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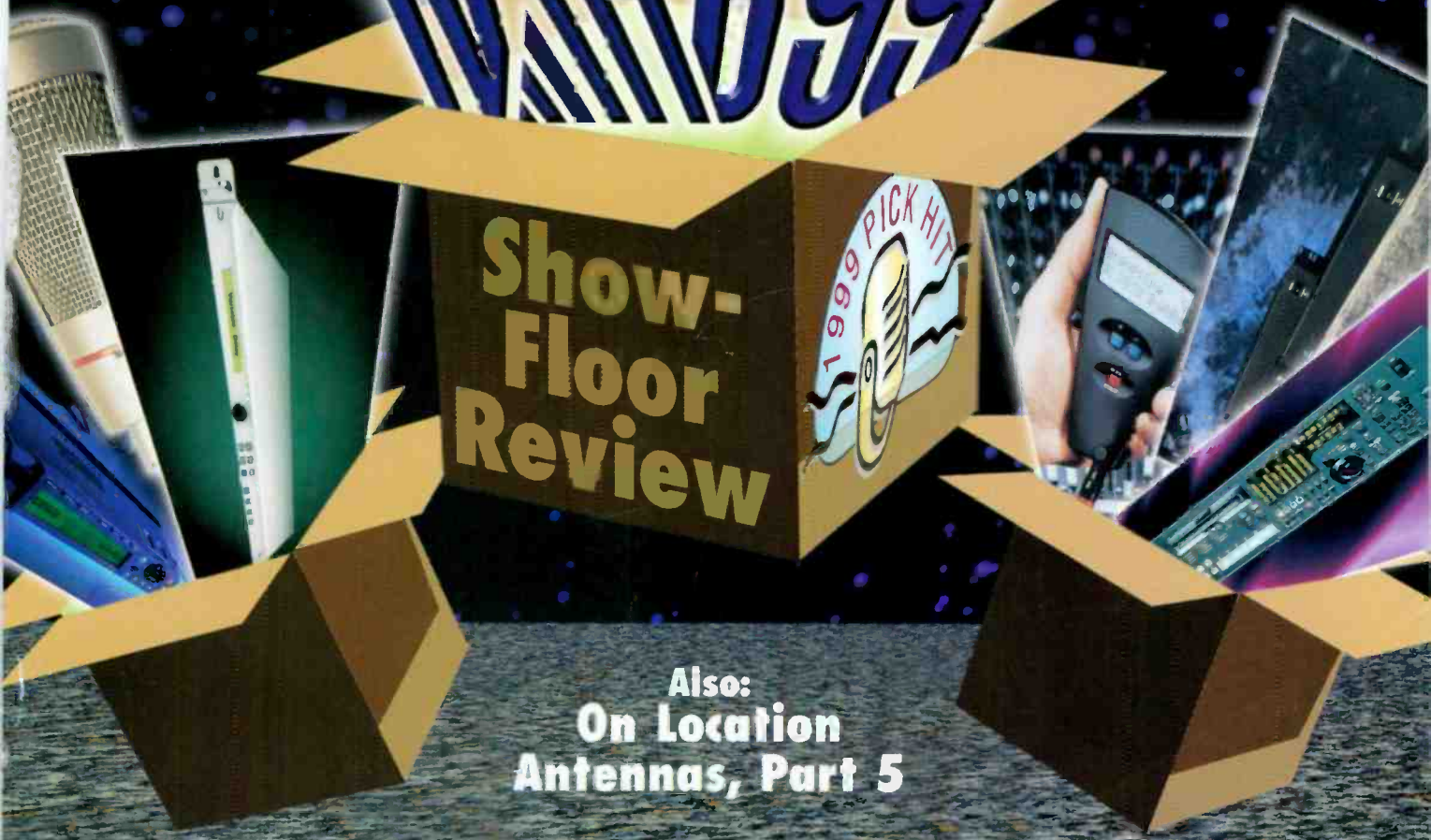

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ON THE COVER: Getting the most out of NAB may require more than just walking the show floor, especially since the convention is growing larger every year. This months' issue, which highlights NAB coverage by *BE Radio*'s panel of expert reporters, will help you wrap it all up. Cover design by Art Director Michael J. Knust.

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Viewpoint

Revolution or evolution?

It's over. Another NAB convention has come and gone. It seems like, once I got used to what was happening, it was over.

Trade shows like NAB give everyone a chance to see what others are doing in the industry. As you walked the floor, you probably brushed up against some big business deals. You had a chance to hear what other people were doing and see what they were perusing.

The number of reported attendees and the size of the show floor have increased, but the time allotted to see everything has remained the same. You may have only been able to get the *Cliff's Notes* version of the show floor. Fortunately, *BE Radio* was there in force covering it all.

A question commonly asked during the event is, "What have you seen that's new?" Plenty. But when asked what is really different, the answer takes more consideration. In short, the common thread seemed to be in the evolution of technology. This issue's show wrap-up (p.37) will answer that question in much more detail than this space will allow.

It seems that, as an industry, we are hesitating before we leap to the next plateau. Though many of the products shown were unique in some way, for the most part they were refinements of existing ideas.

In this age of DSP and digital control, the hardware may not see many changes. A new model number or a redesigned front panel will have no real effect on the operation of the components inside. New software versions provide additional features and further utilize the power contained within, but we may not always be aware of this type of progress. A box with a new color or reoriented indicators will make an impression. A change in decimal (from 4.26 to 4.3) is not visual, making it a revision that may go unnoticed.

The show did, however, include sessions covering these new technologies, and products were shown that implemented some of the technologies. Perhaps the revolution is happening at a more gradual pace.

When radio was invented, men like Marconi, Armstrong and Saranoff broke new ground. The changes they brought about were easy to see. (In the case of radio, the changes were easy to hear.) Radio led the way to advances in audio and RF.

Radio is no longer the technological leader but rather takes advantage of the progress other industries have made. This is not a bad situation, either. We are able to use this progress to our advantage.

The current leaders of the next revolution are working on digital technologies. Dr. Karlheinz Brandenburg of the Fraunhofer Institute in Munich, regarded as one of the founders of the MPEG audio compression standards, led the way for the nearly transparent and extreme data reduction we use in audio codecs and online. This type of technology also makes DAB possible. The strides made in the area of audio coding have begun to level off. This revolution, too, has slowed to an evolution.

There will certainly be a limit to how many bits can be reduced while still producing a clean signal, but we have yet to reach that limit. (When I asked Dr. Brandenburg what he thought the limit might be, he wisely replied that he was not sure.)

As both radio and television continue their digital progress, we may even see a convergence between them. Both media will be involved in distribution of bits. The technology used to do this can pull from both sides.

Whether revolution or evolution dictates the next major step for radio remains to be seen.

Chriss Scherer

Chriss Scherer, editor

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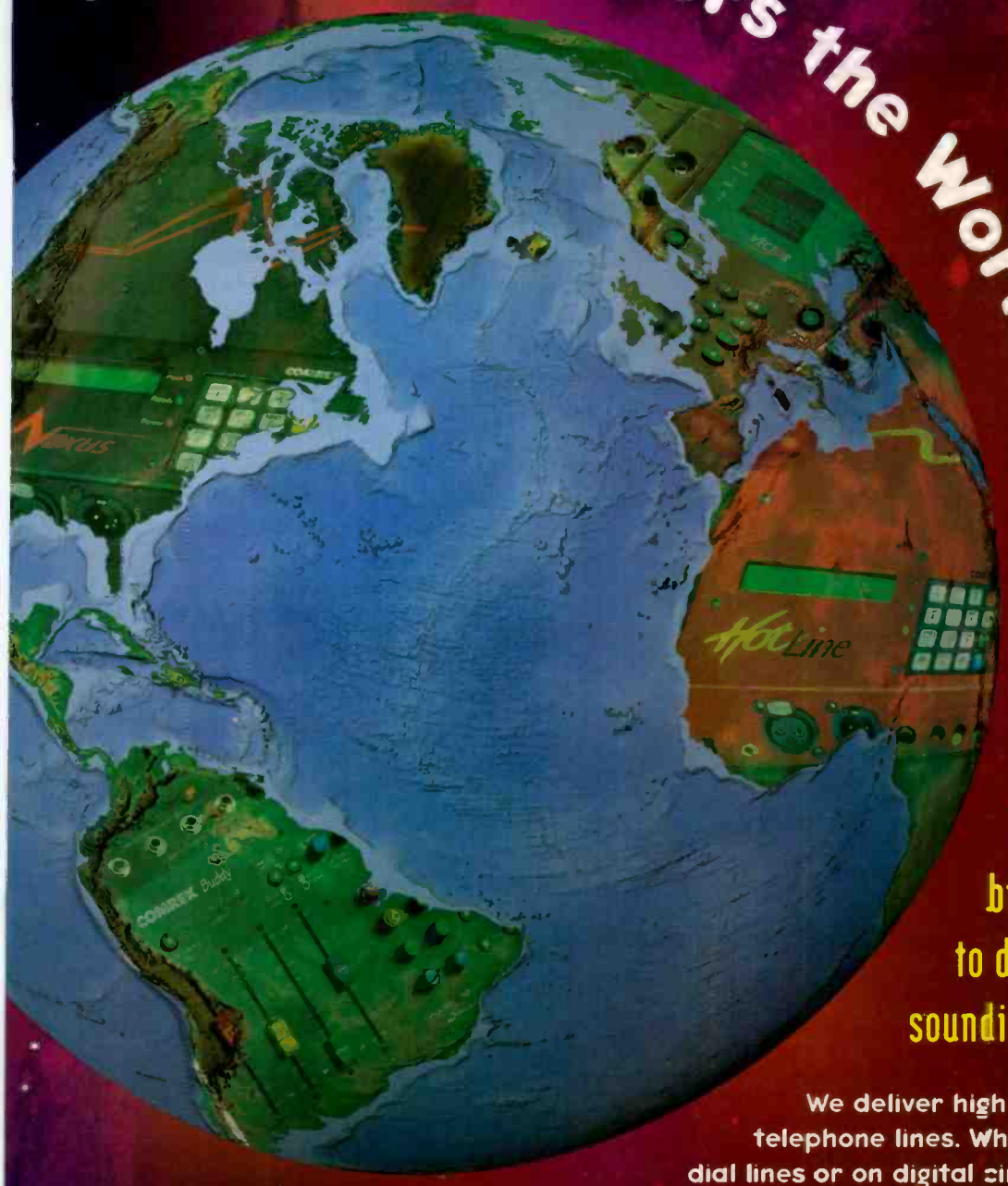

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On-air phone systems

By Barry Thomas, CSRE

Almost every radio format depends on audience interaction for local appeal and to give the station personality. The easiest and most popular method is to put members of the audience on the air via the phone for call-in shows, music requests and station testimonials. The quality of these calls can mean the difference between an effective programming element and an extremely high tune-out factor. Careful selection of the phone system used on the air is critical to ensuring a quality broadcast.

The basic function of on-air phone systems is clear: They allow calls to be placed on the air and to be recorded with the best quality available. The old QKT coupler could carry out these functions quite well, for the price.

Most of you are aware that the basic telephone includes a hybrid network that splits a two-wire audio circuit into a four-wire E&M (ear and mouth) configuration. Hybrids in telephones don't have to be too sophisticated, since the send and receive elements are separated by just a few inches and the volume level is low. But things get more complicated when open speakers are needed.

The 1A2 phone system offers reliable call handling, but service and installation can be difficult.

Simple needs

Using a stand-alone or office-system speakerphone is usually not the best way to put good-quality calls on the air, although they are all many stations can afford. In some cases, I have shopped around for the best-sounding speakerphone at local electronic stores. If you go this route, evaluate the speakerphone based on the speed of the send/receive switch, and make sure the microphone is sensitive enough to ensure that the caller can't override the announcer. You can always add EQ and compression to improve the audio. Bridge the speaker using a proper bridging transformer. You will hear the difference with a good-quality transformer. Don't forget to bypass the speaker volume control and leave it fixed. If possible, use the internal speakerphone mic to talk to the caller. Keep the speakerphone as close to factory stock as possible, and make sure you use connectors on the wiring so the phone can be repaired later.

The standard approach to an on-air system is using a dedicated phone system for the studios, which includes high-quality hybrids and features specially designed for professional audio use. One advantage to this approach is that it isolates the high traffic of the studio lines from the office phone system used for standard business traffic. The separate system also allows the selection process to focus on the specific requirements of the two parts of a station: the business office and the studio facility.

Many stations install 1A2 key telephone systems using 25-pair (sometimes called *fat*) cable to each studio and a gaggle of 66 blocks. This method allows the key system to do the call direction so that true tip and ring can be presented to a single-line broadcast hybrid. Typical hybrids operate best with real phone lines, as they are designed to compensate for lines that extend miles, not feet. The operational simplicity of a 1A2 system is unmatched, but the wiring and repair can be fairly daunting. Technical support and parts stock for 1A2 are dwindling fast, but this established method is still the most proven way to handle a large number of lines and many extension or studio locations.

A few hybrid manufacturers have created broadcast phone systems that are typically electronic versions of 1A2. Like the 1A2, these systems simply route an analog phone line to a hybrid. Their features and applications vary, so you should evaluate your needs before selecting a particular system. Manufacturers typically build their systems around their own hybrid. Therefore, the systems are not compatible with each other. As a result, you will have one source for repair parts and support for the whole system as opposed to calling the local telco parts distributor and getting a new line card.

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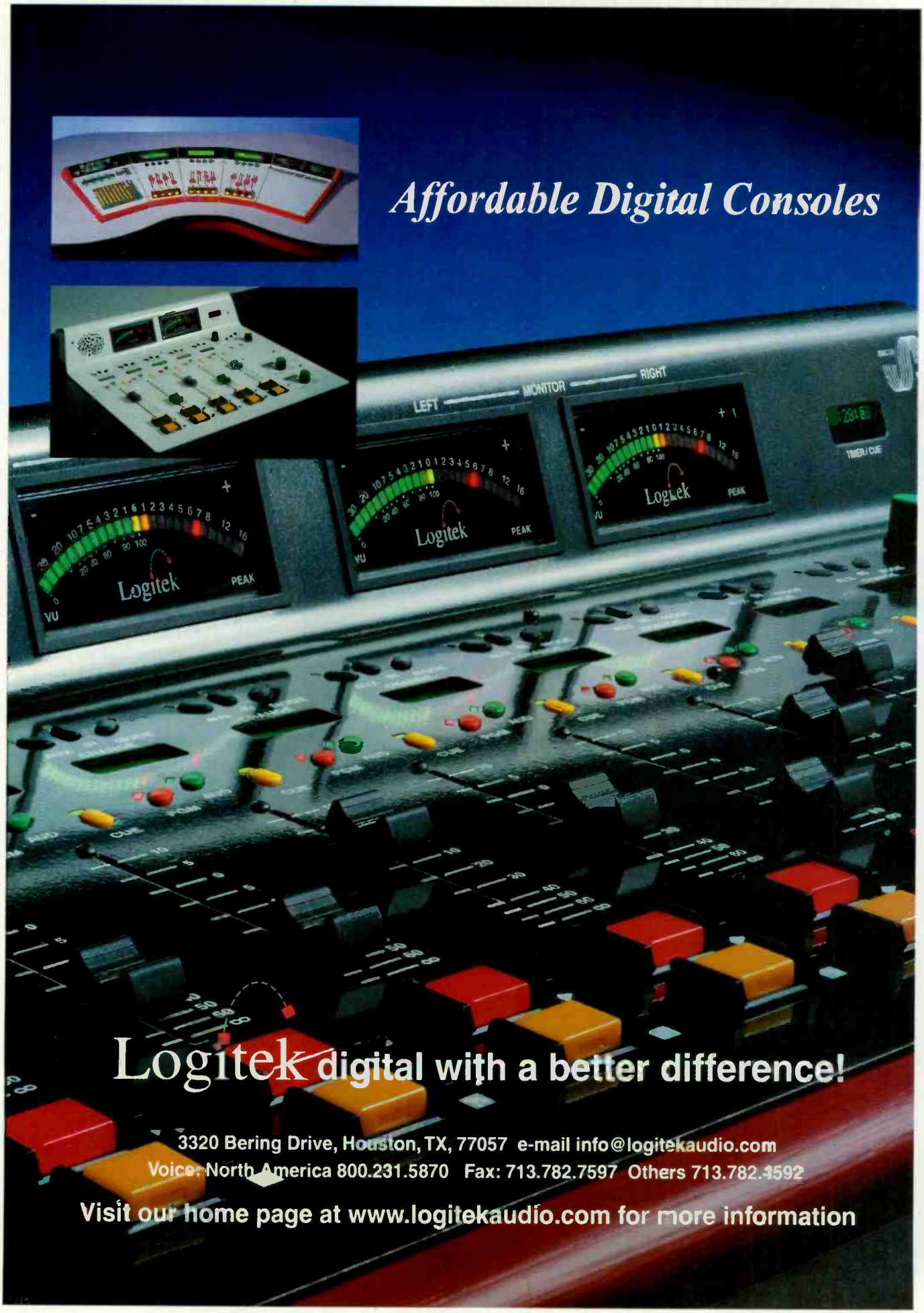
Since such systems are incompatible with other brands, the one you select should be based primarily on the hybrid. Usually, one hybrid is necessary for each simultaneous line in use or on the air, and it serves as the ultimate bottleneck of your telephone audio. Analog telephone lines are difficult to interface: Each call is vastly different. Even calls to and from the same location can take very different paths to get to the station. Hybrids must be able to compensate for the myriad of resistance/capacitance combinations on each call and present consistent and clear audio with every one.

New breeds of on-air telephone systems that use ISDN and T1 carriers are being introduced.

Analog broadcast hybrids are available but usually prove to be unsatisfactory on-air systems, since their settings are static and are based on a set of typical line characteristics. However, there are certainly applications for these hybrids. If there will be only one line connected to the hybrid, settings can be optimized for that line, making the far end of the call the only variable in the equation. I've used these at news edit workstations where only a single line was needed.

Going digital

Digital telephone hybrids are specifically designed to sample different line characteristics and adjust their settings accordingly. There is usually an analog hybrid involved, but its performance is reduced in importance, and adjustment of the hybrid is impossible in some models. The key factor is hybrid performance. *Trans-hybrid loss* is the measure of leakage of audio between the send and receive paths, with leakage of send audio (the studio's) into receive audio (the caller's) being the most important. Make sure the trans-hybrid loss figure is high. You should expect better than 30dB loss. Be sure that specification is measured without *ducking* or processing of any kind. Ducking is used to lower the caller audio while the announcer is talking. While a speakerphone mutes caller audio, modern hybrids will simply lower their level. This feature will give you much better performance on



otherwise bad calls and will also ensure that the announcer has dominance in the conversation (you *do* want that, regardless of your feelings about the talent). Make sure your hybrid has ducking features.

Other processing features, like AGC and EQ, are definitely a plus, since they can help maintain audio levels and improve quality inconsistencies in the call. Features and controls vary on each unit. Cost limits and your station's needs will determine which of these features is needed.

I haven't yet addressed the need to determine the studio requirements for your station. This omission was intentional. It's easy to get lost in the plethora of extra features and lose sight of the most important requirement of any system: getting quality caller audio on the air. Narrow the field of choices based on performance, then look at the system's bells and whistles.

Broadcast phone system manufacturers are aware of most of the applications where their equipment is used and typically design their product line to be modular so it can accommodate a broad range of applications. Make sure your equipment vendor or, ideally, the manufacturer's rep is fluent with the system's architecture and can show you a stock configuration for your situation. Always have the following information available: how many lines (total) you need to handle; how many studios, if any, will need to have access to those lines; how many simultaneous callers each studio will need to have on the air; and any special needs, like different line appearances in each studio, remote control and tally outputs, multiple call screener/producer location(s). Keep in mind all elements of the station (for example, music stations often forget they have to consider the weekend call-in show in the design). You'll quickly develop a clear idea about how each proprietary system is set up, and you'll be able to make price and feature comparisons based on that information.

Make sure you've addressed your operator's concerns before making the final decisions. Usually, your staff will have worked with phone systems they liked and disliked. Find out the *whats* and *whys* of their preferences, and you'll get better staff buy-in. Also, notice who in your market (and in the myriad of network TV shows) has good caller audio. Learn what these stations and what your colleagues have done to obtain this audio quality. As Mark Twain said, "Any fool can learn from his own mistakes." If you learn from your colleagues' mistakes, they won't end up learning from yours.

Your station probably depends heavily on phones for its image. A clear, trouble-free on-air call is a highly visible indicator of an excellent phone system and a quality broadcast. Following a careful selection and evaluation process is crucial to making this goal a reality.

Barry Thomas is technical director of KCMG-FM, Los Angeles.

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The well-routed facility

By Skip Pizzi, executive editor

One of the primary functions of a broadcast station is that of gatekeeper — choosing from myriad sources to select one that goes on the air. This process has not changed much since radio's beginnings, nor is it likely to change in the future. The tools used for this function, however, are changing, and it is important to know how to implement these changes for your facility's greatest benefit.

The best tool for selecting one source from many throughout a facility is the routing switcher. Because of the relatively high cost of these devices, many broadcasters have eschewed their use, preferring to get by with patch cords, mixers and console input selectors. Today, switcher costs are more reasonable, thanks to the economies of new designs and the entrance of new companies to the business. For many facilities, switchers are more critical than ever because of consolidation and increased local production.

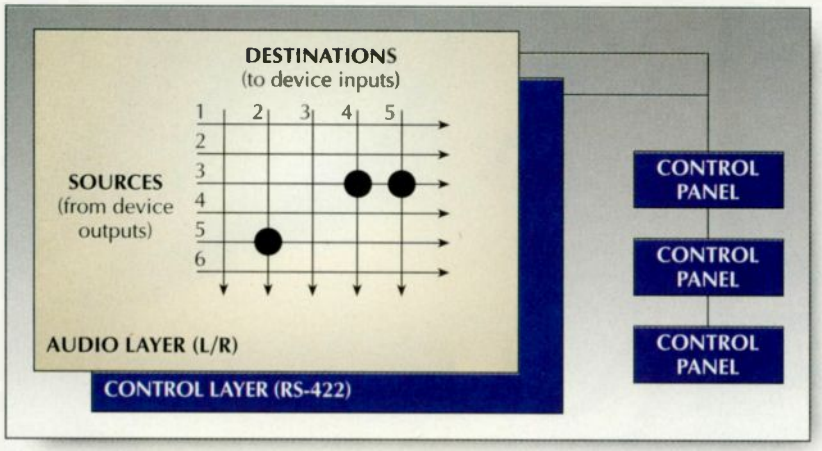

Figure 1. A conceptual diagram of the crosspoint matrix in a routing switcher. An example configuration is indicated by the highlighted crosspoints in which source 5 is routed to destination 2, and source 3 is routed to destinations 4 and 5. A separate remote-control layer exists on this switcher. It allows similar routing of machine control signals. The router itself is configured by a number of distributed control panels.

Routing switchers are no longer "Cadillac" devices intended for use only in the most high-end facilities. These devices also allow economies in other areas, such as requiring smaller mixing consoles and freeing up operators from pulling patch cords at scheduled times.

Basic operation

In the typical installation, all of a facility's audio sources and destinations are wired to the routing switcher's mainframe, which is generally placed in a central or otherwise convenient rackmounted location. The switcher provides *crosspoints*, by which the signal from an audio source is fed to one or more destinations (see Figure 1). These crosspoints thereby allow a single output to feed a single or multiple inputs, usually without modification or processing. In this respect, a routing switcher can be thought of as an electronic patchbay, directing signals from audio outputs to audio inputs throughout the facility.

Today's switchers come in many sizes, accommodating the needs of a wide variety of facilities. The usual metric for router size is a statement of its dimensions — the number of sources by the number of destinations it can handle (e.g., 32x16). The numbers usually refer to stereo inputs and outputs. Actual signal paths are double these values.

