BE Radio

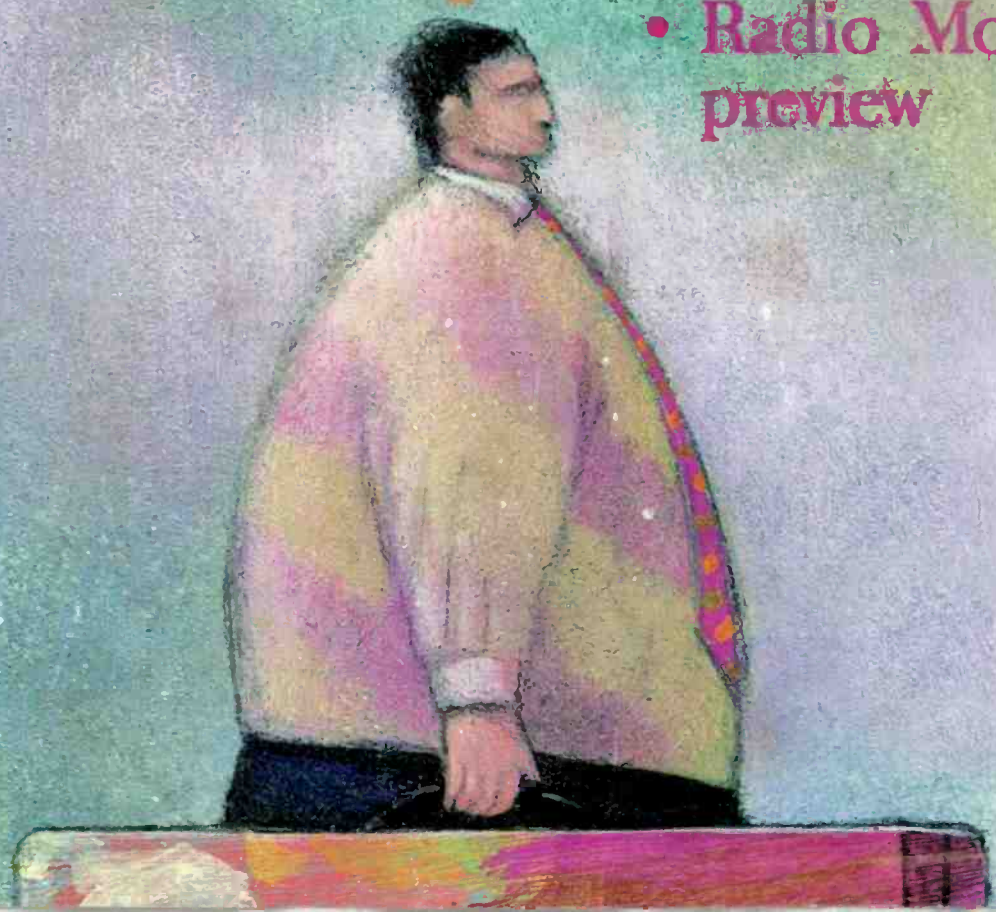
May/June 1996/$10.00
An INTERTEC/K-III Publication

...from the Editors of BROADCAST ENGINEERING

NAB 96: After the show

ALSO:

- NAB Pick Hits
- Radio Montreux preview



WHAT TO TELL YOUR GM WHEN YOU WANT A NEW PRODUCTION MIXER WITH MORE THAN FOUR FADERS.

First and foremost, tell them that you can get a studio-quality 16x8x2 console for just $3199*.
$3199 won't buy an extra hard disk for that digital cart doofrabulator that keeps going south during morning drive. Heck, go whole hog and request a superb 24-channel Mackie Designs 8•Bus console — they're just $3999*.

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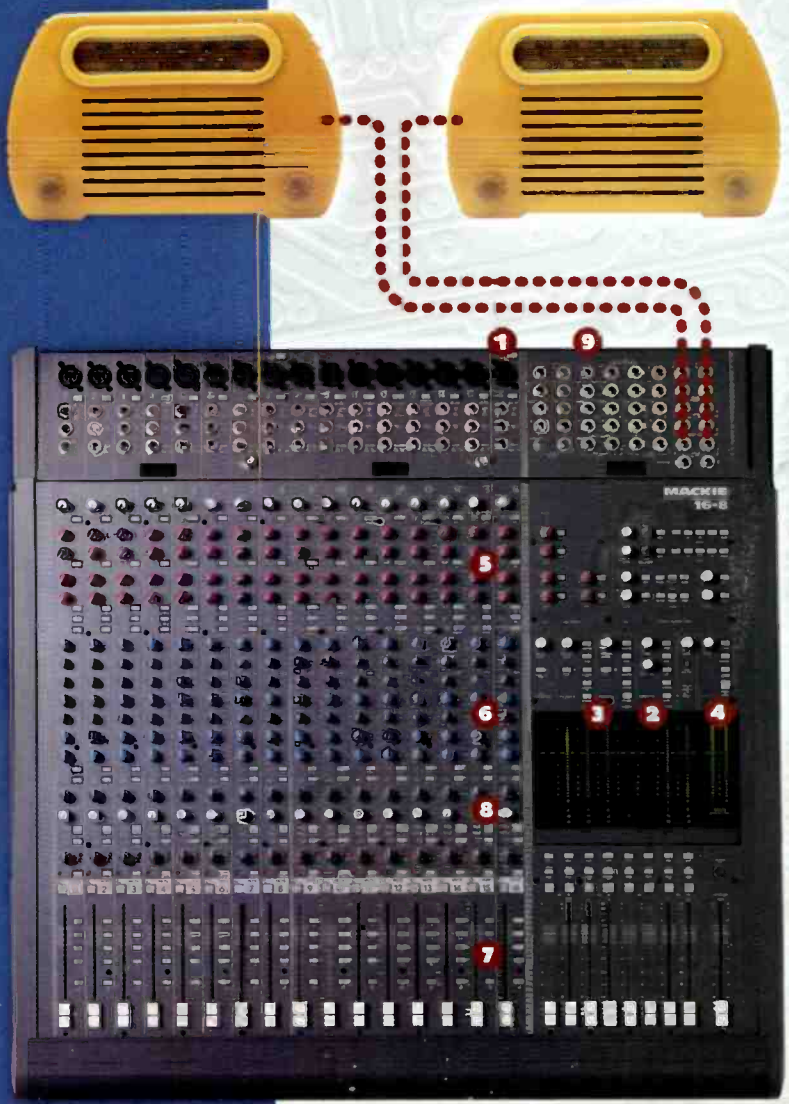
If necessary, call your broadcast supply house,
or Mackie direct and request our 48-page 8•Bus console brochure. It has a lot more arguments as to why our consoles are the best value around.
Finally, if all else fails, consider begging.



*Suggested U.S. retail prices: 16•8, $3199; 24•8, $3999; 32•8, $4999. Slightly higher in Canada. Contact your broadcast supply house for exact pricing.

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The 16•8 shown above is part of a complete mixing system. Optional meter bridges and stands are available for all 8•Bus consoles. There's also a matching 11-rack-space "Sidecar" for outboard gear and a 24-channel expander to the larger 24•8 and 32•8 models.

9 Internal goodies such as double-sided, thru-hole-plated fiberglass circuit boards, gold-plated interconnects, sealed rotary controls, ultra-high duty cycle switches and exceptionally-high RFI rejection.

Not shown: The massively over-engineered, triple-regulated 200-watt, 2-rack-space external power supply.

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2 Monitor section with separate Control Room and Studio stereo level controls. Select any combination of L/R mix, Mix-B, 2-Track or External feeds. Mono summing switch included at no extra charge.

3 Double headphone section lets you create two different headphone feeds with any combination of Monitor, Mix-B, Aux 3 & 4 or Aux 5 & 6.

4 Separate Talkback section with built-in mic. Selector switches let you address any combination of Aux 1, Aux 2 or Tape/Submasters.

5 Six pre/post-switchable aux sends per channel. Four available at any one time.

6 Big-console equalization: 12kHz Hi shelving, 80Hz Lo shelving, swept Lo Mid (45Hz–3kHz) and true parametric Hi Mid EQ. Band center is sweepable from 500Hz to 18kHz; bandwidth is variable from 1/12-octave to 3 octaves. ±15dB boost/cut throughout. PLUS an 18dB/octave Lo Cut filter that cuts room rumble and mic thumps.

7 100mm faders with true, logarithmic taper. Gain is smooth throughout the fader's travel instead of erratic and unpredictable like it is with cheap D-taper faders.

8 In-line console design with separate Mix-B/Monitor section. Doubles inputs during mixdown or create two different stereo feeds at the same time.

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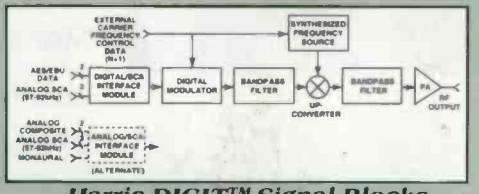
Included with the DIGIT™'s digital input module is a DSP based digital stereo generator which provides lower distortion and greater separation than any competing exciter. Also, included is a digital composite limiter (DCL) which is an implementation of the WAVES L1 Ultramaximizer™, used by digital recording studios. Harris exclusive DCL allows DIGIT™ to sound louder than competing FM exciters without over-modulation. The DCL uses "look ahead" circuitry to predict and correct overmodulation peaks before they can occur.



Harris DIGIT™ Signal Blocks shows that although DIGIT™ is revolutionary, its technology is easy to understand.

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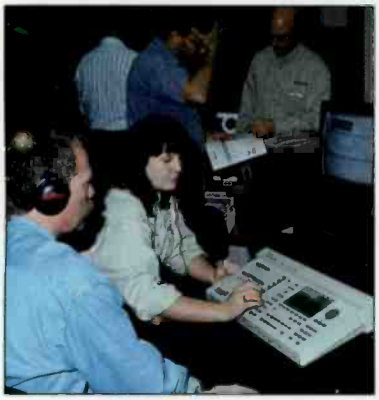

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ON THE COVER: *(Right)* Confused by all of the options shown at NAB 96? This issue explains it all. (Cover design by art director Stephanie Masterson.)

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Circle (5) on Action Card

Editorial:

The ups and downs of DAB

For those interested in U.S. digital audio broadcasting (DAB), 1996 has already offered some interesting developments. First, is the decline in status of in-band DAB. The interference problems affecting all of the in-band formats are reportedly so bad that without wholesale format revisions, no currently proposed system is likely to be usable – at least not in major markets.

Meanwhile, the VOA is apparently rethinking its format's course. The proponent may soon revise its system to be applied to terrestrial HF ("short wave") rather than satellite transmission, based on the reception-reliability and building-penetration problems inherent in satellite DAB delivery.

That leaves Eureka 147 at L-band, which has performed well but cannot be implemented due to lack of spectrum. Every path seems to lead to a dead end for U.S. DAB at present. So how to proceed?

Two possibilities were discussed at NAB 96. The first is an "in-band/on-carrier" format proposed by WCRB-FM and Sanders (a division of Lockheed/Martin) called *FMDigital*, which uses a single, 40kHz-wide FM subcarrier to broadcast about 160kb/s of data for digital audio or other services. The second is a variation of the single-frequency network (SFN) application of Eureka 147 that uses time-domain multiple access (TDMA) techniques. This would allow the multiple stations grouped within a single Eureka 147 ensemble to be physically split among different transmitter sites instead of sharing a common transmitter and antenna. (Given the current consolidation trend, just how big a problem *is* the shared-site issue anymore?) Of course, these ideas still require significant development and raise many unanswered questions, both technical and economic.

On the policy front, Satellite DAB continues to move forward, although hounded by several critical contingencies. At press time, it was expected that the FCC will move to license half of the 50MHz S-band allocation to the current applicants. (CD Radio will get a free ride with a Pioneer's Preference, and the other three applicants will battle it out at a spectrum auction.) What the other half of the band is being reserved for is unclear, but it could become the eventual home of U.S. *terrestrial* DAB. This would follow the Canadian model of splitting its L-band DAB allocation between terrestrial and satellite uses.

CD Radio's plan also includes terrestrial gap-fillers for urban zones, which it proposes could carry local radio stations' DAB signals along with its repeated satellite channels. As the VOA and others have hinted, Satellite DAB may not be viable without these terrestrial components. But whether CD Radio's pockets are deep enough to establish a massive terrestrial network while also launching two satellites, remains to be seen.

Other alternatives? One is back to the drawing board with in-band DAB, but how much more are proponents willing to spend on R&D? Perhaps a "Grand Alliance" of in-band proponents could be convened. In any case, as history has taught us, the quest for backward compatibility may be what ultimately limits (or even kills) a new format.

Finally, don't forget that we've been spoiled by the pace of progress in other fields of late. DAB seems to be going nowhere fast, but in fact, it's only been under development for eight years at most. For in-band formats, it's only been about five years. Although this may seem an eternity in the computer industry, according to broadcast traditions, it's just a preliminary discussion period. DAB is probably going to take a while yet to settle. Broadcasters' best move in the meantime is to work on continuing the improvement of their production and administrative facilities, including the accommodation of things like superduopolies and on-line radio – two areas where the pace of change seems more like the rest of the high-tech world today. Don't be fooled into believing the simplistic premise that terrestrial DAB is necessary as a defense to Satellite DAB. It's really an apples-and-oranges (quality vs. quantity) comparison. *Programming* and *marketing strength* – not technology alone – will determine tomorrow's media winners and losers.

Nevertheless, broadcasters should hedge their bets and support reservation of *some* new spectrum for terrestrial DAB, S-band or otherwise. And watch Satellite DAB for some unexpected twists: It may not be as much of a threat as first thought; or it could even turn out to be surprisingly beneficial to terrestrial broadcasters.

Whatever the outcome, trust *BE Radio* to stick with this story and keep you informed for as long as the road extends.

By Skip Pizzi,
editor

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Circle (15) on Action Card

Contract Engineering:

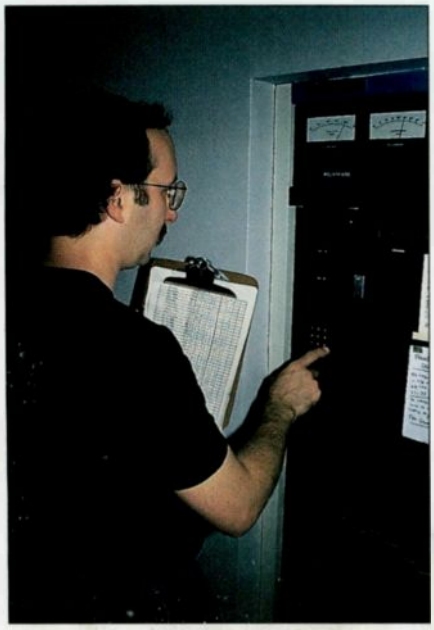
Maintaining computers, part 2

By Chip Morgan

Like a doctor examining a patient, your first step in software maintenance should involve analysis of the symptoms, so you can come up with a strategy to solve the problem. Many times, the reported symptom is only a *part* of the problem, and you need to ask more questions to determine the true extent of the difficulty.

Because a substantial number of "software problems" are actually caused by operator error, the best practice is to keep ahead of the users by working with the system yourself and knowing the most common mistakes. Then, when a real problem arises, you'll have a good idea of whether the trouble is caused by hardware or software. Start by asking the usual basic questions: Has the system ever worked? Was anything changed right before it stopped working? Can the user make the problem occur every time, or is it intermittent?

Then move on to standard divide-and-conquer troubleshooting techniques. If you remove cards or disable drivers, can you make it work? Are there device or memory conflicts? Is there enough free disk space? Is the disk corrupted? Is this a previously reported problem with the software? Eliminate as many variables as you can, and run the software with basic resources. If it works in a basic configuration, try adding components until you see which one causes the problem. Then it's time to look for a workaround.



Editor's note: The March/April issue's "Contract Engineering" column covered the hardware side of computer maintenance. This time, the subject is software.

No user is an island

Over time, you'll learn most of the common problems and solutions of a given application. It's a good idea to post persistent problems on your favorite on-line forum. This helps other users identify problems and can often provide you with answers from people who have dealt with that particular problem before.

If you run a complicated computer environment with many users and constant help needs, you may want to consider using a *help desk system*. This is software designed for support professionals to document help calls, provide first- and second-level support assistance (often with built-in knowledge bases) and track the history and resolution of each problem that is reported. The better systems will auto-escalate problems and provide reports, manage software and hardware inventory, analyze call trends and support-response rates, improve problem documentation, expedite staff training and improve resource allocation.

Beyond computer support, help desk systems are also useful for handling general engineering problems within a substantial group of users. They may also be set up for temporary needs, such as when a station group or network first implements a new interconnection system.

When the workload is too great to handle (and whose isn't these days?), a resident *network remote management* package helps with system administration, software distribution, license monitoring and management as well as system utilities. You can coordinate E-mail, Internet access, file and printer sharing, host connectivity and work group management – all from a remote PC located anywhere you can get dial-up access. This saves incredible amounts of time. The best of these applications have agents that monitor activities and system parameters, providing you with an early warning of low disk space and network problem spots.

