will upon other services). Perhaps making alliances with some of the other organizations that are losing out can make for a stronger voice.

*Chriss Scherer,
Editor*

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Murphy was an optimist

To Mr. John Battison:

Your article on Nitrogen vs. dry air [RF Engineering, February, 1998] was fine insofar as it went, but stopped short of being complete in my opinion. Of course, one has to understand my point of view regarding life. Murphy says that whatever can go wrong will and it will get worse! Patrick's law is "Murphy was an optimist" and I have scratch pads I give out with that thought printed on them.

A majority of our stations (High C) are located on nearby 2500- to 3000ft hills with cloud layers running from 1800- to 4000ft during the winter time. This places our antenna systems in 100% humidity much of the time. Plus, power is out due to lots of ice and roads are impassible for days even to 4x4 sometimes. Therefore, I have developed what I term the ultimate system. First, I use the Andrew automatic dehydrator and as you know, it is better for it to run less often but for a longer period of time when it does come on. Therefore, I come out of it to a 30 gallon propane type tank and then on to the feedline. It is set to come on at about 6.5- to 7lbs. But that's not good enough. Over the years, I have had too many failures of a dehydrator over and above power

outages. Things like lightning, fuses and normal failures. Therefore, in the line between the dehydrator and the bulk volume propane tank, there is a "T" to which I have connected a standard nitrogen tank with the normal regulator setup. It is adjusted to come online at about 5.5- to 6lbs tank/line pressure. When I come to the transmitter for the normal inspection, a quick glance at the nitrogen take tells me if it is or has been on line by the high pressure reading, allowing for room temperature variation. So, the bulk tank provides longer but less often dehydrator runs and the nitrogen provides auto backup. Generally while on site, I will unplug the dehydrator to exercise the tank regulator assembly — they don't like sitting for extended periods and I like to see them perform, remember Murphy?

Thanks for the good article, one of many you have provided.

Don W. Patrick CPBE
Patrick Electronics
Ft. Smith, AR

Every situation is different and it seems that you have come up with an excellent solution for your needs.

Thank you for the note.

*John Battison,
Technical editor, RF*

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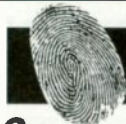
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NAB says pirates are illegal

The National Association of Broadcasters filed an *amicus* brief with the U.S. Court of Appeals for the Eighth Circuit supporting an earlier decision by the District Court upholding the government's seizure of a pirate station's equipment.



Edward Fritts

The pirate broadcaster argued that he has the right to challenge the FCC's regulations concerning power levels of licensed FM radio stations as an affirmative defense to the United States' seizure of equipment he used to operate an unlicensed station. The NAB said that the District Court's decision should be

upheld because the FCC was enforcing the statutory ban on unlicensed broadcasting in the Communication's Act, and not the FCC power regulations.

The NAB pointed out that the Supreme Court has upheld the Communication's Act provisions of licensure for broadcast stations as constitutional for over 60 years and that the licensing requirement is necessary to maintain spectrum consistency and protect against airwave interference.

Furthermore, the NAB points out that even if the rules of the FCC were being challenged before the court, they would have to be upheld because the Act gives the FCC the right to set power levels for broadcasters.

According to NAB President/CEO Edward Fritts, "Pirate radio broadcasters are illegal. Period. The court should affirm the rights of legal broadcasters, but should not tolerate or condone lawbreakers."

Burns moves against free air provision

Montana Senator Conrad Burns, chairman of the Senate Subcommittee on Communications overseeing the FCC, announced that he will go forward with a legislative provision to prohibit the FCC from moving forward with Chairman Kennard's proposal to give free or reduced-rate air time to political candidates.

The FCC Chairman made his proposal after President Clinton referred to free air time as a part of campaign finance reform in his State of the Union address. While commissioners Ness and Tristiani have expressed support for Kennard's proposal, it



Conrad Burns

was heavily criticized by the other FCC members and members of Congress as unconstitutional and beyond the scope of the FCC's authority.