Switcher dimensions can be *square*, meaning its number of inputs and output are equal (e.g., 32x32). A more common arrangement offers more inputs than outputs (e.g., 32x24). This configuration allows a large number of sources to be routed to a smaller number of possible destinations.

The physical size and price of a router vary in proportion to its dimensions. Common sizes for today's radio facilities can range from 24x16 to 128x128. Most systems are easily expandable, and some can be prewired for a large capacity but initially outfitted with a smaller switching matrix.

Control of the switcher's crosspoint operation can be handled from a single, central terminal or more commonly from distributed control panels around the facility. These controllers select a source and a destination, then invoke a "Take" command to perform the switch. Typically, every location considered a destination on the system (e.g., production control room, ISDN codec, DAT recorder) will have a switcher control panel nearby. Control rooms will often have more than one switcher destination assigned to them, allowing

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multiple sources to be simultaneously routed there. Each control room often needs only a single control panel. In some cases, switcher control panels can be fabricated as popular mixing consoles' plug-in modules, allowing them to fit neatly into the mixer's work surface. In other cases, the switcher controller is a rack-mounted device that can be placed at any convenient rack location.

All switchers allow splitting of the source signal to multiple destinations without attenuation, and some also allow minor modifications of the source signal as it passes through. These may include level adjustment, the summing of a stereo source to mono, the reversal of stereo channels and the selection of the source's left or right channel only.

a few other devices around the plant. In the former scenario, an extremely flexible system exists but requires a large, complex and expensive routing switcher. The latter provides switching for only the most frequently used devices, without great expense or cumbersome operation.

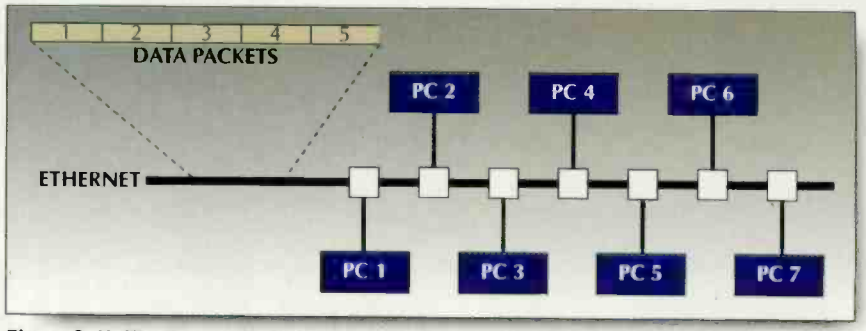

Figure 2. Unlike the parallel arrangement of the routing switcher that uses many discrete wiring paths, the LAN shown here routes all signals serially on a single cable. Data is sent in discretely addressed packets that are routed by virtual means to the appropriate destinations on the network.

Applications

Some facilities design routing systems that include virtually every I/O in the facility. Others include only selected sources and destinations. For example, one facility may connect every recorder, CD-player, microphone pre-amp output, remote site, processing device and mixer to its routing system. Another may choose to connect only a few mixer inputs and outputs, some selected remote sites and

More sophisticated routing systems offer switching of machine-control signals through an RS-422 *layer* (an independent set of crosspoints) of the switch (also shown in Figure 1). In addition to routing a device's audio paths, its remote control path can also be routed through the switcher. An example application is controlling a remote tape deck from any control room at the studio by selecting the deck's control port and assigning it to the

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appropriate control room's transport control panel.

Another variable involves the use of digital or analog switching. Many routing system vendors offer both, including some less expensive designs. The choice hinges on the rest of the facility's makeup. If the majority of I/Os to be connected to the switcher are still analog, it makes little sense to convert all the sources to digital and back simply to pass them through the switcher. The many A/D and D/A converters required would be expensive and ultimately unnecessary, because analog switchers generally do not significantly degrade audio quality. On the other hand, if most of the devices in the facility offer AES3 digital I/O, then a digital router makes more sense. In either case, a few A/Ds and D/As will continue to be required to accommodate any necessary conversions.

Large routers can be configured with separate digital and analog sections, each connected to their respective flavor of sources and destinations. Tie lines between the two router sections are equipped with A/D and D/A converters and integrated into the switching logic. These conversion paths allow any analog source to be sent to any digital destination and vice versa without need for the external A/Ds and D/As mentioned above. Such hybrid routers offer the additional advantage of phased growth. As more of the facility migrates from analog to digital I/O, analog switching-matrix modules can be easily replaced by digital modules.

The control software for some of these more sophisticated systems may include automated operation, allowing frequently needed switch configurations to be programmed into macros or invoked at a regular, predetermined time. Because a calendar function is included, these systems must be checked for Y2K compliance.

Audio LANs

The routing switchers discussed above deal with discrete devices and real-time audio signals, but much of the audio at a modern radio facility lives as files on computers, which routing switcher are not designed to accommodate. Transferring file-based audio data among computers is the role of a local area network (LAN) to which all the audio production and delivery computers are connected. Such a LAN typically operates as a high-speed Ethernet (100 BaseT) over CAT-5 wiring and may be physically separate from the administrative LAN used by the facility's office computers.

Unlike the discrete crosspoint switching of the routing system, which requires a parallel fabric of many dedicated physical connections, the LAN sends discretely addressed packets of data in serial form all over a single wire (see Figure 2). The LAN serves as a virtual router, while the routing switcher embodies an actual switching matrix.

A truly interconnected facility today requires both types of routing to optimally accommodate its production needs.

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Making the most of your consulting engineer

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

Consulting engineers don't come cheap. To be cost-effective, a station should be completely ready for the consultant's arrival. Presumably, the problem will be discussed over the telephone prior to determining that a station visit is necessary. Following the guidelines below will help you save time and money, both in telephone consultations and station visits.

One of three events usually precipitates a consulting engineer's involvement in a station's operation: the management's desire to improve the facility, a problem with the antenna system, or the station engineer's feeling that a consultant can improve operations.

In the first case, the chief engineer may be asked if a station power increase is possible and how much it will cost. In general, the chief engineer can determine whether a change of transmitter site may be required. If the answer if yes, management's desire to expand will often wane. If the answer is maybe, thought should be given to where the facility might go. From here, the path becomes more complicated. Before delving into that topic, we'll look at the issue of increasing a station's power.

Major changes to an antenna system can justify the use of a consulting engineer, like converting from nondirectional to directional coverage.

A new home

Most engineers are happy to increase power and build new transmitting facilities, even though doing so will involve long hours and hard work. Most chiefs have pretty well-tuned feelings about their stations and potential improvements. One area of concern is the effect of the considered changes in the absence of an operating computer program that has an up-to-date database of stations and the terrain data for running FM siting and coverage plots. These expensive aids are essential to radio engineering. Unless the chief is moonlighting on the side, he probably won't have access to them. So, he will have to run a somewhat mental/mathematical check and assess the situation. Often, a station engineer will have acquired one of the many DA programs or similar aids to station work. Valuable help can be obtained in this manner but, unless the programming used conforms to the *FCC Rules*, it is not advisable to use such material in an application.

If the odds for improvement look good, you should get management's approval to call a consulting engineer for confirmation and development of the project. Most station engineers will have a preferred consulting engineer in mind. Usually, these engineers can be consulted over the phone; most consultants will provide quite a bit of input for free via telephone conferences. Certainly, an estimate of engineering costs should be obtained before going to management. Regardless of the relationship between the station engineer and the consultant, you should provide management with an estimate of cost (per hour, per day or for the overall project).

Although the FCC does not require doing so, consulting with a licensed professional engineer on matters concerning site moves, new applications, power increases and conversion from non-DA to a DA operation is advisable. Though the P.E. is not necessarily more capable or experienced in these areas, he will have a closer relationship with the FCC engineers and can feel out ideas unofficially. He will also be familiar with FCC rules and their applications.

To keep the chief engineer in the engineering chain, the engineer and consultant should communicate directly. Nothing leads to more confusion and ill feelings (as well as an increase in cost) than semi-technical phone conversations between a consulting engineer and a general manager.

Once the decision has been made to work with a consulting engineer and the order to keep costs as low as possible has been given, the chief should gather all the material possible and assemble it into an orderly presentation. By doing so, everything will be on hand for the face-to-face visit between the engineer and consultant. The same provision should be made prior to phone conversations with the consultant.

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RF Engineering

What you'll need

For potential sites, the following information will be needed: topographical maps of the areas, information regarding airports, siting problems, power supplies, tall towers in the vicinity, power lines, ground elevations, building restrictions and zoning, and locations of all stations that might possibly be affected by any proposed operation. You will also need copies of the existing operating license. For FM stations, information about any TV or other towers where a new antenna might be mounted will be needed. For AM stations, any possible stations where multiple transmitters could be multiplexed into a single tower will be needed. Also, have studio coordinates in case studio distance becomes involved. Prepare some notes on the means of feeding transmitters, STL types, satellite needs and phone lines.

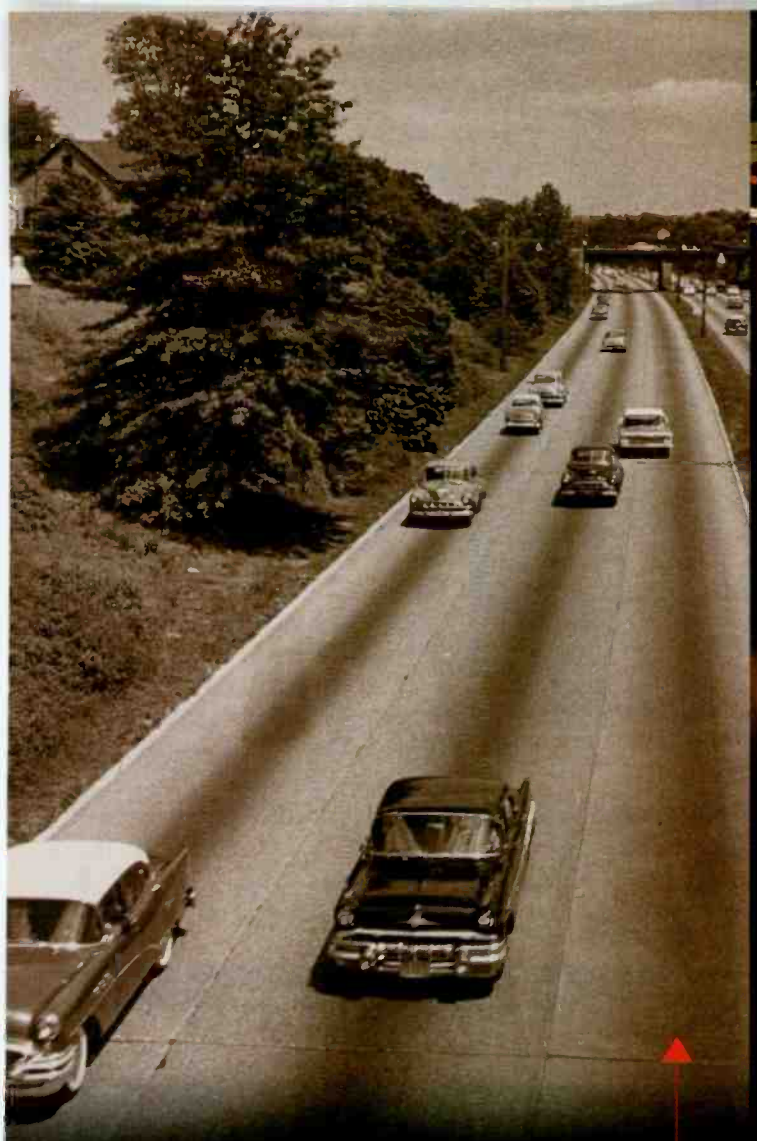
Before making any adjustments, write down all the meter reading and dial indicators. This will allow you to revert to the previous settings if needed.

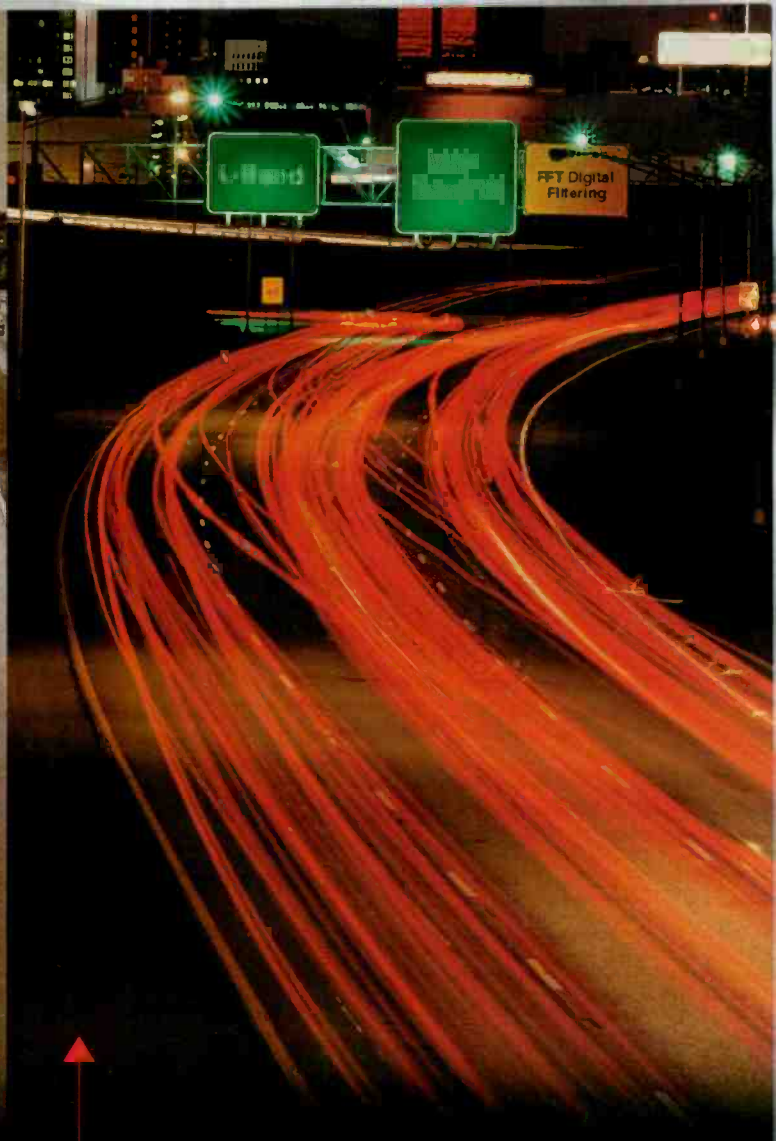
The above list seems overwhelming but probably covers only some of the consultant's questions. Be forewarned that, during phone consultations, you should have all your materials readily available. Some expensive consulting engineers charge by the minute — much like lawyers.

If the consulting engineer is visiting the station to help with an antenna problem, make sure the most recent full antenna proof of performance is available and that all maintenance logs, licensed operating parameters and monitor point measurements are on hand. It's surprising how many stations do not have a current copy of the license that states the current operating parameters and times of operation. On one occasion, I had to call the FCC to find out exactly what the station was supposed to be doing. There were three licenses posted, and none showed a date of issue. The chief engineer wasn't sure which was correct.

Common sense

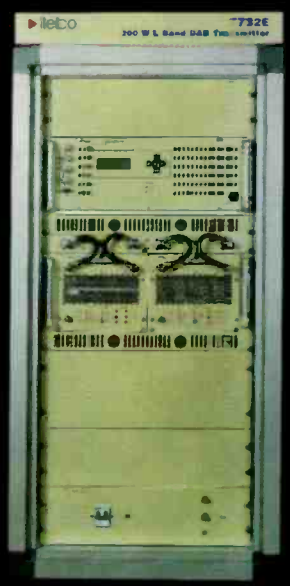
It should go without saying that, before the consultant is called in, every possible source of any problem has been checked. If the problem is intermittent, be sure it is still acting up when the consultant is called. Also, be certain you haven't made a silly mistake that did not warrant the call. If possible, get another engineer to check





Drive Time.

Digital Drive Time.



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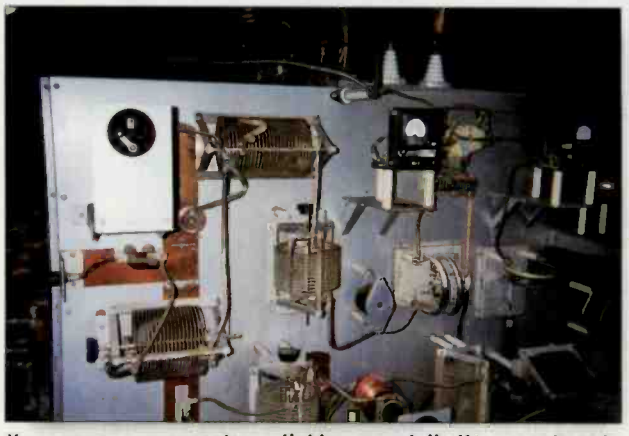
over your findings. Sometimes, you can be too close to the forest to see the trees.

If any applications have been filed prior to your arrival at the that station, find out their status and be sure you know exactly how the station should be operating. Be sure you have copies of the applications and know their disposition.

Verify that the instruction books for equipment in use are on hand. Be sure your field intensity meter (FIM) is calibrated and the batteries are new. If possible, borrow an extra FIM in case the need arises to make simultaneous readings. An inline bridge is also good to have on hand. Have plenty of spare batteries and flashlights.



Keep spare components available, especially if a consultant is being brought in to correct a problem.

If your problem is with a non-DA system, such as a folded unipole, have the original tune-up data on hand — an inline bridge will probably be an important accessory. Also, you may need a tower climber. Have someone available on call. Time spent waiting for a tower climber will cost the station money in consultant's fees, which are higher than those for a tower climber.

The same applies in the case of a DA that has gone awry. Try to have an assortment of capacitors on hand in case an ATU or phasor component has failed. It doesn't hurt to have some inductors around, too.

Have available a PC or cell phone setup so that several monitoring points can be manned at the same time and readings can be called in as the phasor is adjusted. Cell phone fieldwork can be quite expensive, depending on the local time charges. It is usually cheaper to use industrial, or even CB, equipment rather than cell phones. Remember that it is illegal to use VHF or UHF ham equipment for business purposes.

Finally, have your consultant's after-hours number available so you can call and cancel the visit if the problem is resolved.

Contact John at batcom@bright.net.

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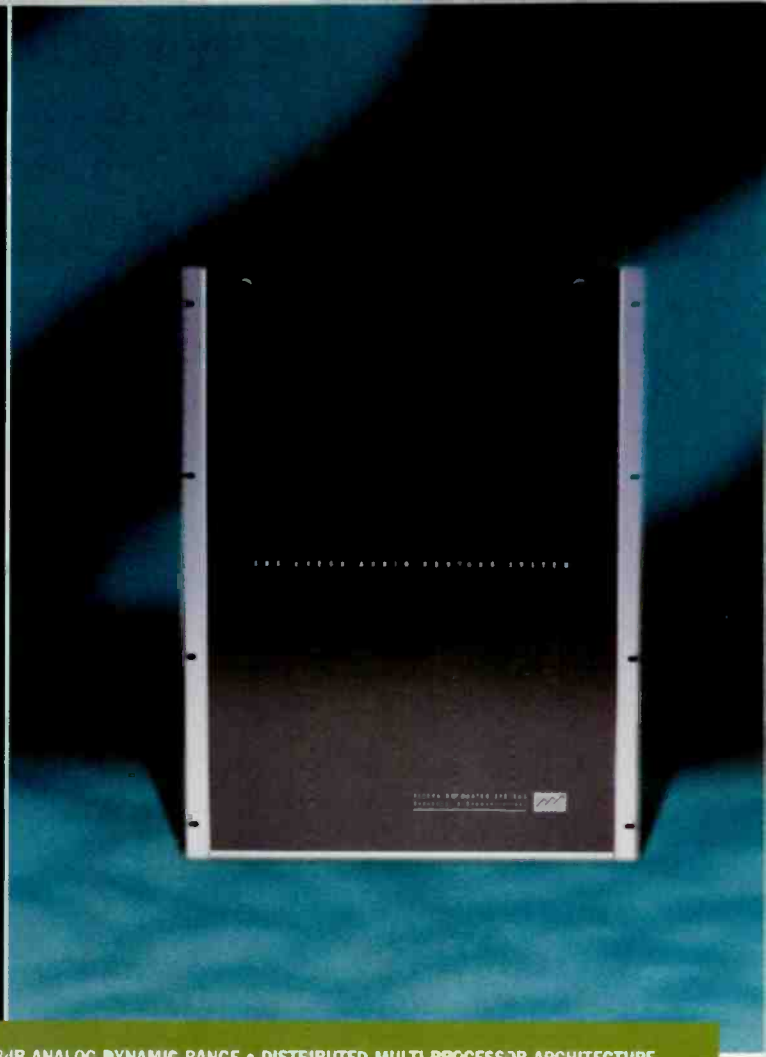

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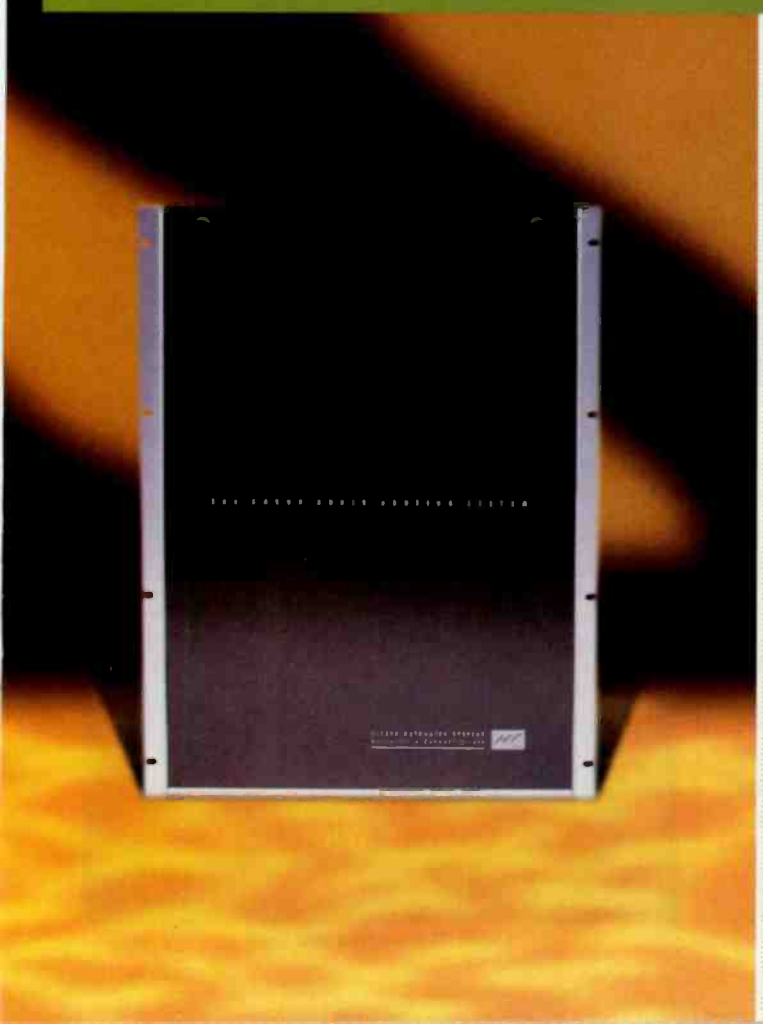

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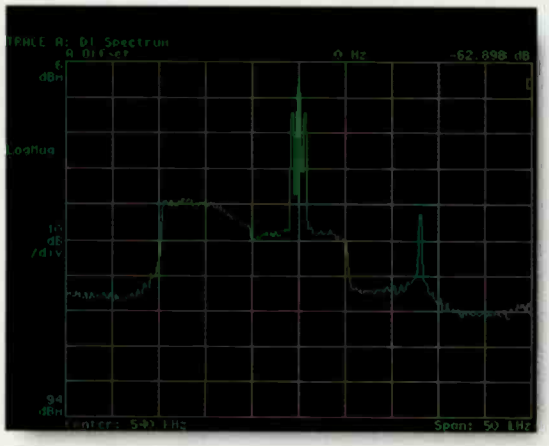
DAB update

By Chriss Scherer, editor

DTV continues to be a hot topic at NAB conventions. In the past, it seemed that any excitement about radio's evolution was lost amid the clamor about DTV. This was not the case at NAB99. Although DTV continues to draw attention, due to recent developments, IBOC is getting its share of the limelight.