Finding solutions

Once problems have been identified, the faulty software may require reloading. A common difficulty in these cases is finding the original software. Some stations feel that the users should be responsible for their own applications, but we learned in kindergarten that we don't all have the same sense of responsibility. It's a good idea to keep at least one copy of each software version locked up in the engineering shop. This copy should be used only in emergencies and must be tightly controlled.

Over time, you'll learn most of the common problems and solutions of a given application.

Speaking of controls, when each of the users at a station has his or her own PC, it really doesn't matter what kind of applications they use. But as soon as you start networking those computers together, you've got compatibility problems. A well-managed network has specific versions and types of software that are supported. All other applications are at the users' own risk, and may be locked out of the network itself. This simplifies support and keeps most files compatible with the rest of the net.

When it's time to introduce new versions of old software or wholly new programs, you should consider setting up a test group of users. Just as with hardware introduction, test the software in a controlled environment before sending it out to the masses. You can also use a small test group for final tweaks and customizations before rolling out the new program to the entire network. Once everything is working well, try to use a network installation rather than manually going to each workstation to install the new software. This keeps all installations consistent and saves a lot of time.

During training, explain the value of help files. Some users really don't know about them. They may not understand the value of context-sensitive help, or they may be intimidated about the entire process. Explain that

Chip Morgan owns Chip Morgan Broadcast Enterprises (CMBE), a broadcast design, systems integration and engineering firm based in Sacramento, CA.

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you can't break a computer by using its keyboard or mouse (and if you have appropriate security installed, this is really true).

Just in case someone actually *does* break a computer, keep records of the configurations of all machines, as well as floppy copies of all system files including .ini and .bat files. It's also a good idea to run diagnostics religiously.

Teach people proper rebooting procedures for lockup problems, and repeatedly explain that they should never power down a server without a proper shutdown procedure. If you backup religiously and document the network topology in an up-to-date manner, then no disaster should keep you from getting the systems up and running quickly (even if installing new PCs is the only solution).

To keep everybody happy, be sure to schedule downtime in advance before doing any major work on important PCs, especially servers. Remind those late users that they can still work off-line when you take the network down.

Required resources

Every PC support person should have a complete set of tools, including boot disks; backup disks; utilities software, such as Norton Utilities; a Windows 95 Resource Kit; a Windows for Workgroups Resource Kit; a Windows NT Resource Kit and virus checkers. If you do regular work at specific sites, it's a good idea to have utility software installed right on the users' PCs. For network support, there are many tools that are useful for auditing each user and the network configuration. These save many hours when there's trouble, because you can see what changes were made before the trouble began.

Keep a computer library with as much reference information as possible for solving problems. This library should have copies of all of the manuals for all of the programs in use, manuals for all of the operating systems, special cards and other hardware and the emergency copies of software and configuration files.

> Just as your clients think of you as a guru, you should have someone to call when you can't figure something out.

Just as your clients think of you as a guru, you should have someone to call when you can't figure something out. It could be a friend, another engineer or even someone you correspond with on an on-line service or the Internet. Remember to treat your guru the way you expect to be treated. Don't call until you've tried everything you know.

You should also subscribe to computer industry magazines, even if it's just to read the headlines and the ads. This is how you can sound intelligent when someone says, "now that Digital has adopted IP over ATM, how's that going to affect the way Fast Ethernet integrates with my WAN?" Even if you don't know the answer, you'll be able to say something like, "Well, they just announced it, and I'm looking into it. Right now I'm busy studying how Java might help us get work done faster." If they glance at your cup of coffee and think you're joking, you know you've scored.

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Circle (6) on Action Card

Managing Technology:

Expand, rebuild or start over?

By William Fawcett

Unlike the fast-food restaurant that remodels every few years, a broadcaster who heaps change upon change will seldom get past paying for capitalization. Yet broadcasters need change, because like the fast-food customer, listeners are fickle. Therefore, long-term planning must allow for flexibility when considering facility improvements. Your goal should be to not have to repeat the same process in four years.

The choices you have to accommodate growth come down to three basic options with a few variants: 1) Expand the existing facility with (contiguous, adjacent or wholly separate) new space; 2) renovate the existing facility into a more efficient configuration; or 3) start from scratch with a new facility (either ground-up construction or a renovation of someone else's former space). The best choice is always dictated by your specific situation.

A common ingredient to the current mix of parameters that radio broadcasters face when making these decisions is the consolidation trend. This can multiply the problem by having to make the same decisions for several different existing facilities around town. Acquisitions of new stations can be complicated, but the complexities of an acquisition pale in comparison to the challenges of physical consolidation. Nevertheless, a carefully thought-out plan might well be the catapult from malaise to success.

In radio, as with most any industry, the work force and facilities are divided into three basic categories: management, sales and production. Determine first if your style of business leads to a consolidated or discrete facility. Look at the physical needs of each department, and remember to build flexibility into your plan.

Pay particular attention to the production area, because it is experiencing the greatest impact of new technologies. Get away from obsolete divisions like "news," "programming" and "music." Here's an industrial analogy: The manufacturing facility that uses flexible tooling will surely outlive the facility that can only produce one kind of widget. Markets change.

All three divisions need to be physically able to react to and adapt to these changes. An aged facility might include interconnected buildings from several generations. Room sizes were set by a previous paradigm. Traffic flow can be a real problem, infrastructure is taxed to the limit, and so on. Evaluate the choke points to further growth, and work toward a plan for the ideal future facility. Then you're ready to tackle the question at hand: "Expand, rebuild or start over?"

A first step would be to list the advantages of each of these options, and choose the most attractive. Of course, it's not that simple; each circumstance presents different limitations. In the case of consolidated facilities, these limitations can affect the whole. This may actually lead you to maintain some separation between functions, rather than take the intuitive approach of maximizing consolidation to maximize economies of scale. Consider the following issues.

Regulatory considerations

The location(s) of your transmission facilities are established by the regulations contained in 47 CFR Part 73. These restrictions probably won't affect your studio or office construction plans, because most good transmission sites are not good studio or office locations anyway.

FCC restrictions only enter the picture in the case of consolidation, when you must determine if it is possible, or even desirable, to co-locate several stations at one transmission site. A good starting point is to have your engineering consultant conduct an *Area to Locate Study* (ALS) for each facility and see if the locations are congruent.

> Your goal should be to not have to repeat the same process in four years.

Less obvious are the other restrictions that may preclude the installation of new towers. Environmental and zoning restrictions make the placement of any new towers a major chore. Don't assume anything — the construction of any new transmission facility will be met with great resistance. This factor alone may significantly shape your strategy, especially because good will and positive public relations with your community (i.e., your audience) may be involved.

Even replacing a rusty 50-year-old tower with a new tower may lead to permit problems. Here, the regulatory agencies must be convinced that this is a "repair," not a new project. You may discover that your grandfathered special-use permit does not apply to such a rebuild.

Restrictions on RF power densities in areas accessible to the public, or by your work force, are also a major consideration. A cursory study is required at each license renewal, but do not assume that you can add stations to the same tower just because the present situation is acceptable. This is often a problem even at remote antenna farms. Again, an engineering study is required. Mitigation may require additional fencing, special half-wave-spaced antennas, and in many cases, a taller tower. Of course, the taller tower option puts you right back into the permit process discussed in the preceding paragraphs.

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the ALS region doesn't mean it is good or even acceptable. Real thought should be given to this "should-be-obvious-but-often-isn't" kind of problem. For example, jacking up the power on an antenna that is 30 feet below average terrain doesn't make much sense.

A split facility requires line-of-sight between the studios and each transmitter site if microwave STLs are used. Much flexibility can be gained by the use of digital landlines, or microwave repeater sites, but each circumstance should be evaluated for cost-effectiveness and reliability. If you need to erect a tower for your repeater site, you're back in the permit process again.

Main studio location

In most cases, FCC regulations (73.1150) stipulate that a station's main studios be located within a certain proximity to the city of license. Creative minds can usually find a way around this problem, but it may not be cheap or effective. Regardless, this problem must be solved before an overall plan can be devised. Furthermore, acceptable locations of your transmitter and studio sites are co-dependent.

Possible solutions include the establishment of a "shell studio" with a skeleton staff (often a branch location for the sales staff), a petition to the commission for an exemption, or a petition to change the table of allotments (in other words, a new city of license). In the case of FCC petitions, don't look for cooperation from your competitors.

It's possible that these restrictions will be eased sometime in the future, but that time may not come until broadcasters are faced with competition from DBS radio. Consider also the nonregulatory aspect of this conundrum: Can you maintain an effective local presence without actually *having* a local presence?

Good construction management and proper communications are essential to a successful project.

Infrastructure

The production facility of the future will have inherent flexibility. Multiple, interchangeable studios will not only provide for growth and changing conditions, but will offer benefits of redundancy. Audio distribution must rely on centralized cross-connect capabilities, and generic – not specific – signal distribution architecture.

Right now, it's likely that your facility has a hodgepodge of studios of varying sizes and capabilities, with an evolutionary wiring scheme. Compromises may have been made in acoustic isolation and traffic-flow schemes may be bizarre (you really shouldn't have to walk through Studio A to get to Studio B). Sometimes, the most cost-effective way to put an end to this nonsense is to start over.

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old, and especially if it's a multiple-station facility with transmission equipment on-site, chances are good that your electrical service is already taxed to the limit. In such cases, renovation can be complicated and disruptive. Where permitted by code, you might consider adding a second service (perhaps a single-phase service for office space and a 3-phase service for broadcast equipment).

Planning for emergency power is also a consideration. In any case, it is important to obtain complete, up-to-date drawings of the existing situation, as well as a current and projected load analysis.

Other areas to consider on the question of replacement vs. expansion: telephone systems (if your phone system is still using 25-pair cables from earlier mechanical systems, you are way past due on a complete overhaul); computer networking (cable conduits make much more sense than direct wiring, given the pace of change in this area); HVAC (low-noise requirements are a difficult fit in an "add-on" scheme); and other environmental issues like food service, rest rooms, potable water supplies and sewer disposal (if the existing facility was designed for 20 people, it won't work well with 50).

The pitfalls of construction

If you decide to expand or rebuild, remember the inconveniences you will encounter during construction. Downtime is expensive, and you must determine just what its costs will be. An alternative is to start over and have one facility operational before the other is shut down. Look at all options and weigh the costs and benefits.

Also be aware that the location of additional building space may be limited by the location of buried cables, grounding systems or satellite dishes.

The effects of dust, noise and mud must also be considered. Delicate electronic equipment and fan-cooled transmitters can be destroyed by concrete and drywall dust. Reasonable acoustic isolation can be overwhelmed by power-tool noise in adjacent areas. Good construction management is essential here.

Divide and conquer

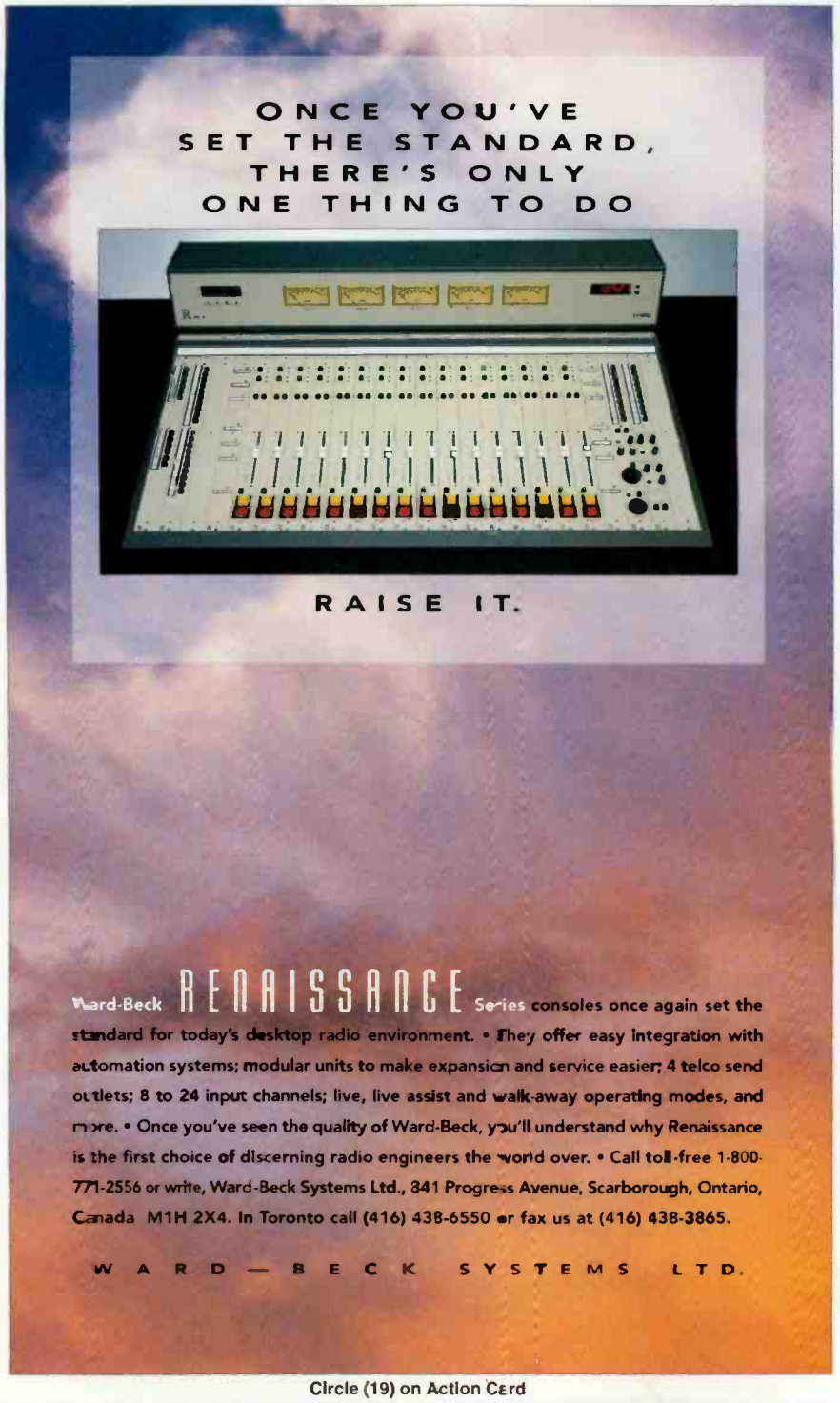
Massive, interrelated problems such as these cannot be handled as a single item. They must be split into component parts, then attacked. Here's a summary of one sensible approach:

• Have a plan. If possible, get over any capitalization hurdles early, so you can concentrate on the effects that this change will have on your true assets: your license, your staff and your airtime.

• Consider the standard business factors involved. Sound advice from a CPA/financial planner may be helpful.

• Examine industry-specific issues closely. Commission any required engineering studies to gather reliable data. Consider each problem separately, making independent decisions wherever possible, but always keeping the whole picture in mind. Compromises are inevitable, so be sure to have all of the information (including costs) of each option before you make decisions.

• Finally, pull all of this information together and determine what's best for you. At this point it should be clear that the real issue is a lot bigger than simply deciding whether you're expanding, rebuilding or starting over. Your construction plans are only a single element, and they must be integrated with the overall direction of your business. Once you've made a plan, stick with it. If you try to "fly by the seat of your pants" on this one, you're courting disaster. A methodical, well thought-out business strategy is essential to effective operation and solvency in the next millennium.



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RF Engineering:

Digital FM exciters

By John Battison, P.E.

Although DAB is still a far-future prospect in the United States, in some ways "digital radio" is already here. The digital FM transmission chain has been completed with the advent of the digital exciter.

For some time, engineers have been able to transfer digital audio from studio to transmitter with the consistently high quality of digital STLs, using either microwave or T-1 (telco) systems. (The latest codecs even allow POTS circuits to provide the audio quality required for many broadcast applications and backup services.) Meanwhile, broadcast audio processors and stereo generators have also improved their quality and control by using digital audio or digital control of extremely high-quality analog paths. The weakest link remaining in the FM air chain was the exciter. Now, that too, has been perfected by at least two major equipment manufacturers, and the 100% digital FM transmission chain is a reality.

One of the keys to putting such an air chain together in a non-proprietary fashion is the AES/EBU (Audio Engineering Society/European Broadcast Union) digital audio interface standard. The inclusion of this standard digital I/O on new air chain products allows broadcasters to assemble their chains with the same off-the-shelf freedom and flexibility that they've become used to in the analog world.

The AES/EBU standard accommodates 16-bit, 20-bit or 24-bit digital audio signals, and supports all of the standard sampling rates of 48kHz, 44.1kHz or 32kHz. Digital exciters equipped with AES/EBU inputs can be fed directly in the digital domain by most digital STL receivers.