Burns, who cast the only vote in the Senate against Kennard's confirmation as chairman, explained, "The FCC has been consistently overstepping its bounds and using the 'public interest standard' as its excuse. We simply can't stand by and watch the FCC take on issues that clearly must be addressed with legislation, not regulation. In order to prevent the FCC from taking this kind of unilateral action in the future, I will introduce language to prohibit the FCC from acting at this time on this matter in the Commerce, Justice and State Appropriations bill.

"I think it's important that this nation's communications agenda not be dictated by a small group of independent regulators who have not been elected to their position. I'm working to schedule a heavy agenda of FCC oversight hearings in an attempt to examine abuses like this. Hopefully, Mr. Kennard will get the message when I have him sitting in front of the subcommittee."

CEMA files report on digital radio

The Consumer Electronics Manufacturers Association filed its final report on digital audio radio (DAR) systems with the FCC, concluding a six-year evaluation.

After looking at nine proposed technologies for broadcast digital radio, the Association's DAR subcommittee announced that of those, only Eureka-147/DAB offered the audio quality and signal robustness that listeners would expect from a new DAR service in all reception environments. The other systems each exhibited shortcomings:

- The in-band, on-channel (IBOC) systems as presented and tested are not feasible at this time due to deficient performance in the areas studied: audio quality, performance with channel impairments, RF compatibility, and extent of coverage.
- The in-band, adjacent-channel (IBAC) system cannot be deployed due to interference with the current spectrum occupancy of the FM band.
- The Voice of America/Jet Propulsion Labs (VOA/JBL) system at S-band frequencies is subject to continuous and/or repeated outages due to blockage. It was not clear to the Subcommittee that this could be totally remedied.

Gary Shapiro, CEMA president, added, "Despite these results, last spring we halted advocacy of the adoption of any system at the request of the broadcasters, who said they needed more time to correct the flaws of the IBOC system. We look forward to broadcasters demonstrating in the near future a system that will work.

While the report contains information that broadcasters

have awaited, the findings are not reflective of what is currently happening with the state of DAR. Currently, work is already underway on two satellite-based systems (S-DARS) by CD Radio and American Mobile Radio Corporation, both of which were awarded FCC licenses in April 1997. Two separate IBOC systems are also in development stages — USA Digital Radio and Digital Radio Express.

The CEMA's report is available to the public from the FCC and through CEMA's website, www.cemacity.org/works/pubs/dar.htm.

SBE requests ruling for unattended operations

The Society of Broadcast Engineers' FCC Liaison Committee has submitted a Request for Declaratory Ruling regarding the clarification of certain aspects of the FCC's rules considering unattended operations.

In October of 1995, the Commission adopted rules allowing the unattend-



ed operation of broadcast stations. The SBE contends that since that time, certain ambiguities have come to the surface and need to be addressed by the Commission, especially the need for clarified definitions of the possible modes of station operation. Other subjects of requested review include manual transmitter shutdown and the designation of a chief operator by unattended stations, directional antenna system tolerances, remote transmitter control for ATS and non-ATS equipped stations, and control points for unattended operation and shutdown capabilities thereof.

The brief requests of the Commission the issuance of a Declaratory Ruling.

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Comrex founder Cheney dies at 70.



John Cheney, founder and president of Comrex Corporation, Acton, MA, passed away at age 70. Cheney had a long career in electronics and broadcast, starting before World War II as an engineer and announcer for WJNO in West Palm Beach, FL. He founded

Comrex in 1961, developing a wireless microphone system and, later, the first UHF wireless microphone, which became popular for newsgathering applications. Frequency extenders, another Cheney development, have long been a standard tool for radio networks and stations.

BE Radio editor-in-chief Skip Pizzi remembers Cheney as a broadcast technology pioneer who nimbly straddled the analog/digital generation gap, and who was unanimously admired by peers and competitors. "His work in adapting communications technologies to broadcast backhaul applications was truly groundbreaking," Pizzi recalled, "first with frequency-extension and later with perceptual coding. So dominant was his company's work that as 'Xerox' was to photocopying, 'Comrex' became to frequency-extension. He will be missed, but his legacy will live on throughout the broadcast industry."