Other parts of the world have begun implementing DAB systems. The U.S., far from being a technological leader, lags behind. We are, however, leading the world in one sense, by developing IBOC rather than Eureka 147.



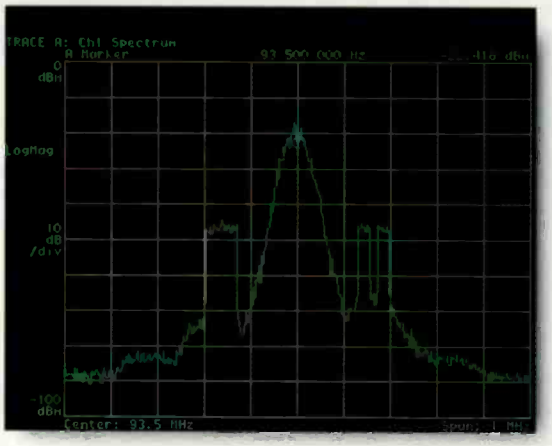


Figure 1. The hybrid IBOC AM (above) and FM (right) signals. Photos courtesy of USA Digital Radio.

IBOC action

Two of the three IBOC developers in the U.S. exhibited at the show: USA Digital Radio and Lucent Digital Radio. Digital Radio Express was noticeably absent. The exhibits for both USADR and LDR were busy. The IBOC arena continues to develop, not only on the technical side but also on the marketing side. Displays and demonstrations of the current work on the IBOC technologies were shown.

The visibility of IBOC progress has increased, partially because of the addition, some time ago, of LDR and DRE as developers. Terrestrial IBOC is also seeing potential competition between satellite radio licensees CD Radio and XM Satellite Radio. Both S-DARS licensees have set service launch dates for late in the year 2000.

USADR's big news concerned the transmission tests conducted with several AM and FM transmitter manufacturers. FM signals were passed successfully using transmitters from Broadcast Electronics, Energy-Onix, Harris and QEI. Each had waveform examples that showed the spectrum mask of the hybrid digital signal (see Figure 1).

On the AM side, Harris and Nautel provided information regarding their tests. They went one step further by demonstrating their transmitters passing the waveform operating into a dummy load.

Figure 1 shows the additional sideband activity in both the AM and FM waveform images. All IBOC proponents will use this hybrid analog/digital phase as an intermediate step before completely removing the center analog carrier and occupying the entire spectrum allocation with digital data.

Coding improvements

Lucent Digital Radio is developing four versions of its Perceptual Audio Coder (PAC) algorithm product family. Version 1 is intended for transmission over an unimpaired channel. Version 2 is designed for impaired channel applications like broadcast and includes LDR's multistreaming technology. Version 3 is optimized for 64kb/s connections, and Version 4 is for 5.1 channel applications.

PAC, developed by Lucent and used for a while in the USADR system, is a robust coding algorithm on its own. A broadcast path, however, is subject to many types of interference, including reduced signal strength and, in the case of FM, multipath. The idea behind multistreaming is to allow a graceful reduction in signal quality as the

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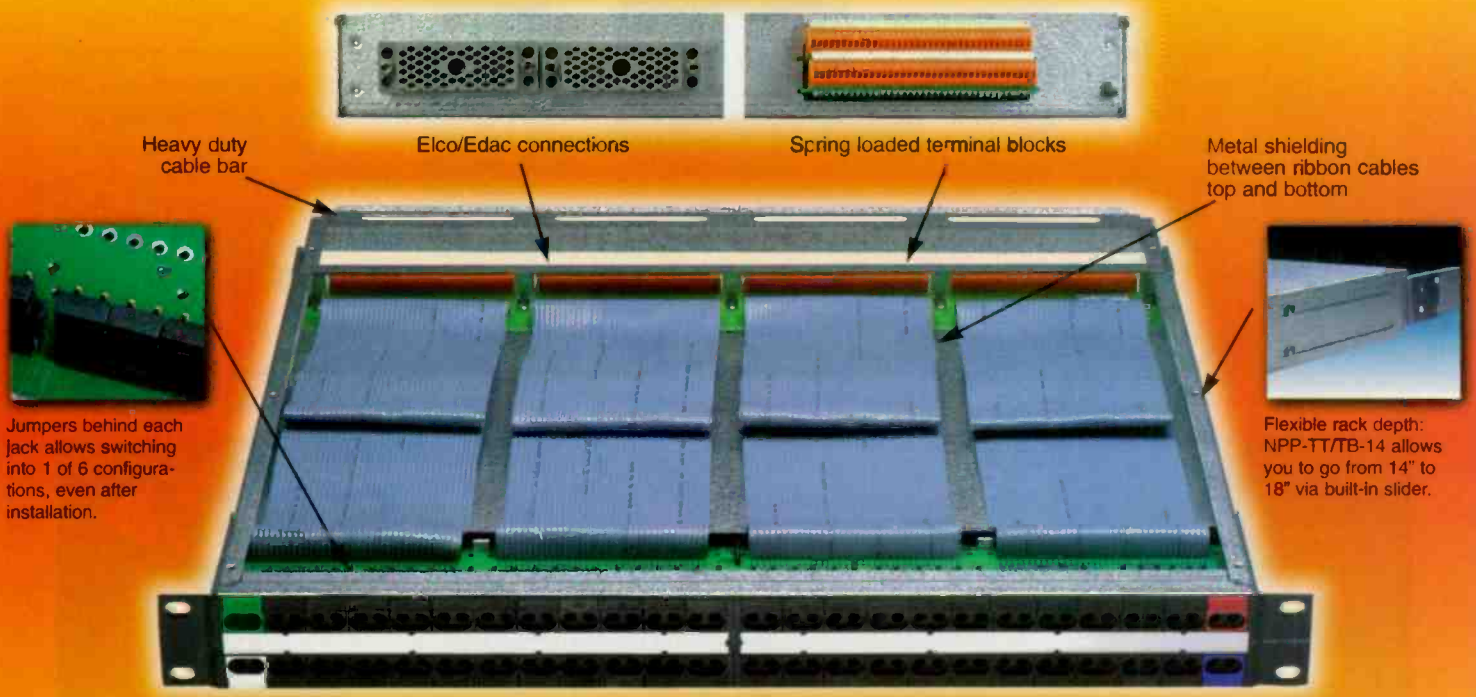

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transmission integrity decreases. This design will help reduce the effect of the digital cliff. In conventional digital signals, as the medium is reduced in integrity, the error correction takes over and recovers the signal. Once the error rate reaches a point where it is unable to recover, the decoder mutes. The listener will not hear the effect of the weakening data path. Multistreaming allows for a gradual reduction in signal quality, as with current analog broadcasting.

Instead of a single data stream being broadcast on either sideband, the data packets are divided into smaller pieces that are then transmitted. Figure 2 shows how the packets are divided among the spectrum. This setup allows a receiver to use as much data as is available to reconstruct the signal. If all of the data is present, a full-bandwidth signal is decoded. If only some of the packets are understood, the signal can still be reconstructed. This function is similar to listening to a sound file over the Internet. The bandwidth of a connection at 28.8kb/s is less than that of a connection at 64kb/s. Multistreaming allows the receiver to compensate for the reduced data rate.

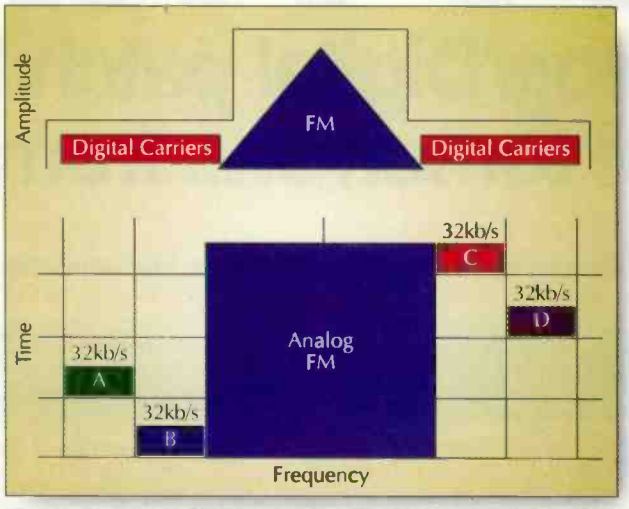

Figure 2. Lucent Multistreaming divides a signal into four smaller packets, then distributes these packets in both time and frequency around the carrier.

Lucent has also announced that field tests will commence shortly at WBJB-FM, Lincroft, NJ, and also with Naussau Broadcasting Partners. WBJB-FM is an NPR affiliate licensed to Brookdale Community College. Naussau Broadcasting operates a statewide network in New Jersey with 15 stations. It also owns or operates two stations in Pennsylvania and two in New York. The data gathered from these tests will be compiled and presented to the FCC later this year. Lucent still plans to begin its AM tests in the second half of this year.

Looking skyward

The satellite radio developers have been busy getting their systems together. Both XM Satellite Radio and CD

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Next Wave

Radio plan to begin their satellite launches early in the year 2000, with their services scheduled to begin later that year. Both companies are also working on building studio facilities.

CD Radio has built a terrestrial repeater network in the San Francisco area. This network will fill in some of the trouble spots that are not fully served by the satellite delivery.

XM has entered into an agreement with Delphi Delco to manufacture XM-capable car radios. CD Radio is working on similar agreements with other manufacturers. XM is partially owned by Hughes, a division of General Motors. This is a plus for XM, because all of the agreements will remain within one corporate family.

The Lucent tests at WBJB require equipment installation and setup. Greg Nease (standing) and M. Shariat are part of the team putting these tests together.

With separate agreements in place, several models of receivers may become available, each with different capabilities. Once IBOC broadcasts begin, listeners will be prompted to purchase new receivers. With hybrid AM, hybrid FM, XM and CD Radio formats available, choosing which one to buy may be difficult.

As evidenced at NAB99, DAB has a strong future in the U.S., and its development is moving in the right direction.

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Painting/lighting rules change for new towers

By Harry Martin

The FCC has modified its rules regarding tower painting and lighting, requiring that all new and altered towers registered with the FCC conform to specifications in the most recent FAA Advisory Circulars: AC 70/7460-1J, Obstruction Marking and Lighting, January 1, 1996; and AC 150/5345-43F, Specification for Obstruction Lighting Equipment, October 19, 1995. The circulars are available on the FCC's website at www.fcc.gov/wtb/antenna/faainfo.html or from the FAA. These circulars update the FCC's rules, which previously referenced outdated FAA Advisory Circulars.

FY 1999 RADIO STATION REGULATORY FEES

Population Served	AM Class A	AM Class B	AM Class C	AM Class D	FM Classes A, B1 and C3	FM Classes B, C, C1 and C2
ALT 0163 20,000	430	325	225	275	325	430
20,001 to 50,000	825	650	325	450	650	825
50,001 to 125,000	1350	875	450	675	875	1350
125,001 to 400,000	2000	1400	675	825	1400	2000
400,001 to 1,000,000	2750	2250	1250	1500	2250	2750
>1,000,000	4400	3600	1750	2250	3600	2750

Important changes in the new circulars include the requirements that all coaxial cables, conduits and other cables attached to the face of a tower be painted and that all flashing red obstruction lights on a tower simultaneously flash.

The FCC did not intend to require antenna structure owners previously assigned painting/lighting specifications to update their structures to comply with the new circulars. However, for more than three years, the FCC has been specifying tower registration authorizations on the new circular AC 70/7460-1J. Despite the lack of intent to modify painting and lighting requirements, tower owners are expected to comply with the circular specified on the tower registration. Moreover, the FCC will require any structure to comply with the new circulars if the FAA specifically requests that it do so.

If a tower you own has circular AC 70/7460-1J specified on its registration authorization, and you do not wish to comply with the new painting and lighting requirements, you may request that the tower registration be modified to specify the circular in effect at the time the FAA approved the tower. To do so, you must submit FCC Form 854, Application for Antenna Structure Registration. On item 12B of the form, indicate that you wish to change the existing obstruction marking and lighting requirements. Attach a copy of the tower's current FAA Determination of No Hazard specifying the prior circular. There is no FCC filing fee required with Form 854.

Annual regulatory fee increases planned

In March, the FCC issued proposed increases to its annual regulatory fees, which usually are due in September. Overall, in FY 1999, broadcast licensees will be paying 15.4 percent of the $172,523,000 to be collected, down from 15.6 percent in FY 1998. The FCC is proposing the reduction of the annual fee for unbuilt FM stations from $1,150 to $765. Otherwise, most broadcast fees will be higher for FY 1999. The FCC's fee proposals for radio are summarized in Table 1. Fees for auxiliary stations will be $12 each; fees for unbuilt AM stations will be $225; fees for unbuilt FM stations will be either $1,250 or $765, pending further deliberations by the FCC.

Auction rules affirmed

The FCC has reaffirmed its August 1998 decision to use auctions to resolve contests among competing applications for commercial broadcast licenses.

In response to petitions for reconsideration, the commission generally reaffirmed its conclusions regarding the use of auction procedures for mutually exclusive commercial broadcast-license applications, including those involving applications filed before July 1, 1997. To expedite service to the public, the commission also affirmed its decision to consider qualifications issues after the auction involving the winning bidder only.

The FCC said it would amend the terms of the anti-collusion rule as it applies to the secondary broadcast services (low-power television and television and FM translator services) to permit settlements and engineering resolutions after the filing of short-form applications but before the commencement of any auction.

The commission affirmed its adoption of the new entrant bidding credit. Applicants with interests in no other mass-media facilities would receive a credit of 35 percent to lower the cost of their winning bids. A

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reduction of 25 percent in their winning bids would be given to applicants with interests in very few media outlets, none of which serves the same area as the applicants' proposed stations.

The commission agreed with petitioners that existing interests in low-power television and television and FM translator stations should not be counted among a winning bidder's mass-media interests for purposes of determining eligibility for the new entrant bidding credit. The commission also refined the standards for determining whether a winning bidder's proposed station serves the same area as the bidder's existing media interests, thereby rendering the bidder ineligible for a bidding credit.

It is anticipated that the first auctions will occur in the fall of 1999. The FCC's Wireless Bureau, which manages the agency's auctions, needs time to come up with an auction notice for each mutually exclusive group of applicants; it will then evaluate the participants' comments on procedures, including the proposed minimum opening bid.

FCC continues microradio push

Despite letters from Congress and pleas from broadcasters, the FCC has not retreated from its plan to establish a low-power FM radio service. Indeed, Chairman Kennard has been outspoken in expressing his support for the proposal. At the NAB99 convention, Kennard chastised attendees as well as the organization that invited him to speak. Kennard stated that the NAB was trying to induce him into conceding microradio's failure even before the comments were submitted. House Telecommunications Subcommittee Chairman Billy Tauzin (R-LA) has written a letter to FCC Chairman Kennard asking him to postpone consideration of low-power FM pending Congressional consideration. NAB continues to request that the FCC provide additional time, beyond the current June 1 deadline, within which to comment on the FCC's proposals. NAB and others are conducting tests on the effect low-power FM radio would have on existing services, but most of the results will not be available for several months.

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

Dateline

Radio stations (commercial and noncommercial) in the fo lowing states (or district) must file their biannual ownership reports by June 1, 1999: Arizona, District of Columbia, Idaho, Maryland, Michigan, Nevada, New Mexico, Ohio, Utah, Virginia, West Virginia and Wyoming.

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PERFORMANCE 2 Channels or Mono (Tests Conditions: +4dB in and out, 1 KHz sine input)

INPUT Level	0, +4 dBm 600 Ohm or H1Z Bal or Unbal, XLR
OUTPUT Level	0, +4 dBm 600 Ohm Bal or Unbal, XLR
Variable Level	± 16 dBm (clips @ +20 dBm)
Frequency Response	± 0.5 dB, 20 Hz - 20 KHz
Channel Separation	96 dB
S/N (A-wt-filter)	86 dB
THD	.04%
Additional Commercial Time	2 Sec. - to - 4 Min., Mono 2 Sec. - to - 2 Min., Stereo
Variable Commercial Time	0.1 Sec. Steps

Note: Unit does not use data compression

OPERATIONAL CONTROLS

Enable Button	Enables each of the other buttons
Start Button	Starts Commercial Insertion Time
Hold Button	Stops Time Reduction (pass real time information)
Stop Button	Returns output to Real Time
2 Mode Buttons	Move forward or reverse in menu
2 Set Buttons & Knob	Increase or Decrease menu selection level or setting
Level Button	Push to enter Level menu
Time Button	Push to enter Time menu
4 Preset Buttons	F1, 2, 3, 4, Preset up to 4 events

ENVIRONMENTAL

Operating Temperature	+32°F (0°C) to 113°F (45°C)
Operating Humidity	10% to 95%, RH, Non-Condensing
Power Supply	117 VAC ± 10%, 60 Hz or 220 VAC ± 10%, 50 Hz or 60 Hz
Power Dissipation	50 Watts Max
Height	1 U, 1.75 Inches (4.44 cm)
Length	19 Inches (48.3 cm)
Depth	12 Inches (30.5 cm)
Weight	20 lbs. (9.1 kg)

OPTIONS

Rack Mount remote	R-A

Prime Image

Printed in US 03/99

Every year, the NAB show floor swells with more equipment, and this year was no exception. Between the South Hall (also called the Main Hall), the Sands Expo Center and the newly expanded North Hall (no longer just the Radio Hall), four days is simply not enough time to see everything. To help you fill in the gaps, BE Radio assembled a team of reporters to gather as much information as they could. For easy reference, their coverage is detailed by category on the following pages. We've got the show...

ALL WRAPPED UP

NAB99

INDEX

Audio Distribution

By Steve Fluker

Microwave, RPU, fiber optic, telco, satellite

Audio Processing Technology introduced new products intended for use as STL backhaul, studio networking and remote broadcast applications using the company's Apt-x algorithm. The BCF256 Broadcast Communications Frame offers an integral ISDN terminal adapter, automatic backup circuitry and alarm functions. The NXL384 broadcast network transceiver is used with permanent digital networks and can be configured in digital or audio versions. The DTR128 Digital Reporter Terminal is a portable, full-duplex digital audio codec operating on a single ISDN line.

Broadcast Electronics spotlighted new products from Marti Electronics,

including the SRPT-40E and SR-10E Frequency Agile VHF RPU transmitter and receiver. All adjustments are made on the front panel. Also shown was the new Marti GX-500 Remote Mixer, an updated version of the GX-440 with four mic channels, two aux inputs and four headphone jacks. It interfaces with many popular models of analog cellular telephones.

Broadcast Tools showed its new MC 16 Mega-Coupler. It offers relay closures for detected incoming signals, has a built-in hybrid, and can detect different key sequences and output a serial RS-232 ASCII stream to other devices.

Circuit Werkes was at the **Broadcasters General Store** booth with its new SEN-6, a Subaudible Tone Encoder. This encoder produces 25-, 35-, 50-, and 75Hz tones to trigger automation systems over satellite or other links.

Comrex continued to draw attention with the Vector POTS codec.

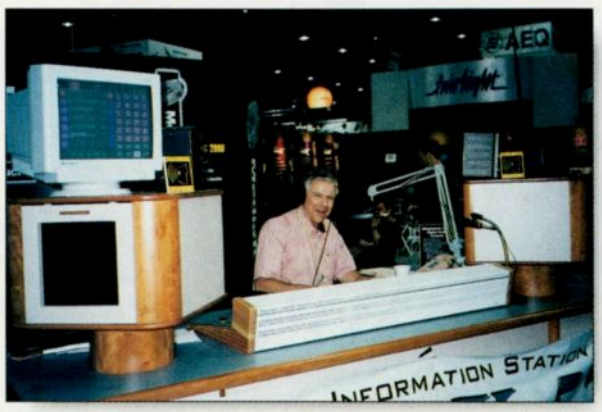
DH Satellite showed its line of satellite products, including satellite dishes. It also showed the **Research Concepts** antenna controller for dual-axis antennas.

Dialog4 displayed the MusicTaxi codec, available in rackmount (SL-pro) and desktop (PAN) versions. Both feature an automatic detection mode so a connection can be made to another location without knowing what device will be there. The configuration is changed to work properly. The CTaxi, a PC card recorder with built-in ISDN codec, was also shown.

Harris Intraplex introduced the Intraplex IntraLink (see "The Pick Hits of NAB99," p.72), an ISDN codec multiplexing and management system. The model 6500 is a 3RU-mounted frame that simultaneously handles up to six BRI connections. Also shown was the STL PLUS for integrating program audio, voice and data communications bidirectionally over T1/E1 lines. It can be connected to the new Harris Aurora Spread Spectrum radio to replace up to two T1 lines, eliminating monthly bills and relieving the fear of a telephone cable cut.

Henry Engineering combined two of its popular products into a new item, the DigiStor-CD, a solid-state digital audio recorder/player for utility use. It holds up to 32min of mono audio with CD quality in up to eight different tracks. With the built-in telephone coupler, the box can be used as a listener information line.

JK Audio showed the new digital telephone hybrid, the Innkeeper 1, an inexpensive digital hybrid with impressive specs and features. The Innkeeper 1 is available in desktop and rackmount cases. Auto nulling typically exceeds 50dB without any setup. A Presence button gives the caller's voice a richer sound, restoring some of the low end lost in transmission.



There were several live broadcasts and demonstrations on the show floor. A station from Guam broadcast from the Mediatouch booth.

Maycom displayed its PC-based ISDN codec, the ISYS Pro+. The unit is capable of recording on the local hard drive and uses MPEG Layer II and G.722.

Moseley Associates expanded its Starlink family to allow users to replace their previous T1/E1 telco lines with new licensed radio links. These new radio links are bidirectional and offer CD-quality audio with no compression. Also announced is the model SL9001ss for program conveyance with spread spectrum using T1/E1 data rates. The final release announced is the SL9003Q. This STL system, previously available only in the 900MHz band, is now available from 335MHz to 1.7GHz.

MusicamUSA showed the TEAM T1/E1 Audio Multiplexer, which can transmit and receive up to 12 audio channels over T1, E1, satellite, fiber or dedicated data lines. The modular, 4RU unit can transmit linear stereo or use Musicam enhanced MPEG Layer II, or J.41 formats. Also announced was the release of the new SendIt 3.1, a hardware-independent, all-software audio codec. MPEG Layer II, Layer III, and BWF wave file formats are supported. The company also demonstrated its new AAC (advanced audio coding) products.

NSN Network Services exhibited in the Sands Expo Center this year, providing information on its complete satellite network services.

QEI Corporation demonstrated the expanded capabilities of its CAT-Link system with the D-Max modules. With these modules, you can input AES/EBU audio data at any sample rate from 24kHz to 48kHz, up to 16 bits of resolution for transport over a T1 channel. The D-Max can output a composite signal on the receive end using the built-in digital stereo generator.

Satellite Export & Engineering offered a complete line of satellite dishes under the Patriot brand name. Antenna sizes range from 0.6 meters to 4.5 meters with a variety of mounts and focal types.