The first entrants

Digital FM exciters are now available from Harris Broadcast, Nautel and Continental Electronics. The Harris exciter, called *Digit*, was mainly developed by development engineer Ed Twitchell. Figure 1 is a block diagram showing its signal flow. Input can be either analog composite or digital AES/EBU, plus analog subcarrier signals.

The digital modulator uses a 32-bit direct digital synthesis (DDS) device to digitally generate the FM carrier, including stereo and subcarrier information. The heart of the system is a *numerically controlled oscillator* (NCO) that is used as a digital modulator to generate the complete modulated FM baseband. The output frequency of the NCO is in the 5MHz to 6MHz range.

In the synthesized frequency source a crystal-controlled, phase-locked loop (PLL) oscillator generates a low-noise, steady-state RF signal. This frequency is mixed in the upconverter with the digitally generated baseband signal from the NCO, thus producing the desired FM channel's modulated carrier. The frequency of the source can be set internally or externally using a 25-bit parallel data interface for remote control.

Better than 80dB of RF filtering is provided by the bandpass filter, which is designed to cause no changes in the FM sideband structure. The power amplifier section uses MOSFETs to provide an output of up to 55W. With the addition of a harmonic filter, this exciter can be used as an emergency low-power transmitter.

Harris claims that more than 500 *Digit* units have been delivered worldwide, about half with AES/EBU inputs. Recent orders show that the majority of units are now being ordered with digital inputs. This seems like a harbinger of the digital world to come, where the only analog signals will be those acoustically generated by the talent.

Meanwhile, at the far eastern edge of North America, in a small town not far from Halifax, Nova Scotia, another manufacturer of digital FM exciters can be found. The *NE50* digital exciter comes from Nautel, probably best known to many engineers as a leader in solid-state RF power generation.

Figure 2 is a block diagram of the NE50. The input section accepts analog composite, analog mono, subcarrier and AES/EBU digital signals. Nautel employs high-speed digital signal processing (DSP) for its analog-to-digital conversion, thus ensuring extremely low distortion and intermodulation products (a THD of <0.005% at 400Hz is claimed). The mechanical design of the exciter allows for future system upgrades with a minimum of reworking.

The NE50's front-end employs 20-bit digital accuracy and it can generate a digital composite baseband signal while simultaneously digitizing analog subcarriers. The upmixer/filter stage generates a frequency-agile, spectrally clean signal using PLL techniques. MOSFETs and a CATV broadband

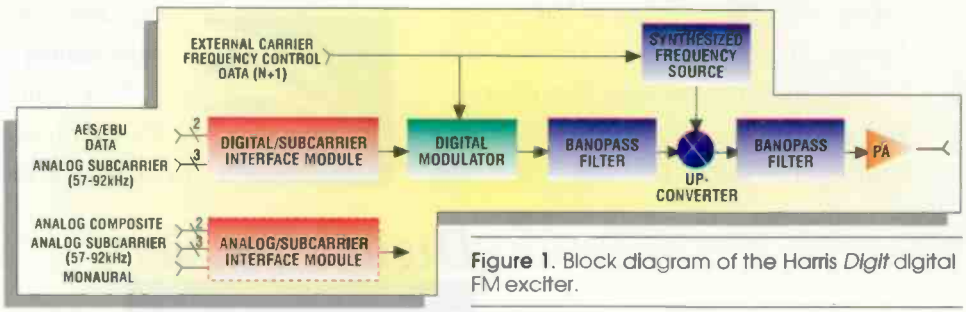

Figure 1. Block diagram of the Harris *Digit* digital FM exciter.

John Battison, *BE Radio's* consultant on antennas and radiation, owns John H. Battison and Associates, a consulting engineering company in Loudonville, OH.

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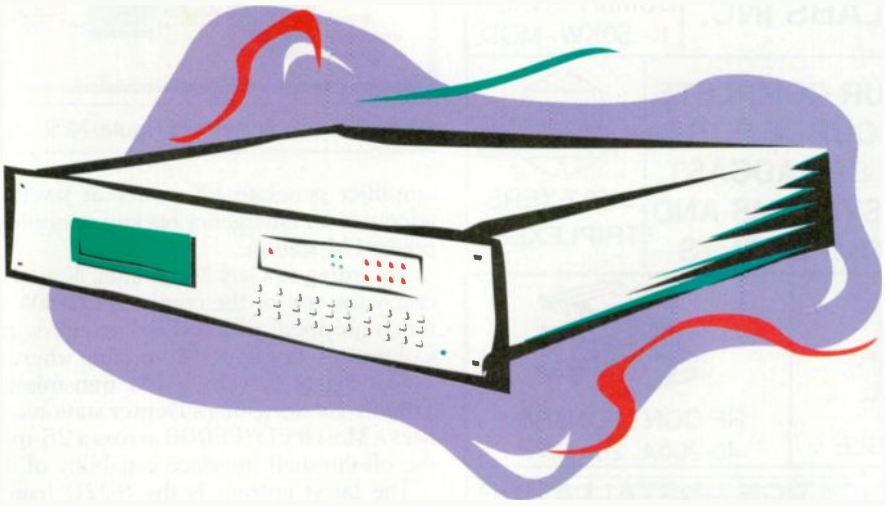

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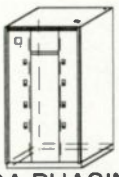
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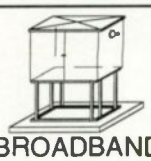
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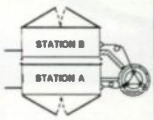

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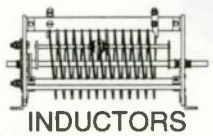
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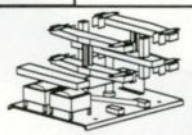
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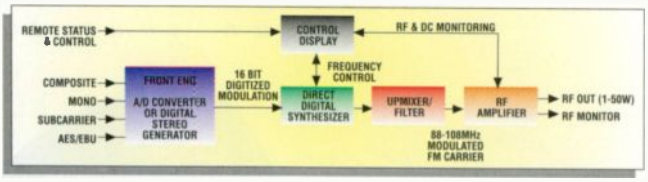

Figure 2. Block diagram of Nautel NE50 digital FM exciter.

amplifier generate RF power at levels up to 50W, again adequate for emergency backup operation or for use in a low-power FM station.

According to Gary Manteuffel, Nautel's manager of broadcast sales, two of the company's 20kW solid-state transmitters equipped with NE50 exciters recently arrived on Colorado's Lookout Mountain, where they completed a 100% digital broadcast FM transmission path for two of Tribune Broadcasting's Denver stations. The STL for the pair uses a Moseley DSP6000 across a 25-mile hop, exemplifying the off-the-shelf interface capability of these systems.

The latest entrant is the 802D from Continental's new Bytecast series. It is a PC-based unit (but packaged in a rack-mounted box) using floating-point DSP. A direct-conversion process takes the signal from the DSP chips to the operating frequency without an IF or heterodyne system. (See the "NAB 96 Review," p. 26, for more details on this brand new device.)

All of these exciters feature a full complement of programmable parameters and remote-control functions, as well as a comprehensive display of operating conditions.

Cold-war trickle-down

The DDS technology used in these devices is a good example of peacetime uses of once-secret techniques developed for military communications. Many veteran engineers will remember back to about 35 years ago, when *spread-spectrum* was a term that was never used outside secure installations. Now hams are using DDS and related systems for spread-spectrum operation routinely, and broadcasters are beginning to use it for remote backhaul via unlicensed PCS and similar services. DDS can be used to create literally *any* RF waveform, using amplitude, frequency or phase modulation. It, therefore, makes sense to use DDS for generating an FM carrier, with its multiple components of varying nature.

The block diagrams of these digital FM exciters look deceptively simple. Yet, when you consider the complex development work performed by engineers in bringing these devices to fruition, broadcasters are a fortunate group indeed. The design requirements of these units' A/D converters, summing amplifiers or digital input modules alone are daunting tasks, but here are complete digital exciter systems – including easy interfacing for the transitional analog broadcaster – at affordable prices.

Looking back to the early days of modulated arcs, Alexanderson alternators operating at 30kHz, modulated oscillators used as AM transmitters, simple frequency modulation obtained by "brute force" on an oscillator and Major Armstrong's pioneering work in FM, the broadcast engineer can certainly say, "We've come a long way, Virginia!"

For more information on digital FM exciters, circle (100) on Action Card.

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FCC Update:

Minor modifications without a CP

By Harry C. Martin and Andrew S. Kersting

The FCC is proposing to modify its rules to permit stations to implement certain types of minor modifications of their facilities without first obtaining a construction permit (CP) authorizing the modifications.

The rules generally require that modifications of broadcast licensees and permits may be accomplished through a 2-step process: 1. The station files an application for a CP; 2. After the facilities are modified, the station files an application for a license for the modified facilities.

However, because certain types of minor modifications are unlikely to have any impact on other stations, the requirements of prior review and authorization of the change are unnecessary and causes needless delay.

The FCC proposes that the following types of minor license and permit modifications could be implemented without the FCC's prior review and authorization, provided the licensee or permittee files a modification of license application, using FCC Form 302, within 10 days after implementing the change:

- Commercial FM stations would be permitted to increase effective radiated power up to the maximum level for the class of station.
- FM and TV stations would be permitted to replace one directional antenna with another of the same pattern.
- FM stations would be permitted to delete contour protection status under Section 73.215 of the rules, where the stations to which they are providing contour protection move to fully spaced locations.
- FM stations would be permitted to use formerly licensed main transmission facilities as auxiliary broadcast facilities.
- FM and TV stations would be permitted to change vertically polarized effective radiated power (ERP).
- FM and TV stations would be permitted to make slight changes in antenna radiation center height.

In addition, the FCC is proposing that requests for waiver of the main studio location rule be made by letter with supporting documentation rather than by filing a CP application. Commercial stations seeking to change to noncommercial status must file a 1-step modification of license application rather than a CP application followed by a license application. In both of these cases, prior commission approval would still be required before the proposed change could be implemented. In addition, the FCC proposes that directional FM stations would be allowed to commence automatic program tests at reduced power upon completion of construction without the prior approval of the commission.

These changes, which implement a section of the Telecom Act allowing some types of modifications without the need for a CP, will not become effective until public comment is received and evaluated.

Harry C. Martin and Andrew S. Kersting are attorneys with Fletcher, Heald & Hildreth, P.L.C., Rosslyn, VA.

Expanded AM band allotment plan

On March 22, the FCC's Mass Media Bureau issued a public notice identifying the 87 AM radio stations that have been tentatively selected for migration into the AM expanded band (1,605kHz-1,705kHz). After the allotment plan becomes final, the FCC will issue a further public notice announcing that each licensee that has been allotted a frequency will be afforded 60 days within which to file an application for CP authority on the newly allotted channel. Applications will be subject to petitions to deny, but not to competing applications.

Once CPs are issued, they will be subject to the standard 18-month expiration period. After completion of construction of an expanded band station, the licensee will be permitted to continue operating its standard AM station on a side-by-side basis for up to five years, after which the original frequency would have to be abandoned.

It may take some time before the newly released AM expanded band allotment plan becomes final. Stations that were excluded are eligible to appeal the commission's decision and the criteria used in selecting the 87 "winners." Appeals of the FCC's first AM expanded band allotment plan resulted in its recision on Sept. 1, 1995, and the reordering that is reflected in the current plan.

Fines assessed

In a recent decision, the FCC targeted a single broadcaster for fines totaling $38,000. The violations included: operating from an unauthorized site (including use of a studio-transmitter link prior to obtaining FCC authorization); sponsorship identification violations, including failure to properly identify record company sponsors of concert trip promotions; violations of licensee-conducted contest rules in which the station failed to award all of the prizes advertised or gave station employees tickets that were advertised as prizes; violation of the lowest unit charge (LUC) political advertising rules; violation of station identification rules by stating the wrong community of license (thereby identifying more closely with a nearby large market, in the FCC's view); broadcast of telephone conversations without prior authorization; and for rebroadcast of materials obtained from other sources without authorization.

Strict adherence to the regulations continues to be the only safe course.

Dateline: Commercial stations in the following states must file their annual ownership reports or report certifications by Aug. 1: California, Illinois, North Carolina, South Carolina and Wisconsin. Radio stations in Illinois and Wisconsin must file their 1996 renewal applications by Aug. 1.

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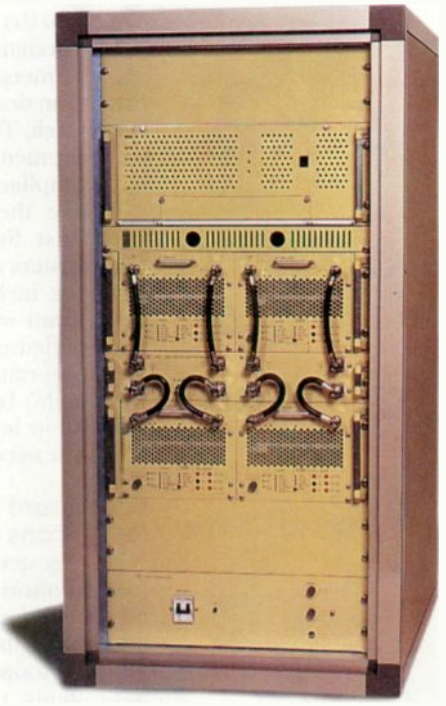

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Circle (33) on Action Card

EAS Update

Purchasing EAS equipment

By Leonard Charles

Now that vendors' submitted equipment designs have been certified, the FCC's Emergency Alert System (EAS) implementation deadline of Jan. 1, 1997 looks like it will stick. The time has come to purchase the equipment necessary to bring your facility into compliance by those deadlines.

Unlike the one-size-fits-all Emergency Broadcast System (EBS) equipment that broadcasters are familiar with, the new EAS hardware includes a range of different features, from which each station can choose and configure its system. Some features will be appropriate for your operation and some will not. So before you call your distributor with PO in hand, you should make a list of what you need.

Equipment requirements for stations

A suggested basic EAS package includes four monitoring inputs (two mandated, plus two for a local plan), an internal printer, internal digital audio recording and audio program loop-through interrupt. With these basic items, plus the appropriate receivers, you are ready for compliance of a single station having its EAS equipment installed at the control point. This package will also suffice for unattended or automated operation. What, if anything, you need to add to these basic features is dictated by your station's unique situation.

First, find out what your monitoring assignments will be from the chair of your State Emergency Communications Committee (SECC). The FCC's EAS office at 202-418-1220 has a list of SECC chairs or, for the Internet user, the SBE WWW site includes a complete list at www.sbe.org under the EAS Committee link.

Once you know your monitoring assignments, determine whether you have appropriate receivers on hand, or whether you need to purchase new receiver modules with your new EAS equipment. In the latter case, be sure to add the receivers to your EAS shopping list. Don't forget adequate antennae, as well.

For multistation facilities with co-located studios, you must decide whether you will operate all stations with a single EAS encoder/decoder. This is permitted by the rules, but raises some logistical challenges you must overcome. If you choose to purchase a separate encoder/decoder for each station, add that number to your list. (Some or all receivers may still be shared.) If you choose to operate some or all stations from a single encoder/decoder, you will need to specify how many stations will share and how many will require their own equipment to determine overall cost. Then, unless you intend to simulcast all tests and activations, you must equip your individual studios with remote-control access to the shared encoder/decoder and coordinate its use. Determine the number of remote-control pods you need and add them to your list.

The specific hardware features you need will be included as standard equipment on some packages, and may be options on others. You will want to shop carefully to get the most for your EAS dollar.

Programming flexibility

Beyond the hardware issues, as you comparison shop for EAS equipment, spend some time discovering how each different model is programmed. You will have to do a fair amount of that before the system goes on-line. If your station has a history of being proactive in local emergency alerting, consider additional monitoring inputs.

Also, find out if the equipment you are contemplating will allow the subsequent addition of custom header codes as they become available from your local officials. Remember, local alert systems will evolve and grow over many years. If your goal is to participate in that evolution, you will want to purchase equipment that accommodates expansion with a minimum of additional cost.

Leonard Charles is an engineer at WISC-TV in Madison, WI, and chairs the SBE National EAS Committee.

For more information on EAS equipment, circle (101) on Action Card.

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Circle (35) on Action Card

NAB 96 review

Our roving band of radio experts reports from Las Vegas.

By the *BE Radio* staff

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Radio automation systems

By Garrett Wood

Garrett Wood is chief engineer at WUKY-FM, Lexington, KY.

The first question a radio veteran might have asked when touring the NAB 96 show floor was, "Where are all of the analog tape machines?" Make no mistake, digital audio storage systems are assuming the major role of audio management for radio stations. More than two dozen vendors exhibited radio automation systems, and each had its own distinct approach.

dbm Systems showed the capabilities of CartWorks for Windows 95. Applying the platform's new 32-bit operating system makes a number of advanced features possible. Emergency, traffic and weather information can be distributed among studios by using the pop-up message feature. CartWorks can also handle the recording of satellite-delivered programs for delayed broadcast while simultaneously playing audio files on-air.