John is survived by his wife, Lynn, two sons, and two grandchildren. In lieu of flowers, contributions can be made to the Deaconess Nashoba Hospital, John Cheney Memorial Fund, 200 Groton Rd., Ayer, MA 01432.

Comrex will continue under the leadership of Lynn Distler.

BUSINESS

Telex Communications, Minneapolis, announced the successful closing of a merger with **EV International** (EVI). The combined companies, controlled by affiliates of Greenwich Street Capital Partners, will be headquartered in Minneapolis. The new company, which will operate as Telex Communications, will have over \$355 million in sales and approximately 3300 employees worldwide.

GlobeCast North America, Culver City, CA, through its joint venture partnership ABC/GlobeCast Ventures, will continue its relationship with the Motor Racing Network by providing distribution services for the Daytona 500. ABC/Globecast will provide Satcom C5 DATS distribution services to the network's 700-plus radio stations.

Pacific Research & Engineering (PR&E), Carlsbad, CA, received an order to supply the GulfStar division of Capstar Broadcasting with audio consoles and studio furniture for new showcase facilities in Capstar's Austin, TX, headquarters. The order, worth more than \$250,000, includes ten Radiomixer on-air consoles and other equipment to be used in the construction of new, state-of-the-art, on-air and production facilities for GulfStar's "StarSystem" broadcast network. GulfStar's parent company, Capstar, is the largest owner and operator of radio stations in the U.S.

Broadcast Software International (BSI), Glendale, AZ, has announced an agreement with the **Microsoft Corporation**, Redmond, WA, for the development of Internet broadcasting software. The agreement provides for Microsoft to assist BSI in the development of software to interface with the NetShow 3.0 Internet server technology from Microsoft. NetShow software provides streaming audio, video and multimedia information across the Internet.

Telos Systems, Cleveland, OH, announced that it is in partnership negotiations with **Digital Radio Express** (DRE), San Jose, CA, to provide equipment to broadcasters for DRE's IBOC DAB system. Telos intends to provide audio encoding and transmission equipment should DRE's system be adopted. Formal testing of the system should take place within the next few months.

Broadcast Electronics, Quincy, IL, which has owned and operated Marti since 1994, will include the entire product line under the BE banner in order to more effectively market that sector of its business. The product line will continue to carry the Marti trade name and will also continue to be manufactured at the Cleburne, TX facility.

BE also announced the creation of a new division to accommodate the exceptional growth of its Audio-VAULT product line. The new Studio Systems Division will be headed by director **Ray Miklius**.

Intelco announced the opening of its first manufacturing facility outside of Europe. The facility, located in the Denver suburb of Westminster, is expected to

produce high-power IOT transmitters and liquid cooled solid state transmitters for both VHF and UHF applications within the next two months. A new service facility is part of the new building and will provide a second service facility in the U.S. in support of the full range of Itelco products.

KNBC-TV in Los Angeles has employed technologies from **Musicam Express**, San Francisco, to aid in the distribution of topical radio spots promoting its nightly newscasts. The station uses the P-DaX and A-DaX sending and receiving units to deliver the spots via T-1 lines to 20 local radio stations.

Waves Audio Ltd., Israel, announced that its Audio Transmission Processor (ATP) software package now supports the Microsoft NetShow 3.0 multimedia server, thus enabling content providers to deliver high-quality audio across LAN and ATM networks.

Carnival Cruise Lines' *Inspiration* will host **Capital Radio UK** for a one-week cruise, thus marking the first ever live digital broadcast via MTN/C-band technology. MTN or Maritime Telecommunications Network's C-band satellite system allows for the broadcast of live video and radio broadcasts while the ship is at sea or in port.

Texas Eagle Radio Networks, Bryan, TX, also known as TexRock Radio, has ordered a total of DADpro32 Digital Audio Delivery Systems from **Enco Systems**, Farmington Hills, MI. Texas Eagle will be uplinking five formats via DAD from its Bryan headquarters and using DAD systems at each of its downlink sites for live origination in the morning hours, and automated local insertion into the master feeds at other times.