Telos Systems introduced the Series 2101 (see "The Pick Hits of NAB99," p.72), which can work directly with digital lines, including PRI or BRI ISDN and channelized T1 lines. The unit can then distribute phone lines to different studios. Combine the Series 2101 with the Telos Assistant producer multiline call screening software that runs on Windows for a complete talk-show system. The company also introduced its MPEG Layer II/4 AAC codec, a 1RU chassis with inputs for analog, AES/EBU or TCP/IP. Outputs are RS-232, X.21 or TCP/IP.

Steve Fluker is the director of engineering for Cox Radio in Orlando, FL.

Digital Audio Workstations

By Conrad Trautmann, CSRE

The term digital audio workstation means many things to many people. Digital audio editing systems come in many styles. Companies like **Prophet Systems**, **Arrakis**, **Pristine**, **Dalet**, **ENCO** and **Digital Audio Systems** make digital audio editors, but they are usually integrated into a larger system such as broadcast automation or a digital audio delivery system. They are usually basic two- and four-track editors used to edit a phone call in the air studio or to create a basic voice-over-music spot.

Then there are audio editing systems that are stand-alone systems use primarily for production. Of these systems, some focus strictly on audio production, such as the **Orban** Audicy and **Syntrillium**'s Cool Edit Pro. Others can do radio production and interface with video, such as **Digidesign**'s Pro-Tools, the **Digigram** Xtrack and the **Sonic Solutions** Sonic Studio HD.

Digigram, which in the past has supplied its editor only to manufacturers, now offers the Xtrack Digital Audio Suite as an end-user product. Coupled with its line of PC-based audio cards, this is a full-function editor, with up to 32 I/Os available.

Digidesign, now a division of **Avid**, is working on making the Pro-Tools system compatible with its sister-company software. The company showed a surround-sound plug-in from a partner company, **Kind of Loud**. And its new Version 4.31 is compatible with the Mac G3.

Sonic Solutions has a new, completely retooled software and hardware package. The SonicStudio HD operates in 24-bit mode, up from 20 bits last year and runs up to 192kHz for DVD-AC3. The screens are much more intuitive. One nice feature is the one-button CD burn, which allows you to line up tracks in a directory and press one big green button on the screen to burn those tracks to CD. The unit also supports writing to the new Direct Stream Digital format, also called Super CD.

Digital Audio Labs has added four new plug-ins for its V-8 digital workstation. Of those, **Aphex** is one of the providers, with a software version of the Aural Exciter. Another plug-in, AutoTune, provides a pitch-corrector plug-in capable of dynamically shifting a track's pitch up or down in real time. Digital Audio Labs also showed a new PC-based audio card capable of 24bits at a sample rate of 96kHz.

Euphonix showed the R-1 multitrack recorder, the latest in digital multitrack recording devices.

Syntrillium announced a new software release, Version 1.2. The new release now has full reverb, hard-limiter, and pitch-bender effects. For the Internet crowd, it supports Real Media G2. The company has also added automatic silence detection and deletion.

Fairlight, the manufacturer of the MFX3plus digital audio platform, announced its networking design, Medialink. With a central server system using Microsoft WindowsNT, multiple workstations can share audio files.

MusicamUSA showed EditPro, the only software audio file editor that works directly on compressed MPEG Layer II and III files. EditPro allows users to edit compressed files — without the need to uncompress the file prior to editing — then recompress the file after editing.

Via its Version 2.5 software upgrade, **Orban** expanded the Audicy to support TCP/IP and Novell networks. The unit was already compatible with WindowsNT. Also included in the upgrade is a feature that allows the finished production to be exported to many on-air delivery systems with an extension that provides traffic and continuity information embedded directly in the sound file. Orban had a link to the **ENCO** booth in the Radio Hall. Other companies supporting this protocol include **Scott**, **Studer**, **Prophet Systems** and **Harddata**.

Finally, **Soundscape** added a new Dolby encoder and a plug-in from **Syncro Arts**, called VocALign, which automatically synchronizes the modulation from one signal to another.

Conrad Trautmann is chief engineer and information systems manager for Cox Radio, Long Island, NY.

RF & Towers

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

Transmitters, antennas, towers, coax, monitoring equipment, RF terminators

ERI presented a new service for broadcasters who need to make tower changes. The ERI Professional Service Team offers structural tower analysis reports and reinforcing modifications as well as annual tower inspections.

Altronic Research lightning arrestors are available in $^{7}/_{8}$-inch and $1^{5}/_{8}$-inch coaxial line units. The company showed a new item, the EMPL series coaxial lightning arrestor, designed for lower-power operations.

ALL WRAPPED UP

Antenna Concepts has a new version of the Ultra Tracker FM antenna. Known as the Ultra Tracker II, it is the latest in the company's extensive series of CP FM antennas, with practically zero downward radiation — 99 percent power is claimed in the major lobe.

Armstrong transmitter displayed several products, including its economical line of transmitters and STLs.

Belar Electronics Laboratory has a new Composite FFT Spectrum Analyzer. Suited for AM, FM and TV, this device shows a real-time spectrum. A modification is in the works for an AM model, which will meet the FCC's requirements for AM mask measurements.

The Dielectric booth displayed antennas in proper position.

Broadcast Electronics showed a frequency-agile FM transmitter, the FM10S, which can maintain 95 percent of full output with one PA module out of service. Equipped with redundant power supplies, all modules are replaceable from the front of the transmitter while the unit is in use. The new Predator exciter is available with 50-,150- or 250W output and can be supplied with the new FM-10S if desired.

Coaxial Dynamics has modified its well-known dummy loads and has made them even more flexible.

Continental Electronics displayed its latest PowerStar product line. The

ALL WRAPPED UP

Power Star A50, 50kW AM transmitter is the first AM transmitter that accepts and generates digital emissions. Also shown was the new PowerStar F10, 10kW solid-state FM transmitter.

Crown Broadcast showed its existing line of FM transmitters, which sported a number of small improvements.

At its booth, Phasetek showed its existing line of AM phasors.

Dataworld showed its usual sparkling display of coverage maps for AM, FM and TV stations.

Delta Electronics showed the Digital RF Ammeter System. This new RF Ammeter has a current range of 1:100. The digital readout covers antenna currents from as low as 0.1 amps to as high as 10 amps. This eliminates the cost of a separate, low-scale, nighttime ammeter. Also, Delta's Model TCA RF ammeters can now be upgraded to a digital readout.

Dielectric Communications showed a new, small, tankless dehydrator for small stations. In use, air enters the pump/dehydrator and exits directly to the transmission line. A pressure switch controls the unit's operation.

Svetlana displayed its line of broadcast tubes.

This year, **Harris** demonstrated a Gates 1kW operating into an antenna and transmitting the USA Digital Radio IBOC signal to show how well it can pass the complex signal.

Itelco showed the new solid-state 2kW transmitter, with 500W modules, and the 20kW FM transmitter.

Kintronics showed its modified Intelligent Control System, known for its fluid control of AM DAs, which now allows for greater freedom in its use. The company also showed a new collapsible mast for AM or FM that can be hand-cranked up to 150 feet.

OMB showed its new 500W FM transmitter, called the AM500. Extremely light, it uses mosfets and dual power supplies as well as a Wilkinson combiner. Should the antenna become disconnected while the TX is on a very fast detector, it cuts power, so there is no damage to the PA stage.

Phasetek showed examples of its tower detuning system.

Propagation Systems showed its new FHR Series of FM antennas, an alternative CP antenna at an alternative price. It is constructed of 3-inch diameter brass, and up to 12 bays can be stacked together with any necessary beam tilt or null fill.

QEI showed the Quantum M series, a solid-state 1.2kW to 9.6kW solid-state FM transmitter with a 50W exciter. The IPA and PA modules are interchangeable. The system has tested well with IBOC signals. QEI is also offering a new monitor and control system for multiple antenna/transmitter installations.

SCA Data Systems showed its Mega 20, a device for streaming data that is practically error-free because of the many iterations of the signal and the diversity of times (i.e., picket fence-type of multipath interference will not cause errors). It resembles spread spectrum but in reality is spread time.

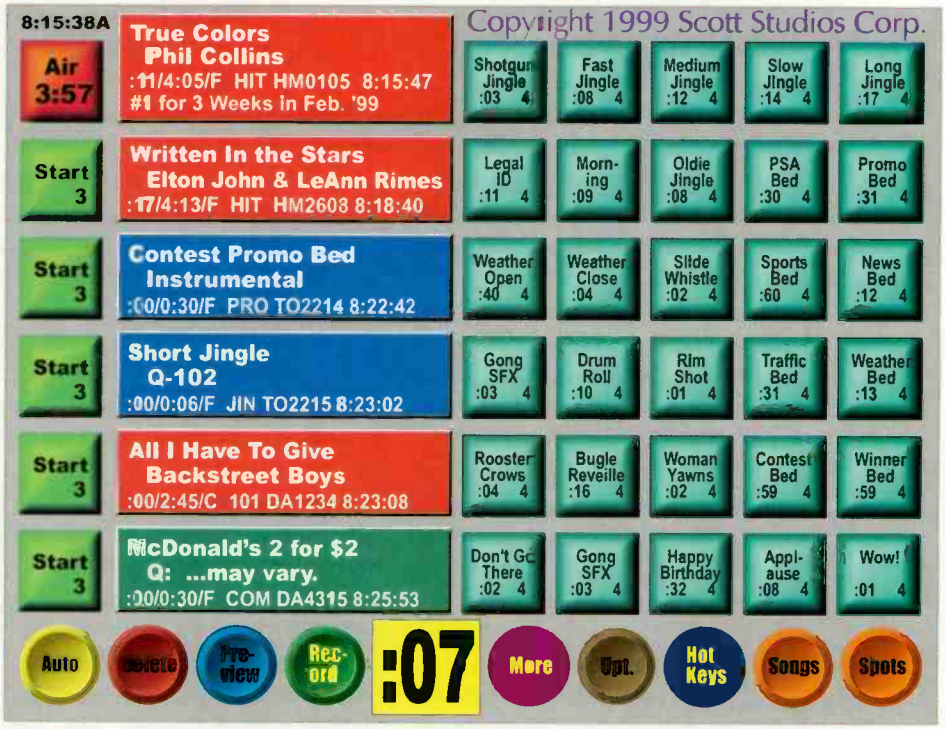
The Best Digital Systems

It's a fact: *More* U.S. radio stations *choose Scott Studios'* than *any other* digital system! 2,025 U.S. stations use 4,600 Scott digital workstations. One reason is that the Scott System is the *easiest to use*. It's simple, straightforward, intuitive and powerful!

And Scott Studios' audio quality is the *very best!* You choose from new 32-bit PCI cards by Digigram, Audio Science or Antex. Scott Studios is famous for our *uncompressed* digital systems at a compressed price, but we also work well with MPEG. Scott software can record and play our audio files on a laptop and home PC.

Scott computers are industrial quality in 19" racks, but *not* proprietary: functional equivalents are available at most computer stores. You get 24x7 toll-free phone support. You also get new software features *free* for years from Scott's Internet site.

Scott Studios offers *three* different systems in *three* price ranges to suit *any* budget.



This is the user-friendly Scott 32 System, with 30 sets of 30 hot keys, phone editor and all songs and spots on line for instant play! It seamlessly mixes uncompressed and MPEG digital audio!

Good Spot Box

Scott's Spot Box delivers the *simplicity* of a triple-deck "cart" player plus *compact disc quality* digital sound.

Spot Box has only the one screen, so announcers always know what's playing. On the left of the screen, three digital players have clear labels on each spot. VU meter bars show levels. Buttons show countdown times and flash as each recording ends.

At the right of the screen, "Cart Walls" let you pick and play any recording by name, number or category. Or, number keys at the bottom load spots quickly from your log.

Scott's Spot Box includes a recorder and costs as little as $5,000. Options include log imports from traffic computers and music on hard drive.

Better AXS® 2000+

AXS® (pronounced ax'-cess) 2000+ is radio's premier digital audio system for automation and live assist. AXS® 2000+ is fully featured, with 99 sets of 28 instant play Hot Keys, log editing in the studio, live copy on-screen, big countdown timers and can include a production or phone recorder.

You also get auto-fill of network breaks to cover missing spots, a Real Time Scheduler, unattended net recording, timed updates, macros and optional time announce and WAVE file imports.

For stations with large CD music libraries, AXS® 2000+ can also control inexpensive consumer CD multi-pack and 300 CD juke box players.

Best Scott 32 System

The Scott 32 System (pictured at the upper right) is the most powerful digital system in radio. Your log is on the left side of the screen. Everything plays at your touch. On the right, 30 sets of 30 Hot Keys play any spur-of-the-moment jingles, effects or comedy. You also get 10 "Cart Walls" with 1 or 2 second access to *any* recording. A built-in recorder quickly and easily edits phone calls, spots or pre-recorded Voice Trax.

Scott 32 options include recording Voice Trax while hearing surrounding songs and spots, time or temperature announce, *Invincible* seamless redundancy with self-healing fail-safes, newsrooms, 16-track editors and auto-transfer of spots and voice trax to distant stations via Internet.

Contact us to see how one of Scott Studios' three digital systems can be tailored to *your* needs and budget.

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Dallas, Texas 75234 USA
(972) 620-2211 FAX: (972) 620-8811
8 0 0 7 2 6 8 8 7 7
(800) SCOTT-77

ALL WRAPPED UP

Scala Electronic Corporation now has the Kathrein line of test equipment; this AC/DC operated equipment is ideal for field measurements.

Shiveley Labs now offers a service to reanalyze FM radiation patterns from existing stations to investigate the effect of towers on radiation patterns.

Silicon Valley Power Amplifiers offered a new 1kW FM amplifier, the Series 20-1000. This unit requires only 10W of drive. As many as five can be stacked with an external combiner to produce 5kW output.

Superior Broadcast Products showed its new line of FM transmitters. All solid-state, they range in power from 20W to 20kW. Coupling them with the new Superior broadband FM antenna that handles up to 5kW per bay makes an excellent combination.

SWR issued a new 116-page catalog showing its wide range of equipment. The company's latest antenna is a redesigned stainless-steel version of the FM panel antenna that has been offered since 1983. It has been broadbanded to over 10MHz, and its new grid panels offer reduced windloading.

Computer Products & Power Products

By Kevin McNamara, CNE

Antex Electronics recently announced an alliance with **Sun Microsystems**, which brings certain audio card products to Sun's Ultra workstations and Sun Enterprise servers running on Sun's Solaris operating system. For the PC environment, Antex has introduced two new 32-bit compatible, half-card PCI audio adapters, the LX-22M and LX-24M. The LX-22M is a low-cost solution well-suited for recording and playing MPEG digital audio files. The LX-24M is designed for multitrack digital audio applications: multiple cards that can be configured within the same systems to achieve six-, nine- or 12-track simultaneous recording or playback. Both cards use 20-bit A/D and D/A converters that yield a typical dynamic range of 96dB and can handle sample rates from 6.25kHz to 50kHz.

Digital Audio Labs introduced the CardDeluxe PCI digital audio interface, which replaces the CardDplus. The CardDeluxe features analog and digital stereo I/O connectors, including TRS balanced connectors for analog and a pair of S/PDIF I/O RCA connectors for digital. The analog and digital channels can be used simultaneously for four-channel operation. Both I/Os will support 96kHz at up to 24 bits of resolution.

Digigram introduced four new products. Termed a digital audio appliance, the NCX200 Network Audio will decode and play stereo audio streams originating from a server connected to a 10Base-T Ethernet. A bidirectional serial connection provides communications with the server and allows source selection and status. For laptops, there's the new Vxpocket type 2 PC card. The VxPocket offers simultaneous, independent digital audio record and playback capabilities. Balanced analog stereo inputs are provided to accommodate mic or line levels and balanced stereo output as well as S/PDIF connections. The VxPocket can run applications that comply with the MS Wave protocol or the Mac OS 8.x Sound Manager. The VX222 is a new linear sound card that provides 24-bit analog and digital I/Os and adds two general purpose interface (GPI) inputs and outputs. The card is designed for both the PC and Mac operating environments. For purely digital applications, the PCX222np and PCX221np digital audio stereo sound cards provide 24-bit A/D and D/A conversion while supporting sample rates of up to 96kHz, programmable in 0.02Hz steps. The cards also provide wordclock and LTC (SMPTE) inputs.

If you need to produce CD-ROMs for distribution, **Mediaform**'s several CD-R duplication systems can handle automatic duplication of up to 800 CDs without refilling.

TELEX introduced the CDP-2001 desktop CD duplicator, which features computability with DVD-R and CD-R through a user-friendly user interface. The CDP supports multisession-to-multisession duplication. This is a slick device for mass CD duplication.

In the way of UPS power systems, **MGE UPS** offers single and three-phase UPS systems, which can be purchased in a number of custom configurations for specific solutions. **Best Power** also offers UPS/power conditioning products, including the Unity/I line, featuring capacities of up to 220kVa. **Equi=Tech** has a full line of AC power balancing systems. New to its line are the ET1.5R and the ET2R. The units are capable of 15 amps and 20 amps respectively, occupy only 1RU and replace the previous versions that occupied 3RU. They also weigh less.

Kevin McNamara is president of Applied Wireless Inc., New Market, MD.

Audio Processing

By Jeffrey A. Keith, CPBE, NCE

TC Electronic showed its new Intonator, a vocal intonation processor; software upgrades for the M3000 studio reverb processor; and the FireWorX multi-effects processor, including the proprietary VSS (virtual space simulation) technology containing presets of real spaces. New DBMax software Version 2.02 was shown as well as the new DBMax Finalizer 24-bit/96kHz studio mastering processor.

Symmetrix introduced its model 306 Preamp/Ducker, a two-channel processor that offers a streamlined paging/foreground music front-end with comprehensive ducking controls. Paging inputs can be fed to

Sound Experience
Sound Partners

Dielectric Communications has installed 3/4 of all the digital antennas in the USA. As a radio broadcaster, you're planning that 21st century digital transition for your audiences also. Let's work together to develop a system with clearer signals now and digital capabilities later. From digital ready combiner systems, transmission lines, and antennas, to complete engineered RF systems, Dielectric is your FM resource today and DAB partner tomorrow.

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COMMUNICATIONS

Engineering Excellence Since 1942

Circle (147) on Free Info Card

ALL WRAPPED UP

either a MIC or line level XLR connector, and phantom power is available for condenser microphones. The unit complements the other 300 series processors and accessories.

Prime Image recently introduced a radio-specific audio time-compression product called Cash, designed to compress one hour of stereo audio into as little as 58min, allowing up to 2min of additional spots. The box is fully controllable externally through its serial port.

Orban showed its new Optimod-DAB 6200 processor, tailroed for DTV, DAB and Internet broadcasters. Although the I/O resolution is limited by the 20-bit analog device's sample rate converters, all internal processing is 24-bit fixed-point DSP and uses linear-phase filters. Orban also introduced new PC remote-control software for use with the Optimod-FM 8200. Additionally, customers using the Optimod-AM 9200 processor are eligible for a free upgrade to Version 2.0 of the software.

Some manufacturers were more aggressive at showing completely new product lines, while others seemed to concentrate on refining things they already had in their product lines.

— Jeff Keith

Inovonics introduced its WebCaster, an audio processor specifically designed to condition audio for transmission through the various webcasting algorithms. The unit combines a broadband AGC, a three-band compressor/equalizer section and a sophisticated limiter section.

IDT provided insight into the potential future of all broadcast audio processors. The DVP model will use new algorithms utilizing FFT transforms to process the audio in real time without splitting it up into bands. Using a mouse, the operator can drag the frequency response curve to nearly any desired shape; the unit will consistently deliver this energy curve at its output.

HHB unveiled the Radius and Classic series of tube processors. Models include the Radius 10 quad mic pre, Radius 20 parametric EQ, Radius 30 compressor, Radius 40 voice processor, Radius 50 mic pre/compressor, Classic 60 compressor, Classic 70 parametric EQ and Classic 80 pentode dual mic pre.

FM Systems showed its new ANR572 Automatic Noise Reduction Processor. Designed to mount in its PMS 500 three-compartment rack housing, the ANR572 is a single-ended noise reduction system offering up to 25dB of noise reduction using its proprietary HUSH process.

Cutting Edge showed several new plug-ins for Omnia.fm: Space-EFX for stereo sound field enhancement, HOT-97 for stations desiring a more competitive edge, and VERIS for critical classical and smooth-jazz formats needing loudness without clipping artifacts. Also shown were Omnia.sg, a new stand-alone digital stereo generator, Omnia.am, the AM companion to Omnia.fm, and the new Tool-Vox microphone processor (see "The

Confiability with Life Time Warranty

EDUCATIONAL CIRCULAR SERIES

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

LOW POWER CIRCULAR SERIES

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

MEDIUM POWER CIRCULAR SERIES

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

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

OMB also Manufactures:
FM transmitters
TV transmitters
FM and TV Links
TV antennas
Medium power FM antennas

Connectors

Circle (141) on Free Info Card

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Fax: 305-4770611
Toll free: 888-OMB4USA

ALL WRAPPED UP

Pick Hits of NAB99," p.72).

Aphex has partnered with **Digital Audio Labs** to provide processing algorithms for its V-8 DAW. For more on this, see the section on digital audio workstations in this feature. Aphex also displayed the FM2020, introduced last year, as well as its full line of dynamics processors.

Jeffrey A. Keith, CPBE, NCE, is director of engineering for Jacor, Cleveland.

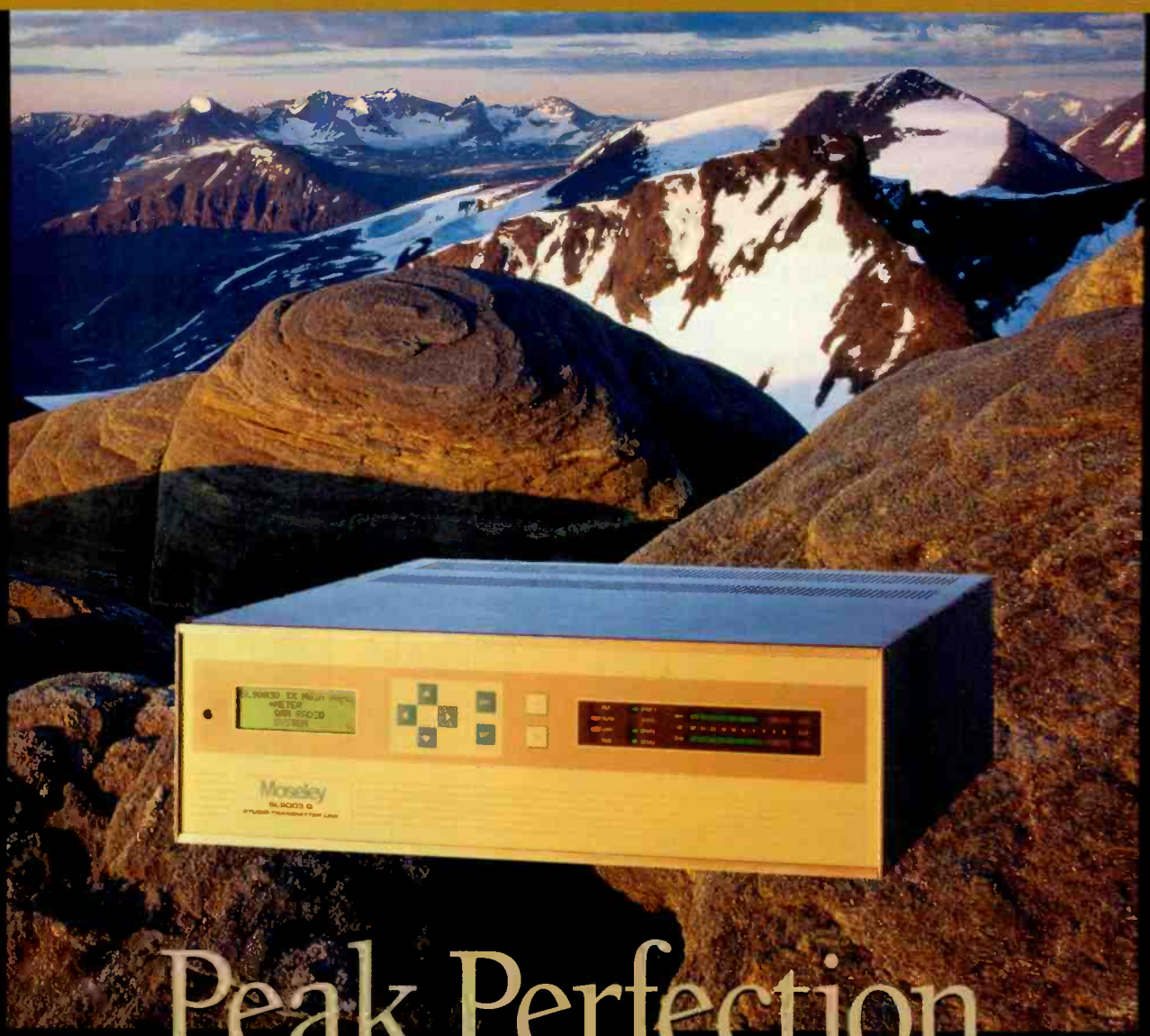
Audio consoles & Audio Accessories

By Ron Bartlebaugh

On-air and production consoles, EAS, monitors, studio accessories

Wheatstone's new A-5000 convertible console allows stations to make the transition from analog to digital without buying all new equipment. The console can begin as a fully analog unit. It can then be converted to digital by using modules from Wheatstone's top-of-the line digital D-500 or D-600 consoles. The company also displayed its new D-600 digital console for radio, featuring serial control of all switch, fader and (eight-character) source display settings for true integration with routers and automation systems. The console also contains the power of 32-bit floating-point DSP processors to handle multiple complex tasks with ease. The **Audioarts** R-17 totally modular console for on-air and production applications is without a motherboard, yet provides easy access to logic and audio connectors. The R-17 will accept 10 input modules and comes equipped with two stereo outputs. Sparky is the new Audioarts digital console designed for stations making the transition to digital that still want the straightforward features and clever engineering for which Audioarts consoles are famous. The console has the intelligence to work with today's analog equipment while transitioning to a digital future. Also on display in the Wheatstone booth was the full line of **Auditronics** consoles. (You may recall that Wheatstone purchased Auditronics earlier this year.)

