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ON THE COVER

K104 Dallas makes the best of a small space with style and sophistication. For the full story, turn to page 24. Cover design by Michael J. Knust.

Features

Columns

Departments

Wireless Broadband Internet Remotes

"The first time out with the Tieline was a brilliantly simple experience for everyone involved. For lack of a better phrase, the codec just worked."

- **Christian Vang**
  Chief Engineer
  Clear Channel St. Louis

"The codecs sounded great. My management was very, very impressed with the demos"

- **Grady Jeffreys,**
  Technical Manager,
  Mackay Communications

"The remote was a spectacular success, in no small part thanks to the flawless sound which the Tieline G3 provided over the public Internet"

- **Mike Rabey**
  Chief Engineer
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Currents Online

Selected headlines from the past month.

D&M Holdings Acquires Calrec Audio

D&M Holdings also distributes Denon, Marantz, McIntosh Laboratory, Boston Acoustics, Snell Acoustics, Escient, Replay TV, D&M Professional, and D&M Premium Sound Solutions.

JK Audio Ships Daptor Three

The Radio magazine Pick Hit Award-winning wireless audio interface offers balanced and unbalanced line-level audio through a cell phone or portable audio device.

SBE Announces New Officers

Barry Thomas, CPBE CBNT, will become the Society's 25th president on Oct. 11.

Thomas

FCC Public Safety and Homeland Security Bureau Launches Disaster Information Reporting System

DIRS is a voluntary, web-based system that is used to report communications infrastructure status and situational awareness information during times of crisis.

Cooney Joins Beasley Broadcast Group

Michael Cooney takes over as Beasley's VP and CTO after eight years as DOE/IT for Entercom Kansas City.

Liquid Compass to Provide Media Players for Internet Radio

The custom media player will utilize Microsoft Silverlight technology to broadcast a live stream, while also using the cross-browser capabilities of Silverlight to rotate synchronized in-stream and banner advertisement content across multiple browsers and platforms.

Sandies Acquires Dynamax

LPB Communications has sold the Dynamax MX series of consoles to Sandies, a company owned and operated by David Strode.

APT Appoints Taylor as Application Support Engineer

Rolf Taylor joins APT after 12 years with Telos.

Site Features

Listen to the Currents Podcast

The week's news items are also available as a podcast. Read the stories online or listen to them via our podcast.

Industry Events

The *Radio* magazine Industry Events section lists upcoming conventions and conferences. Access it today and plan your next convention or conference visit.

Engineers Notebook

Find more tips, tricks, formulas and tools in the Engineers Notebook. Also, be sure to share your ideas with us and we can add them.

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rubicon

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Tag! Is this *it*?

In September, Ibiquity announced technology was coming that would allow HD Radio listeners to take an active step in radio listening by providing the ability to directly purchase the music being played on the radio. This kind of buy-it-now concept has been touted for some time in a variety of ways, but it has not really seen much applied use. Is it possible that tying the technology to HD Radio will be the magic combination?

The technology, called tagging, works with a radio that includes the tagging capability. That makes sense, right? The idea is that a listener hears a song he likes, presses a button (or some similar simple action) and the song is tagged for immediate or later purchase. The recent Ibiquity news adds a widely used music sales outlet and media player to the mix with Itunes and an Ipod.

How does this work? The first two devices to implement the technology aren't available yet, but have been announced to be available at the end of this year. Polk will release the I-Sonic 2 and JBL will introduce the IHD. Both units are HD Radio receivers with Ipod docks. When a song is playing on the radio and the listener's Ipod is in the cradle, the listener presses a button on the dock unit. The tag is stored on the Ipod, and then the Ipod is synced to Itunes later, the tagged songs will be available for purchase and download.

Previous attempts at establishing buy-it-now efforts included plans of Bluetooth-enabled radios that would transfer the selections to a cell phone or some other device, and then the listener would access a website to complete the purchase. The latest method taps into many of the existing elements of a media player owner's routine. Notice that I said a media player owner, not a radio listener. I think the reverse approach from a radio broadcaster point of view may actually work.

While this has all been centered on HD Radio, the technology can be applied to an RBDS signal as well.

As with any new consumer technology application, I don't expect the adults to jump on this right away. I expect younger adults and teens will embrace it more quickly – as long as the technology fits their lifestyles. If it is applied as a natural extension of their regular use, it will succeed. If it requires a forced step, the success will be moderate at best.

Seeing that studies show people learn about new music from listening to the radio, I like this idea overall. However, it still requires some effort for the listener. He must have a tagging-capable dock/radio, he must be listening to the radio on this dock, and he must have his Ipod in the cradle. That's a lot of steps.

What would make this better? Put an HD Radio receiver in the Ipod (and every other media player) in the first place. That eliminates the need for the dock altogether. That also completes the tie between the media player and the radio station. It brings radio back into the portable media experience.

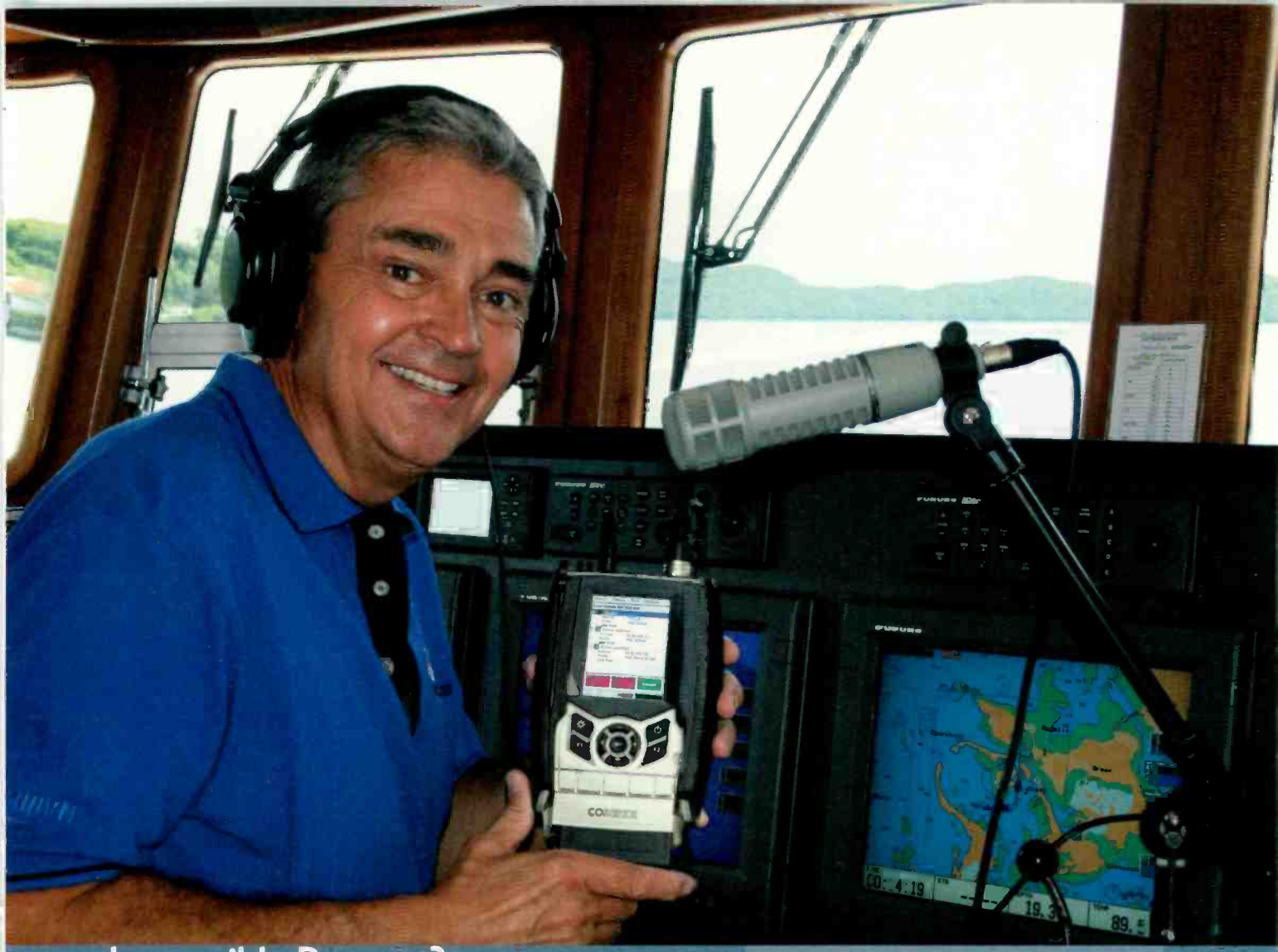
Now, the bad news. As part of the announcement, Peter Ferrara of the HD Digital Radio Alliance said the Alliance will promote Itunes tagging with a multimillion-dollar advertising campaign focusing on the Polk and JBL products. That's quite a commitment – if it were a real advertising campaign. I have no doubt the effort will once again use the unsold inventory of radio stations, making the actual monetary investment equal zero.

Like all the other advances with digital radio, the marketing has to extend beyond the confines of terrestrial radio itself for promotion.

Tagging is another technical innovation to add to the list of HD Radio benefits. This time it has a better chance of becoming a reality.

Chris Scherer

What's your opinion? Send it to radio@RadioMagOnline.com



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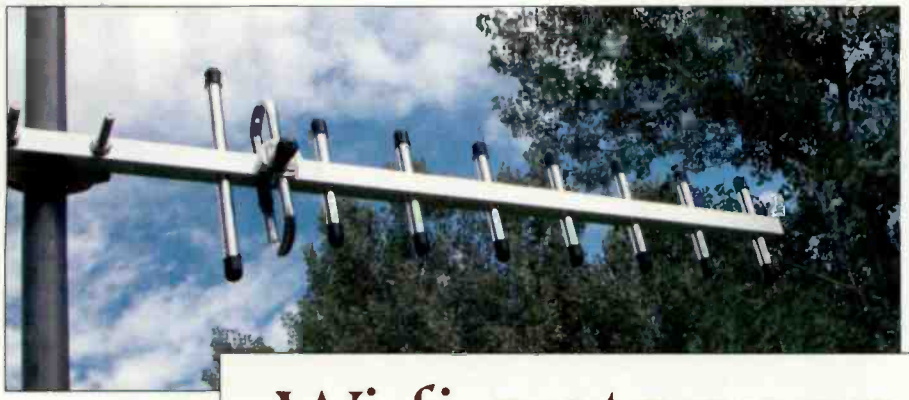


Wi-fi antennas

By Kevin McNamara, CNE

The basic technology behind antenna systems has not significantly changed in the last 50 years. Sure, antennas have become more efficient because of improved modeling and manufacturing techniques, but in the end they work the same way. In recent years, the introduction of wireless networks allows users to work anywhere within a defined location. The technology behind wireless networks changes almost yearly, but one thing remains the same: the antenna.

All wireless networking products currently available can operate on one of four frequency ranges: 902MHz to 928MHz, 2.4GHz to 2.483GHz, 5.15GHz to 5.35GHz or 5.725GHz to 5.825GHz. These frequency bands are also known as the Industrial Scientific and Medical (ISM) bands. As the name implies, this service was intended for certain commercial uses; however, 20 years ago the rules were amended to accommodate other unlicensed services, providing they use some form of spread spectrum modulation and have prescribed very specific limits with regard to power level and antenna gain. The FCC rules pertaining to this service can be found under part 15.

The maximum power level permitted on the ISM bands is 1W; however, that maximum power level could be as low as 0.25W, depending on the frequency range, the spread spectrum technique and number of channels utilized.

Under the ISM rules, antenna gain is limited to 6dBi for single point-to-multipoint use in all bands under normal point-to-multipoint use. If the gain of the antenna exceeds this limit then the output power must be reduced proportionally by the same amount as the gain.

The Rules also permit the operation of ISM as point-to-point or fixed operation in the 2.4GHz and 5.7GHz bands. They state that if the antenna is directionalized, the output power of the transmitter is reduced by 1dB for each 3dB of gain over the 6dB limit in the 2.4GHz band or no power reduction is necessary at all for the same application in the 5.7GHz band. Utilization of the 5.7GHz band is ideal if you are trying to connect two or more facilities (i.e. a studio to a transmitter) over long distances because the use of high gain dishes is permitted assuming there is a line-of-sight between them.

Above: Yagis are useful in a variety applications, including Wi-fi.

Types of antennas

There are several types of antennas available for wireless LAN applications depending on your specific coverage requirements. One of the basic principles to which any antenna conforms is called reciprocity. The reciprocity theorem essentially states that an antenna will transmit or receive electromagnetic energy equally when operating at the same frequency and amplitude. Keeping this in mind, here are the primary characteristics of antennas to consider in your system design.

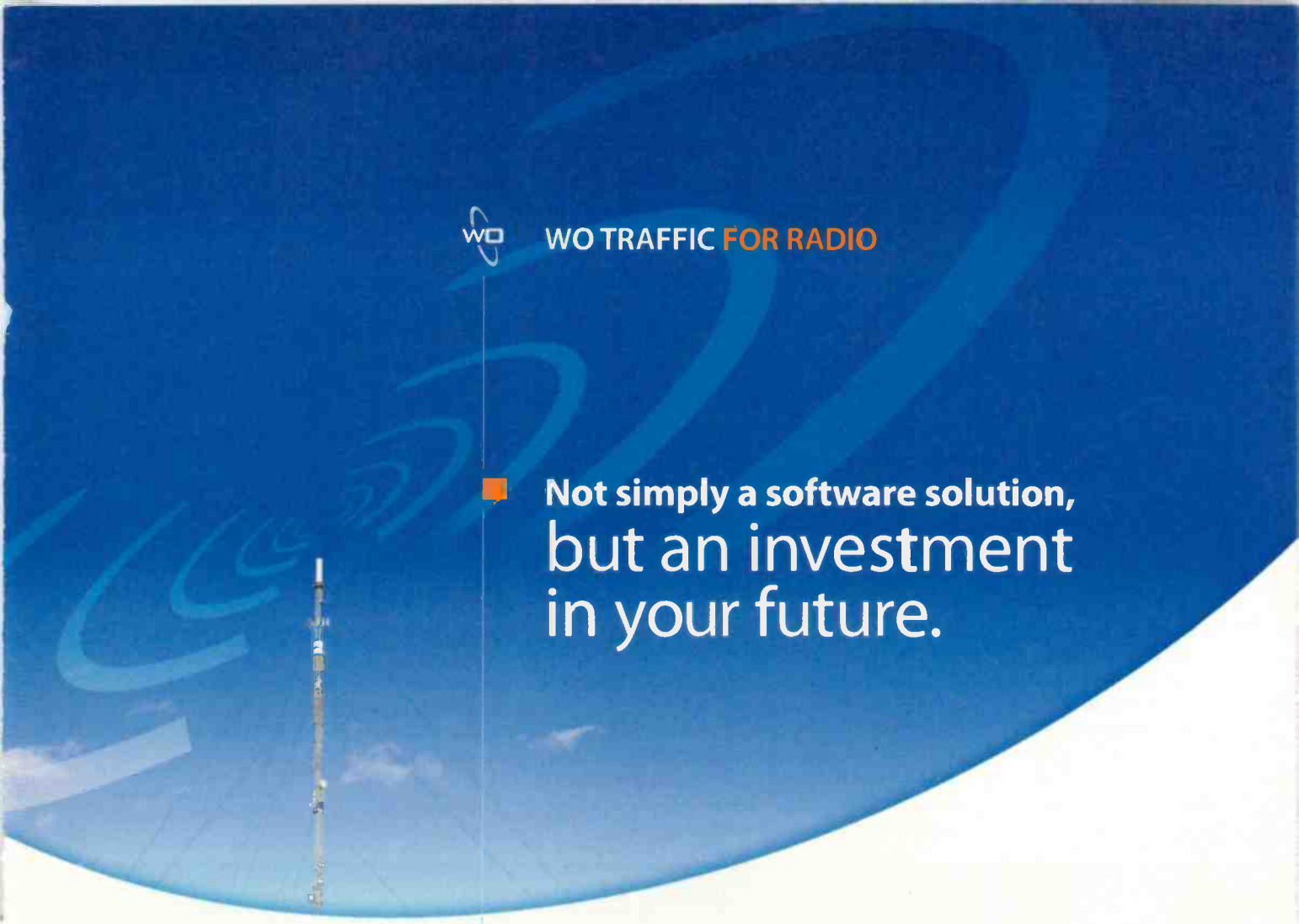
Gain. The gain of an antenna determines the effective radiated power (ERP) of the transmitted signal. ERP is calculated as follows: Radiated Power (dBm) = Transmitter Power (dBm) - Coax/Connector loss (dB) + Antenna Gain (dBi).