PEOPLE

The Society of Broadcast Engineers will present its Lifetime Achievement Award to **Morris H. Blum**, recognizing his 67 years in broadcasting.

Brooks Gibbs has been named director of technology and strategic market for Gentner Communications, Salt Lake City.

Tom Creighton has been contracted to act as the manufacturers representative to the consulting engineering groups at Broadcast Electronics, Quincy, IL.

William "Win" Craft has been appointed vice president of marketing and sales for THAT Corporation, Marlborough, MA.

Nick Hamawi has joined THAT Corporation, Marlborough, MA, as a senior software engineer.

Bill Brewster has been appointed to director, RFT products, for CPI Satcom Division, Palo Alto, CA.



Morris H. Blum



Nick Hamawi

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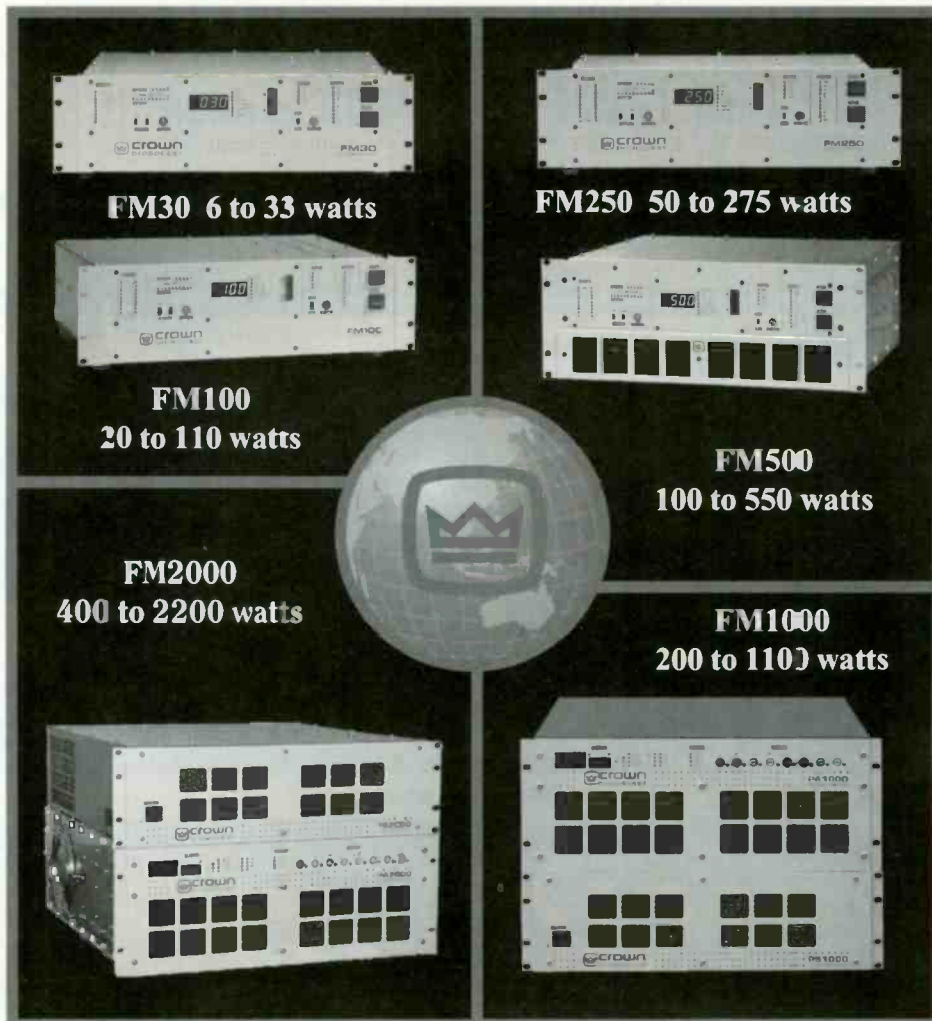
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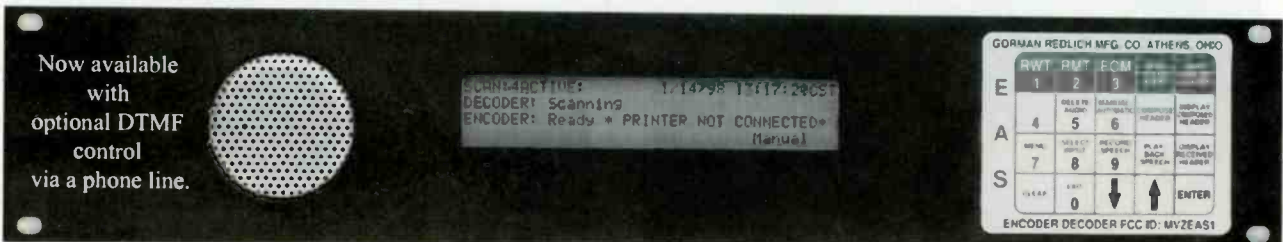
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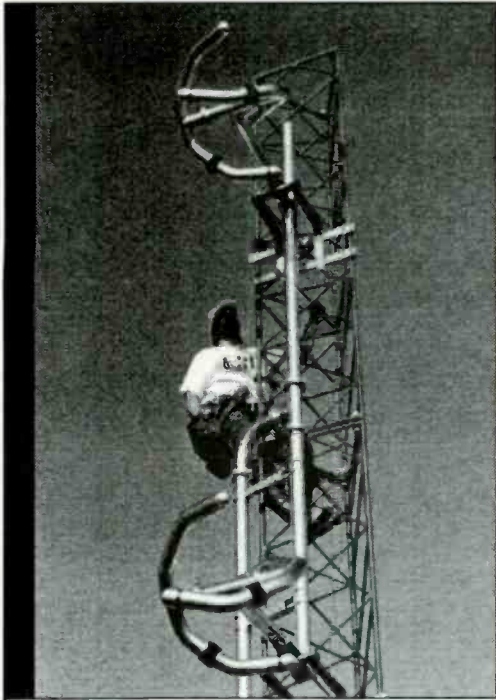