Ward-Beck displayed its new R2K series audio consoles, which feature easy installation via the use of Phoenix pluggable connectors. The console features a unique dual redundancy power-supply package based on the successful 8200 series rackmount frame, which includes provisions for using Ward-Beck D/A converters, A/D converters and distribution amplifiers in only 2RU of space. The folks from Ward-Beck also demonstrated their new SMS4 channel stereo metering system, the AMS4 audio monitor system, the POD11 AES/EBU monitor, the D8202 and D8204 D/A and A/D converters, and their D8204 digital distribution amplifier.



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ALL WRAPPED UP

TFT debuted the model 999 Program Interruptor (see "The Pick Hits of NAB99," p.72). This device is ideal for stations running a fully digital airchain to insert their analog EAS signals. The silent switching has many useful applications throughout a facility.

TC Electronic previewed its new D22 broadcast digital delay product that features up to 1300ms of delay per channel (on two channels), 24-bit A/D and D/A converters as well as a complement of digital I/Os, including AES/EBU, S/PDIF and Wordclock. The company is also now shipping the **DK Audio** MSD600C MKII multichannel surround-sound discrete metering and analyzer device.

Tannoy showed off its new line of active studio monitor speakers, including the Reveal Active, the System 600A and the System 800A. All three models contain high-quality audio power amplifiers and, of course, the famous Tannoy speaker components.

Soundcraft is already known for its live sound and recording consoles. The company unveiled the RM1d digital console this year. It is available in a six- or a 12-fader version.

Wheatstone showed its new A-5000 convertible console.

Radio Systems has created a product called Studio Hub, a spinoff from the computer industry. (see "The Pick Hits of NAB99," p.72) and also the Cable, Connectors & Routing section in this feature.) Studio Hub is an integrated analog/digital wiring system using CAT-5 cable. Radio Systems will manufacture custom cable assemblies for any console and will also soon offer its own Millenium console with RJ-45 connections.

Prime Image brought its Cash machine to Las Vegas. With the Cash (the name of the unit), radio broadcasters can create additional commercial time and that, of course, creates additional revenue.

Pacific Research & Engineering highlighted its new Airwave digital console (see "The Pick Hits of

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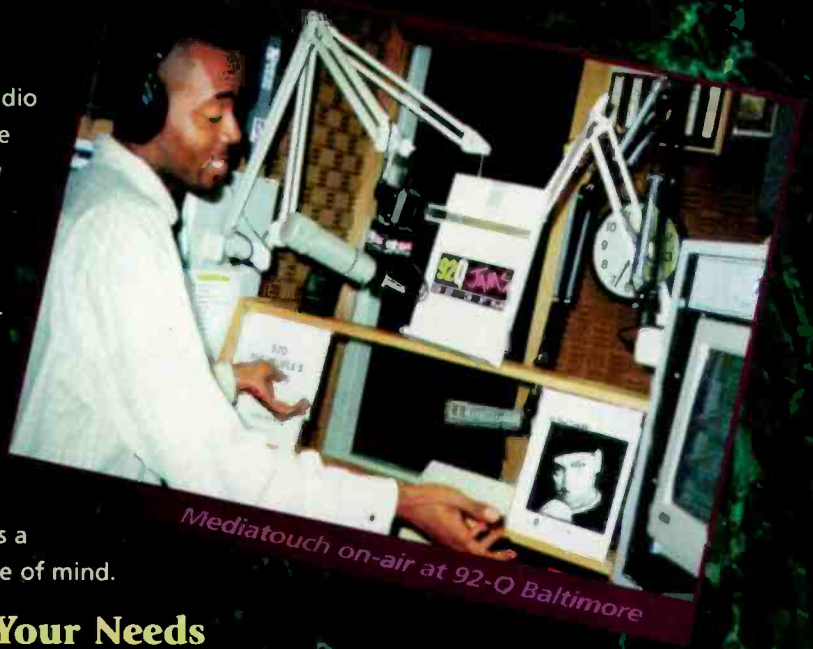

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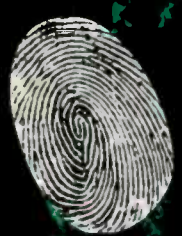

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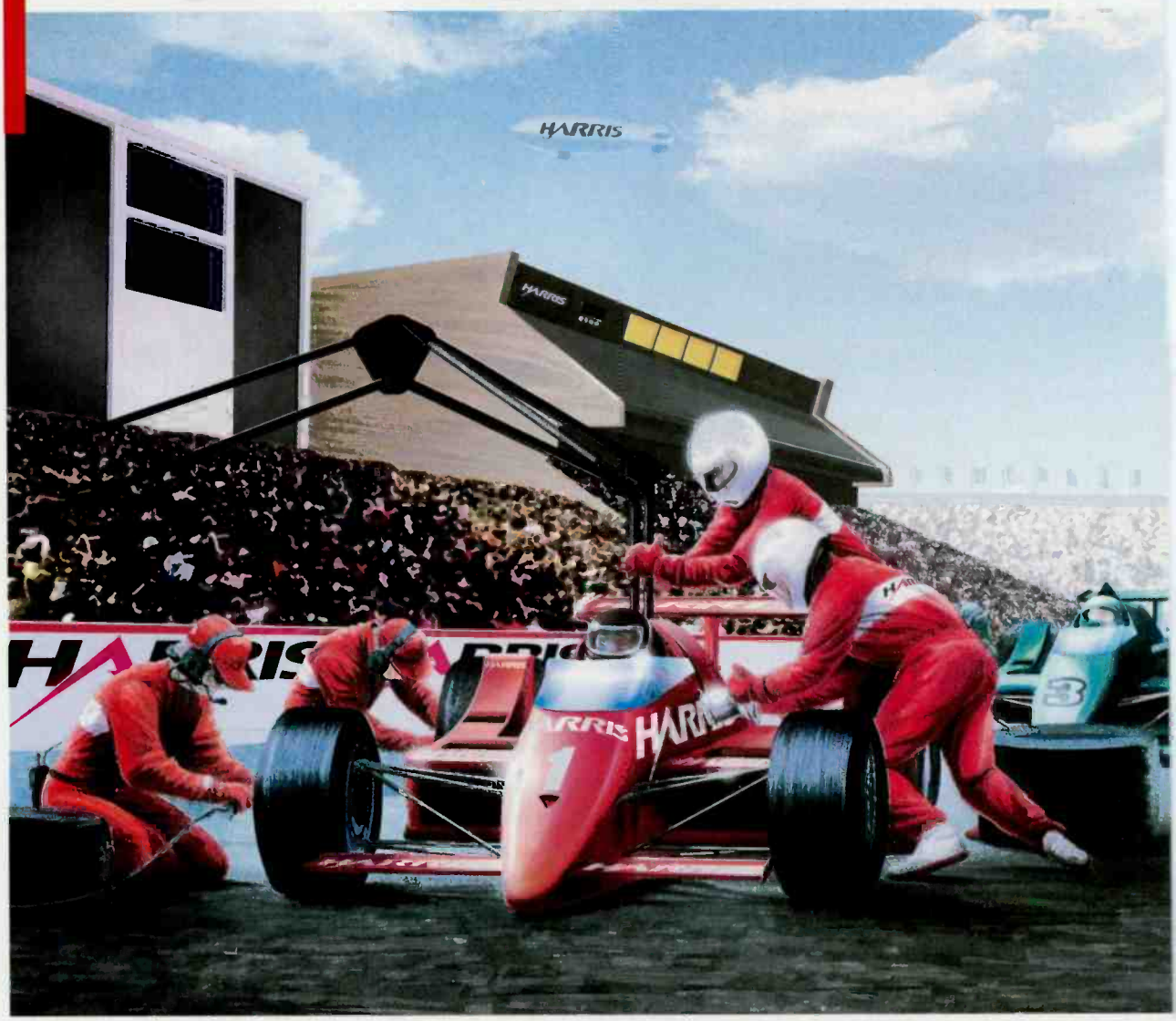

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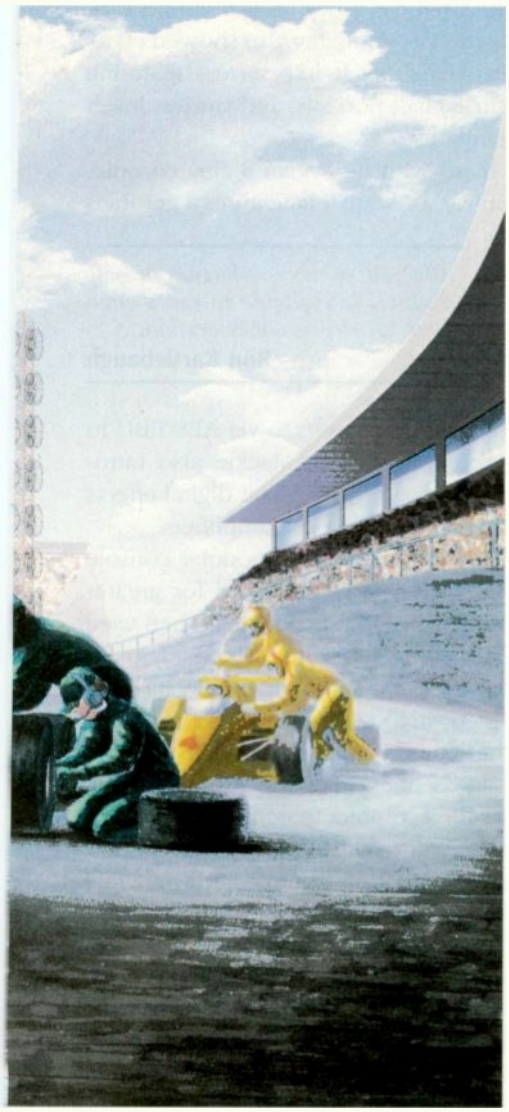

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ALL WRAPPED UP

NAB99," p.72), the digital brother to Pacific's analog Airwave console. The console comes in either a 12- or 20-input mainframe size and is configurable to fit virtually every application. Automatic sample-rate conversion is standard on all digital inputs, and input modules are user-reconfigurable from analog to digital (or back) simply by changing one card per module. The console can be installed as either as a desktop or drop-in.

Neutrik USA introduced several new products for the broadcast engineer, including a new line of BNC connectors, a new, easy-to-assemble series of XLR connectors, and new Bantam plugs. The company also showed off its third generation Patchlink patch bay system featuring programmable normals, half normals, and various insert and output configurations.

Mackie was on hand with its Digital 8 Bus console, with its new Version 2.0 software that features a graphics automation editor and a channel list including MIDI send and receive commands on all 97 faders (over four banks). The console can also interface via AES/EBU to various digital audio workstations. Mackie also introduced its new mic/line mixers with 32-bit digital effects and its traditional, very low-noise preamplifiers.

Overall, a wide selection of new products is available to radio engineers for strong consideration.
— Ron Bartlebaugh

Logitek showed its updated Numix modular console control surface, which has been expanded for greater space efficiency and expanded functionality when used with hard-disk audio storage systems. Updated to include six faders, the unit's alphanumeric display has also been changed to a 200x640 LCD panel. The company also introduced the Vmix virtual mixer software that expands the usefulness of the Logitek Audio Engine. The software allows the computer to control the Logitek Digital Audio Engine without using any other control surface or to duplicate another control surface while occupying little space. Vmix will emulate either the Logitek ROC-5, ROC-10 or the Numix console control surface, depending on how the Audio Engine has been programmed. Additionally, Logitek introduced precision 5.1 and 7.1 surround-sound meters.

Harris created a working WAN system in cooperation with the folks at the **Enco** and **Orban** booths to demonstrate how digital audio can be easily transferred between devices and how talent can indeed share multiple facilities. The **Intraplex** STL PLUS, a digital studio transmitter link system was also used as part of the demonstration. Harris also displayed its new DRC 2024 20-bit digital audio console featuring a 24-fader control surface. The console is capable of controlling up to two audio processing units for a total of 44 mono or 22 stereo inputs. Additional seamless router control allows the DRC 2024 to meet even the largest on-air radio applications. Other unique features include effects that can be assigned on a per-channel basis and a five-band parametric equalizer.

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ALL WRAPPED UP

Cable & Connectors

By Russ W. Mundschenk

Gorman-Redlich introduced an external telephone interface for its EAS equipment. The interface permits a station operator to place a phone call from a remote location to go live on the air with emergency information.

Autogram displayed the Pacemaker IIK audio consoles in both 18- and 28-module frame sizes. Both consoles feature the Autogram exclusive bimodular concept, use **Penny & Giles** faders, and have an external power supply. Since the consoles are modular, a station can grow as its needs grow. The 18-frame model can grow to as many as 40 stereo inputs, while the 28-frame model can expand to 60 stereo inputs.

Arrakis released the DM-4 digital console. This virtual console can be operated from a PC or connected to a 12000 or 22000 series Arrakis console for an easy analog-to-digital upgrade path.

Ron Bartlebaugh is director of engineering for WKSU-FM, Kent, OH.

Perhaps the most inventive interconnect product carries audio on computer network LAN wiring. The **Radio Systems** StudioHub uses industry-standard shielded CAT-5 cable and RJ-45 connectors for both analog and digital interconnection (see "The Pick Hits of NAB99," p.72). The *Hub* of the StudioHub is a panel that supplies ±15VDC to one of the four cable pairs to power peripheral devices such as balancing amps, mic pre-amps, headphone amps and switching panels.

ADC showed its new QCP MK IV IDC interconnect block. The MK IV improves on the traditional single, square MK II terminals by molding eight round, split-cylinder contact carriers in one block. The round thermoplastic carriers eliminate the need to orient the tool prior to punch-down, and the groove in the side provides strain relief. The split-cylinder contacts can terminate up to four 22- to 26-gauge solid or stranded wires with gas-tight connections.

Apogee Electronics introduced its Wyde Eye series of 110Ω balanced and 75Ω unbalanced AES/EBU cable. The cable comes in many lengths and is pre-connectorized with a gold-plated tip/ring/sleeve plug or precision RCA connector.

Belden's addition to its selection of cables is a CM and CMR flame-spec rated multipair, individually jacketed and shielded snake cable. This cable, designated 1408R through 1416R, may be used in multifloor riser applications, without the need for costly fire-stops. Belden also now manufactures

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AudioFlat cable, the industry's first multipair flat cable specifically designed for both analog and digital audio. It is available in 12 to 48 wire pairs with a width spec from 0.6 inches to 2.5 inches. Unlike a more conventional "ribbon" cable, a drain wire separates each twisted-pair.

Bomar Interconnect Products showed an easy-to-install CAT-5 rated RJ-45 plug for twisted-pair. The EZ-RJ45 allows all four cable pairs to fully exit the front of the connector prior to crimping — for easy alignment. The company also showed the No-Fail shielded and unshielded RJ-45 connector line that lines up cable pairs for termination, and the PushEZ F connector, which installs with no tools.

Canare demonstrated the hum-cancelling properties of its well-known star-quad L-4E series cable, available as a snake in up to 24 quads. More traditional multipair MR-202 series snake cable is available in up to 32 pairs. In the digital domain, Canare has made mass impedance transformations easier by taking 16 of its AES/EBU balun transformers and mounting them in a 1RU panel. Their DA-206 and DA-202 digital cables maintain constant impedance by using polyethylene filler rods to round out the cable cross section.

Clark Wire and Cable once again showed the popular 7000 series analog cable as well as the 800 series of 110Ω digital cable.

Gepco introduced its D5524EZ two-pair digital audio cable, a zip-type mating of two 5524EZ single pair 24 gauge cables. The company is also offering another cable in the 5526GFC series of 26 gauge, flexible, multipair, digital audio cables. The 552604GFC features four shielded, jacketed AES pairs in one cable. The AES/EBU cables join a long list of single and multipair analog audio cables.

Neutrik introduced the EaSZyCon series of XLR connectors. The new, solderless IDC XLR provides self-adjusting strain relief on wide cable diameters and may be assembled quickly, with no tools. Also featured were the 2-pole Speakon speaker connectors and a push-pull 75Ω BNC connector, which is attached and removed by pinching the shell (the bayonet latch is not used). Neutrik also showed a new AES/EBU transformer for matching 75Ω unbalanced to 110Ω balanced circuits.

Connectors have been redesigned for greater ease of assembly and use, while numerous types of cable are being introduced to meet the needs of a modern, totally digital broadcast facility

— Russ Mundschenk

Switchcraft showed a termination block, the Professional Punchdown Terminal, designed for stand-alone use or to interconnect to its MTP series patch bays. The PPT's thermoplastic housing has a serrated notch for improved strain relief. The split cylinder can accommodate multiple AWG 22 through 26 solid or stranded wire. Another offering was the AAA series QwikTwist Q-G XLR-type

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connector. The new XLR simplifies cable preparation by integrating the strain relief into the twist-on shell.

Russ Mundschenk is chief engineer for WBEB-FM, Philadelphia.

Test & Measurement Equipment

By Kirk Harnack

Altronic Research is introducing a PC interface for its existing digital calorimetry product line. The PC software is now included with digital calorimetry systems available for use in Altronic air-cooled dummy loads from 5kW to 75kW. A water-based system is also available for use in Altronic water-cooled dummy loads from 5kW to 300kW. Altronic also offers a useful selection of air-cooled dry loads and water-cooled loads and manufactures self-contained heat exchangers.

AVCOM of Virginia introduced several new spectrum analyzers and related products. For precision measurements, the new MSA-90A spectrum analyzer incorporates a phase-locked RF input section. The unit accepts RF from 50kHz to 1000MHz and offers a variety of resolution bandwidth filters from 3kHz to 3MHz. For versatile, portable use, the new PSA-33A spectrum analyzer is well-suited to many broadcast applications. Its frequency coverage extends from 1MHz to 2.1GHz in two bands. Importantly, the RF input connector can also feed +12 VDC or +18 VDC to an attached LNB for convenient alignment and troubleshooting of satellite antennas. An innovative addition to AVCOM's product line is the ADA-10A Analyzer Display Adapter. This small interface box allows easy interfacing from several AVCOM spectrum analyzers to a PC to record the trace signals as seen on the spectrum analyzer's CRT.

Belar Electronics Laboratory is bringing out two new devices of interest to radio engineers. The Composite FFT Spectrum Analyzer (CSA-1) is a versatile FFT spectrum analyzer useful for AM, FM and audio applications. The CSA-1 can be used to view the real-time spectrum of a wide variety of input signals. To complement its line of digital FM modulation analyzers, Belar is also introducing the SCMA-1 — a precision digital FM SCA modulation analyzer. Although designed to match the Wizard product line, the SCMA-1 can accept any FM composite input signal from 1.0VRMS to 2.0VRMS.

Coaxial Dynamics is one company in the tried-and-true camp. Most popular in its product line are the 81100-A and 81600-A series of directional RF wattmeters. Line sections from 1⅝ inches up to 6⅛ inches are available in both EIA swivel flanged

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ALL WRAPPED UP

and unflanged versions.

Harris Broadcast offers two products designed to aid engineers in digital audio system construction and troubleshooting. The Audio Bit Spitter (ABS-1) and the Audio Bit Buddy (ABB-1) are portable beltpack units for monitoring digital audio (AES/EBU and S/PDIF) or analog audio signals. The Bit Buddy offers a headphone output and LED's to display basic signal parameters about the signal under test. The companion Audio Bit Spitter generates digital and stereo analog test signals for injection into the signal path. Stereo analog signals of 1kHz or 400Hz can be generated at –16, -8 and +4dBu. Digital signals of the same audio frequencies may be generated and encoded at standard AES/EBU sample rates of 32, 44.1 or 48kHz. Both are manufactured by **Ward-Beck**.

Inovonics now offers an off-air AM modulation monitor, the Inovonics 520. The 1RU device offers easy selection of RF, negative modulation and positive modulation display on the long, LED bargraph meter. The 520 has an internal RF preselector, tunable from 530kHz to 1710kHz.

Neutrik introduced the Minirator MR-1. This small, battery-powered instrument generates analog sine waves over the audio band from 20Hz to 20kHz at levels from –76dBu to +6dBu. Also included is an automatic sweep function with a variety of sweep rates. Absolute polarity testing is included to unveil devices with inverse polarity. Plus, the Minirator includes both white and pink noise generation for wideband and acoustic analyses. The MR-1 is very small — it fits easily in the palm of your hand — and features a two-line LCD display.

Ward-Beck introduced the SMS4, a 1RU stereo metering system. The SMS4 provides a level display for four simultaneous stereo audio channels – analog or AES3 digital. The digital inputs can be either balanced or unbalanced, and a "lock" indicator illuminates to show the presence of a digital signal. Another WBS product worth mentioning is the M405P Portable Extended Range VU Meter. This battery-powered, portable instrument is designed to measure program levels, noise and VU levels throughout an audio system. It features both XLR-3(F) and ¼-inch TRS input connectors, an amplified headphone jack and switchable input impedance and 60Hz audio filter functions.

Kirk Harnack is vice president of engineering for Delta Radio Inc. and president of Harnack Engineering Inc., both of Cleveland.

Microphones

By Brian Sanders

Broadcasters and project studios alike will notice **AKG**'s new true large-diaphragm (i.e., greater than 1 inch) studio condenser. The C4000B offers LF roll-off, 10dB pad, and switchable omni, cardioid and hypercardioid patterns.

New products from **Audio-Technica** include the AT849 stereo condenser

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ALL WRAPPED UP

boundary microphone, the U100 system, which offers 100-channel flexibility and both beltpack or plug-on transmitter versions, and the AT895 mic system, which replaces long shotgun or bulky parabolic mic systems.