Using reciprocity, the expected received signal at the antenna input can be calculated by substituting "Transmitter Power" for "Receiver Sensitivity (dBm)"

With regard to wireless LAN design, the received gain at the router or access point is probably more important than the transmit gain, considering the relatively lower power levels, antenna characteristics of the typical wireless network interface device, and the user's ability to move freely within a facility.

The gain can be measured relative to either an isotropic or dipole antenna. Isotropic antennas are theoretical in nature and considered to have a uniform gain of 0dBi in all directions. Dipole antennas are considered "real" and through testing are shown to exhibit a gain of 2.14dBi.

Directionality. This is defined as the ratio of maximum radiated power (in the lobe) to the average radiated power (over the entire sphere). Most wireless routers and access points use non-directional antennas, which can easily be replaced with external antennas. There are several good reasons to use directional antennas in a building. For instance, access points placed in the corner



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of a building waste a large percentage of signal in areas not needed to serve users. In this case it would make sense to install directional antennas suited to cover the proper area. Other cases might include areas where interference is prevalent or there is a need to radiate more signals in a particular direction to overcome an obstacle, etc.

The Patch antenna is useful for wall- or ceiling-mounted installations. Some designs even look like smoke detectors.

In wireless LAN applications, directional antennas generally take the form of the familiar yagi or dish, but less known around the broadcast industry is the patch antenna.

Patch antennas use a radiator consisting of a half-wave patch suspended over a larger backplane. This forms a directional antenna with a pattern very similar to a yagi, which also uses smaller director elements in front of the radiator to tighten the pattern.

Polarization. This is determined by the physical orientation of the antenna element. Common polarizations include vertical (most utilized), horizontal and circular. Many of the wireless access points include 1, 2 or 3 standard rubber ducky antennas oriented into unlimited angles.

Diversity

I mentioned that some wireless LAN routers and access points use more than one antenna, and these systems utilize some form of spread spectrum modulation scheme subject to multipath interference. By separating two receive antennas by a small distance, the effects of multipath can be reduced or eliminated.

Someone figured out that if two receive antennas are spaced about a wavelength or more, only the reflections will arrive at different times on each antenna and usually one of the antennas will not be affected by multipath. The receiver internally decides which antenna to use based on signal quality. This technique is called diversity reception and is widely used in commercial and military applications. Cellular telephone networks use this extensively. It is also interesting to note that with data communication applications, diversity can also be applied to transmitted signal. Since data is transmitted in both directions, the router or access point can decide which antenna to transmit on and make that selection based on the level of dropped packets.

McNamara is president of Applied Wireless, Cape Coral, FL.

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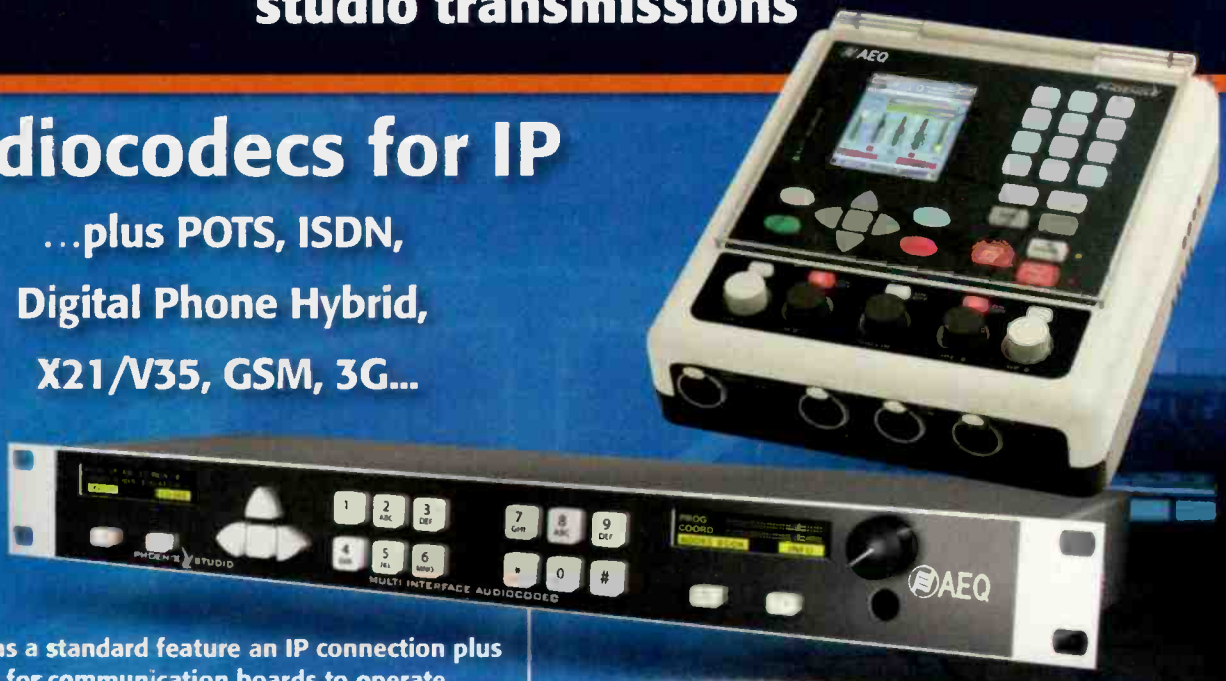

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FCC may help daytime AM stations

By Harry Martin

In addition to the previously-reported proceeding looking toward allowing AM stations (including daytimers) to rebroadcast on FM translators, the FCC received comments in August on a petition for rulemaking that proposes a number of improvements to the post-sunset service rules on the AM side.

The petitioner, a broadcast consulting engineer in New Jersey, argues that the current post-sunset rules lag behind the technical advances made in AM since the rules were last updated in 1992. Operating with the greatest allowable power during post-sunset hours is of utmost importance to AM broadcasters because drive-time hours are after sunset—when many stations are off the air for much of the year—are vital for economic survival. The petitioner contends that his proposed changes would allow AM broadcasters to increase their coverage without causing any additional risk of interference.

Dateline

On or before December 3, radio stations in the following states must file their 2007 biennial ownership reports with the FCC: Alabama, Connecticut, Georgia, Massachusetts, Maine, New Hampshire, Vermont and Rhode Island.

On or before December 3, radio stations in the following states must place their annual EEO reports in their public files and place them on their websites: Alabama, Colorado, Connecticut, Georgia, Massachusetts, Maine, Minnesota, Montana, New Hampshire, North Dakota, South Dakota, Vermont and Rhode Island.

Also on or before December 3, radio stations in Georgia and Alabama with 11 or more full-time employees must file a Broadcast Mid-Term EEO Report with the FCC using FCC Form 397 and attach their two most recent annual EEO public file reports.

The proposals include the following:

- Eliminate the 500W nighttime power limit on PSSA currently contained in Section 73.99 of the rules and permit higher-power operation as long as such operation would not cause interference. According to the petition, computer models are now better able to predict interference at these levels than in 1992 when the rules were issued.
- Make all Class B and D AM stations eligible for extended-hours service—again, as long as such operation would not cause any interference.
- Require more accurate contour mapping of Class A stations than was available in 1992. More accurate mapping of these stations' contours would allow other stations to operate without interference to the Class A station's actual coverage area.
- Give stations flexibility in choosing which antenna or combination of antennas to use for expanded-hours service. The proposal would allow for the use of the daytime, nighttime, critical hours and/or auxiliary antennas.
- Require that all interference calculations, including expanded nighttime service, use the formula set out in Section 73.182 of the rules currently used for allocating AM service.

It is unclear whether any of these proposals will be adopted because their technical feasibility is unknown at this point. The value of the petition is that it will focus attention on the problems of AM daytime stations at a time when the FCC is more concerned with the DTV transition, media ownership limits and the upcoming wireless auction than on radio or AM technical issues. Hopefully, the proposals included in the petition will be considered, and some of them adopted. As is often the case when the FCC seeks comment of a series of proposals, other new and useful proposals emerge which have as much or more appeal as the original ones. No one disagrees that if relief for AM daytimers can be found in a re-evaluation of the technical bases of the current post-sunset authorization scheme, as the petitioner suggests, the FCC should take whatever action makes sense from a technical standpoint.

Martin is a past president of the Federal Communications Bar Association and a member of Fletcher, Heald & Hildreth, Arlington, VA. E-mail martin@fhhlaw.com.

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By Alex Kosiorek

Next steps in Surround

From surround capture to the station infrastructure

There are many facets to broadcasting surround content. Besides choosing a technology, the station's technical staff has to become appropriately educated, suitable monitoring is needed to listen to the content, and the related infrastructure has to be suitably in place. Although many areas of the broadcasting chain can be discussed, I will cover two key areas on either end of the surround-sound broadcasting spectrum. At one end, I'll look at several important aspects of capturing/creating surround content that may not be well known. On the other end, I will touch on several important elements to ensure that surround content can be broadcast successfully (while most certainly improving the stereo and mono content).

Let's start at the tail end of the broadcast/audio chain. A critical step in enabling broadcast surround is ensuring that the facility infrastructure can support it. Do not assume that just because it is seemingly working in stereo that it is ready for surround. It is imperative that the entire broadcast facility (including digital storage systems, analog and digital audio distribution, studio-to-transmitter links (STLs), etc.) can ensure the delivery of audio content with minimal degradation.

Unfortunately, with various digital audio systems integrated with various analog components alongside prosumer equipment, this is an area frequently becoming overlooked. With storage systems, STLs and other systems that may utilize a digital audio codec of one type or another, maintaining audio integrity in a facility has become more complex. Without proper care of the integration of all these systems, audible errors in surround can and will be heard and increased troubleshooting may result.

Don't assume that the facility is surround ready without careful scrutiny over the entire audio path that the content will travel. This becomes critical with surround content as the amount of auditory masking is far less than that used for stereo content. Masking is a property of the human auditory system, where some sounds (or certain aspects of sound) can simply disappear in the presence of other sound(s) with certain characteristics.

With surround content, the sound field is expanded beyond two speakers to five speakers or more placed around the listening position. It becomes much easier for the listener to distinguish auditory information about each sound source in a surround playback system. Sounds that would be previously masked in stereo become easier to discern. Likewise distortion, codec artifacts, poorly implemented and/or aggressive audio processing and other shortfalls in a broadcast audio chain become more apparent in surround than they would with stereo content.

The first steps

To minimize the aforementioned effects, there are several key fundamentals to check for and maintain. Some of the chief areas of concern are:

No. 1 – Implement and maintain optimum system levels, including a standard reference level, headroom and signal-to-noise ratios.

Whether a station has an all-digital infrastructure or one comprised of analog and digital components,

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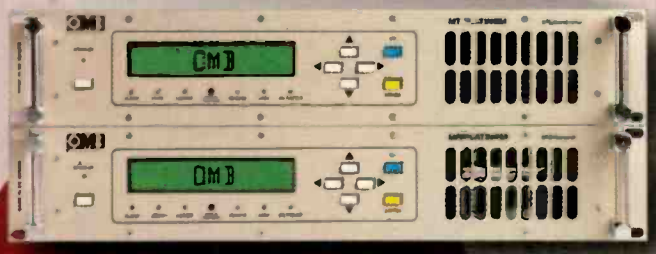

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> 1GHz

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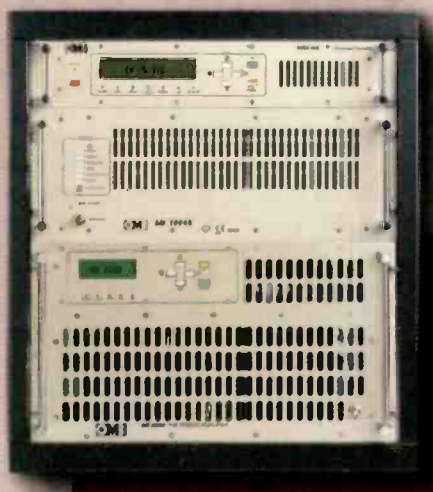

EM 2000

is a 2000W FM transmitter made up of the EM 25 DIG exciter (or EM 20/30 exciter) and the AM 2000 FM amplifier. AM 2000 includes eight 300W high-efficiency MOSFET technology amplifying modules, fed by 2 independent switching power supplies, which are made to withstand the working conditions. The amplifying modules work independently thanks to a power combining structure that provides high isolation between them.

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CUARTE DE HUERVA
50410 Zaragoza, ESPAÑA

fábrica y laboratorio
teléfono. 902-187878
fax. 902-187878
Pol. Ind. Centrovía C/Paraguay, 6
LA MUELA
50196 Zaragoza, ESPAÑA

implementing and maintaining optimum system levels greatly reduces the possibilities of audible errors. There should be a system-wide established reference level, headroom, signal-to-noise ratio and unified clip level of the system. One standard practice for professional digital and analog equipment is shown in Table 1.

With the proliferation of less expensive professional equipment (e.g. prosumer), it is becoming more common to have equipment that is unable to achieve a +24dBu analog output. Therefore, some accommodations to the audio level standards may be necessary. Regardless, if you do not have established reference levels, not only will the broadcast of surround content be in question, the quality of stereo/mono content will be reduced as well.

Reference Level	= -20dBfs digital	= +4dBu analog
Headroom	= 20dB	
Unified Clip Level	= 0dbfs digital	= +24dBu analog

Table 1. Standard practice for audio levels.