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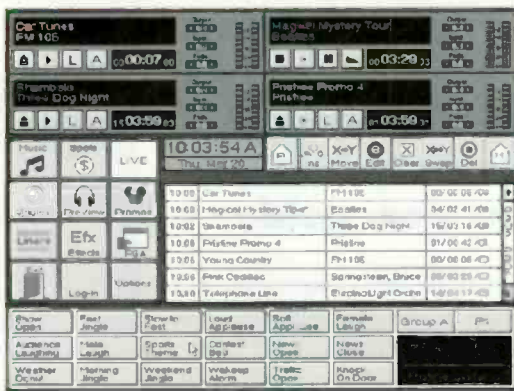
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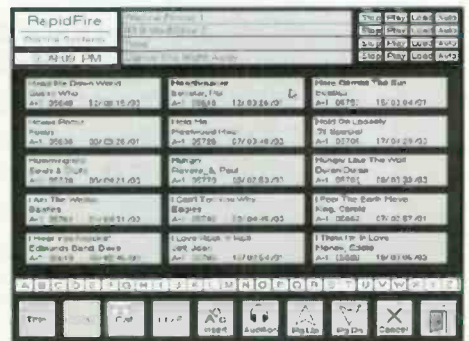


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BE Radio

TNAB will be in full swing when the April issue hits the streets. If you're not attending the show, don't worry, we'll bring it to you. The cover story will look at the technology making its debut, and in many cases an impact, at the show. The conferences will be previewed and the breakthroughs will be explored.

Also:

Feature Story — Acoustics 101 for broadcasters

The basics of good acoustic practice. A good sounding radio station starts with a good sounding control room.

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Our computer expert examines the requirements of a successful transition to a computer-based facility and how to make it all work.

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Next Wave — DAB Update

See where it stands. With launch goals of the year 2000, things are moving quickly.