Beyerdynamic displayed prototype MCD 836/MCD 837 digital long/short shotgun microphones, which, like their MCD 100/101 mics, incorporate an internal 24-bit A/D converter. Also new were large-diaphragm M99 dynamic and MCE 90 condenser mics aimed at the voiceover market. The company's 600-series wireless system (TE 600 camera-mounted receiver, and S 600 64-channel UHF transmitter) includes a short-shotgun capsule, purportedly the world's first.

The NAB Radio Hall show floor.

Sennheiser's improved MKE2-4 Gold miniature lav is designed to be nearly impervious to contamination from makeup and perspiration thanks to a second, overlying protective diaphragm. The SK3063 is the company's new body pack UHF transmitter, designed for increased frequency agility and RFI rejection. The D1000 digital wireless microphone system includes a half-space rackmounted receiver and handheld, body pack or instrument transmitters.

Neumann's entry-level KM 180 series has added the KM 183 omnidirectional condenser and KM 185 hypercardioid. The complete series, including the KM 184 cardioid, is offered in matte black and silver nickel. Matched pairs of the KM 183 and KM 184 are offered in matched pairs.

GT Electronics, a division of **Alesis**, introduced four large-diaphragm condenser microphones. Two of them are class-A FET designs, the AM51 and AM52, and two are tube-based designs, the AM61 and AM62. The AM51 and AM61 are fixed cardioids, the others are switchable omni, cardioid and bidirectional.

CAD Professional Microphones displayed its full line of studio-quality and handheld mics.

Shure's KSM32 is a newly designed side-addressed cardioid that boasts a maximum SPL handling of 154dB (with 15dB internal pad), making the mic at home in the percussion section and announce booth. Shure also brought out the SM 7A; the new version of its classic mic exhibits improved self-noise characteristics and hum rejection.

Also showing for the first time was the WL61 subminiature lavilier,

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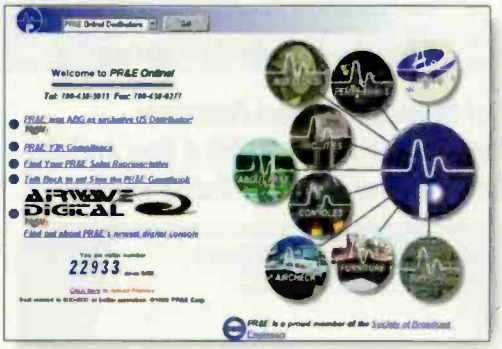

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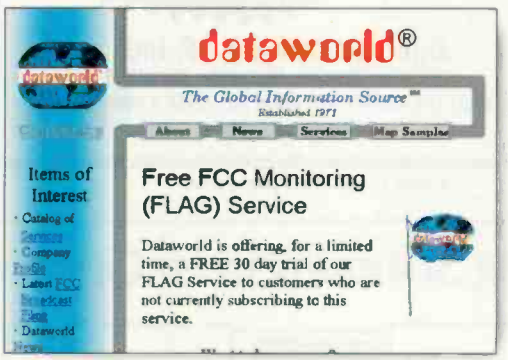
Pacific Research & Engineering: Since 1969, Pacific Research & Engineering has been the most respected manufacturer of on-air and production consoles, studio cabinetry and peripheral equipment for the radio broadcasting industry. Installations cover more than 2,000 studios including seven of the top ten radio stations in the U.S., as well as networks like ABC, CBS and ESPN Radio, and showcase facilities including Disney World and Universal Studios.

www.neutrikusa.com

NEUTRIK USA, Inc.: The NEUTRIK USA, Inc. website features direct links to various sites including Authorized Distributors, Sales Representatives, NEUTRIK USA, Inc. offices and our parent company's website for on-line access to spec drawings through WHIP files. Viewing includes a What's New section for new product introductions and a Trade Show section so that you can come see our products in person!



www.dataworld.com

Dataworld: Dataword is an industry-leading information services company founded in 1971. Twenty-eight years of software development and data processing experience allows Dataworld to set trends in information services and solutions. Click on Dataworld's home page for exciting information on our Flag Service, the production of DataXpert and our new line of digital television services.

www.prophetsys.com

Prophet Systems: Discover true digital audio with the Audio Wizard CFS32 from Prophet Systems Innovations.

www.contelec.com

Continental Electronics: Things to find on the www.contelec.com Web site are: District Sales Manager's contact data; Factory Marketing & Sales personnel contact data; E-Slide - FREE engineering software; Product Line Descriptions and Specifications; Links from Broadcast Supply Division to vendor Web sites.

ALL WRAPPED UP

designed by **Danish Pro Audio** and terminated for use with **Shure**'s wireless transmitters.

Only the name has changed. **Danish Pro Audio** is now the company behind **Bruel & Kjaer** Series 4000 professional microphones. Capsules for the high-end mics are still manufactured by B&K, with everything else handled by DPA by a group of former B&K engineers. Regional distribution for DPA mics is through **TGI North America Inc**.

Electro-Voice had the ENG 618 integrated shotgun mic and boom pole. The unit is collapsable down to 18 inches and extends to 6 feet. A built-in headphone amp is included for local monitoring.

Recording media

Maxell displayed its new line of metal tape, including DAT Ceramic Armor Metal Particle, mini-disc MD-PRO, DTRS and A-DAT formats.

HHB introduced a new 5.2GB MO disk designed for audio recording applications. Also shown was a new 80min pro audio mini-disc called the MD80.

Emtec Pro Media teamed up with **Alesis** to produce an instructional video on the care and maintenance of ADAT machines, titled *Care & Feeding Your ADAT*. The video is available through Alesis and Emtec.

Apogee Electronics unveiled its 30- and 60-min DTRS tapes.

Brian Sanders is program director for KUNV, Las Vegas.

Audio/Radio Automation/Playback

By Chip Morgan

Broadcast Electronics showed how the AudioVAULT product line can be extended for wide area networking via an ISDN link, a worldwide T1 or the Internet. AudioVAULT's newly released Version 6.6, with its AVExplorer module, is custom-designed to help manage multisite requirements.

The **Broadcast Software International** WaveStation uses WAV audio files, MP3 files and TM Century files and works with any Windows-compatible sound card. At NAB99, BSI demonstrated how the WaveStation is equipped with exclusive WAV file labeling technology. BSI also showed the STINGER — providing instant playback of up to 288 audio cuts. STINGER includes a licensed copy of Syntrillium Software's award-winning Cool Edit Pro LE (two-track stereo version).

CartWorks/dbm Systems announced support for MPEG Layer II digital audio compression and Linear (WAVE) digital audio formats at NAB99. Plans also include

support for MPEG Layer III. CartWorks will support the industry-standard Microsoft WAVE format so audio files from home computers may be used without need of conversion. CartWorks also showed how blind radio operators can have full access to the automation system.

CBSI business software introduced DeltaFlex 3.0 with an extensive A/R revision, including full history retention and the ability to generate combo invoices with just a few keystrokes. New WYSIWYG screens can be used for report display and copy entry. CBSI's NetCapture directly stores up to eight different satellite programming streams from a single PC and makes them available for immediate or delayed playback.

Scott Studios displayed its digital workstation working in conjunction with a Logitek console.

Dalet showed Dalet5 at NAB99, an integrated suite of software for radio stations, addressing the complete range of tasks performed in radio: live or automated broadcasting, program scheduling, production, news and traffic management. Also showcased were Dalet's new InterWeb for group connectivity, TeamNews for all newsroom requirements, and TeamRadio for groupwide traffic management.

ENCO Systems has some new features for the DADpro32, including advanced gateway applications for local redundancy and groupwide wide area networking, the optional Brick II Cart Head operator interface, interface to NewsWire Capture & Editing Systems, such as AP/ENPS and ENCO's own NewsDAD32, and support of File Servers using the Linux Network Operating System. Both LAN and WAN architectures are supported.

Maycom displayed the CoStar, an audio storage and playback system that includes a multitrack editor and other full-service features.

MediaTouch unveiled its new Card Independence technology that allows broadcasters to play CD-quality MPEG Layer II audio on any standard Windows sound card. Card Independence is the core technology in MediaTouch's new CD Ripper utility that converts music CD's to MPEG Layer II audio files without dubbing in less than real time.

Mediatron showed its latest version of AirControl NT99. It is available in a standard and professional version for flexibility within different budgets. Plug-ins include voice tracking and a plug-in called VoiceTrack for automated time announcements during unattended operation.

Pristine Systems showed the RapidFire Quick Pick, making it easy to add or change music, commercials, jingles, promos, liners and last-minute insertions simply by point-and-shoot. RapidFire uses only professional-quality audio cards featuring Dolby-AC2 or MPEG at a 32kHz to 48kHz sample rate. Pristine also showed MusicPlus, a multipass music rotation and playlist scheduler.

Prophet Systems Innovations introduced the NexGen Digital, based on the powerful features of the Audio Wizard. NexGen Digital is scalable from a single station to as many as 128 stations out of a single facility. The digital storage capacity can be as high as approximately 1.7TB (terabytes) of music and assorted programming elements, using more than 150 Pentium II 450 workstations.

RCS showed a sneak preview of SelectorWIN, the completely new version of the classic Selector. Add-on features to SelectorWIN include SelectorREACH, which takes your station's Arbitron ratings and compares them to song rotations. SelectorNET displays on your station's website the song title and artist now playing. Also showed was Internet VoiceTracking from any remote location.

Scott Studios demonstrated its system running on several platforms, including Win98, Linux and WinNT. The Win98 version is expected to ship 2Q99. Also on display were News Center, an NT-based system for wire and audio capture, the VTVI — voice tracks via the Internet — for talent to provide voice tracks from a remote location, and the RRR — remote recording router — which handles file transfers between multiple Scott systems in a hub-and-spoke arrangement.

Chip Morgan is president of CMBE, a worldwide broadcast facilities design and integration firm located in Sacramento, CA.

Audio Recording Storage & Playback

By Benjamin H. Brinitzer, CSRE

360 systems previewed its new TCR8, a synchronous eight-track digital hard-disk recorder. The TC8 features superb 24-bit audio quality and VTR user interface. The TC8 and sister four-track model, TC4, are designed to be viable audio/video DAT recorders. The TC8 line includes a large display, analog and digital I/Os and built-in keyboard for cut titling and organization. 360 also introduced Shortcut 99, an upgrade to its two-track digital audio

workstation. Shortcut 99 offers enhancements such as data file compatibility with WAVE, BWF and AAIF file formats. Shortcut can read and generate sound files that are compatible with standard sound cards and the Internet.

AKAI introduced a 12-track random-access digital recorder with combined digital mixer. The DPS12 sports features such as internal multi-effects, a 12-track mixer and up to 180 track minutes at 48kHz sampling as well as the ability to keep production entirely in the digital domain.

Dialog4 showed the CTaxi, a PC-card recorder and audio editor. Files are stored in BWF format. The unit also includes a built-in ISDN codec.

HHB International showed the Genex GX8500 Digital multiple media recorder. The GX8500 sports features such as 24-bit/96kHz performance, an Ethernet port for LAN or WAN interface, built-in digital eight-channel mixer SCSI interface for extant drive connections and simultaneous recording of 8x24-bit, 96kHz tracks via internal converters and 4x24-bit 192kHz tracks via external converters. The recorder is designed to meet the requirements of DVD, Superaudio CD and multichannel sound mastering.

Sony displayed several audio devices, including mini-disc players.

Maycom showed the Easycorder, a second-generation PC card (PCMCIA) recorder that can also store audio internally. Nondestructive editing can be performed on recorded audio. It uses the BWF file format.

Intercom / IFB Products

Broadcast Tools showed its ICM 16 intercom system. This impressive and affordable system is capable of supporting 16 locations via standard CAT-3 or CAT-5 telco cable. Individual controllers are available in desktop, rackmount or console mount.

Comrex offered the CTA/LPQRA Cue system as an option for wireless IFB. This system operates with a full watt of power on 26MHz. It sports the standard connectors for balanced audio. The receiver uses a standard 9V for power. The operational specifications are 10Hz to 6kHz.

Gentner introduced the economical Venture-6 wireless IFB system. The Venture-6 is a mono six-channel wireless IFB system. It uses AA batteries that provide up to 40 hours of operation in the receiver as well as wired or wireless transmitter operation. The system has excellent SNR and an effective frequency response of 10Hz to 10kHz. The system operates in the 200MHz range and includes mic and line-level capabilities using standard XLR or ¼-inch phone jack for connections. The best feature is its very low MSRP.

JK Audio produced the Quicktap IFB as a wired telephone IFB option. This compact box sports an XLR jack for output. It uses a standard phone circuit for communication. It makes quick connection to any standard phone circuit easy. It does not work with cellular phones or any self-contained keypad set.

SAS (Sierra Automated Systems) showed its 32000 based IFB intercom system. Software programmable features include alphanumeric display subscriber destination, separate talk and listen capability, interruptable foldback and programmable groups.

Studio and Support Systems

By Barry Thomas, CSRE

Facility controls, furniture, systems integration

Shure showed a stereo version of a wireless IFB system with respectable frequency response and sensitivity specifications. The PSM600 sports a lightweight receiver and rack-mounted transmitter. The PSM operates in the 620MHz to 660MHz range and operates on a standard 9V battery for the receiver and wall adapter for the transmitter. The PSM 600 sports 10-channel operation selections via dipswitch. The unit sports standard XLR or ¼-inch phone connections.

Audio Routing & Distribution

Broadcast Electronics showed the Audiopoint router, which offers the operator features such as programmable audio delays, creation and analysis of test signals, gain adjustments (in both AES/EBU and analog) EQ adjustments, and mixing capabilities. The Audiopoint offers hardware and software control.

Broadcast Tools offered a complete line of passive and active routing switchers. These switchers are available in 8x2 analog and digital formats. The digital units are 8x1 DAs come in both 110Ω and SPDIF (BNC).

SAS (Sierra Automated Systems) offered its much-enhanced 64000 routing system. The routing switch offers AES/EBU and analog compatibility, with support for software and hardware control. The addition of the DXE256 adds a digital matrix to the existing analog matrix. This makes the 64000 a complete solution for mating the analog installation to any digital installation easy and complete. This new digital option is an excellent complement to it's 16000D, a 32x32 digital router.

Wheatstone introduced an audio router as well. This AES3 system can handle1024 inputs by 1024 outputs. It can fully integrate to Wheatstone consoles for a complete studio audio system.

Benjamin Brinitzer is regional director of engineering for Capstar Broadcasting, Raleigh, NC.

Studio Technologies exhibited its studio and remote truck mixing and routing solutions and highlighted the Model 770 IFB Mixer and the Model 48 Telco switcher; the latter allows telco lines to be switched and assigned with the ease of audio signals. Studio Technologies also showed its Model 68 & 69 Studio Surround monitor consoles.

ESE unveiled a low-cost GPS Master Clock system, the ES-101 and ES-103. ESE also introduced the "U" series of smart slave clocks and SMPTE/EBU Time Code readers.

Burk Technology demonstrated its AutoPilot for Windows software, designed to allow the monitoring and control of more than 500 remote sites using its ARC-16 line of remote-control products.

Electronic Associates displayed its transmitter remote control systems based on its RF Manager transmitter remote-control system. The RF Manager, a real-time monitoring system that allows up to 256 channels of monitoring on a PC platform using standard RS-232 protocols to connect to remote sites. Remote access can even be achieved via palmtop computer using the company's Pocket Monitor software on a Windows CE device.

Davicom exhibited the MacNet monitoring network management software. MacNet is a PC-based system that networks its M-A-C line of metering and control interfaces. The MacNet software allows real-time graphical display of all M-A-C parameters and even plots remote locations on a map and provides point-and-click access to the sites through the MS-Windows Software. Davicom supplemented its system with the FMPM-01 power monitor, which provides a remote transmitter output power reading and includes an FM detector for critical audio measurements.

Wheatstone, known for its line of consoles, also manufactures studio furniture. The company displayed several examples of its furniture.

Pacific Research & Engineering introduced the QuikBilt II series. The company also exhibited StudioAdvantage, a modular studio design that is built off site and then installed in its final location.

Mager Systems, which builds custom furniture systems complete with a 10-year warranty at prices comparable to modular designs, exhibited imaginative Avonite solid-surface countertops with a studio design that would fit in Fred Flintstone's town of Bedrock.

Winstead Corporation presented a new Prestige series of modular control consoles designed to integrate multiple video monitors and audio production equipment into ergonomically optimized multimedia workstations.

Another view of the Radio Hall show floor.

Middle Atlantic Products introduced the new Edit Center furniture system, a flexible, modular work surface and control system, designed originally for video edit stations, that also has applications in audio workstations. The company also introduced new software for configuring edit workstations.

Forecast Consoles introduced the Image Master pre-engineered workstation series, which can be quickly configured and delivered.

KD Kanopy and **International E-Z Up** showed portable canopy systems.

Murphy Studio Furniture and **Studio Technology** displayed sample offerings at the show.

Barry Thomas is technical director for KCMG-FM, Los Angeles.

The Pick Hits of NAB99

Reported by Dana Guthrie Martin, associate editor

Experts select NAB99 Pick Hits winners

The NAB conference can be daunting even for veteran attendees. It's not easy to navigate such a vast milieu of show-floor displays elbow-to-elbow with more than 100,000 of your colleagues. If you think simply attending this year's show was a monumental undertaking, imagine the difficulty of being charged with the task of sorting through all the newly unveiled radio products to select the show's top 10.

That's exactly the task BE Radio*'s undercover judges set out to accomplish each year at NAB. This year was no exception. We unleashed 10 industry experts who once again snaked through the show floor to unearth the most promising products. All of the judges are industry experts with a keen eye for innovation. The products they selected offer significant technological improvements and serve everyday applications.*

Detailed on the following pages, the winning group comprises the top 10 NAB show introductions. These products received the prestigious Pick Hits awards given annually since 1985.

For complete rules governing the Pick Hits selection process as well as a list of judges, see pages 74 and 75.

Cutting Edge
Omnia ToolVox

An all-digital mic processor specifically designed so it won't fight the on-air processor through the use of specialized AGC and compressor sections designed with ratios and time-constants that complement the on-air processor. The de-esser is built around advanced FFT analysis techniques to prevent the on-air processor from creating harsh sibilance. Incorporates phase rotators and TrueVerb from Waves. Includes a reference-quality mic pre-amp with high-end features, such as 24-bit A/D converters and phantom power. Stereo analog and AES/EBU outputs are provided.

(216) 241-3343; fax (216) 241-4103; info@nogrunge.com; www.nogrunge.com

Circle (207) on Free Info Card

Intraplex
IntraLink

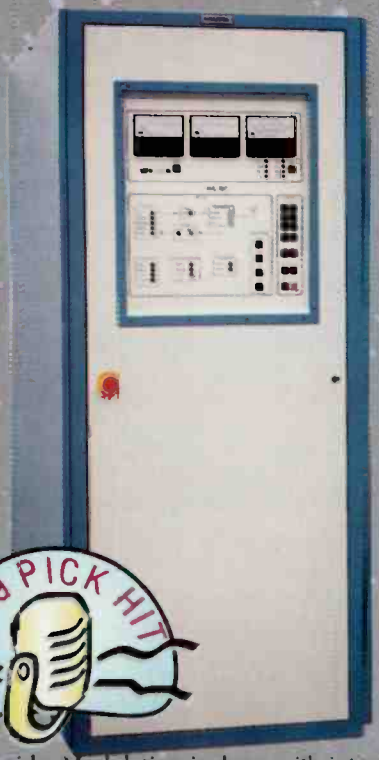
Eliminates the need to use codecs in pairs by providing full compatibility with MPEG Layer II, Layer III or G.722 ISDN compliant codecs. Facilitates the management of remote broadcasts, conserves studio rack space and allows broadcasters to redeploy existing codecs to the field. The 6500 supports up to six BRI ISDN connections simultaneously in a 3RU space. Also delivers LAN data at rates of up to 128kb/s in one ISDN line. The 6100 supports up to three ISDN connections simultaneously in a 1RU space.

(217) 221-7577; fax (978) 486-0660; sales@harris.com; www.intraplex.com

Circle (208) on Free Info Card

Nautel
XR2

A wideband, solid-state AM transmitter capable of 145-percent positive peak output at 12kW. The modular design has eight power modules capable of 1.6kW each. Each power module has two RF power amplifiers



inside. Modulation is done with interphase pulse duration modulation. The overall system efficiency is 84 percent. Modules connect with D connectors and can be removed and inserted while the transmitter is in operation. A complete standby exciter with automatic changeover keeps the transmitter on the air in the event of a failure.

(207) 947-8200; fax (207) 947-3693
info@nautel.com; www.nautel.com
Circle (210) on Free Info Card

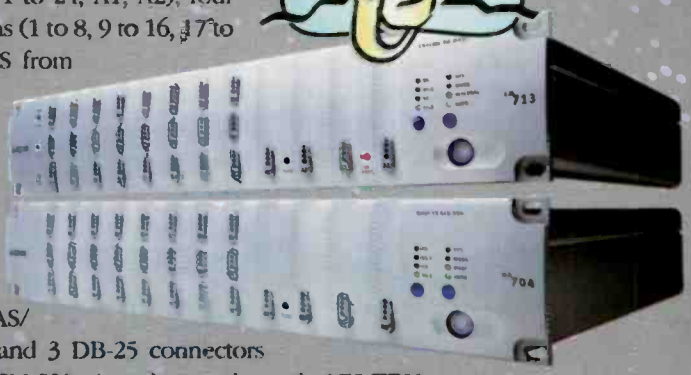
Telos
Series 2101

The first large-scale multiline talk-show system that interfaces directly with digital phone lines. Its open architecture allows broadcasters to reassign numbers to different studios, thus maximizing the unit's flexibility, with multiple lines feeding multiple studios. The basic system handles up to 24 lines and can be expanded to accommodate up to 96 lines. The system connects to the phone company's network entirely in the digital domain. This allows faster call setup, better call supervision and extremely high-quality audio.

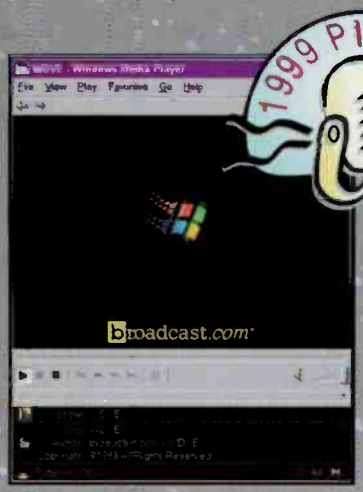
(216) 241-7225; fax (216) 241-4103
info@telos-systems.com; www.telos-systems.com
Circle (209) on Free Info Card

Euphonix
AD-26+2

Features 26 balanced analog inputs on XLR connectors (channels 1 to 24, A1, A2), four analog input-level trims (1 to 8, 9 to 16, 17 to 24, A1, A2) for 0dBFS from +27dBu to +6dBu in 3dB steps, stereo AES/EBU input on the XLR connector with parallel S/PDIF input on the RCA jack (channels D1, D2), 24 channels EAS/EBU out on 12 XLR and 3 DB-25 connectors (Yamaha 02R, Sony PCM-800 pinout), two channels AES/EBU out on XLR with parallel S/PDIF out on the RCA jack (channels D1, D2), two balanced analog outputs on XLR connectors (channels A1, A2), analog output level trim (A1, A2) for 0dBFS from +27dBu to +6dBu in 3dB steps.