No. 2 – Minimizing use of digital audio codecs/prevent use of multiple audio codecs.

Most digital audio codecs utilized, such as AAC or MP3, are lossy. Passing audio through more than one codec creates generation loss, degrading the audio quality. If one or more codecs are used, set the data rate of the available codec at the highest setting feasible to minimize the effects that audio codec will have to the audio. If possible, remove unnecessary use of an audio codec.

No. 3 – Appropriate selection of HD Radio data bit-rates.

Currently, the maximum data bit-rate for HD Radio is 96kb/s. When choosing the data bit-rate on HD Radio for the surround content, make the choice wisely and with careful consideration. The integrity of the surround playback field will be reduced as a lower codec data rate is used. Using 64kb/s or more and no less than 48kb/s is suggested.

No. 4 – Minimizing distortion, including inter-modulation distortion (IMD).

Distortion can occur in a variety of ways. Among others, inadequate headroom in a system component can result in the clipping of audio, producing distortion. One simplistic method to minimize distortion is to avoid reaching the last 2 or 3dB before full scale of an A-to-D converter. With the increased quality of storage and transport protocols, the need to reach digital zero to maximize audio quality is no longer necessary.

Increased distortion also occurs with heavy/aggressive use of broadcast audio processors. In surround, the more aggressive the approach, the more distortion that may have been previously masked in stereo now becomes

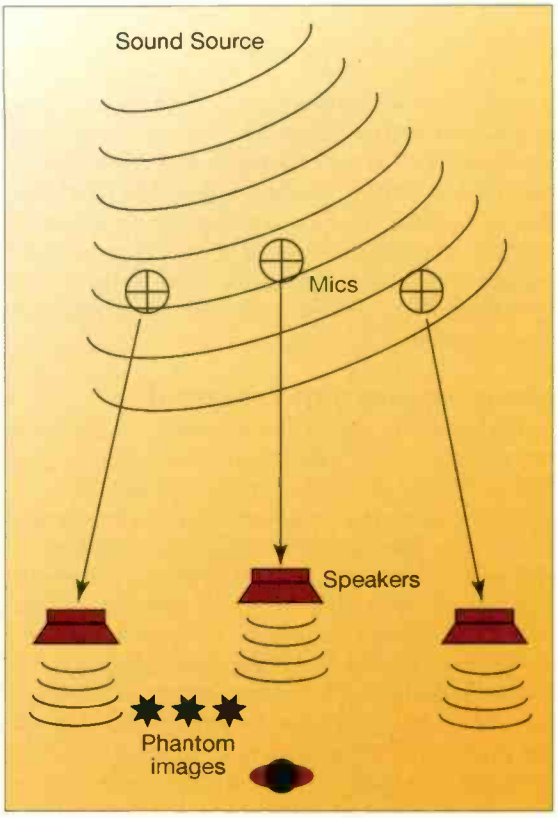


Figure 1. Phantom images created in surround.

apparent in surround. A few rules of thumb will assist in reducing IMD and processing artifacts:

- Choose a less aggressive limiter/clipper type.
- Minimize the use of the limiting/clipping section of the processor.
- Use look-ahead whenever possible.
- Utilize slower release times of the compressor/limiters as much as possible.

No. 5 – Maintain equal balance of all audio channels.

Maintaining equal balance of the audio channels is required for surround. In addition, maintaining phase relationships and unified frequency response of the audio channels is also imperative. An imbalance or improper phase relationship and/or frequency loss of even one channel can result in a dramatic shift in the integrity of surround content.

Now that we have addressed these basic infrastructure requirements, we can move to the other end of the surround broadcast spectrum, choosing and creating the surround content itself.

There are many sources of pre-recorded surround content available. It is possible to pass the surround content through one of the surround sound broadcast technologies and likely have a pleasant result. However, it is unlikely the result will be pleasant at all times. This is where one of the advantages of using prerecorded content comes into play.

Next steps in Surround

With each selection, either the surround content and/or the technology employed can be optimized for optimum playback performance. Much like content provided to many radio stations today, it is possible for prerecorded content to be pre-encoded appropriately in surround in an ideal production environment. Then this content can be shipped and placed on digital audio delivery systems for playback. This is the case for those who are successfully broadcasting surround content heard today on satellite and on several FM radio stations. Other advantages of utilizing prerecorded content include adding metadata for various automation systems, audio processing and/or to provide content information to listeners.

With live content, there are several other variables involved. The variables include how the live content will be captured and delivered to the broadcast station from remote locations and maintain quality. Standard ISDN connections or 128kb/s are barely enough simply due to the limited data bandwidth available as well as the utilization of another digital audio codec in the broadcast chain. Luckily, there is an ongoing development of new technologies and connectivity to assist in this process providing higher data bandwidth and advanced audio codecs to optimize the expanded data throughput. Data rates of 256kb/s begin to permit enough data throughput for surround content with some systems reaching near linear digital audio data throughput, which is the ideal scenario.

Resource Guide

Broadcast surround system providers

Dolby
www.dolby.com
800-33-DOLBY

MPEG Surround
www.mpegsurround.com

Neural Audio
www.neuralaudio.com
425-814-3200

SRS
www.srslabs.com
800-243-2733

Creating surround content

With monitoring, appropriate infrastructure in place and overcoming the challenges involved with delivering surround content, the next challenge is creating content itself.

There are two primary approaches in creating surround content. The first approach is placing microphones on each instrument and mixing that instrument into the surround sound stage. This method is useful for popular music. An engineer can create a mix that has instrumentation all around the listener, essentially putting the listener "in the band." The second approach to creating surround content is capturing the event so that it sounds like you are in the natural acoustic space in which the performance is occurring, or said another way, from an audience perspective.

There are challenges in creating accentuated content as all radio broadcast surround technology systems use some

version of a downmix in their structure. (Note: A downmix is the process where multiple channels of surround audio content are converged together into a reduced number of audio channels, typically stereo, labeled Lt/Rt. Upmix is the reverse, where multiple channels of surround audio content are derived from a reduced number of audio channels.) Many of these challenges can occur from the in-the-band scenario as well; however, since they are more prevalent from the audience perspective, they will be primarily discussed from that context.

Conventional spaced omnis, ORTF or other standard stereo recording techniques may be utilized for creating surround content. However, they have one drawback: They do not utilize the center front channel of the surround field. Center images would become phantom center images just like they are in standard stereo. With most downmix algorithms, the original phantom center image may be recreated in the center channel only, sometimes with different intensity. Therefore, use of standard stereo microphone techniques should not be the primary means of capturing surround content and surround microphone methods are recommended.

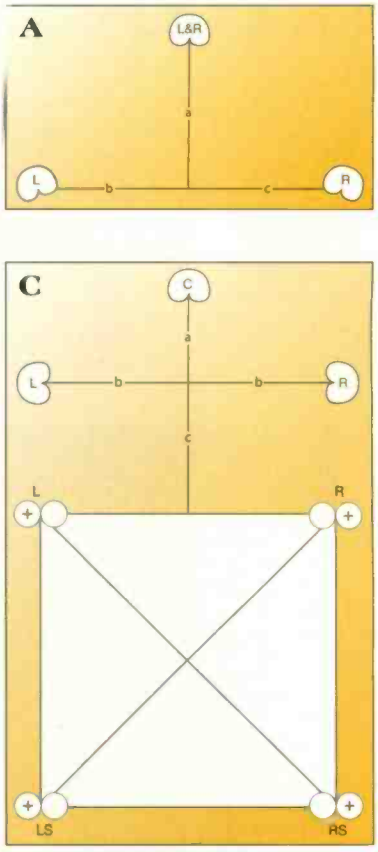


Figure 2. Various stereo mic techniques: A. Decca Tree. B. Fukada Tree. C. OCT with a Hamasaki Square.

Multiple methods

There are now several surround microphone arrays, methods and systems available. When choosing, pay particular attention to one detail that is often overlooked: interchannel crosstalk. To understand interchannel crosstalk, you must first understand how

most surround microphone array and methods work.

With almost all the microphone arrays and methods available, there are three microphones assigned (left, center, right) to the front-left, center and front-right of the surround sound playback system. In some of these systems, the placement of these microphones is relatively close. Interchannel crosstalk arises when multiple phantom images (just like the phantom center that occurs with stereo microphone techniques) arise from the front three or more microphones.

For example, if three microphones were placed across the front of a stage and assigned to front-left, center and front-right, it is possible that a phantom image would be generated for each pairing of microphones for a single sound source on the stage. A phantom image would occur in the playback system from the front-left and center microphones. Another phantom image will occur from the front-left and front right and another from the center and front-right microphones. These three phantom images compete auditorally. This interchannel crosstalk, smears the location of the sound-source, reducing the localization of that sound source in a surround playback system. The stronger the phantom image for each pairing that competes with one another in the surround playback system, the more interchannel crosstalk.

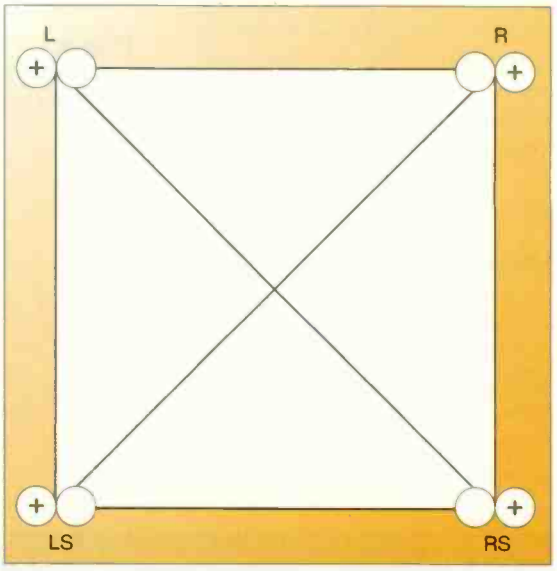


Figure 3. A Hamasaki Square. Figure-eight mics are placed at each corner with their nulls facing the sound source.

Interchannel crosstalk may not seem to be much of an issue in discrete-channel recording, however, just as a human will have to deal with the multiple phantom images emerging out of the speakers, a surround sound broadcasting technology will have to deal with this as well. For example, when high amounts of interchannel crosstalk are applied to a downmix algorithm, it challenges the system, often producing comb-filtering (unless the system has adaptive filters to address this issue), loss of fidelity and can produce localization errors in the both the downmix and the upmix.

Furthermore, high amounts of interchannel crosstalk can produce undesirable phase relationships in downmix algorithms that can increase L-R. With some technologies, unpleasant IMD can occur in the recreation of the surround material. Some technologies can deal with these issues much better than others, but regardless of the surround broadcast technology employed, interchannel crosstalk challenges the systems, sometimes producing undesirable effects.

As seen in Figure 1 (page 19), for a single sound source, there would result three different phantom images in the surround playback system.

Reducing phantoms

Interchannel crosstalk can occur in in-the-band recording scenarios as well, when multiple microphones pick up one sound source and are mixed into the surround field in different locations. However, this is far rarer as the intensity and time of arrival of each sound to each microphone is far greater than in an audience perspective recording situation.

To reduce interchannel crosstalk, carefully choose the surround microphone technique. The microphone arrangement of the front three microphones should be positioned such that intensity of sound to each microphone or pairing or microphones is far greater than the adjacent microphone or pairing of microphones. Test results have indicated that microphone techniques such as the Decca-Tree, Fukada Tree and Optimized Cardioid Triangle (OCT) (see Figure 2, page 21) have lower amounts interchannel crosstalk and are also more desirable to listen to.

Taking this information one step further, the microphone techniques used to capture the surround channels are important as well to reduce crosstalk between the front array of microphones and the rears. Microphones that are assigned to the rear surround channels should pick up as little of the direct sound from the stage as possible.

Therefore, it is suggested that directional microphones are used for the rear surround channels. These can be direction microphones that have their null pointed at the primary sound-source such that the primary pick up is pointed elsewhere. Omnidirectional microphones can be used, but it is important that they are immersed in acoustic reflections of the acoustic space and have very little direct sound from the sound-source.

Examples of these techniques include techniques such as the Hamasaki-Square (invented by Kimio Hamasaki of the NHK Science and Research Lab), which utilizes four figure-eight microphones arranged in a square about six feet apart, placed beyond the main microphone array anywhere from 12 to 20 feet behind the front microphone array. The figure-eight microphones face the side walls of the acoustic space and have their least amount of sensitivity point (null) towards the sound-source, usually on a stage, as shown in Figure 3 (page 22).

There are other techniques to use as well, and careful study and research should be used to pay attention to the amount of cross-talk that occurs between microphones in either an in-the-band scenario or audience-perspective scenario when recording surround.

Quite a bit of time and attention will need to be spent in learning how to capture and produce surround content. It is not nearly as easy as throwing up a stereo pair of microphones on a stand and hitting record. Multiple microphones will have to be placed with care. Live audience perspective recording situations should also address concerns such as visual aesthetics. Using all-in-one solutions may not produce the most useful and desirable result, so buyer beware. There are plenty of other key factors in producing quality surround content. It is highly suggested that anyone wishing to produce surround content listen to a wide variety commercially available and discern quality differences. Becoming educated on many of the other basics of surround production is crucial.

Kosiorek is the director of recording services at the Cleveland Institute of Music.

Technology Turnaro

By Gary Wachter

Once a state-of-the-art studio, it was time for a fresh start

Before last year, the venerable KKDA-FM (K104) control room was way past its prime. The studio was built in an era before remotes were carried via satellite and ISDN, and Tom Joyner created his morning show there and jetted to Chicago for the afternoon drive. Still embedded in the old cabinetry, were the boxes filled with sand to dampen vibration to the turntables. Vinyl records gave way to tape carts, which were replaced by CDs. And just a few years ago, computer playback replaced both.

What was remarkable is that this on-air studio survived all of the sweeping changes in technology and still sounded reasonably good. But the accommodations were well worn. Equipment that was not even imagined in the 1980s had to find a home in locations that were less than ideal. The flow of on-air talent was obstructed by the layout. People were cramped and scattered. Space was not used efficiently. It was a place you had to struggle to make work leaving little opportunity to be creative and entertain.

The time had come to abandon the classic U-shaped cabinetry and start completely from scratch. The challenge was that the new studio had to be in the same location as the previous, which could not be enlarged. To utilize the space to the fullest, some of the major specifications were:

- The space has to be adaptable to many varied scenarios without any physical reconfiguration. (From one person to the full morning show with operator, producer and guests.)
- All on-air participants had to see each other without looking around obstacles.
- Include a permanent home for keyboards, mice and controllers with easy access.
- Provide space for seated/standing visitors and live performers.
- Address acoustic considerations.
- Must have a unique look and feel.

Control room design

The existing room dimensions were measured, including windows, doors, HVAC, electrical and cable access points. A two-dimensional plan of the available area was drawn to scale using Microsoft Visio. Multiple copies of the layout were printed and then the fun began by sketching possibilities. It became apparent that a very unconventional solution was called for.