Prophet Systems introduced version 5 of its Audio Wizard for Windows system. The Audio Wizard CFS allows for a group of up to 14 radio stations to share audio and data from one system. The live show interface (LSI) allows audio events to be moved around easily by providing drag-and-drop editing. A quick record feature can be used to capture phone caller audio, modify the content on a waveform editor and then place the finished file on the log for playback.

ENCO Systems has changed the name of its DAD486x product to the DAD_{PRO} digital audio delivery system, representing support of the latest Pentium/PCI computer hardware. DAD_{SAT} is a satellite-based store-and-forward management system intended for satellite uplink master control facilities. Also introduced was DAD_{JR}, a lower-cost workstation for unattended downlink sites. Enco Systems announced support of RAID level 5 and 7 disk arrays featuring hot-swappable drives. Just released are optional software drivers that provide significant gains in file server performance, allowing network operation of up to 20 linear PCM (uncompressed) stereo audio channels.

The AudioVAULT digital storage system from Broadcast Electronics featured a new 32-bit version functioning under the Windows 95 platform. AVSchedule is one of the new 32-bit AudioVAULT software applications demonstrated. This feature was developed to import traffic and music data from most best-selling schedulers, perform a merge of the two and permit the produced playlist to be modified in many ways.

The DigiCenter version 2.0 showcased International Tapetronics Corporation's (ITC) digital audio efforts. DigiCenter employs proprietary hardware and software developed by ITC to perform its tasks in the PC environment at real-time speed. By using a digital audio bus, the DigiCenter bypasses DOS and provides a path for data to flow directly from the DSP board to the SCSI drive. Version 2.0 also allows the Central Audio Library to integrate MPEG Layer II cuts with DigiCenter's noncompressed file format.

Maestro is the latest product to be exhibited by Computer Concepts Corporation. Featured as the hub of a totally digital station, Maestro is designed for on-air audio and information control. It combines music, commercials and copy allowing full integration with other radio facility operations. Features include interfacing to most music-scheduling systems, the auditioning of music by intro, hookline or outro, and the playback of three audio files simultaneously. Audio searches can be sorted by type, length, title or artist.

Dalet Digital Media displayed its latest Windows-based system and highlighted its new PowerSat downlink control system, which enables stations to receive documents and other commu-

nication via a satellite data channel. Dalet systems offer an open-architecture design and can operate as a standalone workstation or it can be interconnected via Ethernet LAN. Networked audio files are centrally stored, providing multiple-user access to all recorded materials. Current applications include cart machine replacement, live assist or walkaway broadcast automation, multitrack audio production and newsroom activities. Three sound files can be overlapped, allowing voice-overs to be positioned anywhere within a crossfade region.

LPB upgraded to 486-based systems for operation of the Satellite Automation Live Studio Assistant (SALSA). The open architecture allows for future system upgrades. Up to 21 user-defined format clocks can be programmed with an unlimited number of events per hour, making interfacing to satellite networks an easy task. Up to 15 stereo satellite feeds can be accommodated. A powerful search engine allows spots and music to be located by title, artist, theme, album or time. Most popular traffic- and music-scheduling systems can be downloaded into the SALSA.

The Scott Studios digital audio and automation system uses touchscreen technology to provide virtual instant access to stored audio files. The system is capable of spotting obstacles in upcoming playlist events and warning operators of imminent problems. Twelve audio events are tested in advance, and the user is notified of missing or damaged files. Missed events are flagged via the make-good button and can be inserted later.

Circle (125) on Action Card

Digital audio workstations and hard-disk recorders

By Brian Sanders

Brian Sanders is senior producer at KNPR, Nevada Public Radio, Las Vegas.

Digital audio workstations are hardly the novelty they were when introduced a few years ago, but they still are responsible for many clogged convention aisles. Portability, pricing and power were the themes in this spring's DAW wars. Hard-disk audio recorders, another means to a similar end, also drew crowds.

DAW platforms

One of the more popular DAWs is Orban's DSE 7000, which premiered some long-awaited hardware and software upgrades. Today's DSE ships with a 24-bit internal DSP board and version 6.0 software, including Orban parametric equalization, Optimod compression and Lexicon reverberation. Eight different digital effects modules – 16 additional with the optional daughterboard – may be inserted at any of 12 patch points in the DSE. Factory presets are designed with the broadcaster in mind: standard production EQs (telephone sound, for example) are included. Parameters are all adjustable and storable. Time-Fit will expand or compress audio up to 25% without pitch shift. The new software is automatically distributed to all prior DSE users; the new hardware is available as a retrofit.

Orban also announced that the DSE 7000 is fully compatible with the ENCO DAD system through a combination of software and a network card. A network adapter card is added to the DSE 7000, which makes it appear to the LAN as another DAD workstation.

SADiE has a big sister (and a few young cousins). New from the UK's Studio Audio is Octavia, a modular, expandable editor with six times the power of her older sibling. Using the new SADiE3 software, up to 10 8-track SADiE modules can be chained together for significant increases in processing power and storage capability.

Also making its debut is SASCiA, a bridge to a real-time network capable of transferring multiple channels of digital audio between SADiE and Octavia workstations via ATM. Meanwhile, for engineers, reporters and producers on the run, the new SADiE Mobile stores field recordings in SADiE format on a portable, removable (or SCSI-interfaced) hard disk, thus eliminating the time-consuming uploading step of the editing process.

Roland introduced the VS-880, an integrated 14x8 mixer/recorder. Each primary track offers eight virtual tracks, for a total of 64 tracks per project. Storage is a built-in 540MB hard disk or optional 1GB removable Jaz drive from Iomega. Two studio-quality effects processors can be added using the onboard expansion slot. Roland also showed the DM-800, calling it the industry's only truly portable workstation. Much attention was directed toward Roland's new PMA-5 Personal Music Assistant, a pocket-sized unit with sampled instrument sounds, digital reverb and chorus, 8-track sequencer and 100 preset styles – basically a music bed in a box.

DAW functions for radio automation systems

Broadcast Electronics (BE) presented AudioVAULT for Windows 95 and also several other innovations. NewsBoss provides full copy-management capabilities and can also merge news audio clips with copy. Users can preview stereo actualities, download feeds or pull library clips. The system is compatible with BE's AudioVAULT or can operate as a freestanding system.

The current version 6.3 software of ENCO Systems' DAD_{PRO} digital audio delivery system, now includes ES-EDIT graphic waveform cut-and-paste assembly editor and ES-2C multiple DSP board support, previously available only as options. The company also released software drivers and architecture that substantially boost network performance for compressed and non-compressed audio file transfer.

Hard-disk audio recorders

360 Systems has added another hard-disk recorder to its product line, this one designed to allow fast, simple editing. The Shortcut is a 2-track recorder that can cut, paste, insert and scrub audio for phoners, interviews, news clips and promos, using dedicated controls and an LCD screen. (See "Pick Hits of NAB 96," p. 44.)

The Fostex D-80 records onto a removable 3.5-inch 850MB IDE hard disk, resulting in 18 minutes of uncompressed track time (16-bit, 44.1kHz). An optional plug-in 1.3GB drive raises that to 30 minutes. A program change function allows the hard drive to be divided into five independently recordable segments. Copy/move functions are allowed across different tracks and the D-80 can be cascaded to other D-80s (or the previously released DMT-8 hard-disk recorder/mixer) for up to 24-track recording.

Circle (127) on Action Card

NAB 96 review

Microphones and mixers

By Terry Skelton

Terry Skelton is an audio consultant and trainer based in Bucks County, PA.

This year saw the introduction of several microphones and many wireless products, along with a number of mixing console innovations. Many of these new items are particularly applicable for field operations.

Microphones

Sennheiser introduced "the world's smallest" cardioid lavalier mic, the MKE104, which is interchangeable with the MKE102 omni on various cables and clips. The MKE104 is highly immune to moisture and perspiration and the frequency response has been optimized for voice with a rise at 8kHz. Also shown were the HMD25, a lightweight combination headset with a supercardioid dynamic mic and the NB2, a clever, plastic-covered wire headband for all of the company's small lavalier mics. In new wireless systems, Sennheiser offered an entry-level UHF system, the SET 1081-U (hand-held) and SET 1083-U (lavalier), with 16 switchable frequencies in a diversity receiver. Another new diversity UHF receiver is the EM2004, which is tunable across up to 24MHz. This allows it to be used anywhere in the world.

The Neumann U47 microphone was a legend, and after years of requests from customers, Neumann is offering the M149 large-diaphragm, tube-powered mic to fill that demand. Using the U47 capsule and a new tube, the company has created a sound it feels is similar to the original. In the process it also made the world's first transformerless tube mic. The M149 has nine polar patterns and a 9-position high-pass filter.

Shure Brothers' Beta microphone line has been expanded and enhanced. The Beta 52 and the Beta 56 have been added and the Beta 57A and 58A have had their frequency responses improved (along with some mounting improvements and a new hardened grill on the 57A). The Beta line now totals five microphones, including the Beta 87 condenser. Shure also introduced its new UHF diversity wireless mic system, available as either a single or double receiver in one rack space. The system is frequency-agile through 191 frequencies. Two alkaline AA batteries provide 12 hours of transmitter operation.

The unique look of the Stedman N90 studio dynamic mic is now available in the SC3 studio condenser version. Offering a published frequency response of 25Hz to 20kHz and a noise level of 13dB, this mic also includes a 2-position attenuator and three choices of response curves. The mics are being handled by LPB.

Electro-Voice (EV) introduced three mics. The CO2 mini-lavalier is designed to be painted any color with acrylic lacquers. EV also showed the RE1000 "true" condenser studio supercardioid with transformerless output and a low noise level of 14dB. This mic looks somewhat like the company's top-of-the-line RE2000 and is intended to provide many of the 2000's strengths at a lower price. Also new is the RE200, an externally biased cardioid condenser intended for home/project studios and instrument use in tight spaces. EV also displayed its classic 635A with a new long handle called the 635L, available in fawn, beige or black.

Beyerdynamic had two new hand-held transmitters to go with the NE 600 UHF diversity wireless receiver: the S 600 and SEM 600. A low-profile series of announcer headset/mic combinations, such as the DT 250, are now available with a choice of omni-electret or supercardioid dynamic boom mics. Also shown was the MCE 84 electret condenser cardioid mic, which will run off of phantom power or an internal AA battery. The company also introduced two moderately priced microphone fishpoles, the MZA 717 (5.5 foot) and MZA 718 (10 foot), made of lightweight aluminum with felt-covered handles.

Mixers

Intended for mid-market TV stations, Wheatstone's SP-8 incorporates many of the features of its higher-end consoles. The console includes four mix-minus buses, two mute masters, full EQ and eight submasters. All indicators on the board are LEDs. Wheatstone also had its new digital radio console, the D-500, which looks and acts like a high-end analog broadcast board, but accommodates analog or digital inputs and outputs. It includes on-board telephone processing, separate mix buses for speech and music to allow different processing and machine-sequencing functions.

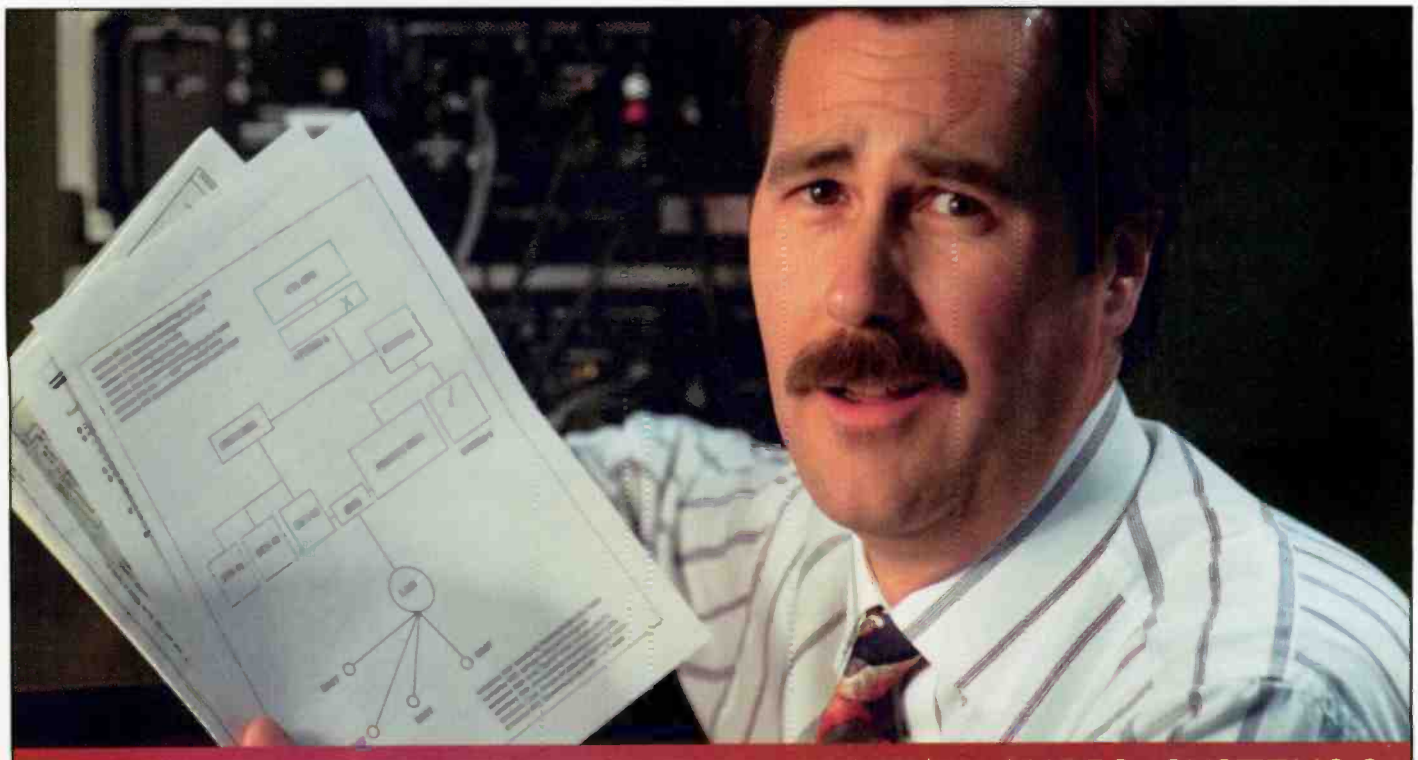
Harris demonstrated the DRC-1000, an all-digital radio broadcast console that is easily expandable from its nominal 10-input channels. Up to four analog inputs can be digitally converted internally and/or more A/D converters can be added externally. AGC, compression/limiting EQ, gating and panning are standard, with delay and noise reduction as options. These can all be assigned channel by channel as desired. The console is a joint venture with Zaxcom Audio.

Mackie introduced its version of the 1604, the CR1604-VLZ and kept the price close to the original. Now you get four submaster buses, 16 mic pre-amps, a swept mid-frequency EQ and longer faders. The MS1402VLZ and MS1202-VLZ are also updates that include the very low impedance (VLZ) circuitry, which reportedly helps keep noise and crosstalk down. Ultramix universal automation has been added to Mackie's line of audio consoles, although it will work on just about anything that has insert points. The new SR40-8 console is designed for sound reinforcement with a nod toward broadcasting functions like sports remotes. Among its features are 40 mono inputs, four stereo returns, eight submasters, full mute automation, an 11x4 matrix and an optional redundant power supply.

Ward-Beck introduced a line of audio problem-solvers called PODS with seven half-rack boxes designed to answer audio needs from headphone amplifiers to stereo peak/vu level indicators. The company also showed its Renaissance audio mixer for television. Available with mono input modules with mic pre-amps and stereo line input modules, the console incorporates VCA faders on each module and eight VCA submaster output channels with assignment to stereo master output channels.

For those who need to combine up to eight line-level sources into a stereo or mono mix, Henry Engineering offers its StereoMixer. A level control for each input provides adjustment from up to +10dB of gain, and there is a separate mono output that is a sum of left and right. It can also operate as four stereo channels, and it's packaged in the familiar Henry "form factor."

Alongside its many ISDN codecs, Comrex displayed its Codec Buddy



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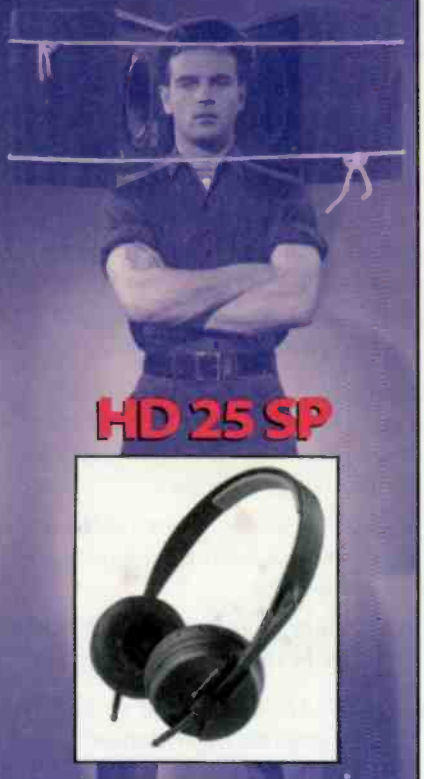

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Circle (38) on Action Card

NAB 96 review

mixer. It includes a 4-channel mixer, four headphone outputs, a PA feed, a POTS telephone interface, DTMF dial pad and a POTS-line frequency extender.