(818) 766-1666; fax (818) 766-3401
blaze@euphonix.com; www.euphonix.com
Circle (211) on Free Info Card

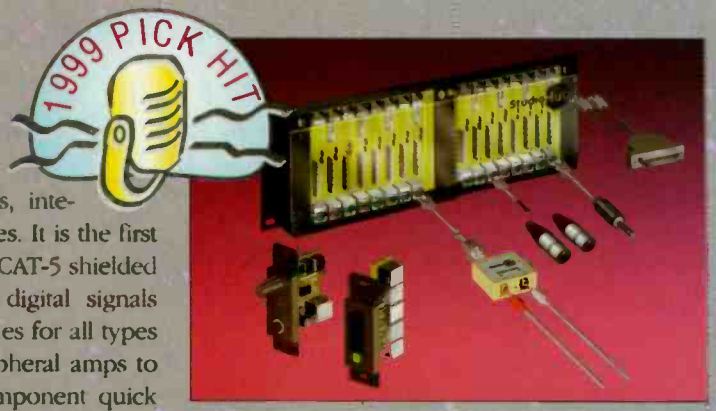


Microsoft
Windows Media Technologies 4.0

This authoring and encoding component of Windows Media Technologies provides developers with cutting-edge tools for creating and publishing live and on-demand streaming media content. Provides built-in support for the key new features in the Windows Media Technologies platform. Of greatest significance for radio is support for the new Microsoft audio codec, MSAudio, which is optimized for both voice and music and provides high-quality sound at every data rate. The files download in half the time of MP3 files and can be stored in half the space. Results in FM-stereo quality over 28.8 modems.

(800) 227-4679; fax (425) 936-0251
saram@wagged.com; www.microsoft.com/windows/windowsmedia
Circle (212) on Free Info Card

Pick Hits



Radio Systems
StudioHub

StudioHub features plug-and-play cable harnesses, integrated balancing amps, patch panels and accessories. It is the first rewired cabling system for digital-ready operation. CAT-5 shielded twisted-pair cables efficiently route analog and digital signals throughout a facility. Features premade source cables for all types of studio gear and quick-connect blocks and peripheral amps to harness all studio gear together. Each system component quick connects with RJ-45 jacks, and all peripheral products are phantom powered with the built-in DC-link system.

(609) 467-8000; fax (609) 467-3044
dan@radiosystems.com
www.radiosystems.com
Circle (213) on Free Info Card

TFT
999 Digital Insertion Unit

Designed to fit applications for stations with a fully digital signal chain, the unit allows a digital or analog signal to be inserted into a station's EAS/EBU signal path. Intended to serve as the digital version of TFT's Model 940A program/transmit interrupt unit. Features include a digital interrupt for transparent AES/EBU operation; support for all current AES/EBU formats (including 32kHz, 44.1kHz, 44.056kHz and 48kHz); signal detect for automatic switching, control and backup; seamless interruption (no pops or clicks).

(800) 347-3383; fax (408) 727-5942; info@tftinc.com; www.tftinc.com
Circle (214) on Free Info Card

Pick Hits rules

The Pick Hits judges are radio technical professionals who work independently and anonymously. During the show, their identities are withheld from everyone, including other panelists. This confidentiality ensures that there is no bias in their selection of the 10 best new products of NAB99. See page 75 for the complete list of judges.

1. Products must be new and must not have been shown at a previous NAB convention. In some cases, distinguishing a new product from a modified 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 effect 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 improvements over previous technologies. 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 during calendar year 1999. Equipment must be on display on the show floor, currently (or imminently) in production, and some type of product literature must be available. Judges take the exhibitor's word on availability dates. Products demonstrated in private showings do not qualify.

Pick Hits

Pacific Research & Engineering
Airwave Digital

The digital complement to the AirWave: the AirWave Digital is available in two mainframe sizes of 12 or 20 input modules and is fully configurable. Automatic sample-rate conversion is standard on all digital inputs. Inputs can be reconfigured from analog to digital (and back) by changing one SIMS-mounted card per module. Three stereo program buses are standard, each with a digital and an analog output. Also standard are two automatic telephone mix-minus (clean-feed) buses and logic control with a built-in machine interface. The console combines studio and control room monitoring with integrated talkback, and its five-mic pre-amp module delivers high performance using transformerless, balanced I/O pre-amps.

(760) 438-3911
fax (760) 438-9277
info@pre.com; www.pre.com
Circle (215) on Free Info Card

Pick Hits judges

Andy Laird
Director of Engineering, Radio Group
Journal Broadcast Group
Milwaukee, WI

Bert Goldman
Vice President of Engineering,
Radio Division
ABC Inc.
Dallas, TX

Dan Mettler
Regional Director of Engineering
Seastar Communications
Indianapolis, IN

David Stewart
Corporate Director of Engineering
Hefel Broadcasting
Dallas, TX

Jeff Littlejohn
Vice President of Engineering
Chancellor Media
Cincinnati, OH

Jeremy Ruck
Senior Engineer
D.L. Markley and Associates Inc.
Peoria, IL

Kirk Harnack
Vice President
DeltaRadio Inc.
Cleveland, MS

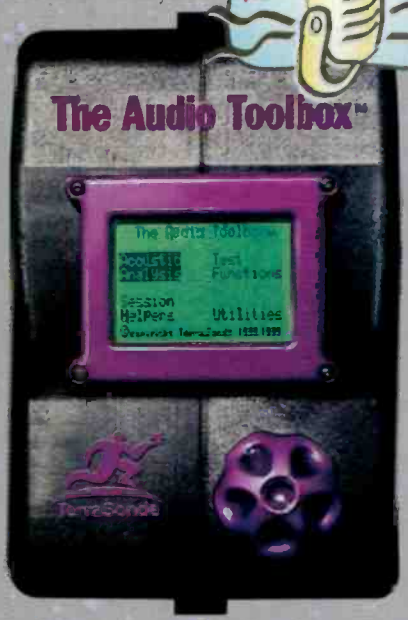
Mike Starling
Vice President of Engineering
National Public Radio
Washington, DC

Richard Rudman
Director of Engineering
KFWB
Hollywood, CA

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

TerraSonde
Audio Toolbox

Provides a comprehensive set of tools in one package. Includes a sound-pressure level computer, a reverb decay time computer, an energy time graph, a polarity tester and a real-time analyzer.



Test functions include a signal generator, a stereo level meter/frequency counter, computation of S/N, a 1/3- and 1/12-octave frequency-response sweep to measure equipment response, and a sample scope. Includes a monitor amp for monitor and guitar modes; a cable tester for XLR, 1/4-inch, and RCA cables; a phantom power checker; a battery checker; and the game Ping.

(303) 545-5848; fax (303) 545-6066
sales@terrasonde.com
www.terrasonde.com
Circle (216) on Free Info Card

REMOTES

WNYC Radio: On the town

By Chriss Scherer, editor

Remote broadcasts are not new to radio, but the rules change when a station must build a studio for each one.

Lincoln Center is the setting for one of the many WNYC Radio remote broadcasts.

WNYC Radio is a public radio station licensed to New York. The station was once owned by the city of New York and operated as a city agency. WNYC now owns its own licenses. Its FM station, on 93.9, primarily plays classical music and carries several of the drive-time NPR programs. The AM station, on 820, simulcasts NPR news programs and broadcasts talk shows and music programs, primarily jazz, folk and American popular standards.

An engineer identifies the mics for the mix engineer.

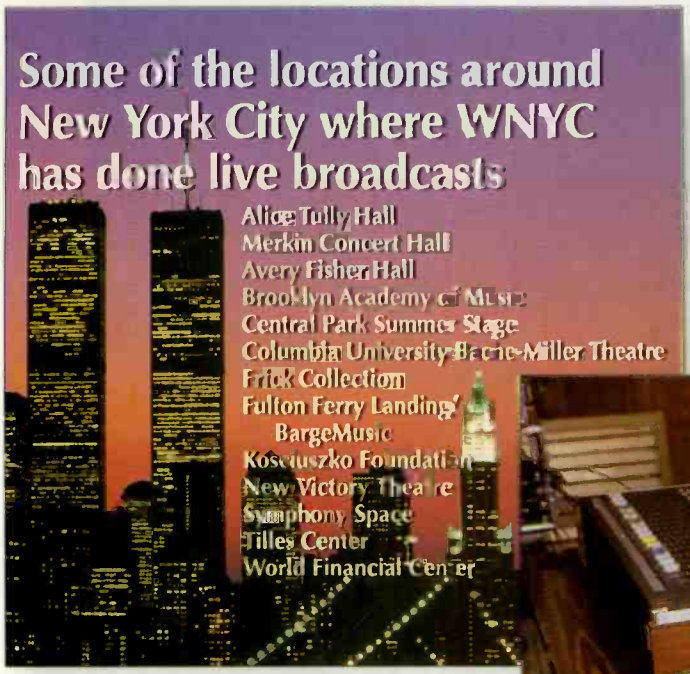
Not-so-simple remotes

WNYC's remote broadcasts differ from most stations. Common remote setups, with a vehicle and mast fed by an RPU with a single mic, are not the norm. The majority of WNYC's remote broadcasts are music performances given at the many concert halls, auditoriums and parks in and around New York City, the country's largest radio market.

WNYC broadcast 12 selected concerts held by the Chamber Music Society of Lincoln Center.

ISDN is used at every event. When possible, a multiplexed feed using two ISDN lines is established. This connection offers a 256kb/s channel to transmit the audio back to the studio. For these applications, a MusicamUSA Prima is used with Layer II stereo coding. Some events have only one ISDN line installed. For these events, a Telos Zephyr is put into action with Layer III stereo coding at a 48kHz sampling rate and a dual 64kb/s connection to fill the 128kb/s capacity.

Before the proliferation of ISDN, stereo, equalized phone lines were



installed at each location. Because the costs for these lines has increased and ISDN has become more affordable and reliable, the switch was inevitable. Though the station engineers would prefer to send all of the audio uncompressed (not data reduced), doing so is no longer a cost-effective alternative.

Setting up a broadcast from any venue takes time. For WNYC, preparations may include mounting microphone supports around the hall, running snake cables, and practically building a control room for every broadcast.

Standard setup

In addition to the remote broadcasts, most of the events are recorded. Therefore, the setup must cover both aspects of the production. Studer consoles are at the heart of the system. The station owns one Studer 962 (a 16-input, stereo-out console) and three Studer 169s. One Studer is an eight-in, four-channel out console; the other two are 10-in, stereo-

For the Chamber Music Society broadcasts, a 16x2 console is linked to an 8x4 console.

The mix engineer sets up the mics for the host studio. The second mic is used for the interview segments of the broadcast.

out consoles. The smaller boards, which feed the recorders directly, are used for the concert mix. These boards also feed the larger console, which takes care of the elements needed for the broadcast with the host and interview mics, CD player and minidisc player. The CD player and minidisc are used for drop-in elements, such as prerecorded interviews and ambience beds.

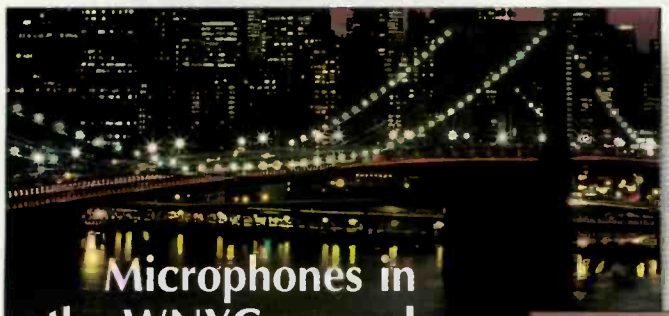
The three Studer consoles can be linked electronically to form one large console. This configuration is used for jazz, big band and other large-ensemble performances. For these shows, three DA-88s are used to record the performance in addition to the stereo master. The multitrack recording provides a clean backup in case a remix of the performance is needed.

Most of the classical music setups use either a pair of spaced omnis and a center mic in X-Y or three spaced omnis. Ambience mics are usually placed near the back of the hall. The level of the center omni mic pair is about 3dB down from the side mics to prevent the image from becoming too narrow. Additional accent mics are placed as needed.

The front mics are placed about 10 feet above the ground, just in front of the performers. The side mics are 5 feet from the center (i.e., 10 feet apart). Mono compatibility is continually checked. The phase of every item is checked and double-checked, including the mics and all cables used.

Unique venues

One unique remote location is BargeMusic, a monthly series from a barge on the East River at Fulton Ferry Landing. BargeMusic has a low ceiling, and the musicians are on a stage. This setup does not leave much clearance for overhead microphones. The room is not very reverberant, and the musicians are closer to the mics than they would be in a concert hall. These factors result in the capture of a rather dry sound. The Ferry Landing is one of the few locations where additional reverb (from a Lexicon 480L) and EQ from the console are added to the broadcast mix to compensate for the room's



Microphones in the WNYC arsenal

AKG: 414, Calrec SoundField MarkIV
Crown: Lavelier
ElectroVoice: RE20
Neumann: U87, TLM170, KM84, KM86, KMR81i, 149
RCA: 77D, 44
Schoeps: omni, cardioid and stereo
Sennheiser: Lavelier, MD421
Shure: SM58, SM81, Beta87

acoustical limitations.

Two ISDN lines are installed at Avery Fisher Hall, another unique venue. A recent performance given by Yo-Yo Ma and the Amsterdam Baroque Orchestra was broadcast from the hall with a microphone arrangement like those for WNYC's other classical setups. A pair of spaced omnis and a center X-Y were used. Additional accent mics were placed above the woodwinds, and mics were hung above the audience. A shotgun mic was hung in case the soloist or conductor spoke. During the dress rehearsal, the station engineers discovered that the shotgun also functioned as a distant accent mic on the cello. They added this mic to the accent placed on the cello for a more natural sound.

WNYC also broadcasts the Chamber Music New York series, which performs at the Frick Collection art gallery.

Steve Shultis, director of engineering, checks in with Master Control from the director's section. Also shown are the operator's position and ancillary outboard audio equipment.

(L to R) Edward Haber, George Wellington and Shultis discuss last-minute details before the broadcast begins.

A variation on the standard microphone setup, this series uses Schoeps mics, with cardioid capsules installed, placed in an ORTF arrangement.

Alice Tully Hall

The Chamber Music Society of Lincoln Center holds an annual concert series at Alice Tully Hall. All of the photos included in this article were taken at a performance held in the hall in late March. Two ISDN lines are installed, and the MusicamUSA Prima multiplexes the two circuits.

The station sets up the control room for the broadcast in the men's locker room. The host for the broadcast is positioned in the women's locker room. (When listening to the broadcast, it's hard to imagine the host surrounded by lockers and wooden benches rather than velvet couches and luxurious carpeting.) At a recent concert broadcast, the host thanked a performer she had interviewed for stopping by the broadcast booth. The performer replied that she had to pass the booth because it was in the women's locker room.

A video feed of the hall is set up for the host. This feed, along with the intercom feed to the control room, helps the broadcast run smoothly.

All audio distribution is done in analog. A multichannel snake carries the microphone signals to the control room. The final stereo mix is fed to the ISDN codec, and the record feed is fed to a 20-bit Apogee analog-to-digital converter, sampled at 44.1kHz. The pre-amp then feeds two HHB DAT recorders.

Other musical genres

Merkin Concert Hall is the stage for New Sounds, a contemporary series that features many types of music. For this series, all of the consoles are linked to handle the large number of sources needed for the broadcast and recording. The microphones are split with a 20-channel Whirlwind splitter and an 11-channel WireWorks splitter to create the additional audio feeds needed for the house PA.

One unusual aspect of this series is that the host is not in a room that is separate from the performance. Instead, he sits on one side of the stage. This position allows him to introduce the musicians and interview them between pieces. Because the program tends to be somewhat improvisational, the host has a Mackie 1602 to control his own mic. Valley processors are used on the host and audience mics. The host mic processor is also fed into the sidechain of the audience mics to automatically duck the audience level while he speaks.

Equipment WNYC uses

Here's a list of some of the equipment that is taken out on the road for the WNYC broadcasts.

(3) Studer 169 console
(1) Studer 962 console
Genelec 1030A monitors
Tascam 801 MiniDisc (with AES/EBU I/O)
(2) Sony CD players
(2) Panasonic 4800 DAT
(12) Valley People compressors
(3) Tascam DA-88 for multichannel backups
Millenia Mic pre with Apogee 20-bit A/D converter
(2) HHB PortaDAT
20-channel Whirlwind splitter
11-channel WireWorks splitter
Clear-com four-channel intercom system and Clear-com IFB
Telos Zephyr
MusicamUSA Prima

Director Eileen Delahunty checks the mix during the broadcast. Mix engineer Wayne Shulmister is at the board.

Poised for success

Even the station's New Year's Eve broadcast entailed setups at three locations around New York City. The live material was interwoven with prerecorded elements and performances given earlier that day.

Though they are not the usual fare of restaurants and gas stations, WNYC's remote broadcasts still achieve the usual goals: They position WNYC in the public eye and provide live radio content for the station's programs. Each appearance requires considerable planning and preparation to ensure a successful broadcast.

Thanks to Steve Shultis, director of engineering at WNYC and Edward Haber, WNYC's senior concert technician.

To learn more about WNYC or to check out their online audio archives, visit their website:
WWW.WNYC.ORG

ANTENNAS

Directional antennas

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

Covering the basics of directional antennas

This is the fifth in a series of nine articles on basic broadcast antennas.

This month and next month, this series will deal with directional antennas. The DA is the second most important development since radio was invented and commercial broadcasting was introduced. Without the use of DAs, far fewer radio stations would be on the air.

In a previous installment, we saw that radiation from a single vertical antenna proceeds equally in all directions in the absence of other re-radiating objects nearby. This is one of the disadvantages of the single radiator, because there are times when omnidirectional radiation is not a blessing.

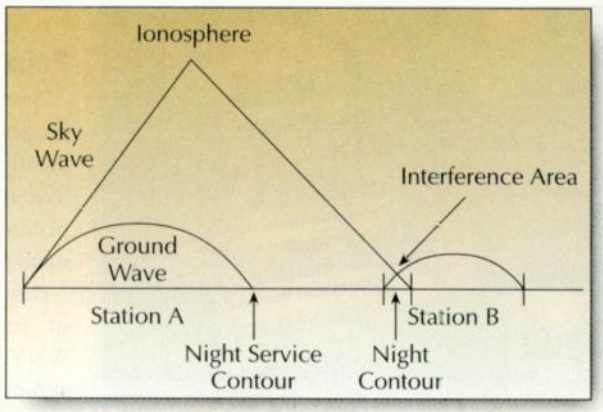


Figure 1. Skywave interference from a non-DA station.

Why use directional antennas?

Directional antennas reduce coverage in a direction where there is no audience, such as a station on the coast, where half its radiation would go out to sea or over an area of land where there are no listeners. These antennas also focus the signal in a specific direction to an area where the listeners are concentrated. Probably the most important function of the directional antenna is to prevent both groundwave and skywave interference between stations.

Consider a station whose power is 5kW in the daytime and whose usable 0.5mV/m signal goes about 50 miles via groundwave propagation. At night, this station might produce interference to a co-channel station more than 400 miles away (see Figure 1). The daytime groundwave is attenuated long before 400 miles have passed. But the same vertical signal that exists in the daytime also exists at night. As a result, this much weaker vertical signal is reflected from the ionosphere and returns to earth at a distance that depends on space conditions. The ionosphere is an ionized layer of gases above the earth whose reflectivity changes with time. A layer of ionization known as the E-layer reflects MF signals — when they can reach it. In the daytime, a lower layer usually prevents passage of MF signals to the E-layer. Occasionally, this lower layer opens and allows daytime skywave phenomena, but this is not often a problem. At night, this impediment no longer exists, and high-angle MF radiation from earth is reflected, sometimes bouncing back more than once and causing interference at large distances.

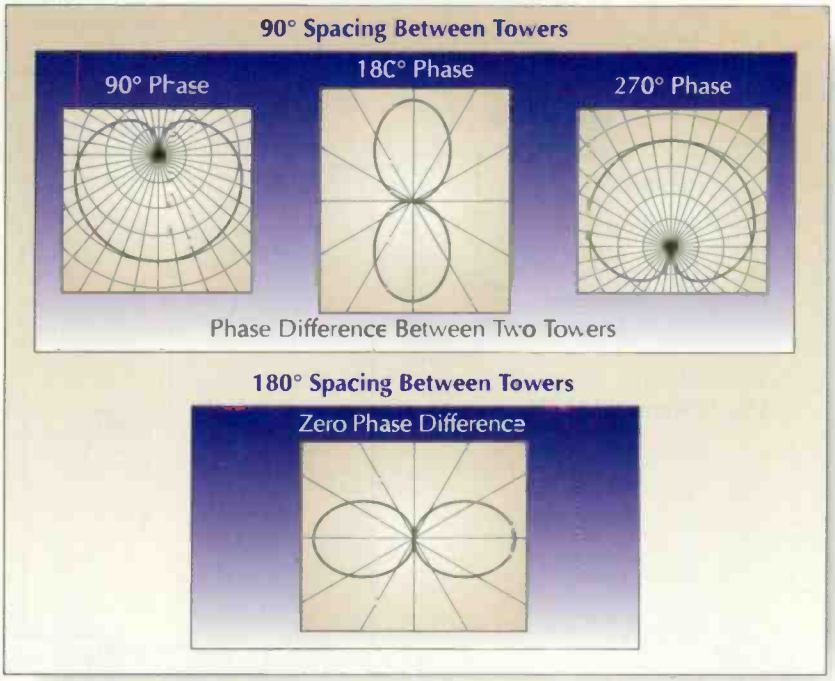
The *FCC Rules* specify that a co-channel interfering signal must not exceed a ratio of 20:1, desired to undesired (D:U). The consulting engineer has to take care of this requirement when designing an antenna (as specified in FCC #73.182) and reduce the vertical radiation while still covering his city of license.

It is not possible to control vertical radiation adequately with a single radiator. Therefore, two or more are used to shape the radiation pattern and control the vertical radiation. Until about 16 years ago, the FCC authorized daytime-only AM stations. A great number of these were omnidirectional and were silent at night. But when the U.S. decided to participate fully in the CCIR (international communications regulatory committee), new day-timers were no longer authorized. Now the only way to get

a new station is to use a directional antenna to obtain the required protection and coverage.

In a few cases, the DA proved to be a blessing for day-timers granted a very low (30W to 50W) night signal and whose antenna pattern covered their cities of license. This meant that the very low night power was often concentrated into an amazingly viable night signal. For this reason, it is important for chief engineers of DA stations with very low night power to make every effort to ensure that the antenna is operating with 100-percent efficiency at night and that night full licensed power and antenna current are maintained.

Most AM stations are probably licensed DA-N, meaning omnidirectional day and directional night operation. DA-U means directional all the time; DA-D means directional day operation only; DA-LS means directional at local sunset. There are even DA-2 and DA-3 designations, meaning one DA pattern daytime, another DA pattern night and a third pattern during critical hours (the two hours after sunrise and two hours before sunset when the ionosphere is changing rapidly).



The top line shows fixed tower spacing with various antenna phases. The lower line shows the same tower with zero phase difference. A wide range of pattern shapes is possible by changing phase and spacing.