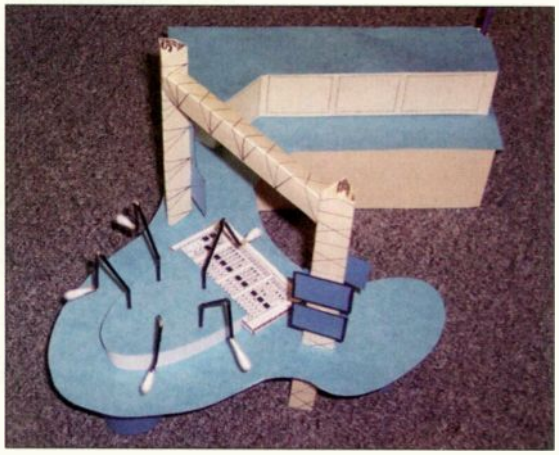
Instead of the free-floating island, the cabinet with equipment was going to have to be placed against the wall. The console surface would extend toward the center of the room and angle slightly to maintain line of sight with the newsroom and avoid crowding guests by the door. From past experiences, an operator's view of the door is important because it allows the operator to maintain control of the room.

On-air talent has unobstructed views . This arrangement provides for plenty of space in the left side of the room for guests and performers to stand or sit. Behind the console was room for one or two people side by side. The on-air guests are seated in front of the console in a 180-degree arc.

LCD displays are everywhere. What is the ideal location? It is accepted (and sometimes necessary) to have a monitor right in your face. You can still see the other people, sort of, from the nose on up, but communication is impeded and everyone starts looking like a "Kilroy was here" doodle. The solution turned out to be very simple: Stack the displays vertically on each side of the console, one directly at eye level, one just below and one just above.

Support truss work for LCD monitors and speakers. Perfectly suited to attach T.V. lights.

To accomplish this, a lightweight stage lighting truss spanning from floor to roof joist was placed on each side of the console. A slightly arched horizontal section bridged the two trusses just below the 2'x2' fiberglass grid ceiling. The truss structure gave the room a stylish flair and a practical place to mount the speakers, LCD monitors and other items. Visiting TV crews would also have a ready-made place to hang their lights.



A paper model of the studio was constructed to prove feasibility of design.

This preliminary layout looked good on paper, but would it be practical and work in the real world? A three-dimensional drawing could be rendered, but it would still be viewed on a flat sheet of paper. What was desirable was a true three-dimensional model.

The solution was found using S.A.D. (scissor-aided design). It's not very high-tech, but easily accomplished. All that was required was a copy paper box lid, two colored file folders, five wood stick cotton swabs (surplus from the tape head cleaning era), paper glue and a marker. I proceeded cutting out and gluing together a scale model based on the drawing. Within a few hours, a very effective mock-up of the new studio emerged. Little did I realize, experience from making dioramas in junior high school would actually have a purpose in the real world. While being able to view this model from all angles, the on-air crew was able to better visualize working in the new studio and provide feedback for the final design. When the planning was complete, it was time to find a custom furniture builder and begin actual fabrication.

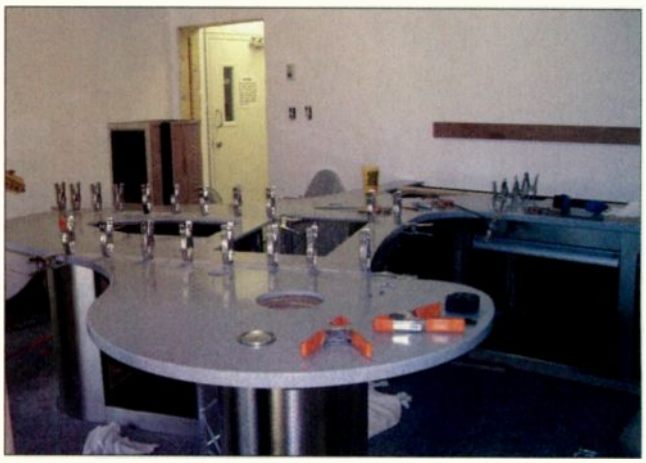
Cabinet construction

Inspiration sometimes strikes when you least expect it. While waiting for a flight out of Las Vegas McCarran Airport, the ticket and gate counters caught my attention. They looked appealing, solid, stainless steel with resin tops and accents. This high-tech look was similar to what I was searching for. If those fixtures could stand up to the daily rigors thousands of passengers can throw at them, they had a good chance of surviving in a radio station environment.

McCarran staff referred me to Bill Shiver, president of Volume Millwork in Houston. The company name is indicative of what the company does: construction of large quantities of cabinetry and fixtures. Most of the manufactured goods are custom ordered by the airline industry all over the country. Although not the customary assignment, Shiver was willing to build a one-of-a-kind for us.

Shortly thereafter I was working with the company's design engineer on the unique needs of broadcast furniture and provided him with drawing dimensions and photos of the S.A.D. model. CAD layouts were generated for approval. The final version would be sent to the shop's computerized cutters. The cabinets would be constructed from plywood and finished with stainless steel. A horizontal weave pattern was embossed into the steel, which provided an interesting finish, hid scratches and provided a background for accent lighting.

Hiding scratches and wear was also a consideration



Clamps hold seams tight while the solvent cures.

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$3,795 msrp (10 ch)
$4,795 msrp (15 ch)

Digital Consoles

X-Mixer
digital console
$5,495 msrp (10 ch)
$6,995 msrp (14 ch)

Analog Consoles

12,000 series
analog console
$4,995 msrp (12 ch)
$6,195 msrp (18 ch)

6604 Powell St. Loveland, Colorado 80538

in the selection of color and internal texture of the resin countertops. The Luxite countertops were also built from scratch. Resin was mixed with the chosen finish and poured into forms and allowed to cure before finishing. The main countertop surface was such a large area, it had to be built in four pieces and assembled into one solid piece on site.

The truss could have been custom built as well, but I found the perfect size and weight with the Quick Truss from Milos Structural System. The factory built and welded the sections to my specifications and shipped them to

A touch screen with headphone source selector serves positions on each side. Accent lights also illuminate the countertop, filling in shadows from overhead lighting.

Houston for assembly. The sections connect with barrel connectors held in place by retaining pins.

Attaching to the structure was easy with the Milos Cell clamp. It attaches around the vertical pipe and is secured with a wing nut. It has a 1/4" mounting hole on a flat surface. This has been perfect for mounting everything, including the two-piece Victory LCD mounts. Pressing a release clip and lifting up and away can easily remove the display.

Dedicated displays

With all of the computer displays in the contemporary control room, it is easy to become overwhelmed by a dedicated screen for every source. Some monitors needed to been seen all the time, others just on occasion and do not justify a dedicated display. This would significantly cut down on the clutter.

The three monitors to the right of the console are fixed: Media Touch on-air playback on the bottom, Vox Pro in the middle and VRC transmitter remote control on top. The monitor on the left is switchable (using keyboards shortcuts) and has all of the primary sources plus backup on-air playback, call screener, liners and Internet access. On the opposite side of this truss is another monitor with independent switching for the talent/host position. An Adder eight-input, two-output keyboard, video, mouse (KVM) switcher was utilized. If the same computer is selected at the same time by both positions, control is automatically determined by which keyboard or mouse is in use. Located in the center support pedestal is the switcher, KVM extenders and VGHA distribution amplifiers.

Host and guest positions

Guests are seated on tall stools (or stand)

around the table extension behind the console. Two people can be accommodated on each side. A 6" high center riser section in the middle of the counter supports six Mika microphone arms. The Mika arms are very streamlined and reduce the visual clutter.

Located in the center of the microphone nest is an omni-directional Mirage Nanosat speaker for the phone caller audio. The unique Nanosat has a 2 3/4" woofer pointed up, which is dispersed by a cone containing the tweeter. The near uniform dispersion allows everyone to hear the caller equally well. The mounting location is ideal – at the minimal sensitivity point of the Shure SM-7B microphone pattern.

A separate Benchmark Audio amplifier with volume control and 1/4" and 1/8" jacks mounted on a stainless steel plate in front of each person provides headphone monitoring. The panel can be unscrewed from the riser and the entire assembly unplugged for maintenance when needed.

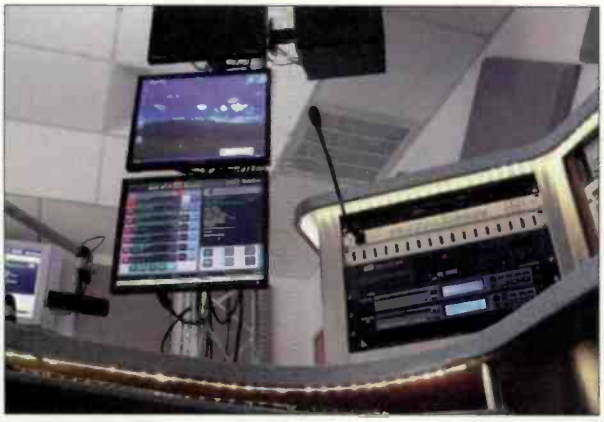
The keyboards and a controller have a permanent home on a fixed shelf.

The audio for the headphones is chosen by either a source selected on the console or 7" LCD touch screen placed between each set of headphone positions. A small computer in the pedestal running Logitek's Vscreen software drives the panel. Vscreen allows complete flexibility in designing an interface used for selecting the monitor source, turning on/off the microphones (with virtual buttons), timer and VU metering. This can be easily changed in the future to meet any need without having to rewire anything, just add the software code.

Under the right side countertop is a rack opening that holds the control surface power supply and a rack panel with jacks to bring external sources in and out. This is where the TV crews would plug in to get a program feed. Just about all levels and formats are provided, so external adapters are not needed, including AES-3, balanced line, mic and -10 consumer-level on RCA jacks. The sources are selected on the control surface and can provide just one microphone or the entire program.

Removing the blank rack panel above reveals another small rack with the CAT-5 patch panels, surge suppressors and network switches. Twenty-four separate CAT runs are made to a matching panel in the technical area. At each end, the runs are first looped through APC rack-mounted surge suppressor modules before going to their destinations.

Running KVM data through CAT-5 is a lifesaver, but on long runs the video can become blurry from the individual red, blue and green colors arriving at different times. This skew is because each pair of rated CAT-5 cables has different twists per inch that are used to control timing and reduce data collisions. Some high-end KVM extenders can compensate for this, and in many cases the length may not be a significant problem. But if it is, KVM-type cable is available with all the pairs having the same twists per inch. Be careful, this cable cannot ever be used for networking. To get the best of both worlds, Belden has introduced Video Twist 7988 cable with minimal skew, used for either application.



A channel was made under the counter lips to accommodate the LED rope lighting.

The lower cabinets on the right have two roll-up doors. One is storage for the DJ mixer and turntables, the other provides access to several computers located in the studio. The entire cabinet is cooled and a positive pressure is maintained by taking a 4" tap from the main air conditioning.

The upper cabinets contain four 8RU openings for the commonly used CD recorder, players, EAS, light controller and other equipment. In the center space is a 1RU power strip to provide convenient access to ac for DJ mixers, chargers and other equipment temporarily brought in.

At the very back are remote control buttons for the Broadcast Tools Program Switcher. This is an independent controller that will allow the operator to bypass the control room entirely and place another source on the air directly. To be used in an emergency or maintenance, selections include control room, on-air playback computer, production room or router. The buttons are large, require a deliberate press and have a circular guard to prevent accidental triggering.

Equipment list

Acoustics First Sonora Panels
Adaptive Displays Beta Brite
Adder Adder Link IP
Adder Smartview 2xPro8
Alesis DSP820
American Lighting RGB & White Rope
APC Modular rack mount
Audion Labs Vox Pro 4.1
Audio Science ASI5044
Belden wire and cable
Benchmark HPA-2
Broadcast Tools DAS 8.4
DCS DCS 995
Dell Optiplex
Fostex RM-2
HHB Burn-It Plus
IO Gear GVS-94
Lilliput 7" Touch HR702
Logitek Audio Engine
Logitek Mosaic
Lucid Clk-x6
MediaTouch Onair 2.6
Milos Structural Systems Quick Truss M222
Mirage Nanosat
Network Technolgies KVM-300
Samsung 940N
Shure SM-58
Symetrix Airtools 6100
Symetrix Airtools 6200
Tascam CD-01UPro
Telos NX-12
Victory Mounts XUF-1330
Volume Millwork studio furniture
Yellowtec Mika

Insight to IBOC
November 2007 Part of the *Radio* magazine DAB Answer Series

Itunes Tagging: A New Hook for HD Radio

By Chriss Scherer, editor

In September 2007, a bridge between the gap of radio and other media services was formed. The introduction of tagging – the ability for a radio listener to make note of a song that he might want to purchase later – was announced as an enhancement to HD Radio. The technology can also be applied to RBDS, but HD Radio is getting the most attention for the feature.

The concept is fairly simple. Listen to the radio. When you hear a song that interests you for a possible purchase, press the tag button. The radio remembers the choice and uses the Ipod to access the selections later through Itunes.

Tag: a new button for HD Radio receivers.

It sounds so simple, but why is it only now being offered? The HD Radio transmission system has been in development for many years. While it's an established system, it is still undergoing updates and additions. The HD Radio bitstream includes additional data fields that have not yet been completely defined, which is one way that HD Radio can stay current with broadcaster and listener needs.

In addition, while Ibiquity is developing the underlying technology, other companies are looking at ways of enhancing the technology. Conditional access was the point of discussion a few months ago, and while that effort continues to be developed, other uses for HD Radio will be developed.

Getting tagged

For a station to transmit tagging codes to communicate with Itunes, the station must first enter into an agreement with Apple, the operator of Itunes, to enable the station to attach Itunes music codes to the music it plays. Just as a station's automation system can provide artist and song information to RBDS and HD Radio displays, a music code can be attached to each song. This information is transmitted in addition to the standard metadata contained in SIS and PSD.

For a station to transmit the tagging information, the station automation system must support HD Radio Program Service Data. Ibiquity uses the UFID tag of the ID3 specification for PSD messages to support the tagging feature. When the technology was annonced, Broadcast Electronics and RCS noted they supported it. Systems that support ID3 tagging should accomodate Itunes tagging as well.

Extending HD Radio

By Chriss Scherer, editor

When the FCC's IBOC rules took effect on Sept. 14, 2007, much of the attention was focused on the use of AM IBOC at night and the changes to the notification procedures for multicasting and the use of separate antennas. A change that has received less attention is the ability for stations to operate in extended hybrid mode. Before the rule change, stations were allowed to operate only in the hybrid mode.

Both modes of operation transmit an analog and a digital signal within a station's spectrum mask, but the extended mode provides additional bandwidth for the digital signal. In hybrid mode, an FM station can deliver up to 96kb/s of data. In extended hybrid mode, additional carriers, called extended partitions, are added on the inner edges of the digital spectrum to provide up to 146kb/s. Figure 1 shows a spectrum layout.