A couple of tiny but tough metal boxes from JK Audio might solve some of your audio mixing and interfacing problems. The RemoteMix C+ is a portable 3-input mixer with built-in DTMF dial pad and hybrid that runs a claimed 36 hours on two 9V batteries. The QuickTap plugs in between a telephone handset and instrument and provides a solid audio output connection. The Pureformer is a 2-channel isolation transformer with RCA jacks used to cure ground loops and DC paths that cause audio problems, especially with computer sound cards.

Shure has improved its portable stereo field mixer, now the FP33, by adding high-precision input pots, internal headphone level adjustments for external program and seamless switching to battery backup. Price has been kept the same as the FP32A.

Logitek introduced Serial Sound, a 32-bit digital on-air console. It includes rate conversion on digital inputs, 20-bit conversion, assignable channels and 16-character LCD displays for identifying each input and monitor channel.

Auditronics debuted NuStar, a fully modular digital mixer for on-air use. The 22 universal positions on its control surface mainframe allow any module to be placed anywhere. The control surface frame is connected to a rack-mounted DSP frame and numerous standard and optional modules are available for both frames. Sample-rate conversion is standard on the console's digital inputs and optional on its digital outputs.

Tascam showed its new 1600 series 8-bus mixers, available in 16- and 24-channel configurations, with a full set of features, including direct and group outputs on each channel and eight XLR mic inputs. Tascam also had an 8-input microphone mixer, the MA-8, designed to support its DA-88 digital audio recorder or for expanding the number of mic inputs on another console.

The model 750 audio mixer from Studio Technologies Inc. is an extremely flexible and well-equipped rack-mount remote mixer. This stereo 2RU device seems to have every feature ever dreamed of by an engineer, including a digital ID recorder that can trigger a set of spot frequency tones, an AFL bus, dual analog meters illuminated by rows of white LEDs and three isolated line-level stereo outputs.

Circle (127) on Action Card

Audio processors and recorders

By Christopher H. Scherer, CBRE

Chriss Scherer is chief engineer of WMMS-FM/WHK-AM, Cleveland.

Audio processing developments at NAB 96 ran the gamut from tubes to DSP, while advances in removable-media recording seemed to favor optical technologies.

On-air audio processing

Orban's news included the introduction of the OPTIMOD-FM 2200 processor. It is based on the ideas in the popular OPTIMOD 8200, but with reduced control capabilities and a significantly lower price. (See "Pick Hits of NAB 96," p. 44.)

Among many other devices at its stand, Inovonics presented the model 716, also called David II – a cost-effective FM processor and stereo generator.

Cutting Edge Technologies showed the Unity series of processors for FM and AM that are now available with AES/EBU inputs.

Eventide has released its latest profanity delay, the BD500. This 1RU device is a stereo unit, and has the ability to divide its delay time into several segments for dumping. (See "Pick Hits of NAB 96," p. 44.)

Symetrix showed its 610 profanity delay. It can split its delay time into two segments allowing for successive memory dumps.

CRL has begun shipping its DP-100 digital processor. The all-in-one processor has a touchscreen display for control of its parameters.

Studio audio processing

Aphex continues to implement its new tube technology called Tubessence with the introduction of the 109 Equalizer and 661 Expressor. The 109 is a 2-channel 2-band or 1-channel 4-band equalizer, and the 661 is a compressor/limiter that can be operated in manual (Expressor) or automatic (Easyrider) mode. The 108 Automatic Compressor was also shown. It is a solid-state unit that uses the same Easyrider circuit found in the 661.

Superscope displayed the IS5022 and IS5021 A/D-D/A processors. Both of the units have 20-bit performance and analog and S/PDIF inputs and outputs. The IS5022 also has AES/EBU ins and outs. They include sample-rate conversion, jitter removal, varispeed, digital level indication and control, plus a variety of audio processes, such as de-noising, de-clicking, stereo image adjustment, compression/expansion and tonal adjustments.

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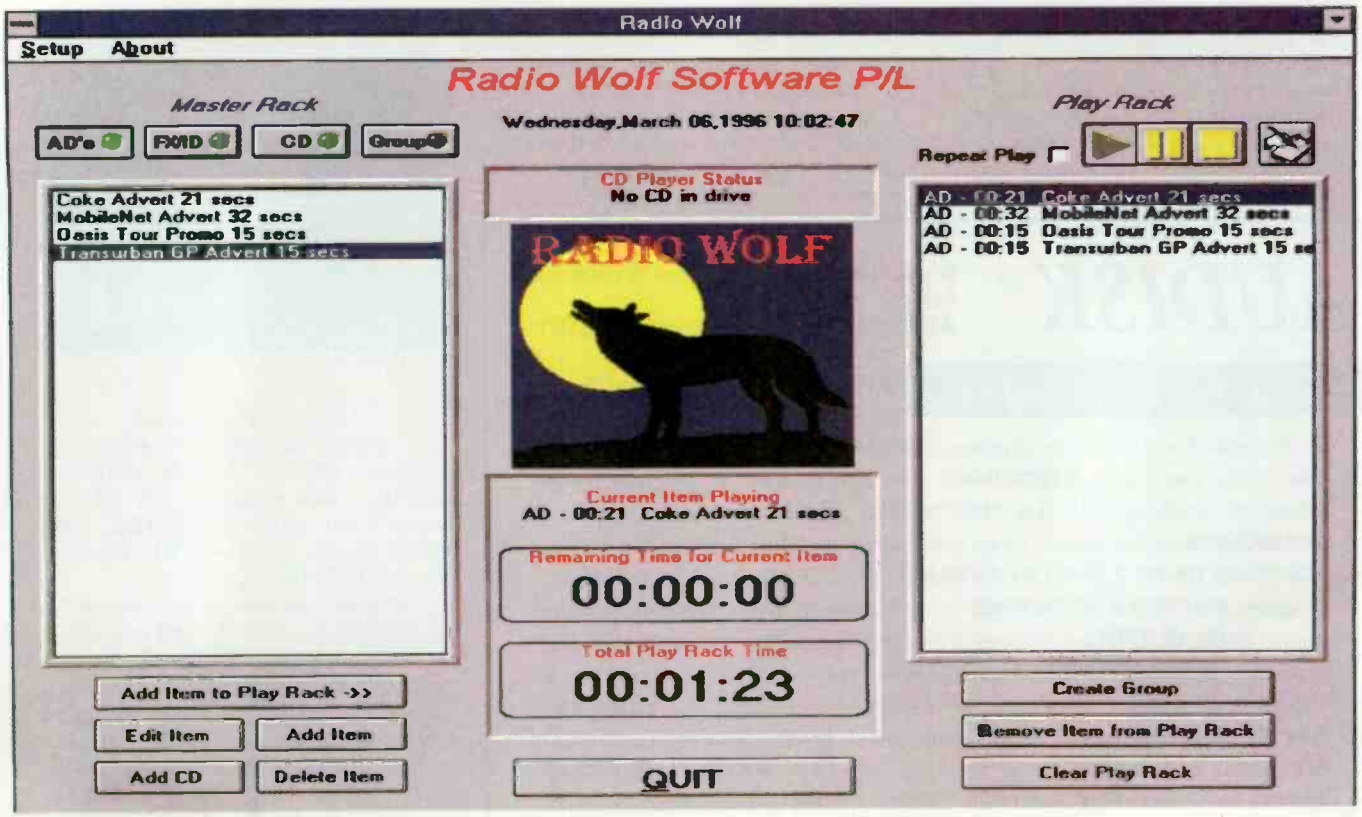

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NAB 96 review

Roland had the SN-700 noise/hum eliminator, a stereo noise eliminator designed to identify, analyze, isolate and remove specific frequencies and noise. Also shown was the BOSS VT-1 voice transformer, an inexpensive yet powerful device for altering and effecting the human voice. (See "Pick Hits of NAB 96," p. 44.)

Dolby Labs presented the DP503, a format converter that can handle analog, AC-2, AC-3 and MPEG Layer II. The DP561A is an AC-3 encoder capable of converting up to three stereo inputs simultaneously.

Eventide has added a member to the Ultra-Harmonizer family with the DSP4000B multi-effects processor. A variety of presets and effect storage locations allow extreme flexibility.

Lexicon announced the inclusion of its reverb circuitry in the Orban DSE7000 workstation platform. The company also released the PCM90 digital reverb and several upgrades for the PCM80 multi-effects processor, including pitch shift and a series of new effects.

Symetrix has made a small change to the 421 processor, now calling it the 421m. The AGC/leveler now has a built-in mic pre-amp. New to the line is the 422, a stereo version of the original 421, as well as the 620 A/D converter, capable of 20-bit performance.

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Audio recorders and players (removable media)

Pioneer unveiled the CAC-V5000, a 500-disc, dual transport CD jukebox controllable through RS-422. Also shown was the CDJ500II DJ CD player and the PDR-99 CD recorder.

Fidelipac continues its support of the DYNAMAX DCR1000, and now offers two drive options: the already popular triple-density (13MB) floppy, and now a 230MB MO drive to allow up to almost two hours of stereo FM-quality audio.

Fostex showed its CX-8, an ADAT-compatible modular digital multitrack, along with the company's wide range of DAT recorders.

Studer was busy with several new items. The D741 is a second-generation CD recorder. The company also showed the D424-2 MO recorder.

DENON is continuing its support of the MiniDisc format with two new entries: the D-045R (a MiniDisc duplicator that copies audio up to 3.5x real time) and the DN-1100R (a MiniDisc recorder that features hot-start buttons for instant access to any 10 cuts on a disc). Also shown was the DN-1400F and DRD-1400, both 200-disc CD jukeboxes, for audio CDs and CD-ROMs respectively.

Marantz has added several new products. The PMD-820 and PMD-850, both of which are pre-amp selectors with an AM/FM tuner and a CD player. The PMD-350 boasts a CD player and cassette deck in one unit. Both of the components can be operated separately. The CDR-615 and CDR-620 are CD recorders, designed to allow an inexpensive means of recording compact discs.

Nagra is shipping the ARES-C digital solid-state field recorder. This recorder has the similar size of the analog Nagra machines, but records on PCMCIA

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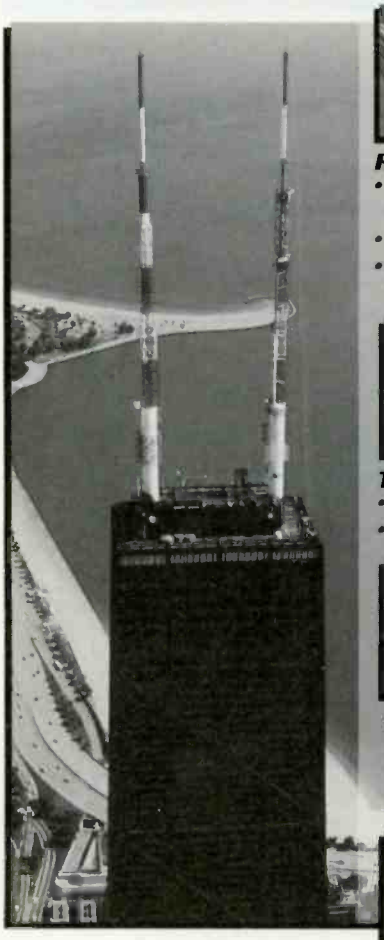

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NAB 96 review

memory cards. It also can perform basic editing and can connect directly to an ISDN line for transmission.

Panasonic has added the SV-3800 DAT recorder to its line. It is based on the SV-3700, but adds some improvements. The company also presented the MDA-1, an ADAT-format modular digital multitrack machine with XLR and RCA I/O on the back panel.

If you could get through the crowds at the Sony stand, you'd have seen the MZ-B3 portable MiniDisc recorder/player, which is about the size of a Walkman cassette deck. The CDP-L3 CD player is a consumer-style unit, but it includes balanced inputs and outputs.

Tascam has continued its additions to the digital recorder line with the MD801-P and MD-801R MiniDisc player and recorder. The DA-60 MkII DAT has time-code capabilities, while the DA-20 DAT offers many features at an economical price. The Portastudio line adds the 564, a digital mixer/recorder allowing 4-track recording on a MiniDisc. It employs the MD data format, providing 37 minutes of 4-track recording per disc. The 302 is a dual cassette deck with auto-reverse.

Circle (128) on Action Card

Audio backhaul, program distribution, monitoring and accessories

By Kevin McNamara

Kevin McNamara is president of Exegesis Technologies, a developer of applications for computer/telephone integration and computer-based mapping in New Market, MD.

Certain analog technologies will still have a place in broadcast facilities for awhile, but face it, digital audio and video is everywhere. Most of the digital-based equipment found on the floor of NAB 96 has evolved from the user-defiant bit boxes of the past to far more elegant, solution-based products. Many take full advantage of ISDN, which is available in most locations for a fraction of the cost of Switched-56 or dedicated digital circuits.

Audio backhaul and STL equipment

The Comrex NEXUS ISDN audio codec is a small package that incorporates a bidirectional G.722 codec, a BONDING-equipped terminal adapter (TA) and an NT-1. It accepts mic or line-level inputs and a mixer is provided to balance the send and return signals for monitoring at the remote site. Setup and dialing is accomplished with a front-panel keypad and backlit LCD display. A 10-number auto-dial feature is included. The unit will provide 7.5kHz audio at 56kb/s or 64kb/s and 15kHz audio (using Comrex's unique Turbo G.722 algorithm) at 112kb/s or 128kb/s. Comrex also showed its wide, established range of MPEG Layer 2, G.722 and apt-X codecs.

Intraplex is shipping its model 4464, a small, lightweight package that includes bidirectional MPEG-1 audio Layer 2 or G.722 coding, an ISDN TA with BONDING and S/T or U interface. It can be operated as mono or stereo, with setup accomplished through a modem, local PC or optional hand-held terminal. Setup parameters are stored in flash memory. The unit will store up to 10 configurations that can be accessed through a one-touch call setup. Auxiliary RS-232 data at rates up to 9,600b/s can be carried along with audio. The company has recently reduced the price of the 4464,

making it even more attractive to broadcast users. Intraplex also introduced AES/EBU audio interfaces for its T1 and E1 audio multiplexers.

Telos introduced the ZephyrExpress, which takes the features of the company's rack-mount Zephyr codec/TA and combines them with a mixer and audio limiter into a rugged field package. The unit boasts compatibility with MPEG audio Layers 2 and 3 plus G.722 coding. It can deliver up to 20kHz stereo using Layer 3 (in joint stereo mode). (See "Pick Hits of NAB 96," p. 44.)

QEI has revised its earlier 902MHz-928MHz unlicensed spread-spectrum Quick-Link system and introduced Quick-Link II. This time it's using the 2,400MHz-2,485MHz band (still no license required) for its direct-sequence spread-spectrum transmission of uncompressed digital stereo audio. The system consists of two terminals, an optional antenna and optional PC control software. A well-written manual accompanies the system.

POTS hardware

In the "how many bits can we push through a POTS line" department, there are several offerings of remote broadcast solutions that use standard analog dial-up lines. These products each include an audio mixer, a low bit-rate codec and a V.34 modem.

The Scoop Reporter from AETA (marketed by Harris Broadcast) can provide up to 8.4kHz of audio with a 28.8kb/s connection, although the company claims a more conservative estimate of 7kHz based on a more typical connection rate of 24kb/s (especially for long-distance calls). The unit accepts two mic and one line input and provides output to headphones and a line feed. It employs a special algorithm optimized for speech called Code-Excited Linear Prediction (CELP) that offers low delay and few artifacts at these very low bit rates. (See "Pick Hits of NAB 96," p. 44.)

The FieldFone from Musicam USA (formerly CCS Audio Products), introduced last year, can provide 6.5kHz of audio in both directions using an enhanced version of the MUSICAM compression algorithm. New features incorporated into the FieldFone since its introduction allow it to work with connection rates as low as 14.4kb/s. Another new device from the company is the StudioFone, a rack-mount mate to the FieldFone for the studio end of the backhaul path.