We are not going to delve into the basics of DA design, since the subject has been covered many times. The

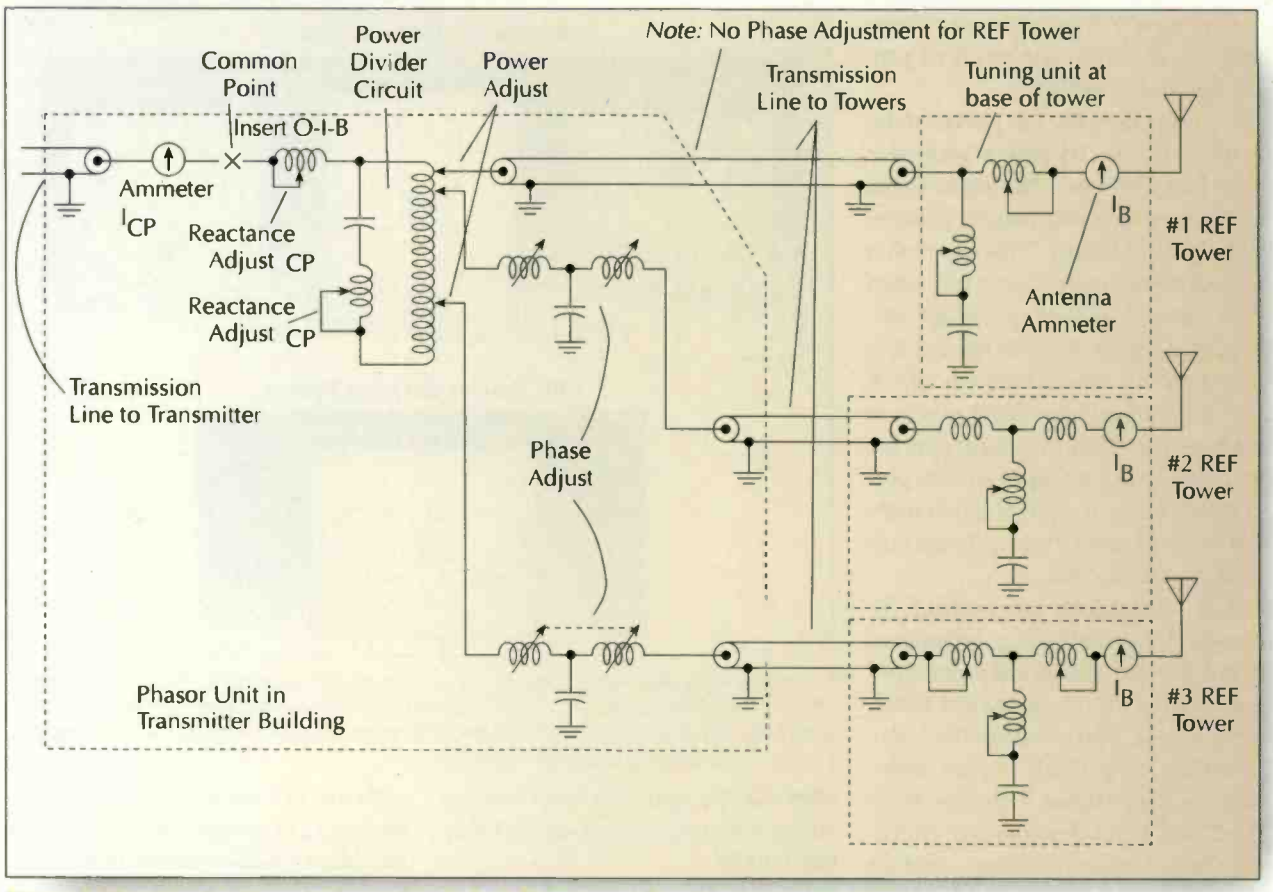


Figure 3. Phasor and antenna tuning networks for a three-tower directional antenna system.

purpose of this piece is to remove the mystery of DAs and make it easier for new engineers in the AM and FM broadcast field to cope with operational problems. This article and the next will cover theory of operation and working with DAs.

Basics of DAs

When DAs first evolved, it took a good engineer days to calculate a simple daytime pattern to provide the desired coverage and protection. A night pattern could take several weeks using a slide rule and, in the '50s and '60s, a comptometer (forerunner of the computer) to iterate a pattern to get the desired parameters. Today, a desktop computer program or pocket calculator can be used to complete the job in hours. Various broadcast tech networks have DA programs that can be downloaded. DataWorld and Vee-Soft are two companies that have excellent programs.

A directional antenna system may consist of as many antennas as the engineer requires to do the job within reasonable limits. Two antennas form the smallest DA design, and pairs are also used in multiplication patterns to arrive at the desired shape.

Inline DAs always have a symmetrical pattern. If you have an inline array and an asymmetrical measured pattern, you can be sure that there is some outside foreign object that is causing it. Quite possibly, these days it will be a PC or cell tower that has gone up overnight without following FCC guidelines.

A dogleg array consists of two or more towers in line, with one or more additional towers off at an angle. This design is used to obtain very asymmetrical patterns, usually for rather tight situations.

A group of four or more towers may be inline or in a square, rectangle or rhomboid arrangement. Occasionally, you may find a line of six towers. Often, a multitower array will have a tower with negative operating resistance. This is used basically to take power out of a pattern — acting as a parasitic element — to obtain a required radiation value. To the uninitiated, a negative tower can be very

confusing. An inline bridge set up in the usual way to measure its impedance will give unexpected results and may lead unnecessary and incorrect adjustments to the system, which could lead to trouble. Before tampering with *any* antenna adjustments, refer to the proof of performance to ascertain the designed and operating parameters, and be sure the bridge is reading in the correct direction.

Many stations that operate directionally day and night do not use all the towers at any given time. For instance, a station with six towers might use three inline during the day and all six at night to provide the desired coverage and protection. The unused towers will be detuned so that they do not affect the day pattern. Sometimes the towers are detuned by mere disconnection of drive at the phasor, but usually there is a detuning network that is connected across their bases when the tower is unused. The method of detuning depends on the individual tower height and its effect on the pattern.

Consider a two-tower array. By merely changing spacing between towers and the antenna current phase difference between towers, we can produce the following, quite extreme, horizontal patterns shown in Figure 2. In the case of a multiple tower array, when using two-tower units and multiplying, almost any pattern shape can be produced. But there are caveats. Extreme patterns may produce high Q, narrow nulls with distortion, poor operating impedance and unstable operation. The vertical pattern must also be considered. In areas with very low horizontal radiation, there is often a bad vertical overhang that produces interference to distant co-channel stations. With computer programs that can iterate until the desired vertical and horizontal patterns are obtained, this factor is usually considered, but it is important to not overlook this point when making manual calculations.

The most important function of the directional antenna is to prevent both groundwave and skywave interference between stations.

Figure 3 is a block diagram of a typical three-tower array. The phasor is the heart and brain of the array. It should be next to the transmitter. Its job is to distribute the correct power at the designated phase angle to each antenna. Its input is known as the common point (CP). This is a critical part of a DA. It is the point where the sum total of RF power delivered to the antenna system is measured. It has an impedance that is measured by an in-line bridge at the point marked BR. This measurement is made when the array is set up and tuned. It is extremely important in station operation, the product of I_{cp}^2 and the CP resistance (R_{cp}) equals the licensed power of the station. The

product of antenna current and base operating resistance for each tower in an array should add up to the approximate licensed power for the station. The FCC allows a small amount of power in its *Rules* to cover losses in DA circuits. Eight percent is allowed for stations up to 5kW, and 5.3 percent for stations above that power. This means that the license shows that much more power than the nominal power (eg., 5.4kW for a 5kW station).

The phasor is the heart and brain of the array.

Usually, the CP is set for 50Ω resistance and 0Ω reactance. Although the actual resistance used depends on the transmitter's requirements, reactance *must* be zero. Some phasors have a built-in inline bridge. This refinement makes DA adjustment much easier than having to make a change and then get inside the phasor to hang a bridge to measure the CP.

If you have to order a new phasor, order a CP measuring point jack that comes up on the front panel. That way, you can hang a bridge and measure CP and then use the bridge elsewhere (at about $3,000, most engineers have only one bridge). The jack can be protected and shielded when not in use and the bridge is available for use elsewhere.

There are power and phase controls for each tower. These are clearly labeled and usually have microdials that make clear and precise readings. In general, the dials for the reference tower (usually designated tower one) are set to zero and are not used when adjusting the phasor. Any change in the reference tower value will affect every other tower, which will make adjustment that much more difficult.

When you encounter a new DA installation, it is wise to write down the exact phasor dial settings, I_{cp} and antenna monitor readings before doing anything else. Doing so will enable you to return to a presumably correct operation if you make any changes that are not satisfactory.

The antenna monitor (formerly called phase monitor) is an important instrument in your daily operation. When the station is first set up, the monitor is calibrated and used to establish the actual combination of current and phase required in each tower to produce the desired pattern. Sampling devices connected by means of special stabilized monitor cables from each tower supply the antenna monitor with voltages that are representative of the individual towers. The monitor shows the ratio between the reference tower and the individual towers and phase angles. It is rare that the consulting engineer's theoretical current and phase figures match the actual values obtained when the array is finally set up as designed. Small tower differences, slight-line length changes and the immediate environment of the array account for these differences. When installation is completed, the actual operating parameters read on the antenna monitor are shown on Form 302 and appear on the license when issued.

Never make changes in the antenna monitor sampling cables or the transmission lines without following the commission's procedures. Changes improperly made to either can affect the accuracy of the radiated pattern and the antenna monitor readings, and can produce interference (as well as instilling terror when an FCC inspector arrives).

Next month's installment will cover pattern changing, antenna adjustment and DA maintenance.

This is the fifth in a series of nine articles on basic broadcast antennas. Upcoming installments will appear monthly in BE Radio *through 1999. Once all the installments are published, the series will be available for purchase as a single document. For information regarding bulk orders of this series in quantities of 500 or more, contact Jenny Eisele at 913-967-1966.*

E-mail John at: batcom@bright.net.

Currents

News

Business/ People

Radio receiver agreements made

CD Radio's digital satellite radio system is two steps closer to completion. The company has announced agreements with Recoton Corporation and Delphi Delco Electronics Systems, a division of Delphi Automotive Systems, for the design and development of its receivers.

Under terms of the agreement, Delco will design, market and sell a factory-installed three-band (AM/FM/CD Radio) audio system to vehicle manufacturers.

Recoton, a major supplier of audio and accessory products to the automotive electronics aftermarket, will design and develop several CD Radio receiving devices. These will include a plug-and-play adapter that works through the cassette bay of existing car stereos and a second adapter that works with 95 percent of existing car stereos. In addition, Recoton's Mobile Audio Division will develop and market Jensen brand aftermarket three-band car stereo receivers.

CD Radio also announced that Lucent Technologies has completed the technical specifications and systems engineering of the chipset that will be employed in CD Radio receivers. CD Radio and Lucent engineering teams are implementing the chip design.

CD Radio's system is scheduled for launch in the fourth quarter of the year 2000.

Yahoo! to acquire broadcast.com

Yahoo! Inc. recently announced that it will buy broadcast.com Inc. for stock valued at about $5.7 billion. The deal is expected to close in the third quarter of this year. Broadcast.com will continue to operate out of Dallas under its current name.

This deal will broaden Yahoo!'s website offerings. Yahoo! targeted broadcast.com because the latter has become one of the leading destinations for audio and video streaming on the Web.

A walk in the park

During World War II, the Voice of America relay station beamed American radio programs to Nazi Germany. Later, it broadcast to Western Europe, the Mediterranean, North Africa and South America.

Now the station, located just outside Cincinnati, is getting a new face. It will be converted into a park.

About 220 acres of the 550-acre site, now named Freedom Park, will be developed by Butler County as a public golf course. The rest will become the township park, which will include seven baseball fields and seven soccer fields as well as a walking and jogging course. Miami University-Middletown hopes to add a student learning center.

The broadcasting operation was closed in 1994 when the VOA was consolidated with other U.S. overseas broadcasting efforts, such as Radio Marti and Radio Free Europe.

A small switching station and the 10 acres around it will be devoted to VOA history.

Business

USA Digital Radio Inc. and **QEI Corporation** have signed a joint technology and marketing agreement designed to further the implementation of digital radio. The companies will work together to develop, test and promote the necessary IBOC DAB transmission equipment required for the radio broadcast industry. Also, both companies will work together to define the IBOC DAB certification process for QEI transmission equipment and to develop coordinating strategies required for the launch of IBOC technology and associated QEI products.

Wheatstone's acquisition of **Auditronics** is complete. The acquisition will not result in any immediate changes in the operation of Auditronics, according to Wheatstone. Auditronics will remain at its current headquarters, and sales and marketing of the Auditronic's product line will continue as before. Wheatstone's facility in New Bern, NC, will be employed to streamline manufacturing costs.

The **Mid-Atlantic States Expo**, scheduled for June 8-9, 1999, in Atlantic City is approaching quickly. Technical sessions will be provided courtesy of **ARMA**, the American Radio Manufacturers Association. Attendees will learn of the latest advances in transmission , studio gear and source equipment. **Lucent Technologies** will present a special session on digital technologies, titled "An End to End View of IBOC: Its more than meets the air?" **Radio Systems** will host a special session titled "Studio Hub: The amazing new analog/digital/CAT-5/time saving/cost-effective wiring solution." "EAS: What every broadcaster needs to know" will be presented by **Gorman Redlich Manufacturing Inc.** "Digital for the Future" will be held by **ABG Audio Broadcast Group**. Panel discussions on webcasting and digital automation systems will also be held.

A.R.M.A

For more information on the expo, contact ARMA at (609) 653-6130; fax (609) 653-1075; e-mail mail@armagroup.org.

Harris Corporation has signed a nonexclusive master purchase agreement with **Cox Broadcasting** to supply radio broadcast equipment for all Cox-owned radio stations, which are located across the U.S. The agreement covers Harris analog and digital transmission equipment, including transmitters, STL systems, antennas, accessories and options. Atlanta-based Cox Broadcasting Inc. is

the majority shareholder of Cox Radio Inc. and is a subsidiary of Cox Enterprises. Cox Radio owns more than 55 radio stations.

◀ **Andrew Corporation** has completed the buy-out of Andrew Satcom Africa, its joint venture in South Africa. The company, which had operated as an Andrew majority-owned venture since 1996, is now a wholly owned subsidiary of Andrew Corporation. The company will continue to operate under the name Andrew Satcom Africa.

Ward-Beck Systems announces delivery of six R2K series consoles. Telemedia Communications Inc. ordered three 20-input channel R2K/20s; CBC Radio ordered two R2K/20s and one 28-input R2K/28.

Also, the company has won the contract to supply the U.S. Information Agency with 60 frames of the D8202 D/A converters for their International Broadcasting Bureau facilities in Washington. This system will provide 480 channels of conversion, with the ability to expand to 720 channels.

▼ **Sennheiser** has named **Scharff Weisberg Inc.** 1998 Professional Products Dealer of the Year. The award recognizes the highest-dollar sales of Sennheiser professional products in the broadcast/rental category. John Falcone, president and CEO of Sennheiser, presented the award. The award was accepted by Scott Schachter, VP of professional audio sales at Scharff Weisberg.

Ten **Sonifex** HY02 telephone balance units were recently shipped to TeleDanmark, the largest national telephone company in Denmark. The order was obtained after the HY02's received the Certificate of Pan European Approval, the CTR21.

The TBR21 technical approval specification for the CTR21 was introduced in January 1998 and is a general European-wide approval for telephony equipment. Sonifex applied for approval on its HY02 product range at the end of 1998.

NPR has been awarded three of the four 1998 George Foster Peabody Awards for radio. The awards were given for the daily classical music magazine, "Performance Today," for news coverage of Africa, and for a documentary celebrating the life of Paul Robeson.

People

Phil Ramone has been named senior advisor to Lucent's Internet music initiative. The initiative, which recently announced the first non-MP3 handheld player with e.Digital and Texas Instruments, is a founding member of the Secure Digital Music Initiative (SDMI), and has the Bell Labs-developed Enhanced Perceptual Audio Coder (EPAC), which is the highest-quality audio codec in the industry.

David Burkey has assumed responsibility of company president and CEO of Continental Electronics in addition to his duties as COO. In his expanded role, Burkey oversees all aspects of management and is responsible for launching the company's digital vision for the broadcast industry.

Marty Sacks

▶ At Telos/Cutting Edge, **Marty Sacks** has been appointed national sales director. Most recently, Sacks worked for Pacific Research & Engineering.

Alan B. Shirley

◀ Telex/EVI Audio announces the appointment of **Alan B. Shirley** as vice president of marketing for the Speakers and Microphone Group. Most recently, Shirley was managing director and founder of ABS Consulting LLP, a firm that specializes in marketing and strategy issues for audio/video and music industry companies.

Reader Feedback

In praise of antennas

Hi John,

I must commend you on a fantastic article in *BE Radio*! And, it could not have come at a better time — within the past month, the facility I help maintain has been going "through the ringer," as we try to get everything in working order for the new owners. The article gave me a great deal of insight into some of the problems we have been experiencing (bad reception, etc), and I look forward to the follow-ups!

Jeremy Preece
KCKC-AM San Bernardino CA

Hi John,

I am a regular reader of *BE Radio* magazine, and I think you guys have a great thing going there. Keep up the good work. I am impressed with the articles pertaining to AM antennas, and I was wondering if you could recommend a book or any kind of text on AM tuning and phasing, radiation patterns and so forth. I work for a small radio station in the Niagara Peninsula and would love to have that kind of information.

Tyrone Dey

Thank you for your kind words. Antennas are a fascinating area, and I can't get enough of them! The next two installments of the antenna series will discuss directional antennas in general, and later will provide some information on testing.

I recommend the book by Jack Layton on the subject of directional antennas (Directional Antennas Made Simple, *copyright 1996, available through the SBE bookstore, www.sbe.org). Feel free to contact me anytime for help.*

John Battison
P.E., technical editor, RF

Hi John,

Enjoy your articles in *BE Radio*. Keep up the good work. I wonder if you have seen the [information] on the paper the Egyptians are presenting on the cross-field antenna medium wave antenna? It's only 30 feet high for 603kHz.

Vern Killion, W5UYF
Director of engineering KRVN-AM/FM
Lexington, NE

BE Radio *has an article slated for an upcoming issue discussing the cross-field antenna in detail. Look for it later this summer.*

Chriss Scherer
Editor

Business/People

Good information

Dear *BE Radio*,

Thank you for maintaining the quality and integrity of *Broadcast Engineering*, now *BE Radio*, over the years.

I last worked as a broadcast engineer in March of 1978, then went into electronics manufacturing until last fall and, sadly, didn't keep up with the changes in technology, equipment and FCC rules during the 20 years that I was away from radio.

Last November, I started working again in radio as an engineer. I had a lot of catching up to do, and the first resource I turned to was *BE Radio*, remembering what a valuable piece of literature it was 20 years ago. I wasn't disappointed! *BE Radio* has been, and will continue to be, a lifesaver. I find that I am getting up to speed in today's radio broadcasting field much faster than I expected, thanks in a big part to *BE Radio*.

Gratefully,

Tom Wirch
KINK FM 102
Portland, OR

Full fidelity

Dear Chriss,

I am quite amazed to read [in April's Contract Engineering column] that: "...for music streaming, anything less than full 20kHz bandwidth will be noticeable..."

If this is so, why have we had to suffer a 15kHz bandwidth on FM multiplex broadcasting these past 30 or so years without anyone complaining? Personally, I should be overjoyed to have even an honest 12kHz bandwidth over the Internet, without the objectionable artifacts of compression that limit my enjoyment at present.

David Pickett
Director of Recording Arts
Indiana University School of Music
Bloomington, IN

You are correct in your statement. My point was aimed at the other forms of entertainment (CD, DVD, MP3) that will be competing for the same ears. I personally would like to have the entire audio spectrum presented. While 12kHz is a respectable bandwidth, a full 20kHz has that extra sparkle. However, unless a side-by-side comparison is made, you are probably right that most people will not realize that there is a bandwidth limitation in use.

Chriss Scherer
Editor

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Charles Kinney Director of Engineering,
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Dawn of a new day

By Skip Pizzi, executive editor

Many of us remember our first transistor radio. As avid young listeners, this device allowed us to bring radio with us wherever we went for as long as the battery would last. We carried its companionship as we went about our day. By the time most of us were of driving age, the car radio was commonplace, and it continued this trend.

These flashbacks are not intended to make you feel old but rather to help you realize how far broadcast radio has come in our lifetimes. The mobility and portability of such a cheap yet rich and reliable medium is part of our landscape today, but it is still a relatively new phenomenon. It is also an essential component of radio's business strategy.

Return to the present and shift your attention to online media, which remains tethered to a fixed, wired receiver. Online radio today is like broadcast radio of the 1950s. Mobile and portable use is largely a fantasy. All that is about to change.

Consider the magnitude of the shift that broadcast radio experienced between the 1950s and the present, and you'll get a sense of what lies ahead. In fact, it's quite possible that the impending changes may dwarf that earlier mutation, and it's a virtual certainty that they will occur more quickly.

The driving force

The move to mobility and portability of the portable online receiver or personal digital media-file player (or palmtop PC) is fueled primarily by one technological development: the *single-chip computer*, the era of which is just dawning.

Don't confuse the CPU chips of today's personal computers (e.g., Pentium II, AMD K6-2 or Mac G3) with these emergent devices. Although we tend to speak of PCs as being based on a single chip in the CPU, today's desktop and laptop computers are more appropriately referred to as *single-board* devices. The motherboard that holds the PC's CPU chip includes other elements that are all part of the computer's central core.

In contrast, the new single-chip device replaces the functionality of the entire PC motherboard along with some of its peripherals. Unlike the PC, which relies on a variety of separate processors connected via an internal bus, the single-chip device manages computation, applications, memory, display and I/O on a single piece of silicon. This advance is analogous to what the single-board device did to its predecessor, the mainframe computer. Similar or better functionality was provided by far more compact and cost-effective hardware, and the rest is history.

Radio will once again have to adapt to divergent audience behaviors.

Again extrapolating from lessons learned, the single-board revolution of the 1980s was the fundamental development that spawned the PC era. The single-chip computer could engender a technological movement no less dramatic, perhaps more so. Just as it was difficult to foresee the impact of the desktop PC in the mainframe age, it is equally hard to predict what will transpire in the wake of the single-chip movement. It is safe to say we can make is that we are probably underestimating its potential.

Changing habits

If palmtops achieve the massive penetration of the marketplace that PCs have already earned (as most analysts expect they will) their use will likely alter the way audio media is consumed. The effect of this change on radio could be similar to that of television's introduction. Radio once again will have to adapt to divergent audience behaviors.

The primary shift will likely involve the browsing behavior acquired by a generation that grew up on the Internet. This is something between the purely passive channel-surfing of today's listeners and the highly proactive seeker behavior of the research-oriented Net user. While the latter is after something specific and predetermined, the browser-type is more flexible. Such a listener is interested in seeking out something but willing to rely on an established and trusted brand to deliver it. Instead of seeking a particular team's score in last night's game, for example, he may simply log on to ESPN Radio's website. Or, instead of looking for a particular band's new song, he may log on to a familiar music-download site to see what new titles are available.

The store-and-forward behavior that this process allows may also become endemic, further changing listening — and purchasing — habits. Coupled with the launch of DBS radio, it's easy to see why the next few years will prove challenging for radio broadcasters as their competition and audiences change substantially.

Looking for the best digital audio system?

Compare apples to apples.

Digital audio systems aren't created equal. You'll find that Digital Universe, CBSI's new system for live assist, satellite, automation and routing, stands out from the crowd.

Uncompressed Audio

Because most other systems depend on compression, they take huge bites out of your audio before it ever reaches the airwaves. Digital Universe serves up full CD-quality, 44.1 kHz audio, start to finish. That's audio fidelity sure to appeal to even the most golden-eared of your listeners.

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Just try running a station or 2, 3, even 6 channels. Most systems can't get much further than that, uncompressed, without adding lots of extra hardware. Digital Universe gives you 50 stereo channels,* all from a single server. No other system comes close.

**Tested capacity as of January 1999. Advances in PC hardware yield ongoing improvements in channel capacity.*

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Digital Universe's leading-edge Windows NT platform and client/server architecture give your system room to grow, without clumsy workarounds or multiple PCs in every studio. And Digital Universe was written for NT, not just "optimized" for it – it's the right infrastructure for the future as well as the present.

Sound impossible? Take the Digital Universe challenge. Contact us today to request your checklist for selecting a future-proof digital audio system. Then, compare apples to apples. Once you've heard what Digital Universe can do for your station, you won't settle for anything less than gold.

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