Hybrid mode places 10 carries on either side of the analog FM signal. Extended hybrid mode adds one, two or four additional carrier pairs to the signal, which provides an additional data capacity of about 12.5kb/s per carrier pair. The additional 12-, 25- or 50kb/s allows extended hybrid mode to pass 108-, 121- or 146kb/s of digital data.

The extended hybrid mode should interest broadcasters who provide multicast channels, because the additional band-

continued on page 3

Inside

A special supplement to
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There's a reason why more of the world's powerhouse AM radio stations have turned to Omnia processing...It just sounds better! Additionally, Omnia continues to lead the industry with constant innovation. We pioneered the first non-aliasing digital clipper. (Some still feel it's the only one!) We introduced combo processing for HD-AM broadcast – dedicated processing for conventional AM, as well as a separate processor for HD Radio.

Omnia.5EX HD+AM has a powerful toolbox. 5-Band limiting for conventional analog transmission, along with a powerful oversampled, distortion-controlled, non-aliasing clipper that delivers loud, clean, and competitive audio. Output filtering that is suited for NRSC, ITU, or HD Radio requirements.

Processing for HD Radio/DRM is smooth and clean, thanks to a precision look-ahead limiter that reduces unwanted intermodulation distortion (IMD). This enables one box to generate two incredible sounding signals.

And for convenience, Omnia.5EXi HD+AM offers built-in Diversity Delay, which reduces redundancy, and points of failure in your transmitter plant. (BTW: it was our idea to put the Diversity Delay in the audio processor.)

Analog or digital, it doesn't matter. With Omnia.5EX, your signal will be remarkably clean and clear, with punch and presence that makes AM radio come alive!

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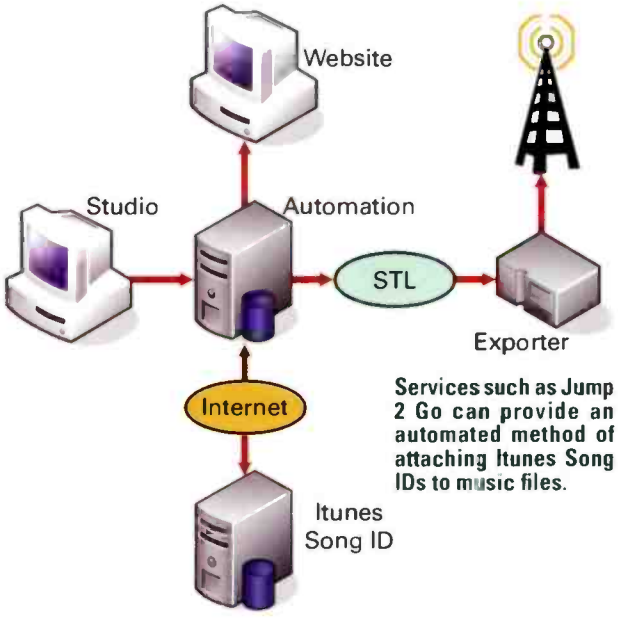
Tagging

The station's Exporter must run IRSS software version 2.3.3 or later. Also, for stations that want to use tagging on multicast channels the Importer must have Ibiquity version 2.1.5P1 software or later and Ibiquity version 3.0 SPS capture client or later.

The Itunes Store ID must be inserted into each song's PSD. This could be manually attached to each song, but that could be an overwhelming task. There is currently one company that we know of offering a service to provide the Itunes codes for a station's music: Jump 2 Go. Each time the station plays a song, the automation system connects to a database to access the Itunes song code. That code is sent back to the station where it is then included in the HD Radio stream. The station automation system can also store the code locally so a future look-up request will not be needed.



On the listener side, the receiver decodes the data stream and displays the song information on the radio's screen. If the listener presses the tag button, the radio will remember the key press and pass it to the Ipod when the media player is docked. If an Ipod is not docked, the radio will store the tag button presses until an Ipod is docked.

The tags are transferred to Itunes the next time the Ipod connects. The owner is given a playlist of tagged music to preview and possibly purchase.

Tagging for dollars

At the NAB Radio Show, CBS Radio, Clear Channel, Cumulus, Cox, Entercom and Greater Media announced that they were installing the necessary systems to enable tagging.

There is a revenue potential for stations that adopt tagging. A typical song purchase on Itunes costs 99

continued from page 1

width can be used to provide a wider pipe for one or two multicast streams, or it could be used to add additional streams at lower bandwidths.

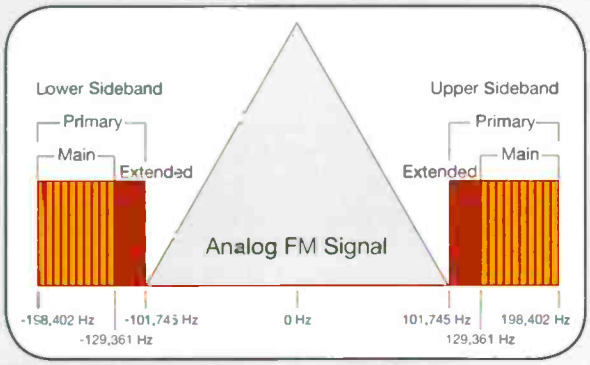


Figure 1. The extended extended hybrid mode.

Effects to analog

In 2004, NPR Labs evaluated the effect of the extended hybrid mode to existing analog service. Those tests used the 121kb/s (two carrier pairs) hybrid operation mode. The study, titled *Host Compatibility Measurements for the Extended Hybrid Mode of IBOC Digital Audio Broadcasting* and written by NPR Senior Technologist John Kean, is available on the NPR Labs website (www.nprlabs.org).

The test measured the signal-to-noise ratio (SNR) from the digital carriers to the analog reception using the hybrid and extended hybrid modes. NPR evaluated car, home hi-fi, and portable/compact receivers and found that car and home suffered minimal effect on the SNR. Portable receivers did not fare so well and experienced an increase in SNR from almost nothing to nearly 8dB. NPR also evaluated the effect of extended hybrid mode on SCA operation and found that there was no real change in SNR.

Unfortunately, the test did not investigate the effects of using four carrier pairs for the maximum data rate. The results of the middle-ground test have promising results, but until the maximum data rate can be evaluated, the maximum use of extended hybrid mode may have to wait until HD Radio receiver penetration grows dramatically.

Ahead to digital

It's premature to know how broadcasters will most effectively use the additional bandwidth available in extended mode hybrid operation. Multicasting appears to be the immediate benefactor to the added bandwidth, but stations are still learning how to use the data path to its fullest potential. HD Radio is still a work in progress, so enhanced data or additional multicast channels are two of the options available today. The future may provide other opportunities for the spectrum.

The *DAB Answer Series* is an ongoing series of supplements that covers the technology of digital audio broadcasting.

Open Mic

Citadel's Concern with AM IBOC at Night

When the FCC Rules allowed AM stations to transmit IBOC signals at night, concerns were raised about the potential interference that would result to all analog stations in AM band. In the end, there hasn't been the doom and gloom destruction of AM radio from nighttime IBOC use, and *Radio* magazine research has found mixed experiences relating to actual received interference.

Within days after Sept. 14, the day AM stations were allowed to transmit IBOC at night, Citadel Broadcasting Director of Corporate Engineering Martin Stabbert issued a memo to Citadel's AM IBOC stations that transmitted a signal at night. The memo instructed stations to cease nighttime transmissions because of interference issues. We talked to Stabbert about the memo and the interference problem to help set the record straight.

Radio: What kind of interference was experienced?

MS: The interference appears to have been caused by the skywave signals interfering with the ground wave signals. Everyone expected to experience some skywave-to-skywave interference, but not the ground aspect.

Stabbert

Radio: How did the interference manifest itself?

MS: There was an elevated noise floor, and I understand that at its worst, the interference would obliterate reception of the desired station. This is based on reports I received from the field. A substantially elevated noise floor is cause for concern.

Radio: How many stations experienced the interference?

MS: Citadel had 10 AM stations transmitting IBOC at night. Five of them experienced some type of interference. We had no complaints from the other five. It wasn't universal. It seemed to center around the high-power Class A stations. We have a couple of Class C and lass B stations that were running IBOC at night, and they had no interference.

Radio: Were the Class A stations the cause or the recipient of the interference?

MS: Both. This is not intended to be a criticism of the technology or the proponent of the technology. This is a case of us turning it on and having some results that we want to take a look at.

Radio: When will you complete the evaluation with Ibiquity?

MS: I had hoped to have something set up in the next 30 to 45 days, but I don't have anything definitive from Ibiquity yet.

Radio: How does Citadel decide which markets should be upgraded for HD Radio?

MS: Clearly there is a bigger push for the major markets. For AMs, we then look at a combination of the market size, the status of the station in the market and the facility condition [ease of conversion, age of equipment]. Stations slated for equipment upgrade are considered for an HD Radio upgrade when appropriate. It's a combination of factors.

FM has similar considerations, but we also consider building space, tower capacity, power capacity and other specific factors.

Citadel has 16 AM stations that can transmit HD Radio signals. Only 10 were operating at night. Six more AM stations are in the process of converting to HD Radio operation, which should be completed by the end of 2007. Until the AM nighttime interference issue can be resolved, all the Citadel AMs are limiting their IBOC operation to daytime only.

Tagging

cents. The Itunes affiliate site says that affiliates receive a 5 percent commission on all qualifying revenue generated by links. While this sounds like a small amount, the per-sale revenue adds up over time.

Is tagging a new idea? Not really. Tagging has been applied previously, although it has not seen great success in the past. In the cases that I know of, the difficulty has been in providing a return channel for the listener selection. The Ipod interface in this case completes that loop. Another form of tagging is used with the Sansa Rhapsody player and Rhapsody music service.

The Polk I-sonic ES2 is one of two Ipod docks/HD Radio receivers that includes the tagging function.

So far, two manufacturers have committed to producing tagging-capable devices: Polk Audio and JBL. Polk announced that the I-sonic ES2 would be available in October. The JBL IHD is slated for delivery at the end of the year. The Polk unit will have a retail price of $499, while JBL has not yet announced a price. The price seems high for a radio and Ipod speaker dock, but like most first-generation electronic devices, the first units are expected to be more expensive.

As the HD Radio rollout continues, many people frequently ask about the killer app and what it will be. No single aspect has proven to be the killer app for HD Radio yet, but by considering HD Radio to be a platform on which to build, individual enhancements have a place to develop, making the entire system a useful app.

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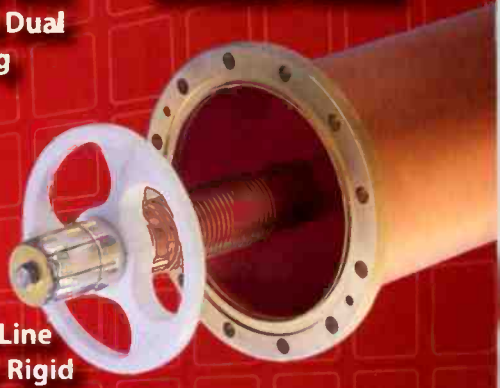

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Keeping Good Time

The HD Radio system has an inherent audio delay due to the processing time required in the receiver. Because of this delay, when a station operates in hybrid mode, the analog audio must be delayed to match the digital audio signal so the blend function from analog to digital and back is smooth and transparent. In October, Brian Beezley, an engineer in southern California, applied his passion for RF to evaluate the current state of HD Radio time alignment for the more than 30 stations that he is able to receive at his home. The stations cover the Los Angeles and San Diego markets.

When the time delay is not set properly, the resulting effect can be an annoyance to the listener. When the difference is small, a comb filter effect is applied to the audio. In extreme cases – like that when there is no time delay at all – the digital transition will repeat the previous 8 seconds of audio.

Beezley's results did not show well. A table showing the measured variations is posted on his website at ham-radio.com/k6sti/roster.htm.

According to Beezley, a reasonable time-alignment error limit "is a few samples (less than 100 microseconds). This will place any delay-induced spectral notches well above the midrange." He also discovered that some stations are transmitting the analog and digital signals in opposite phase polarity. His results found that the time alignment can vary with the analog leading the digital and vice versa. His test setup included a computer sound card fed from a Sangean HDT-1X in split-channel mode with the analog signal on one channel and the digital on the other. He visually compared waveforms and used a cursor to measure errors greater than 100ms. For smaller errors he used a waveform normalizing and differencing program. He made the measurements between Oct. 14 and 19.

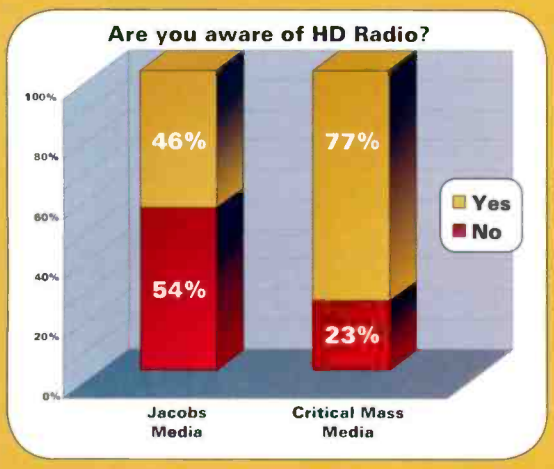
This should serve as a reminder to stations to verify the time alignment of the HD Radio signals. Even if they were set once, it is wise to check them again to ensure that the alignment has not drifted.

Sample and Hold

Comparing awareness

By Chriss Scherer, editor

A major concern with the rollout of HD Radio deals with the consumer element of the technology. Even the best technology will ultimately fail if no one wants to use it, so how is HD Radio doing? That depends on whom you ask.



Surveys continue to report various statistics on consumer awareness, interest and adoption of HD Radio. It's not surprising that as more stations adopt the technology and more marketing material is presented, that consumer awareness will rise. After awareness comes interest, and then comes acceptance.

But there is a disparity in the awareness figures that are being shown. At the NAB Radio Show, recent information from Critical Mass Media was released that showed HD Radio as having a newly discovered mass recognition among consumers. This data says that 77 percent of consumers are aware of HD Radio. The HD Digital Radio Alliance compares this to other studies, such as the Jacobs Media study conducted just a few months ago, that cite consumer awareness of HD Radio as being 46 percent.

The HD Digital Radio Alliance attributes the significant increase to better polling methods (telephone surveys instead of online polls), which has resulted in more accurate data. Curious about the results, I took my own poll to gauge consumer awareness of HD Radio. I asked people in my neighborhood, people in my office building, people in stores (with some strange looks usually) and others. I asked, "Have you heard of HD Radio?" While my sample size is fewer than 100 people, I was surprised that my results were almost evenly split 50/50. Most of those who said yes heard about it on the radio. Kansas City has about 10 stations in the metro that transmit an HD Radio signal.

Of those people who said yes, about half really had any clue what HD Radio was. This survey was about awareness, after all, not understanding. So what's the reality of consumer awareness? Frankly, it's hard to tell, but I think it's safe to say that awareness is growing, even if consumers don't understand what it is.