Marti Electronics unveiled the

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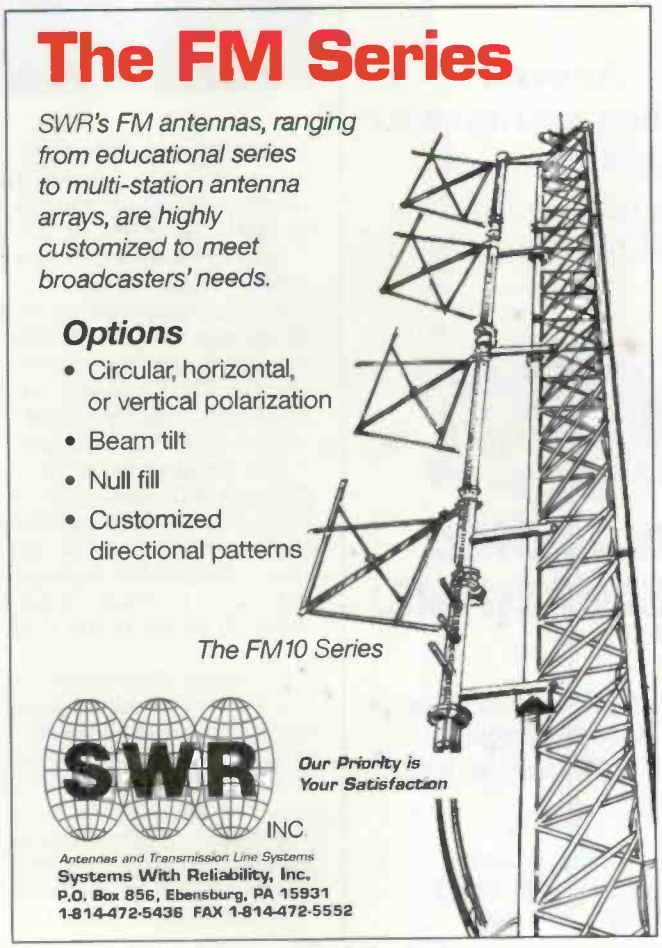

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Question:
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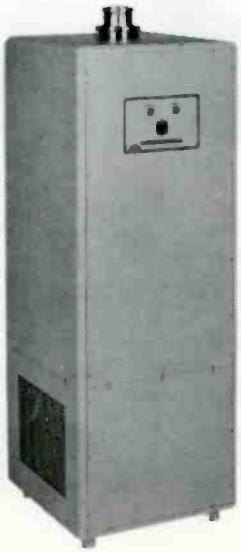

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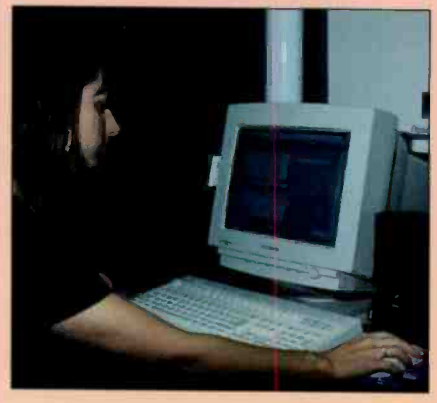
NAB 96 review

SMARTI codec, also intended for POTS-line usage. It can operate in one of three modes: 7.5kHz audio, reduced frequency response with reduced delay and as a standard analog POTS hybrid. It provides a 4-input mixer (each mic/line switchable), a 10-number memory, plus two relay closures for remote device control. A handy LCD up-timer is included to assist the remote operator or talent in timing breaks and feeds.

Going mobile or need a simple solution for remote broadcasts or remote newsgathering? The Cellcast RBS400 integrates a 4-channel audio mixer, frequency extender and a 3W cellular transceiver into a neat package. The unit can provide a frequency response of 300Hz to 3kHz or 50Hz to 2,750Hz with frequency extension from a cellular or landline connection.



Gentner has enhanced its line of telephone interfaces. The TeleHybrid is now capable of creating its own mix-minus, and the TS612 is able to connect to additional units for greater line access.

Telos Systems introduced a client/server component to its Call Screen Manager talk-show software for Windows (3.x, 95, NT), and also presented its Internet Audio Suite. The latter is a system designed for high-quality streaming audio playback (full-time or on-demand) on the World Wide Web.

Digital distribution services

E-mail is becoming a popular alternative to slow and expensive hand-delivered mail for exchanging text and data. It was only a matter of time before someone applied this concept to the speedy delivery of information (i.e., spots, audio clips, music, etc.) to broadcast stations. These "store-and-forward" systems allow audio files to be transmitted to a central server by a production studio and then sent to single or multiple destinations (stations) as appropriate, using nonreal-time transmission on ISDN or digital satellite delivery paths.

About two years ago, Digital Generation (DG) Systems was the first company to provide such service to selected ad agencies and radio stations. Now its network links nearly 4,500 stations in the United States and Canada with hundreds of programming and advertising suppliers. At NAB 96, DG Systems unveiled the ADvantage Audio Communications Server (ACS), which it calls "radio's first intranet." It combines client/server architecture with Netscape Navigator software, allowing multiple users around a radio station to access audio and data files from their desktops. DG also announced work in progress on integration with radio automation systems from ENCO Systems, Media Touch and Register Data Systems.

Meanwhile, the Canadian-based Digital Courier International (DCI), which claims to be the world's only 2-way audio and data distribution network serving the broadcast industry, also broke some important news at the show. DCI and Arbitron announced the formation of The Radio Exchange, which takes advantage of DCI's data communications capabilities and is intended to facilitate the communication of ratings and other sales-related information between stations and their respective external marketing agencies. This includes ratings, avails, traffic instructions, confirmations, audio and more. These services may be useful to the many fast-growing station groups in the United States in maintaining or improving their interstation communications.

A third entrant to this field is Musicam Express from Virtual Express Communications L.L.C. (Virtex). Its subscribers can receive data either by ISDN or from the company's StarGuide II addressable digital satellite receiver. The system can store spots, traffic information or even entire network shows. Virtex offers two interesting features, the Windax PD Control and the Jockbox. Windax allows you to dynamically preview the various audio sources and sequence those sources as needed. The JockBox is a device that would typically be located in a studio and allows the operator/air talent to play selected audio cuts (as programmed by WinDax) at the touch of a button.

In a more generic context, NSN Network Services introduced Spotboxx, a "black box" solution that stores selected audio sources (spots, news, short programs) and can replay them when required. It works in conjunction with any satellite audio delivery system.

NPR Satellite Services offered hardware (manufactured by ComStream) and digital audio SCPC connectivity via C-

band satellite transmission. Both temporary and full-time services are available.

Audio monitoring and accessories

LPB announced that it will distribute the Australia-based Hayes line of near-field monitor speakers. They feature a unique fractal spatial system that provides stable stereo imaging at a price that is affordable for the typical radio station.

Studer presented an upgrade for the D827-MCH DASH recorders with a 20-bit A/D converter. Its D19 series of pre-amps includes the MicValve, a tube mic pre-amp with two channels that has a variety of controls for affecting the sound of the pre-amp and the MicAD, which has eight solid-state inputs. Both have 20-bit A/D converters.

Whirlwind introduced The Brick, a compact, battery-powered mic-to-line-level pre-amp with an independent headphone output. Housed in a rugged extruded aluminum chassis, the unit's input is adjustable over a 60dB range and it provides 18V phantom power. The headphone output has its own level control, and the unit is powered by two 9V batteries.

Benchmark Media Systems showed a new, high-quality A/D converter, as well as the AD2004. It provides four channels of 20-bit conversion with metering in a one-third rack-unit space. The AD2004 has low THD+N and ultralow jitter.

If you have a master clock system, ESE has introduced a new "self-setting" analog clock. It can use SMPTE/EBU, ASCII or ESE time-code inputs.

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Intercoms, audio distribution and test equipment

By Andrew McHaddad

Andrew McHaddad is an audio maintenance engineer at The Nashville Network (TNN), Nashville, TN.

As broadcast facilities grow, routing audio and communications around the shop become increasingly important. Maintaining the larger facility with appropriate test equipment also becomes critical. It's, therefore, no surprise that NAB 96 presented numerous advances in these areas, typically based on digital and computerized systems.

Routing/distribution

ITC showed WIN-ARM2, a Windows software package allowing for almost unlimited control of its well-established analog audio switcher. Placing the control architecture in the computer allows for standard PC hardware to be implemented in the control system, such as modems, parallel control and timed

operation with unlimited file quantity. This is an improvement over the 99 maximum files available with the embedded controller.

Sierra Audio Systems showed its 16000 and 32000 audio routing switchers, designed to provide small to moderately sized facilities with cost-effective, high-quality routing systems. (See "Pick Hits of NAB 96," p. 44.)

Audio Technology Incorporated (ATI) had a prototype of the newest of the Nano-Amp series, which is a stereo version of its 3x1 one-third rack-space mixer. Besides a headphone output and stereo metering, the mixer also has input-channel high-pass filters and a tone oscillator.

Opamp Labs, long known for press audio and video distribution systems, displayed an improved battery life unit for audio-only and audio/video mixed devices. The future may bring color LCD video monitoring as an option and built-in audio monitoring, as well.

Leitch showed a variety of digital audio routing switches and routers. The

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NAB 96 review

VIA32 series of routing switchers gives the user several input and output options to provide a flexible method for switching the analog and digital signals in your facility (up to 32x64). Leitch also showed modular converters and distribution amps for AES/EBU audio. Leitch's line of AES Glue distribution amplifiers feature automatic cable equalization, data reclocking, jitter reduction and error correction.

Otari introduced the Lightwinder, a multichannel digital link that carries up to 64 channels of audio on a fiber-optic cable. Each input has a mic pre-amp, phantom power and mic gain-trim pot.

NVISION, after success with large-scale AES/EBU routers, has developed a smaller router for nonlinear production bays and smaller pre-production rooms. These routers are synchronous, allowing the individual signals to be clocked to a master reference. This is important if the switched output will feed a live destination as it is being switched.

Wire and cable

New from Gepco is a superlow-temperature outer jacket material called GEP-FLEX that can maintain flexibility to -60°C.

Audio Accessories showed its line of value-added wire assemblies. There are signs of heavy commitment to the area of patchfield pre-assembly with the Project Patch studio wiring and patching system. Audio Accessories can produce an entire facility's patching architecture prior to installation.

Switchcraft provided a sample of a PLJ 1/4-inch TRS patchfield connector that uses the same common and efficient connector scheme as the standard TRS connector that has long been the standard for in-line connections. Production should begin in late 1996.

Canare introduced a line of constant-impedance 110Ω cable for the distribution of AES/EBU signals. The cable is sold in larger gauges (for longer runs), smaller conductors (for punchdown), in multiconductor forms and with a foil shield.

Test and measurement

Audio Precision (AP) had on display the full range of test equipment, including the PC-based System Two hardware and software. AP's multitone test signal is ideal for on-air audio path testing. This test allows the Audio Precision unit to be at the receive end of a chain as a recording of the Audio Precision generator's test signal is played back from any analog or noncompressed digital format. The 250ms burst is able to test for level, crosstalk, THD, IMD and phase with

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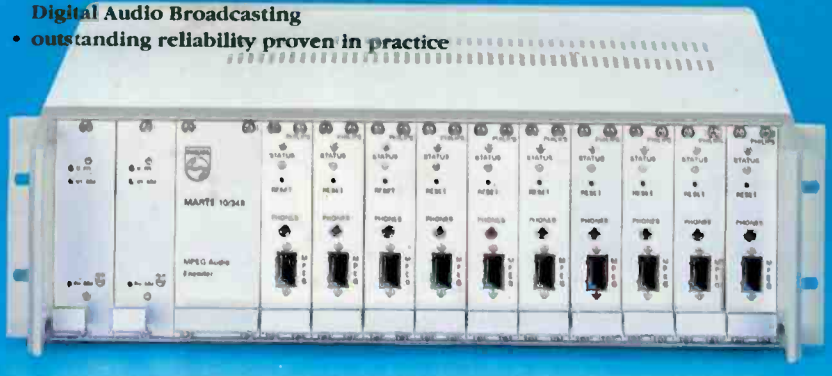
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the results remaining in the test set at the receive site. If the PC is equipped with a fax/modem, the results can be automatically faxed to the remote playback site for analysis.

Neutrik had a brand new device called the Rapid-Test RT-1M. The 1RU chassis and attending Windows software can provide multitesting using a short burst of a calibrated test signal. Tests include level, frequency response, distortion, noise and S/N ratio. One unique feature is its ability to interface with third-party industrial control software, allowing the operator a great measure of creativity in designing the most efficient front end.

Tektronix presented the 764 digital audio test set, which allows the monitoring of two AES/EBU signals plus phase display and bar graph metering. Also from Tektronix was a color LCD screen for its AM700 audio test set, along with its upgrade to 20-bit A-D converters and a redesigned power supply.

Circle (130) on Action Card

RF transmission equipment

By Mike Tosch

Mike Tosch is chief engineer at KPBS-FM, San Diego.

The NAB show has consistently been the premier showcase for the introduction of new broadcast transmission equipment. NAB 96 was no exception.

Broadcast transmitters and accessories

The BYTECAST Series 802D, a PC-based 50W digital FM exciter with sophisticated DSP technology, was shown by Continental Electronics. Using Super Harvard Architecture Computer (SHARC) technology, the 802D digitally generates pre-emphasis, audio processing, composite baseband processing, stereo and subcarriers. Using direct conversion from the DSPs, an on-frequency FM RF signal is generated. A front-panel LCD display provides the user interface for the exciter. (See "Pick Hits of NAB 96," p. 44.) In addition to upgraded versions of its proven AM and FM transmitters, Continental also displayed an L-band DAB transmitter manufactured by newly acquired Telefunken Sendertechnik of Germany. This 2.304Mb/s transmitter is currently in use at nine sites in Germany.

Harris Corporation introduced a 5kW solid-state FM transmitter as part of its Platinum Z series. The transmitter includes the Harris Digit digital exciter, and its broadband design and internal harmonic filter make it ideal for quick frequency switching when used as a common standby at combined sites. A 10kW version should be available soon. A new

low-cost FM exciter, the SuperCiter, was also on display. For the European market, Harris introduced a line of VHF DAB transmitters in the 300W to 2kW range.

The Lynx, a DSP-based digital audio stereo generator, was introduced by Broadcast Electronics (BE). It features AES/EBU inputs and is ideal when a digital audio link is employed from the studio to transmitter site for conventional analog transmission. Two outputs are available to feed the main and alternate transmitters. The PowerMizer from BE is a new solid-state 1kW AM transmitter designed for low-power stations on a budget. It is highly efficient (73%) and features a built-in AM stereo generator.

New from LPB is a type-accepted Part 15 FM stereo transmitter. The transmitter is ideal for use in auditoriums and other small venues. In addition to this low-power transmitter, LPB introduced a new leaky RF cable designed to radiate a VHF FM signal up to 250 feet from the cable location. Applications include distribution of a college radio through a

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Circle (9) on Action Card

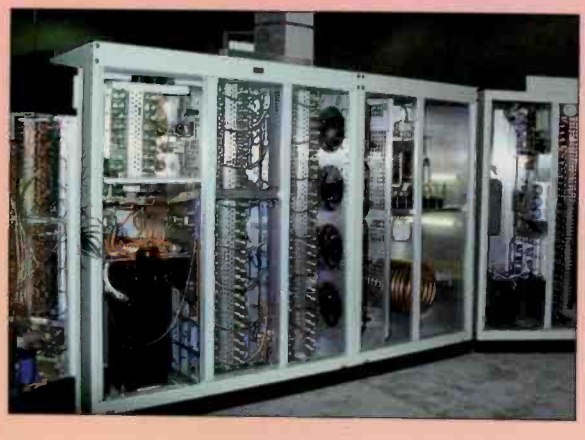
dormitory or other campus buildings.

The new SST-150 FM exciter from Energy-Onix may be used as a low-power transmitter or translator station. The 150W exciter includes an internal harmonic filter and has been designed to drive its new single tube, grounded grid, 2kW transmitter. In the high power arena, Big Bertha is a compact (2-cabinet) 50kW FM transmitter featuring dual output triodes with a 4kW solid-state driver. In the event of a failure of one of the tubes, the transmitter will continue to operate at 50% power.

The model 630 is a precision FM receiver for use in translator or off-air demod applications from Inovonics. It features two composite outputs, selectable IF bandwidth and a multipath indicator. Inovonics was also busy showing the model 710 RBDS encoder and model 510 RBDS decoder (which connects to a composite output from any modulation monitor), along with the model 708 stereo generator.

The Italian manufacturer ITELCO is now distributing its line of FM equipment in the United States. FM transmitters in the 2kW to 12kW power range featuring a 3-phase switching power supply were shown. Also on display was an L-band DAB transmitter suitable for use in Europe and Canada.

Russian tube manufacturer Svetlana's inventory of tubes is now quite extensive, covering audio, RF and microwave applications. The 100+ year-old company traces its roots to St. Petersburg, Russia, although it now operates offices in Alabama and California. It was one of the first large Russian firms to be privatized, and it has since become a part of one of the first Russian-U.S. partnerships, employing about 3,000 people in both countries.



In the subcarrier marketplace, SCA Data Systems continues to break new ground with its NT series of high-speed, high-performance datacasting systems. The company also presented its RD-57 RBDS generator.

Dielectric Communications introduced an FM Interdigital bandpass filter for low-power FM transmitters. It is physically smaller than a conventional bandpass filter and each filter is custom designed.