Last Byte — Serial Buses

Part 2 of the series. We learned about FireWire in this issue, we'll explore the Universal Serial Bus (USB) next.

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Get on the bus, Gus (part 1)

By Skip Pizzi, editor-in-chief

Probably the most cumbersome part of computer interconnection is the interface of peripheral equipment. "Plug-and-play" setup is often a "plug-and-pray" process, but sometimes just the "plug" part is a challenge of its own. Broadcasters are used to dealing with multiple connector and interface types, but the connector hardware found on the back of a PC deserves a whole wall of its own at Radio Shack.

Because of the way PCs have developed, nearly every new peripheral device (or its update) has engendered its own separate interface. Amazingly, each of these interfaces are relatively standardized throughout the industry, but there are still different hardware and cabling required for printers, video monitors, audio speakers, keyboards, pointing devices, game controllers, outboard disk drives and outboard communications devices. A typical desktop PC setup today can involve more than half a dozen different interface types. With the exception of SCSI, all of these interfaces also require a discrete cable run between the computer and each peripheral, creating the potential for a world-class rat's nest behind every desktop.

The connector hardware found on the back of a PC deserves a whole wall of its own at Radio Shack.

It's not just you

The industry as a whole has recognized this problem, and has been struggling to solve it for the last few years. On the software side, the plug-and-play capabilities of Windows 95/NT have actually improved things somewhat for PCs, and the Macintosh has always been pretty good in this area. Future systems will be even better.

But what about the cost, messiness and complexity of multiple *hardware* interfaces? This is where the two new standard peripheral buses should help. Yes, there are *two* new standards emerging, but each will have its unique advantages and applications. (Two formats tomorrow beats the six or more of today, in any case.)

These new standard buses are called *IEEE 1394* (also known as *FireWire*) and the *Universal Serial Bus* (USB). They are both intended for the serial interface of *any* type of peripheral device, and can be used in daisy-chain form. This means that the rear panel of future PCs will be far less cluttered, with perhaps only one or two peripheral interface cables and a power cord terminating there. It will also allow a far greater number of peripheral devices to be interfaced to the computer than is typical today — a

critical enabler for the "smart" homes and workplaces of tomorrow.

FireWire

IEEE 1394 is the faster of the two buses, and is therefore more suited for media applications like audio and video. The FireWire cable contains six copper wires — two individually shielded, twisted-pairs for signal, plus a pair for power (8- to 40VDC, <1.5A) — and an overall shield. This means that most peripheral devices could use only one cable for power, signal and control. (There are also some implementations of 1394 that do not include the power pair, typically found in battery-powered devices such as camcorders.)

Up to 63 FireWire devices (or *nodes*) can be connected to a single 1394 PCI adapter card (or *bus bridge*), with up to 16 of these devices in a single daisy-chain. Cable lengths between devices can extend up to 4.5m (15ft) using standard 1394 cables, or longer with special cables. Repeaters can also be used to extend connection paths. Transmission speeds of 100-, 200- and 400Mb/s are specified (called S100, S200 and S400 respectively), with speeds up to 1Gb/s proposed. Hot-plugging of devices is also supported.

There are two types of data transfer possible via FireWire: *asynchronous* and *isochronous*. Asynchronous transport refers to the traditional, buffered file-transfer process used in most computer communication today. To this, FireWire adds isochronous transport, in which data is communicated via discretely established channels that provide guaranteed delivery at a pre-determined data rate. The latter approach is quite applicable to real-time, high-quality digital audio storage and retrieval, without the need for large and expensive RAM buffers.

While some PC hardware and software makers quibble with the difficulties of using FireWire in a general and comprehensive fashion (therefore preferring USB for these applications), more singularly purposed professional environments will soon be able to implement 1394 for cost-effective data transfer at previously unattainable speeds. Professional digital audio interfaces using 1394 have already been prototyped, and it's likely that FireWire may soon become a commonly spoken language among computer-based radio production systems.

Next month: The Universal Serial Bus (USB).

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