Source: Jacobs Media Tech Survey III, May 2007; Critical Mass Media Sept. 2007.

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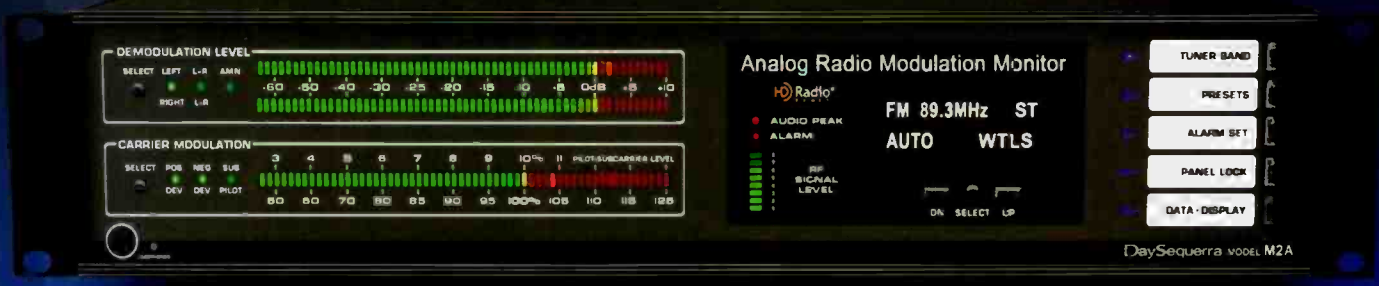

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The M2A includes a sensitive yet selective synthesized FM preselector with 20 presets so you can quickly monitor other stations off the air. A high level input with built-in attenuator lets you connect directly to a forward power RF port for greatest accuracy. RBDS is decoded and shown on the M2A's Vacuum Florescent Display (VFD).

The M2A's brilliant LED meters can be read from across the room. The upper meters measure stereo, L+R, L-R and incidental AM noise. The lower meter measures positive and negative carrier deviation, and also pilot and SCA injection levels. 57kHz RBDS subcarriers can be accurately read to a minimum level of 2.6 percent. A multiplex output lets you connect external SCA demodulators.

The M2A comes complete with opto-isolated alarm outputs for audio peak, audio program, carrier loss and RBDS, with flexible settings for level and duration..

In addition to its accuracy and features, the M2A gives you audiophile-grade Class-A biased audio outputs, so you can precisely monitor and adjust your processing. In addition to L and R analog outputs, the M2A has a full-time digital output, so you can feed your AES monitoring chain, and a front panel headphone jack powered for uncompromised, full-quality audio.

AM measurement is available in an optional package, as is Ethernet Remote Control with DaySequera's Remote Dashboard™ software, a proprietary PC-based application that gives you 100 station scanning, remote control monitoring, logging and alarms with E-mail alarm notification.

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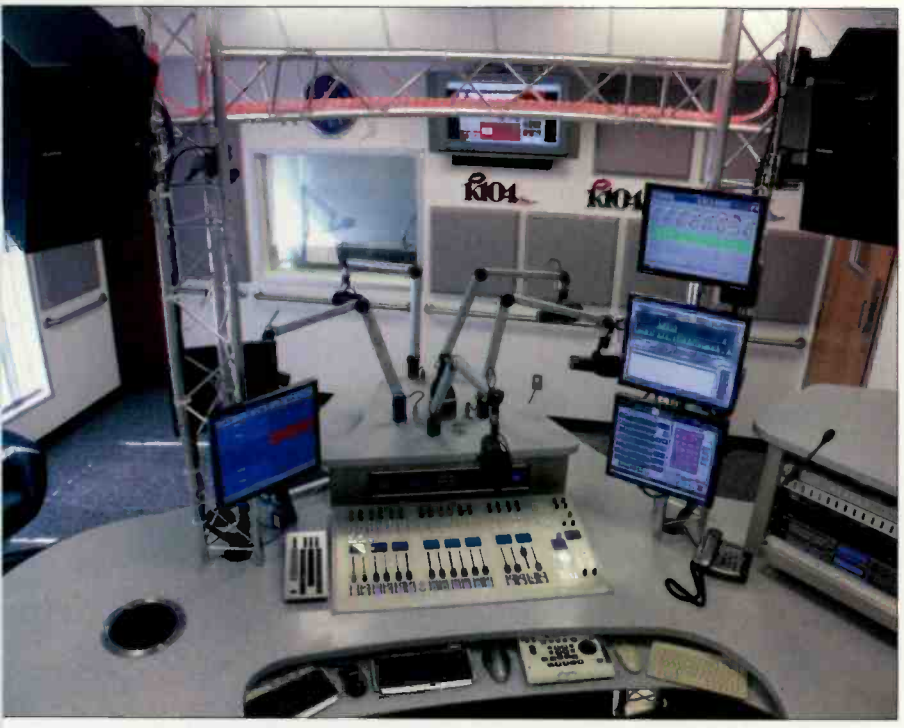


A trash chute in the center of the workspace makes for a convenient way to keep the room tidy. No food or fries, please.

Special lighting

Shadows from the riser and the cabinets were substantially reduced by placing white LED rope lighting in a groove under the lip of the countertops. This also illuminated the keyboard shelf very nicely. The idea was also to provide accent lighting that would reflect from the patterned stainless steel.

The original thought was to use RGB rope light where each of the primary colors could be varied to produce a wide range of colors. A 10' piece was purchased to experiment with. The rope was actually a rectangular flexible strip that could be mounted underneath the counter lip, but it could not accommodate the sharp bends. It did not go to waste, as it was positioned in the upper horizontal truss segment pointed at the ceiling, creating a light show for the entire room.

The wing to the left is general-purpose counter space with plenty of room to place briefcases or spread out papers. When cleaning up, trash can go directly down a chute in the center to a removable trashcan inside the support column.

Console

The Logitek audio engine and Mosaic Control Surface running Supervisor software simplified many common repetitive tasks. Software triggers were writ-

FACILITY FOCUS

The Logitek Audio Engines, Supervisor software and DCS Master Clock in the technical rack room.

ten to accomplish a variety of tasks.

Running a show with a full house of guests requires turning all microphones on and off. This has been reduced to a single press by simply turning the main mic on or off. The unused talkback button on each mic channel has been repurposed to a group take. A mic with this take button enabled will follow the main mic.

Another very useful feature is the one-button record. When pressed, it sets up the phone mix minus, assigns the microphones, switches the headphone monitoring, mutes the speaker, starts Vox Pro recording and illuminates the Beta Brite with a big red recording message. When the button is pressed again, it reverses the process and restores the monitoring to its previous setting.

The LED Beta Brite panel in the front of the studio displays status messages. EAS alerts, hot mics, off-air and even high/low audio levels get a pointed out. It is not overused; otherwise it would be more prone to being ignored.

The LCD big screen monitor is capable of not only showing TV, but can also display computer screens from the KVM switcher. It makes the screened calls and liners easy for all to see.

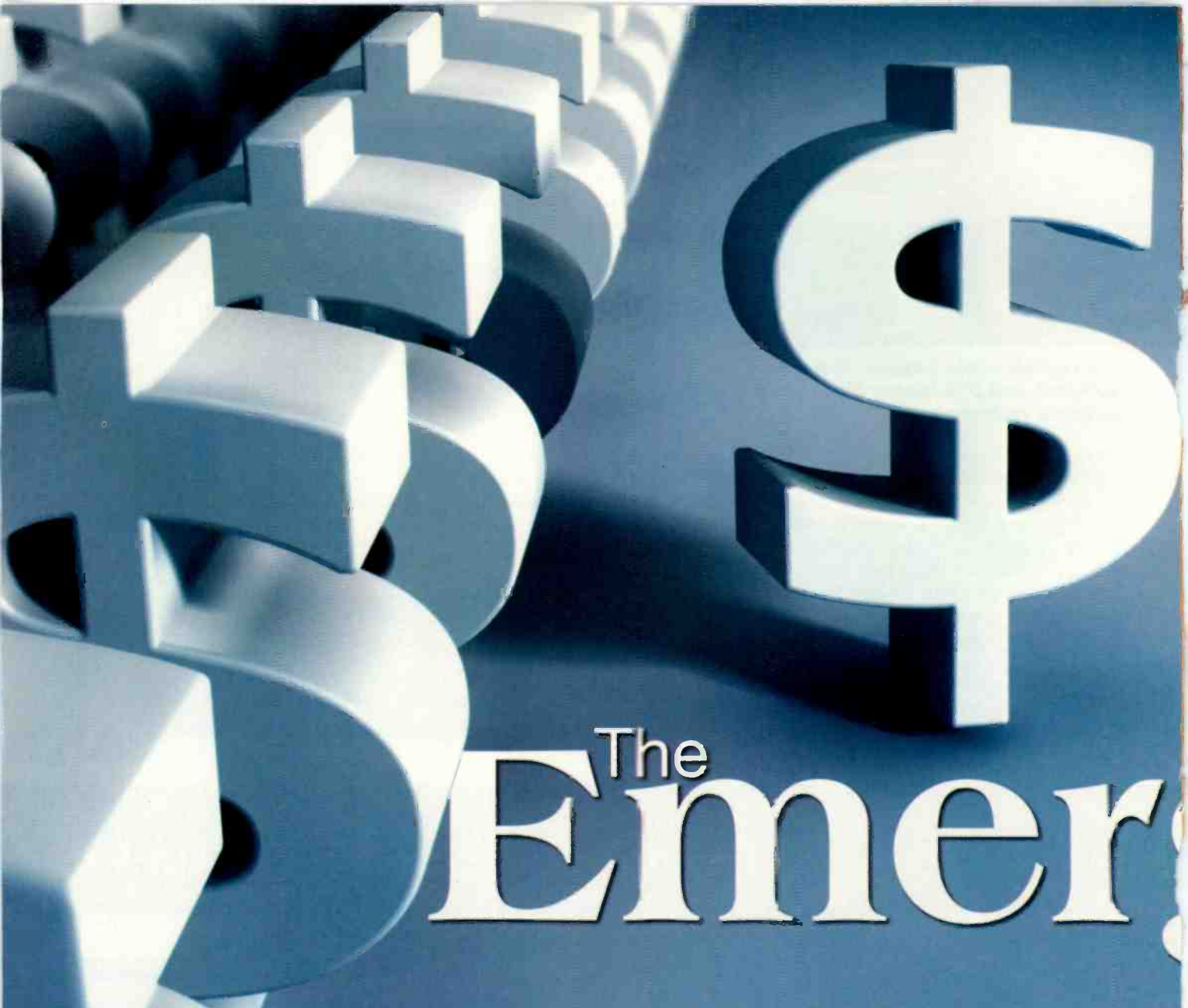
The K104 Web cam provides a peek inside the workings of the radio station. From its perch inside the truss, it presents a great bird's eye view of all the action in the studio.

The pre-planning and attention to details paid off big in the end. The long anticipated new studio worked better than expected. It is a very exciting, vibrant setting to create inspiring entertainment.

Wachter is director of engineering of Service Broadcasting Company, Dallas.

More online

For additional information and photos about this article, visit www.RadioMagOnline.com



The Emer

There is no doubt that radio has been changing in dramatic ways in the past few years. But these advancements in technology and radio's overall capabilities haven't just changed the way we listen to music—it has changed the way we transmit music—and a radio engineer's job is more complex and developmental than ever. The good news is, you have been at this for a long time.

The great majority of radio engineers today have been in broadcast engineering for 20 years. That means you've seen the installation of more reliable equipment, you personally handle more stations (nearly four on average), and you've been forced into the role of IT guru, operating stations with computer technology that didn't even exist 20 years ago.

This year's *Radio* magazine salary report shows some interesting statistics about your ever-evolving careers. In general, 62 percent of respondents are in technical roles, 24 percent operational and 11 percent business. Small market salaries have increased by more than $8,700 from 2005 and two-thirds of contract engineers earn $50 or more per hour. The survey also found that, although some of you said you don't need it, SBE certification increases salaries from nearly $44,000 to $57,000 below Top 50 markets and around $52,000 to $71,666 for Top 50 markets. The majority of you have attended an online seminar in the past five months, and 59 percent prefer this type of training.

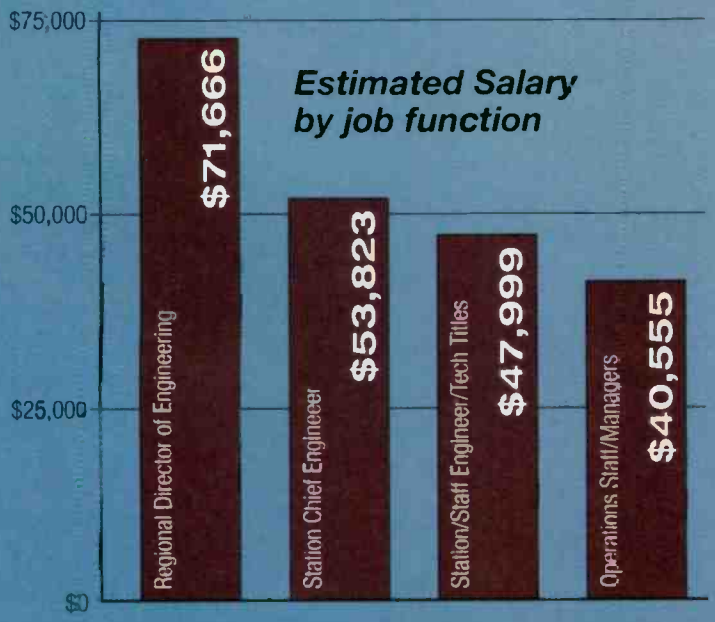
So take a look through some highlights of this year's report. Want to know even more? You can purchase the entire report at www.buypenton.com/ProductDetail.asp?PRDID=493E.

Methodology

On May 15, 2007, Penton Media e-mailed invitations to participate in an online survey to a total of 4,092 subscribers of *Radio* magazine selected on an nth name basis from the categories radio stations and networks. To encourage prompt response and increase the response-rate overall, the following marketing research techniques were used: A drawing was held for one of four $50 Amazon.com gift certificates. A link was included on the invitation to route respondents directly to the questionnaire. The magazine name was used on the invitation to tie the study effort to the magazine. Follow-up e-mails to non-respondents were sent on May 30 and June 5, 2007 to this same group.