Antennas and accessories

A new "rototiller" antenna from Jampro Antennas was introduced this year. The antenna is capable of medium powers and is fed using 1 5/8-inch transmission line. A new line of tapered RF line reducers were shown, including one which converted 6 1/8-inch line to an N-style connector.

The FMU high-power FM antenna bay is new from SWR, Inc. Each circular polarized bay handles up to 80kW with 4-inch transmission line. With a brass and copper construction, long dependable service is assured. SWR also displayed a new 2.5GHz MMDS antenna designed to handle 500W. Models are available beginning at four bays and may be vertically or horizontally polarized.

A commercial-grade telescopic mast was introduced by Will-Burt. The design, similar to the military version, uses a stainless steel foil column, that will raise 200 pounds up to 38 feet.

Circle (131) on Action Card

Circle (12) on Action Card

RF support products

By Marvin Born

Marvin Born is vice president, engineering for the Dispatch Broadcast Group, Columbus, OH.

There were a surprising number of developments in the area of RF support products at NAB 96. These advances spanned a broad spectrum, ranging from RF combiners and dummy loads to computer-based remote controls.

RF transmission line and components

Altronic Research showed an impressive array of dummy loads, both air-and water-cooled, ranging from small (5kW) to large (300kW MW). Also on hand was the 3500 Digital Calorimetry unit that monitors rms power fed to a dummy load by measuring the energy turned into heat. The 3500 is available for air- and water-cooled loads.

Kintronic Labs had a wide variety of handy RF components on display. They were selected from the company's legendary inventory of devices for AM radio transmission systems, which includes ATUs, diplexers and triplexers, phasors, inductors, RF contactors and

dummy loads.

MYAT of Norwood, NJ, has developed an interesting method of combining multiple high-power transmitters in phase. Its E-Star system can combine between 3- and 8- input ports in a much more efficient manner than the conventional hybrid system used today. The system operates on VHF, UHF and FM, and it is smaller than a conventional combiner. There are no moving parts and temperature changes do not affect performance. The big news is that there are no adjustments, period. MYAT claims an efficiency of 99.3%. Efficiency is so good for an E-Star 4-way VHF system that it provides as much power as a conventional 5-way system.

Remote site control

Burk Technology showed its BDT-115 RF data link, a spread-spectrum wireless control link (902MHz-928MHz) to its ARC-16 transmitter control system. No license is required and a frequency-hopping spreading code ensures robust operation. The system provides a 115.2kb/s bi-directional link across paths of up to 20 miles. Also on hand was Burk's BTU-4, a temperature and line-voltage monitoring system with a variety of sensors tailored for broadcast transmission sites. Enhancements to the ARC-16 were also presented, including multisite control, speech interface and control/display/logging software.

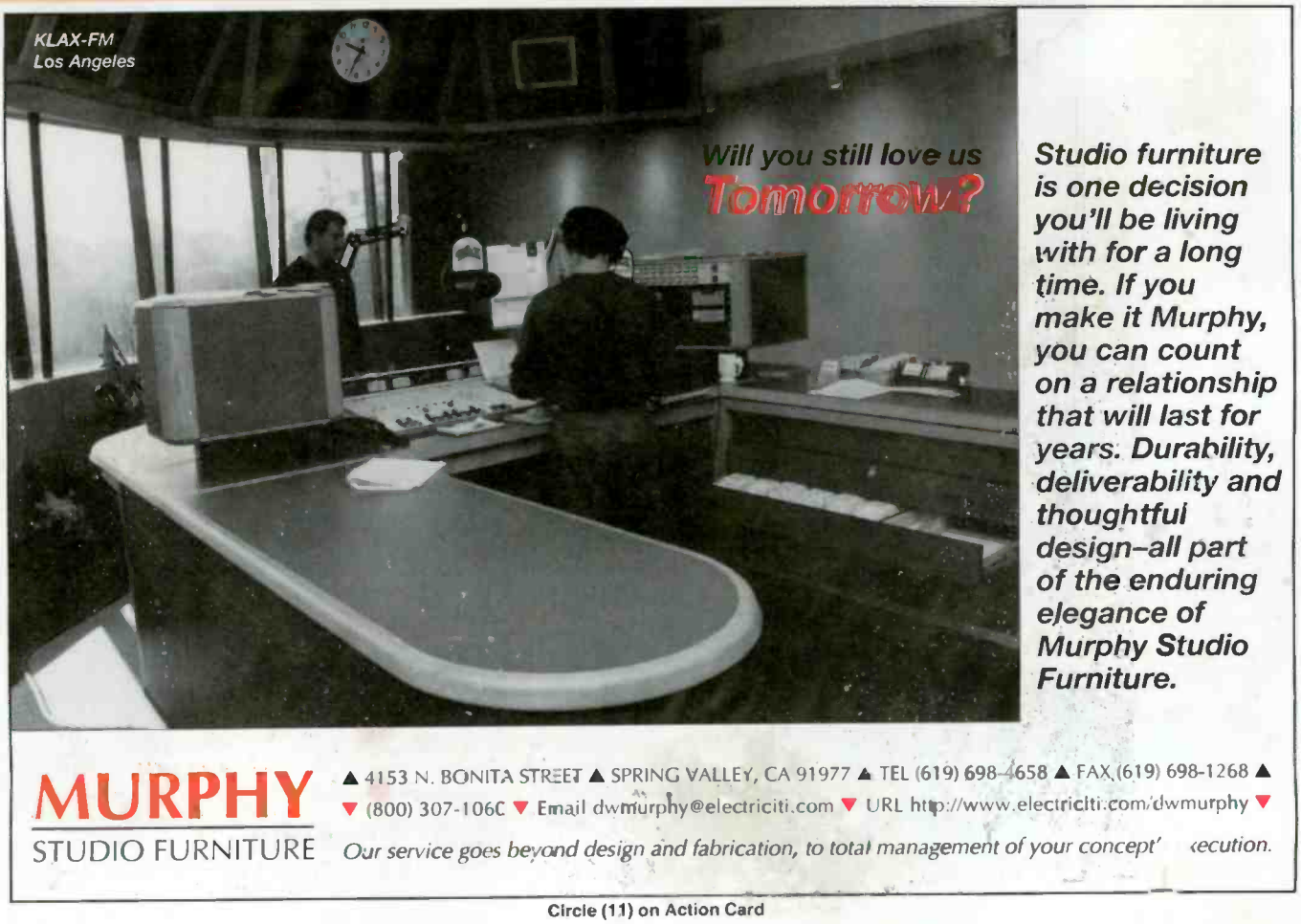
Gentner introduced a number of new products. The largest crowd magnet was the GSC-3000, which is a Windows-based remote-control system. It does logging, time-of-day clock, plus the normal remote-control functions. The operator can dial up any one of 256 remote sites, with phone numbers and access codes stored within the program. Once connected to the desired site, up to 256 parameters can be monitored, with point-and-click commands used to make adjustments. (See "Pick Hits of NAB 96," p.44.)

EAS equipment

The new EAS 911 Emergency Alert System encoder/decoder was presented by TFT. The unit is compatible with the NOAA Weather System SAME codes. Options include a printer, mullet-module receiver chassis and audio program interrupt module. Control and status signals from the EAS 911 may be remote controlled and an LED message screen may be interfaced to provide visual information. (See "Pick Hits of NAB 96," p. 44.)

Sage Alerting Systems also presented its ENDEC line of EAS equipment. The products are being marketed by Harris Broadcast. (See "Pick Hits of NAB 96," p. 44.)

Circle (132) on Action Card



Circle (11) on Action Card

Pick Hits of NAB 96

The top 10 — or make that 11 — new products at NAB 96, as seen by our panel of judges.

BE Radio NAB 1996 PICK HIT

Like every year since its birth (and like its forbear, *Broadcast Engineering* has done every year since 1985), *BE Radio* has once again selected a panel of eminent practitioners in the radio broadcasting industry and commissioned them to choose the top 10 new products unveiled at the NAB Convention. The competition was tough, as always, and many worthy new products were considered. Ultimately, the winning products were determined, and they are presented here.

BE Radio NAB 1996 PICK HIT

Orban: OPTIMOD-FM 2200 digital audio processor

The 5-figure price floor has been significantly undercut by this 1RU device, making digital on-air processing accessible to a wider range of users. While its feature set and size are smaller, its audio performance rivals that of its big brother, the OPTIMOD 8200. The 2200 offers eight factory and eight (non-volatile) programmable presets for its 2-band processing, and includes high-frequency enhancement, bass EQ, gated AGC, an independent protection-limiting section and a digital stereo generator. AES/EBU I/O is optionally available, complementing its standard analog audio I/O and two composite outputs. Eight opto-isolated remote-control inputs are also provided.

Circle (112) on Action Card

360 Systems: Shortcut personal audio editor

This nicely designed unit is a self-contained, hard-disk stereo audio recorder with simple editing features. Intended for jocks or news reporters where fast turnaround is essential, it features no-compromise audio quality, storing 1.5 hours of 16-bit uncompressed 20kHz stereo (expandable to three hours). A mic pre-amp, built-in stereo speakers and a headphone output are included, and it's small and lightweight enough for portable use. Real-time waveform editing employs dedicated buttons, plus an integrated high-resolution LCD screen, a scrub wheel and QWERTY keyboard (for titling). Edited cuts can be loaded to 10 "hot keys" for instant playback. Judges liked the unit's price, too.

Circle (110) on Action Card

BE Radio NAB 1996 PICK HIT

BE Radio NAB 1996 PICK HIT

Telos Systems: ZephyrExpress portable ISDN audio transceiver

A new level of integration is achieved by this combination mixer/codec/ISDN terminal adapter/monitor. It provides three different coding algorithms (MPEG-1 Audio Layers II and III, G.722) along with a 3-input (2-mono mic, one stereo line) mixer, plus two independent stereo monitor outputs – all in a single, road-worthy chassis. Send and receive level meters are included, and an LCD panel monitors call status or displays built-in help screens and advanced features. Up to 40 set-up modes and phone numbers can be stored. Bidirectional RS-232 data at 9,600b/s plus four parallel "closure" commands can travel along with audio data.

Circle (111) on Action Card

NAB
1996 PICK HIT

AETA: Scoop Reporter POTS codec

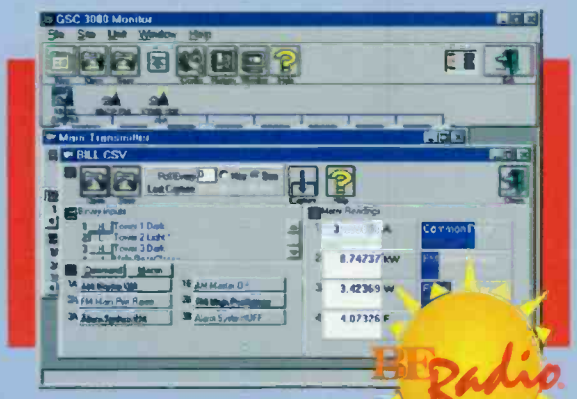
Providing the same full-duplex, 7kHz mono audio quality that a G.722 codec does on SW-56 or ISDN circuits, this portable unit requires only the "plain old telephone service" (POTS) of the standard analog public switched phone network. It combines a V.34 modem, a 3-input (two mic, one line) mono mixer with headphone and line-level monitor outputs, and a codec employing the *Code-Excited Linear Prediction* (CELP) algorithm (optimized for speech). Power is provided by five D cells or 100-240VAC. Its 7kHz audio performance only requires 24kb/s connectivity. Should a full 28.8kb/s path be available, audio performance extends to 8.4kHz.

Circle (113) on Action Card

Gentner: GSC 3000 site control system

Calling this a product born for the times, our judges appreciated the usefulness of this Windows-based, multisite remote-control system. Its 1RU I/O units are available in 8- or 16-channel versions, which can be networked via RS-485 for expandable control of up to 256 channels per site. The I/Os connect via POTS lines and modems to a PC. Multiple control points are possible, and each control point's PC can operate up to 256 sites. Tolerance limits and automatic commands (both event-driven and time-based) can be programmed, and macros of up to 32 steps can be built. A voice/DTMF option is available.

Circle (114) on Action Card



NAB
1996 PICK HIT

Eventide: BD500 digital broadcast delay

Smaller, better, less expensive – a familiar refrain, this time applied to profanity delay. This 1RU device comes with 8.5 seconds of stereo delay, and more can be added in the field. Its delay buffer can be broken into two or three segments, with only the last deleted upon a "dump" command. This keeps some delay on-line until the unit "catches up" to a full buffer. The input to the buffer can also be muted for a real-time "edit," allowing talent to cough or comment off the air without noticeable pause. An improved delay algorithm allows fast catch-up without artifacts. Control and status can be remoted.

Circle (115) on Action Card

NAB
1996 PICK HIT

Sierra Automated Systems: SAS 16000 audio routing system

This low-cost, high-quality router may be just what a lot of stations need. It offers up to 32x32 routing in a 2RU chassis (which includes a monitor speaker), with numerous 1RU and console drop-in control panels available. Alphanumeric display is included, and adding or changing sources on the system is a snap. PC software is provided for programming alphanumerics or numbered push-buttons. The system integrates stereo and mono sources, and handles maximum I/O levels of +28dBu. Salvo sequences can be interfaced to automation systems, and multipoint RS-422 and RS-232 interfaces are included. The judges were especially impressed by this product's cost-effectiveness.

Circle (116) on Action Card

NAB
1996 PICK HIT

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Circle (26) on Action Card

NAB
1996 PICK HIT

Continental Electronics:
BYTECAST 802D digital FM exciter

A 50W digital FM exciter with a twist – it's PC-based, but housed in a 3RU chassis with a front-panel LCD display. While the PC controls the system, four floating-point DSPs perform the actual signal processing. A unique direct-conversion board takes the digital output from the DSPs right to the operating frequency without any IF or heterodyning steps. Front-panel test jacks allow the user to monitor internal signals or inject test signals. The LCD display and its associated soft keys provide monitoring and adjustment of operating parameters. Spare slots are available for future hardware, and software upgrades are uploaded from an external PC.

Circle (117) on Action Card

Roland: BOSS VT-1 voice transformer

This inexpensive audio processor allows a wide range of voice alteration, and includes some unique capabilities. A voice's pitch can be varied independently from its "formants" (the harmonics of speech that provide intelligibility and voice character), allowing pitch to be changed without creating unnatural "chipmunk" or "munchkin" effects. A wet/dry balance control allows the original voice to be mixed in for "duets," and adjustable stereo reverb is included. A "robot" feature adds vocoder effects. Up to eight setups can be stored, and recall of stored settings is instantaneous. Although widely useful for production, judges noted that the device could be employed by news operations to protect a source's anonymity.

Circle (118) on Action Card

NAB
1996 PICK HIT

NAB
1996 PICK HIT

TFT: EAS 911
EAS encoder/decoder

Sage Alerting Systems:
ENDEC EAS encoder/decoder

Acknowledging the input of both of these companies in developing the new Emergency Alerting System, our judges broke with tradition to offer a "shared" Pick Hit for 1996 – the year of EAS implementation. While both systems provide the same basic EAS functions, each offers different configuration and interfacing options. (See "EAS Update," p. 24, for why this is important.) For example, the ENDEC bases its system's control on the "ATM" model, using four soft keys under its LCD display for user interface, while the EAS 911 takes a dedicated-button approach. The number of sources that can be monitored simultaneously without optional hardware also varies between systems, as do the systems' operating modes, multistation configurability and remote-control options. Both systems were deemed flexible and successful in their respective implementations by our judges.

For Sage Alerting Systems,
Circle (119) on Action Card

For TFT,
Circle (120) on Action Card

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JUDGES

Margaret Bryant
Director of Engineering
ABC Radio Networks
Dallas, TX

Andy Laird
Vice President, Engineering
Radio Group
Heritage Media
Santa Clarita, CA

Chip Morgan
President, CMBE
El Dorado Hills, CA

Richard Rudman
Director of Broadcast
Operations & Engineering
CBS Radio
Los Angeles, CA

Chriss Scherer
Engineering Manager &
Chief Operator
WMMS-FM
Cleveland, OH

Milford Smith
Vice President
Radio Engineering
Greater Media
East Brunswick, NJ

Mike Starling
Director of Engineering
National Public Radio
Washington, DC

Ellis Terry, Jr.
Director of Engineering
& Operations
Personal Achievement Radio
West Hollywood, CA

Andy Vallon
Manager Technical Services
CBS Radio Networks
New York, NY

Barry Victor
President
The Victor Group
Westhills, CA

PICK HITS RULES

BE Radio's Pick Hits Judges operate independently and anonymously. They look for new products that meet the following criteria:

1. **Products must be new, and not shown at a previous NAB Convention (Spring show).** In some cases, distinguishing a new procuct from a modified older one is difficult. For Pick Hits purposes, a new product is one with a new model number or designation.

2. **Products must have some positive impact on the intended user's everyday work.** Judges search for equipment to be used on a regular basis. Products should provide new solutions to common problems.