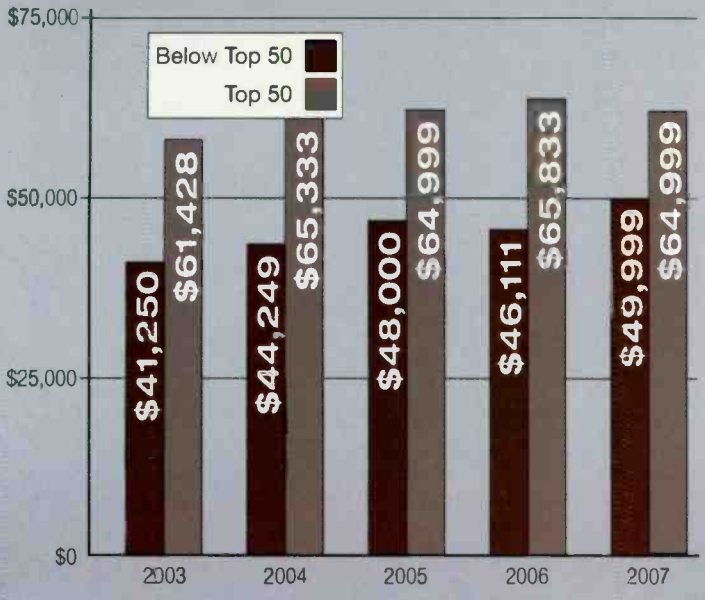
By Erin Shipps

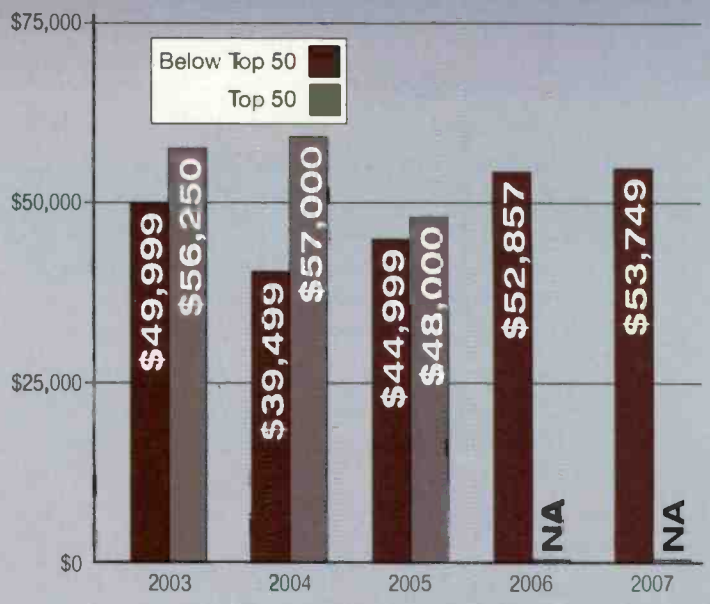
gent Employee



The Emergent Employee

Estimated staff engineer salaries





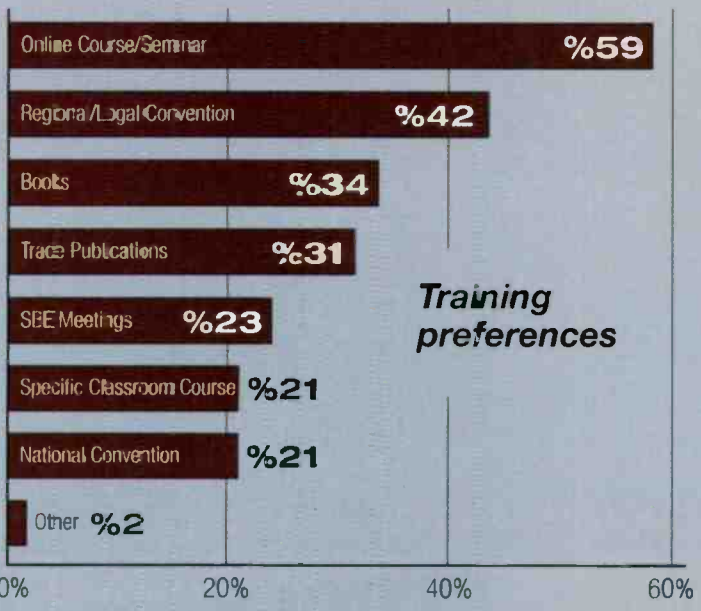
Estimated Salary for station managers, small markets

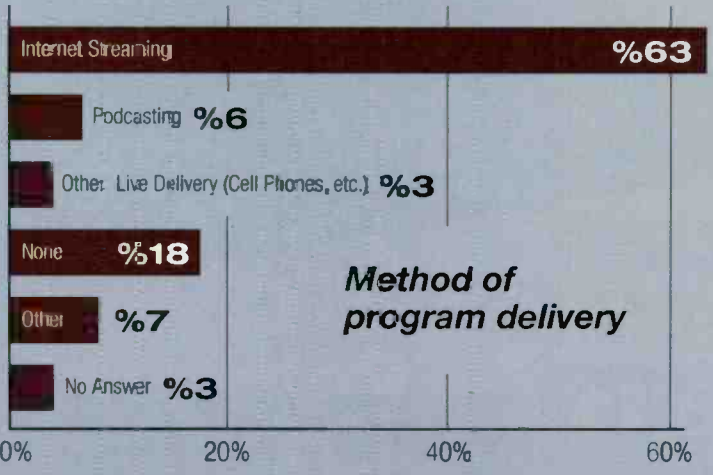
Write-in Answer:

What types of educational, instructional or tutorial topics would be most valuable to you?

When it comes to learning, few of you believe your education days are over. In fact, our survey shows you are mostly eager for any opportunity to do a better, more efficient job. With radio trends as they currently are, it is no surprise that the majority of you would like to learn more about HD Radio. And even though you have been wearing the hat of an IT professional for years, you believe you could use some help in the world of computers.

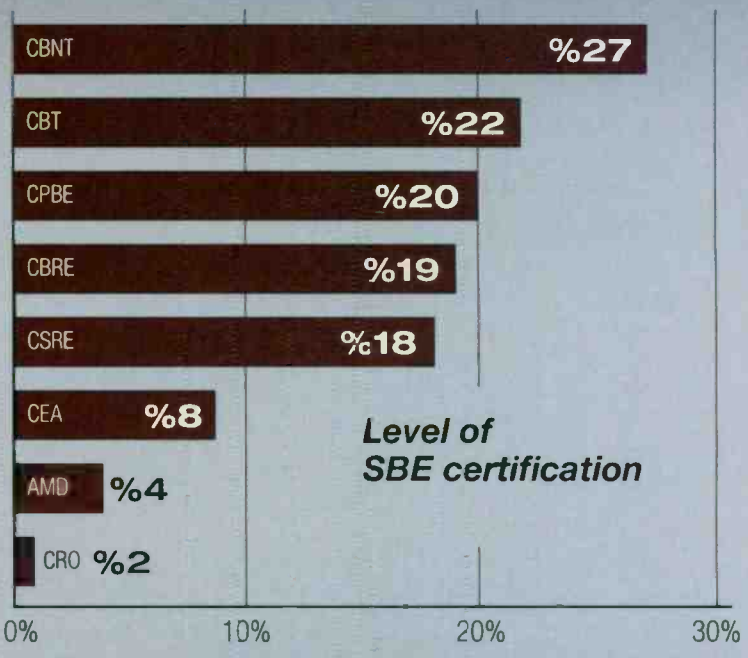
Another core group of engineers believe they could stand to learn something about emerging technologies and new media, including podcasting, streaming and satellite radio. You are also interested in topical instruction, such as RF, AM directional antennas, AES-3 audio over IP, automation and antennas. And you would like to learn a bit about management, legal aspects, basic engineering, efficiency and fund-raising.



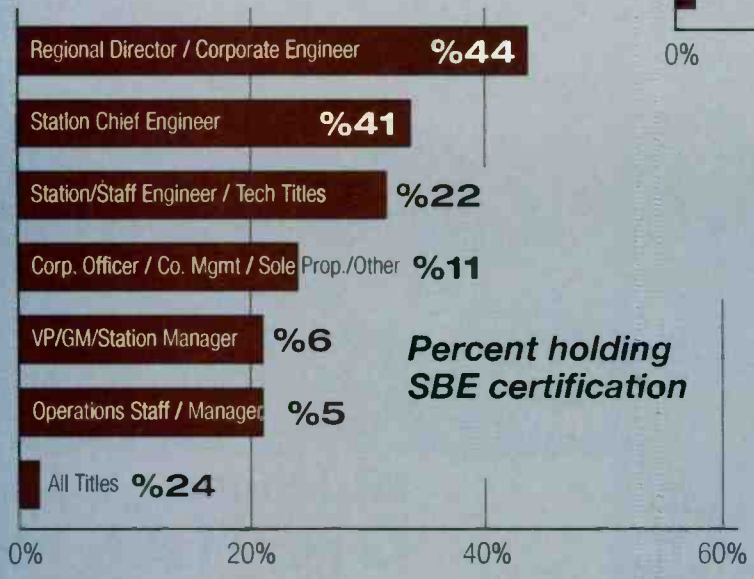


The Emergent Employee

Median salaries by SBE certification



Level of SBE certification

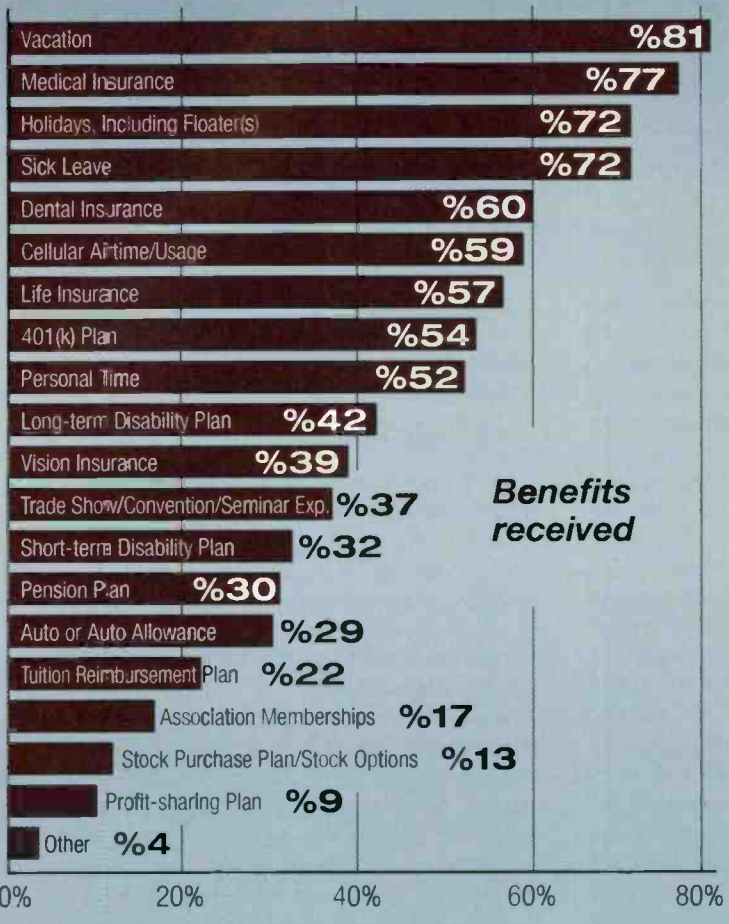


Percent holding SBE certification

Write-in Answer:

If you could change one thing...

There is an overwhelming majority on what you want out of your job: better pay and more technicians. After that there are a good group of you who are happy, followed by people who want better equipment/tools/company cars, a better budget, better management, an assistant, more free time/time to be creative, recognition, a change in a technical aspect, training opportunities and benefits, better communication, a change in programming, hours, regulations, personnel, less IT and more time in the field. There are a lot of things you would change to make your job easier, better, more fulfilling. Here are some of your responses:



- Better communication within the facility (e.g. management to ops staff, and interstaff)
- Another person to help with operations, IT and engineering.
- Better hours, replacing the required 24-hour on-call responsibility.
- Create a greater respect for engineering and engineers by top management. Change the business environment so that we plan and execute versus just reacting to the competitor.
- Get congress to legislate IBOC receivers if we are serious about making a transition to digital. Television has done it with ATSC; why not radio?
- I am quite satisfied really. At times the "always" on call idea can get old, but that is the trade off of being out in the field without management looking directly over your shoulder.
- Increase technical staffing, salary commensurate with experience and education
- The concept that pay is not tied to experience. I consider myself to be drastically undervalued for what I do. I do many things rather than specialize in one discipline.
- To have a full-time or at the very least a part-time assistant who could do coverage for me on the weekends, or for vacation, so it wouldn't be such a hassle for me to get away. Currently I have to find another engineer to provide coverage for me.
- Since radio stations are getting close to being all computer-based we need to learn more about this area.

Tips, tricks, hints and more

By John Landry, CSRE

Analog tape, part 1: The mechanics

While most radio stations are fully digital now, there are still a few limited (often forgotten) parts of the facility that are analog. Since most tape machines tend to be old, they need some TLC now and then. Whether tape is something unfamiliar or something you grew up on, here are some pointers.

Analog tape is magnetic. The tape head is a magnet that presents a field that changes with the incoming audio signal. This field changes the magnetic alignment on the tape as it passes over the head. On playback, the tape's varying magnetic signal imparts its changes to the playback head, which then provides an electrical signal. This is a simple process, but it requires many electronic and mechanical details to produce an exact reproduction of the original sound.

Once a mainstay of every station, the reel-to-reel recorder is now a mystery to some people.

The tape must contact the tape heads firmly and at a precise location. Proper tape alignment is imperative for proper recording and playback. The tape is guided in a specific path using rollers, slots and sometimes felt pads. The surface of the tape is a little abrasive, and it will wear the heads and guides as it runs through its path. In addition, some small bits of the tape fall off and get stuck to the tape path parts. A tape machine has to have all of these parts cleaned using alcohol on a cotton swab.

Cleaning is the most important part of analog tape maintenance. A good rule of thumb is to clean the machine before each use. In addition to dirt, small residual magnetic fields can develop on tape path parts. They are very small but they can build up over time and cause audible artifacts and can ruin an existing recording. Part of regular maintenance should also include demagnetizing the tape path parts using a special ac-operated demagnetizer.

Finally, because the tape is a moving object it must move as smoothly and consistently as possible. There can be no jerking or wobbling. To do this, the drive system must be mechanically sound. Parts that rotate must do so freely and quietly. Parts that are stationary must stay that way. And if the tape is housed in a cartridge or a cassette, that housing must not interfere in any way with the smooth movement of the tape. Because many tape path parts are round, they must stay that way to obtain the best results. Mechanical maintenance of the tape transport is just as important as cleaning.

I will cover the electronics of tape machines next month.

VU Meters rule

There is no better device for measuring and setting audio levels in real time. Bar graphs look cool, and some of them are actually set up to mimic actual meters. But in a pinch, the VU works every time. And an off-the-shelf VU meter can usually be placed directly across a balanced line with only one resistor in series with it, which makes them all that more useful.

Recently, my interest in VU meters helped solve a problem as well. A friend's new DAW in his newsroom was producing material with widely inconsistent audio levels. Material recorded on one workstation would play 8dB soft on another and 10dB loud on a third even though the workstation's settings were identical. What was especially confusing is that everything came out perfectly when just tone was recorded.

I looked at the floor and saw several old cart machines with VU meters on the front panel. After drilling a few holes and adding a few resistors, I installed VU meters on the workstation inputs. Now, the audio levels are more consistent, and it's easy to see what the exact level is as any time. The lesson learned here: never throw away VU meters.

Save the meters. You never know when you might need one.