3. **Products must offer substantial improvement over previous technology.** Unique circuit architecture need not be included, but some new approach or application must be involved in the product's design.

4. **The prices of the products must be within reach of their intended users.** The judges seek products appropriate to a wide range of facilities.

5. **The products must be available for purchase within the calendar year.** Equipment must be on display on the show floor and currently (or imminently) in production. Judges take the exhibitor's word on availability dates. Products demonstrated in private showings do not qualify.

HONORABLE MENTIONS

The judges found these new products also worthy of note:

APHEX SYSTEMS
Model 661 Expressor/Easyrider with Tubessence tube compressor/limiter

BIRD ELECTRONIC CORPORATION
AT-800 antenna tester

DIGITAL DJ
DDJ high-speed data receiver

FOSTEX
D-80 8-track hard-disk recorder

MOSELEY ASSOCIATES
Starlink 900ISS digital spread-spectrum RPL

QEI
Quick-Link II spread-spectrum stereo digital radio system

ROLAND
SN-700 hum and noise filter

SAGE ALERTING SYSTEMS
ENDEC companion receiver

TELOS SYSTEMS
Internet Audio Suite
on-line radio system

FM Value Leaders ...at NAB '96

"DAVID-II"
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The *"DAVID"* tradition contiues. A hot new *feedforward-PWM* processing section is coupled with flawless Digital Synthesis of the multiplex signal. Add the built-in, adjustable Composite Processor, and *"DAVID-II"* delivers the *density* you demand, and a sound that *keeps listeners tuned-in.*

FM Mod-Monitor
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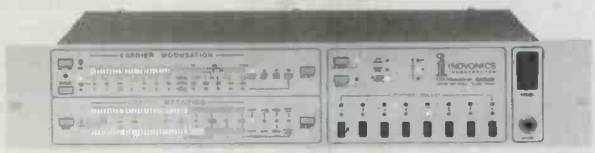

Accurate and affordable. Fully featured monitor displays total modulation, demodulated program audio, pilot and subcarrier injections. Remotable Peak Flasher, plus alarms for loss of carrier and loss of program audio. Carrier level and multipath readouts.

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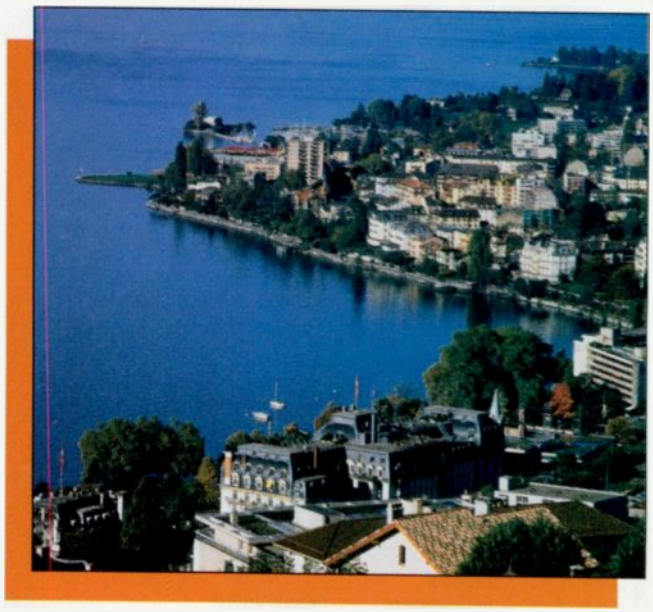
Third Montreux International Radio Symposium

By Gerald Walker



Once again, radio around the world is re-inventing itself — this time to join the transition to digital and to remain competitive into the 21st century. Clearly, this implies digital audio broadcasting (DAB), and the Third Montreux Radio Symposium and Technical Exhibition (June 6-9, 1996, Montreux Convention and Exhibition Centre, Montreux, Switzerland) emphasizes the importance of this developing technology from beginning to end.

The chairman of the UK's Radio Authority, Sir Peter Gibbings, will present the keynote lecture, "21st Century Lifestyle and Radio's Place In It," in which he points to the first DAB broadcasts in Great Britain as a sign of the future. Last September, the BBC began DAB broadcasts using the Eureka 147 system. Private stations in the UK will begin DAB transmissions soon, which should hasten consumer interest in purchasing new digital receivers for home and auto, Gibbings suggests.

After its conspicuously low profile at the last Montreux Radio Symposium in 1994, the NAB returns this year with a stronger presence, starting with an opening address by Eddie Fritts, NAB chairman and CEO.

A tale of two DABs

Prior to the start of Radio Montreux, *Sounds Digital*, the Third International Symposium on DAB, will take place on June 4-5, 1996. Organized and coordinated by the European Broadcast Union (EBU), in cooperation with the International Academy of Broadcasting (IAB) and the EuroDAB Forum, the symposium will focus on developments in the Eureka 147 system and its early applications around the world.

For Radio Montreux delegates unable to attend the DAB Symposium, a review of its results will be presented on June 6 by the EBU. This summary will cover broadcast and receiver developments.

The NAB has also organized two engineering sessions. The first takes place on June 6, in which attendees will learn about the contrasting standards for DAB in the United States and Europe. Lynn Claudy, Science & Technology vice president for NAB, will chair the session on DAB in the United States, which looks quite different from that being proposed for Europe. Al Resnick of Capital Cities/ABC will review the results of DAB testing in the United States, which is about to move to its field-testing stage. Charles Morgan of Susquehanna Radio will then describe DAB from a U.S. broadcaster's perspective.

Make room for data

On June 8, the second NAB session examines practical implementation of data broadcasting in the United States. Chaired by NAB technical conferences director John Marino, the session will describe how stations transmit digital data along with their regular programming and give an overview of the data broadcasting business opportunities. "Data Broadcasting Systems: Tests and Applications" will be presented by David Layer of the NAB Office of Science and Technology. "The Economics of Data Broadcasting Technologies" will be described by Skip Pizzi, editor of *BE Radio*.

A complementary EBU session looks at the possibilities offered by data broadcasting for additional services to audiences from radio networks and stations.

Other technical sessions will cover RF transmission, system integration, recording media and production equipment/technique and on-line radio.

For the technologically challenged

Digital radio and data broadcasting also permeate the sessions for management and non-engineering delegates. George Waters, technical director of the EBU, chairs two sessions, "Is Digital Radio the Future?" and "Regulation for Additional Radio Services."

In another session, David Witherow, DAB project director for the BBC and president of the EuroDAB Forum, will head the panel discussion, "Getting the Best out of Digits: Production and Distribution." Speakers from the United States, Europe and Australia will take up the impact of digital radio on station managers and program makers, including the effects on work practices and company structures.

Will radio have a place in the multimedia future? "New Age Radio," a panel chaired by David Wood of the EBU, will explore how radio must prepare for the future. Other nontechnical sessions will consider sales and marketing growth, audience research, copyright issues, competitive positioning, merchandising/promotion and on-air personality development.

Cirque du Montreux

Two other conferences and a technical exhibition called "Innovation Forum" will all cross paths at the Montreux venue. The list of radio equipment vendors at the exhibition is expected to exceed 100. Not surprisingly, the companies are mostly European, but a fair number of U.S. manufacturers will also be on hand.

Meanwhile, the third edition of *DigiMedia*, a new-media conference covering multimedia, 3-D animation and virtual reality development, will run alongside Radio Montreux, as will a brand new conference, *Montreux Interactive Media Services* (MIMS). While DigiMedia trends toward the creative/content side of multimedia, MIMS will stress the delivery side. Presenters will come from Europe and the United States.

The common ground of all of these events is digital technology. Radio Montreux should, therefore, provide its attendees with a well-rounded look at the future of broadcasting.

Gerald Walker is editor of *BE Radio*'s sister publication, *World Broadcast News*.

Reader Feedback:

Gearing up for EAS in Wisconsin

Dear Editor,

Radio stations in northeast Wisconsin have begun putting plans in motion to switch from EBS to EAS.

Emergency alerting systems are especially important in Manitowoc County, which is located in an area known as "Tornado Alley" and is one of Wisconsin's more frequent alert areas.

The stations are currently alerted by the primary EBS outlet, a 100kW commercial FM in Green Bay that operates 24 hours a day, and by a paging system operated by the Manitowoc County Sheriff's Department.

With the proposed EAS, the primary alert will change to a public radio station in Green Bay, which signs off at midnight, then as a second source, the commercial 100kW FM in Green Bay. A third audio input will be wired to the NOAA Weather Radio service from Green Bay (35 miles away) and the fourth input will be from the locally operated paging system staffed by the Sheriff's Department.

By using creative ways to find outside help, we came up with financial assistance for our county's broadcasters. For instance, a small grant was requested from the county

emergency government office locally, as well as from the utilities that own the nuclear power plants. The county has developed a relationship with the nuclear power plants over the years, and we recognized that the nuclear plants would benefit by the more efficient alerting system. There are also plans to purchase several EAS units from the same provider in order to qualify for a quantity discount. By using creative strategies to locate funds, we hope to keep the costs of implementing the new system to less than $1,000 net for each station.

To alert listeners of the upcoming changes, a local billboard company was contracted for space. The billboards were placed in eight locations near the community sirens. The $3,000 price tag for the month-long display was shared by the nuclear power plants and local emergency government.

Also, the local emergency government office purchased the SBE Primer on the EAS and is sharing the book with the county's broadcasters.

Mark Heller, president
WTRW-AM
Two Rivers, WI

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BUSINESS

Wheatstone, Syracuse, NY, sold several audio consoles to WSIX, Nashville.

Harris Broadcast, Quincy, IL, sold the first Sage Alerting System ENDEC (EAS encoder/decoder) to WVXU-FM, Cincinnati. ENDEC was the first EAS product to be authorized by the FCC.

The Harris Corporation also received a contract valued at more than $20 million to provide radio and TV broadcast and production systems for Speer Communications Ltd, Nashville, TN.

On the international scene, the Harris Corporation supplied **National Transcommunications, Ltd. (NTL)** with a digital audio broadcast (DAB) transmitter system for NTL's new DAB trial service for greater London.

Orban sold DSE 7000 digital audio workstations to Bonneville Broadcast Center, Kansas City, and ABC O&O KQRS/KEGE, Minneapolis.

TFT, Santa Clara, CA, formed alliances with **Continental Electronics**, Dallas, and **CUE Network Corporation**, San Jose, CA, to provide Emergency Alert system (EAS) equipment. The Broadcast Supply Division of Continental Electronics will provide EAS equipment to the broadcast market. The CUE Network Corporation will distribute the EAS system under the trade name EmergencyAlert.

Digital Courier International (DCI), Vancouver, Canada, announced a reverse takeover agreement between DCI and **Kwikstar Communications**, Vancouver, Canada. The common shares of Kwikstar will be exchanged for 100% of the common shares of DCI, and the shares will be traded on the Alberta Stock Exchange.

Audio Processing Technology (APT), Belfast, Ireland, won the Daily Mail Business of the Year Award. APT was recognized for its commercial success, as well as the contribution of APT's effective training and staff development.

Wegener Corporation, Duluth, GA, was selected by the South Carolina Network to supply digital audio receivers to completely upgrade the network to digital.

Also, Wegener delivered digital audio receivers to Network Indiana, Indianapolis, a network owned by Wabash Valley Broadcasting Corporation.

International Datacasting, Ottawa, Ontario, Canada, provided Clear Channel Communications, Inc., San Antonio, with satellite digital audio systems for all of Clear Channel's state radio networks. The contract includes more than 300 satellite receivers and redundant uplink systems in four states.

PEOPLE

Howard Mullinack was promoted to vice president, sales and strategic planning for Orban, San Leandro, CA.

Richard Rudman and **Michael Smith** were named directors of broadcast operations and engineering for CBS Radio.

Ed Longcrier joined the radio field sales team of the Harris Broadcast Division that covers the Southwest United States.

Doug MacCallum was appointed vice president, marketing and sales, for AKG United States.

Tim Schaeffer was named director, sales and marketing, for the Otari Corporation.

CLASSIFIED ADVERTISING RATES

Advertising rates in ***BE Radio*** Classified Section are $45 per column inch, per insertion. There is a one inch minimum.

Ads may also be purchased By-The-Word for $1.75 per word, per insertion. Initials and abbreviations count as full words. Minimum charge is $30 per insertion.

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BE Radio

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CLASSIFIED

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Wheatstone Corporation	BC	3	315-452-5000

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BE Radio™

BE RADIO (ISSN 1081-3357) is published bi-monthly (except an additional issue in August) and mailed free to qualified recipients by Intertec Publishing Corporation, 9800 Metcalf, Overland Park, KS 66212-2215. Non-qualified persons may subscribe at the following rates: USA and Canada, one year, $30.00; all other countries, one year, $35.00 (surface mail), $70.00 (air mail). Second-class postage paid at Shawnee Mission, KS, and additional mailing offices.

POSTMASTER: Send address changes to *BE Radio*, P.O. Box 12937, Overland Park, KS 66282-2937.

BE Radio is edited for corporate management, technical management/engineering and operations and station management at radio stations and recording studios. Qualified persons also include consultants, contract engineers and dealer/distributors of radio broadcast equipment.

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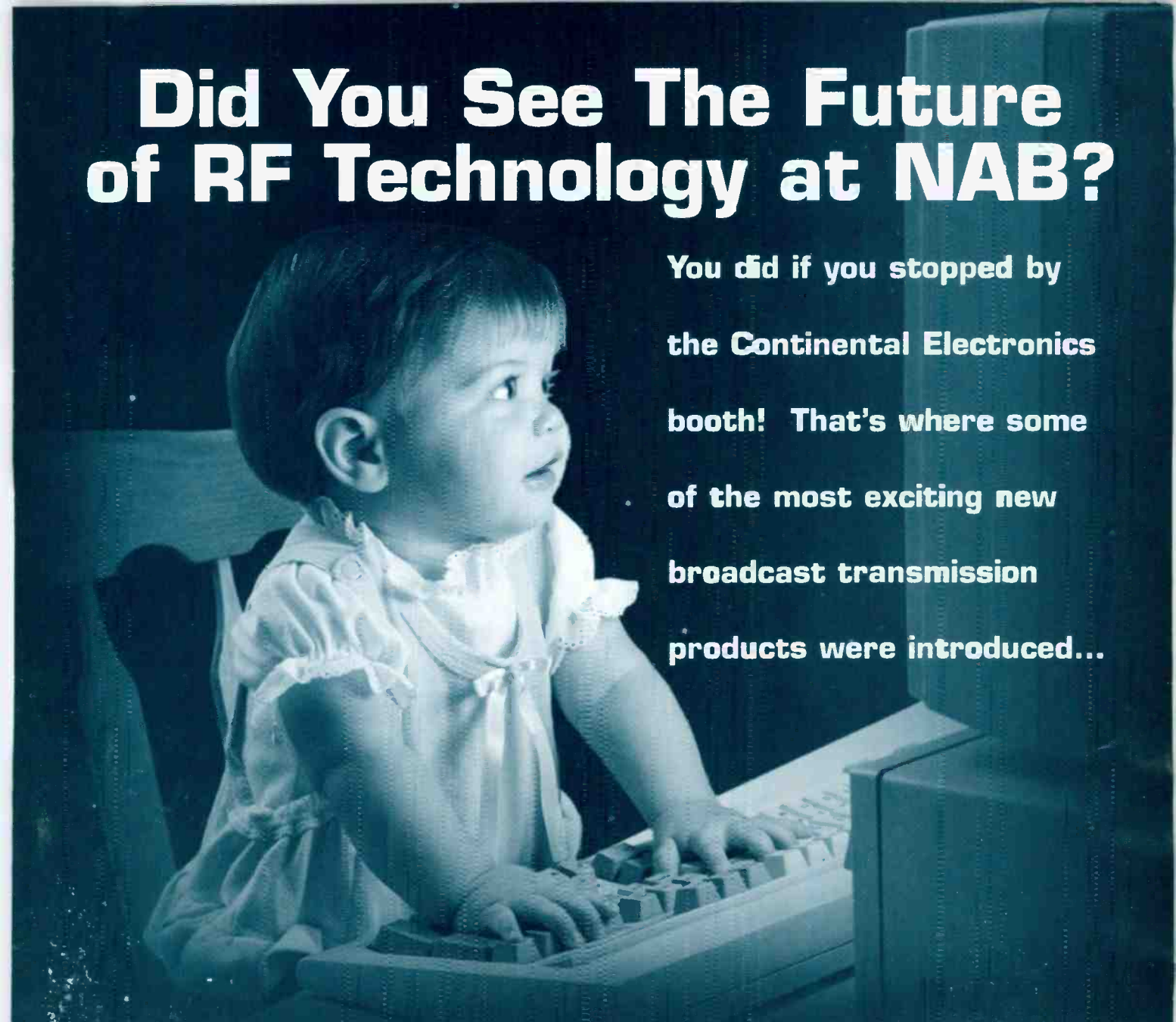

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