Landry is an audio maintenance engineer at CBS Radio/Westwood One, New York.

Do you have a tech tip? Send it to us at radio@RadioMagOnline.com.

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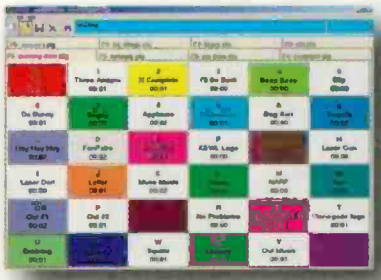

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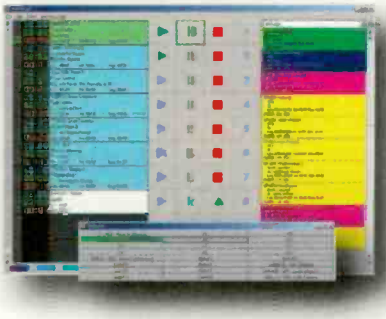

WaveCart - the original on-screen cart machine

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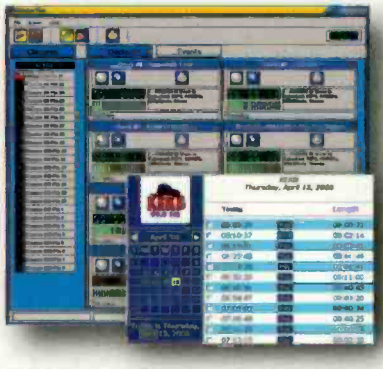

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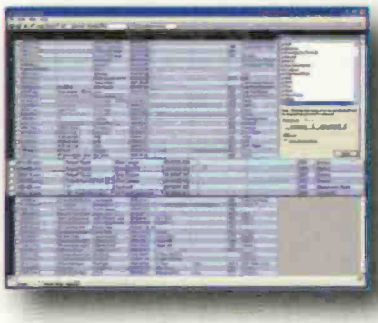

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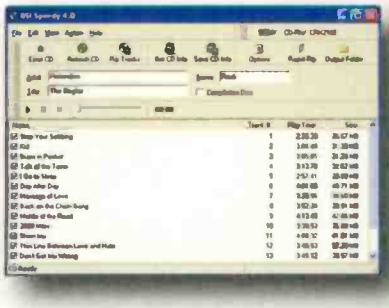

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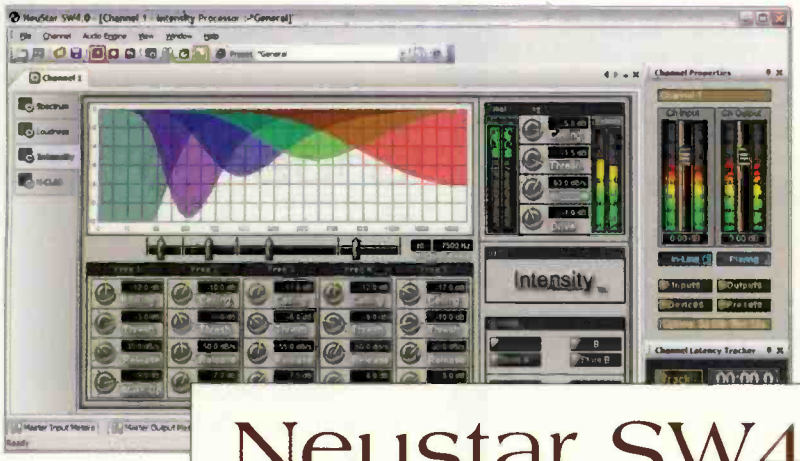


Neustar SW4.0

By Rich Parker

Vermont Public Radio is Vermont's only statewide public radio network covering the Connecticut River Valley, Manchester, Middlebury and Bennington. We broadcast two separate program services on six frequencies (soon to be eight), and we stream online 24 hours a day.

When we first started looking into processing for HD Radio, the few existing software products were either not optimized for low bit-rate HD Radio multicast streams or couldn't provide processing for multiple streams easily. The hardware products were not an option because of the substantial investment they presented in processing six HD Radio stations (four are on the air now). Multicasting on each of these signals could have required multiple devices for different types of programming on each stream.

During this investigation, we kept coming back to the Neural Neustar SW4.0 software. It became clear that by using the Neustar software directly on the HD Radio Importer we could maximize our multicasting capabilities beyond the two channels available using dedicated hardware. Also, as the requirements for physical space for HD Radio equipment in general has grown, this was an excellent way to minimize rack space needs and eliminate the need for another computer or outboard devices from having to be installed and configured.

The flexibility of the SW4 to provide multiple channels of independent processing was also important to us as we investigated issues such as whether to have one or two supplemental services, and what a change to the higher bandwidth extended hybrid mode would mean in terms of streams available. A software-based processor allowed us to experiment with different settings without a new hardware investment. And of course, SW4 is certainly a cost savings over two or three independent hardware devices for that purpose.

Performance at a glance

Software-based audio processor

HD Radio codec-specific feature set

User presets included

Software upgradable

Codec preconditioner and processor

USB port dongle for licensing

Making trades

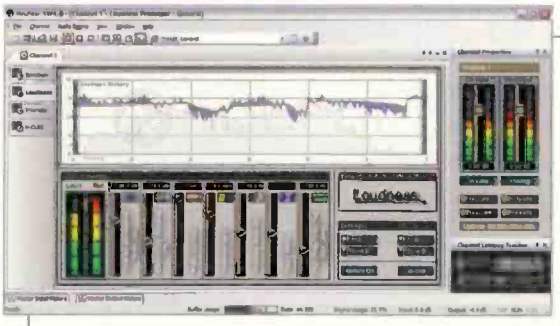
Low bit-rate audio is always a trade-off and a challenge, whether it is HD Radio multicasting or Web streaming. Digital artifacts, watery sounds, spectral anomalies—all the side effects we are used to hearing must be managed. To my ear, the SW4 software had the greatest capability to specifically address some of the more egregious problems in a simple and effective way.

The low bit-rate international news is delivered at 16kb/s. At this bit-rate, it is difficult to make it sound good because the source material is often already compromised—whether phone-quality sound from a distant place or multiple cascades of previously bit-reduced material. But we were able to make a palatable setting in SW4 that not only makes it intelligible, but overall very listenable. The smoothing function is perhaps the single most astonishing feature for enhancing this type of audio.

For our initial HD Radio multichannel broadcasts, we had a standard Neustar hardware unit for the HD1 channel and an Omnia 6EXi for our analog channel. We have an Aphex Compellor positioned before the STLs for the analog signal, which are connected to a Harris Flexstar Exciter. The SW4 was loaded directly on the Harris Importer, which feeds the Exporter for the two multicast channels. The audio fed into the Importer/SW4 is not pre-processed.

The final links in the HD Radio puzzle are our Harris transmitters – HT35K for analog, and the Mini-Z 2000 for digital and digital+analog FM backup for our biggest transmitter on Vermont's highest peak, Mt. Mansfield, and several other solid state HD transmitters at our other sites around the state. These feed a dual-port Shively panel antenna system that uses opposite ports on the antenna inputs for the analog and digital signals.

The installation for the Neustar SW4.0 was fairly easy; the SW4 is runs on Windows XP on the Importer. There were a few issues to learn with the different paradigm for processing and



The various settings screens show a plethora of information.

some questions about whether to use virtual audio cable software or simply the available hardware channels on the Importer (which is what we ended up doing). But they were easily worked out with support from the Neural staff.

We have been running the Neustar SW4.0 since our HD Radio multicast in this market went on the air in December 2006. We are running an international news service on our HD3 channel at 16kb/s. We have been able to get a very respectable sound from that low bit-rate stream using the Neustar software. Our listeners who have access to HD Radio receivers find it very listenable. We also have a 32kb/s classical music stream on the HD2 channel, and it sounds very good. Our music hosts, who are usually critical of anything that isn't quite right, have been impressed with how good it sounds at that lower bit rate.

The feedback we have received from our listeners touts how amazing multicasting is and how thrilled the listeners are to be able to receive multiple program streams on their new HD Radio receivers. We are committed to HD Radio, and are truly excited about all the opportunities to experiment with new formats. At VPR, we feel that the sky is the limit when it comes to multicasting.

Parker is director of engineering of Vermont Public Radio, Colchester, VT.

Editor's note: Field Reports are an exclusive *Radio* magazine feature for radio broadcasters. Each report is prepared by well-qualified staff at a radio station, production facility or consulting company.

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Neural Audio

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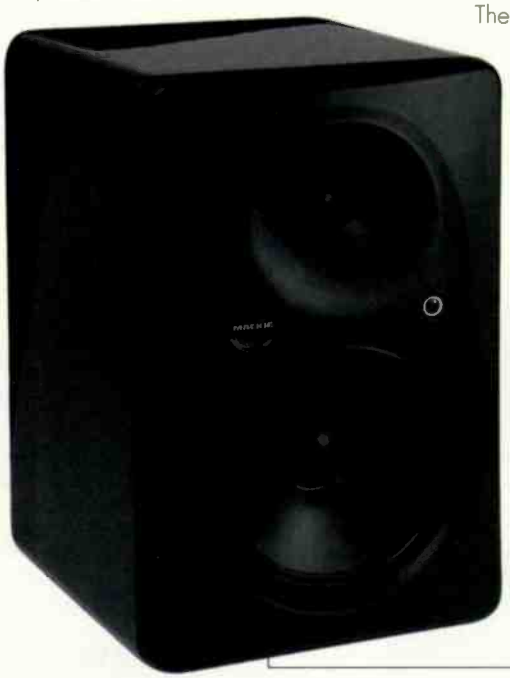
Mackie HR824 Mk2

By Scott Trask

As we prepared to remodel one of our production rooms we talked about what type of control surface, microphones and peripherals we wanted, but the topic at the forefront was the type of studio monitors we would select. Questions arose: Active or passive? Nearfield or midfields? What monitor would provide us with the best sound quality?

After researching and talking with others, we selected a pair of Mackie HR824 Mk2 speakers. These are the successor to Mackie's HR824 series of active two-way studio monitors.



The first thing that jumps out at you is the size, even though we knew the dimensions, 16.8"x10.8"x13.8", it was hard to picture them in our drawings—that is until we got them out of the box. They are slightly larger than their predecessor and finished with a Sherwin Williams Piano Black paint.

Design and construction

The monitor features an 8.75" woofer to handle the low end and mid-range with a synthetic cone, a magnesium chassis and a 1.6" voice coil. Handling the high frequencies is a one-inch titanium-dome tweeter, with a 6"x12" flat piston passive radiator to the rear. Also on the front of the monitor is the power ring and overload indicator.

The power ring around the power switch illuminates when the power amplifiers are on and turns off when the amplifiers are in standby mode or off. The power ring flashes red when the overload protection circuit has been triggered. The switch on the front works in conjunction with the power mode selector switch on the rear panel of the monitor.

The HR824 Mk2 has three protection circuits to safeguard the monitors: Overload Protection, Thermal Protect and Integrated Magnetic Shielding. Overload Protect is indicated by the blinking of the power ring on the front of the monitor at which time the signal level of the input needs to be reduced.

The monitor is built to be efficient both electrically and thermally. If the heatsinks get too hot it will place the monitor into standby mode until they cool down. Always ensure sufficient airflow to the rear of the cabinet.

The rear panel sports the signal input connections and the adjustments to tailor the frequency response to fit the room. There are three signal inputs: XLR, TRS and RCA. The input jack connectors face downward so the speakers could be mounted against a wall. The XLR and TRS inputs can accommodate balanced or unbalanced input signals.

Along with the signal inputs are switches for Input Sensitivity, Acoustic Spacing and Filter settings for low and high frequency adjustment. The monitor expects a line-level signal and is designed to operate with a +4dBu signal in the normal position, which is set using a rotary switch.

The Acoustical Space switch sets the bass level to suit the room; Quarter is best for speakers placed near corners. Half is for speakers placed against one wall, and Whole is set when placing the speakers away from the walls. Mackie recommends that these not be placed against any corner or wall.

The Mk2 has a switch to set the low frequency performance; it has roll-offs at 80Hz, 47Hz and 37Hz. Use the 80Hz setting for THX applications. The 37Hz setting is used when the speakers are used with a sub-woofer in non-THX environment. When the room is too small to work well at very low frequencies, the 47Hz setting is the one to use.

The High Frequency filter has settings of +2dB and -2dB beginning at 10kHz. Leave this switch in the 0 position unless the sound needs to be brightened or darkened.

The performance

Like any monitor, the Mackie HR824 Mk2 has its own sound. Being that we had a set of HR824s in a studio, there was concern that

Performance at a glance

Active studio monitor

8.75" LF transducer

1" titanium dome, ferrofluid-cooled tweeter

150W LF, 100W HF amp

Bass extension to 35Hz

Balanced XLR, TRS, and unbalanced RCA inputs

Omnimount ready

THX PM3 certified

The rear panel includes the input connections and adjustment controls.

Mackie may have made a lot of changes to affect quality of the monitor. We couldn't have been more wrong; despite the physical changes the overall sound is still smooth and well balanced. Well-mixed material seems less in your face with the mid range holding its clarity. The bass response is impressive for the size of the monitor.

The Mackie HR824 Mk2 is reliable and designed very nicely. I think you will like the sound. Vocals seem alive and bass can get very low due to the passive radiator. If you liked the originals then you will like these monitors also.

Trask is director of engineering of WSTR-FM and WQXI-AM, Atlanta.

Mackie

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by Erin Shipps, associate editor

RF spectrum analyzer
Kaltman Creations

Spectran HF4040: The Spectran HF4040 is a handheld, field RF spectrum analyzer that addresses frequency selection, interference identification, RF system monitoring, testing and exposure limits. The HF4040 frequency range is from 10MHz to 4GHz. In addition, the unit features display markers, which display the three strongest peaks and their associated frequencies during each sweep. There is also a zoom feature that allows the user to narrow the frequency span down to below 100KHz. The HF4040 will also perform extended data logging and long-term peak hold recording. New models of this analyzer were recently introduced, including 1MHz to 7GHz frequencies, with some models offering optional 10GHz peak detectors.

678-714-2000; www.kaltmancreationsllc.com
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Audio connectors
Neutrik

XX-HE Series:

Neutrik's XX-HE Series is an exclusive version of its standard XX Series featuring velour chromium plating and extra high temperature resistant insulator material. Available in male (NC3MXX-HE) and female (NC3FXX-HE) configurations, the three-pole connectors include velour chromium housing and machined (not stamped or rolled) gold contacts. Improved chuck type strain relief provides higher pullout force and makes assembly easier and faster. Offering a sleek and ergonomic design, the boot features a polyurethane gland, which gives high protection to cable bending stresses. Colored rings and boots are also available for easy coding and identification.

732-901-9488; www.neutrik.com
info@neutrikusa.com

In the 2007 Product Source, we featured the RCS News product but mistakenly referred to it by its previous name: Prophet Newsgen 1.6.

Portable recorder codec
Mayah Communications

Flashman II: Whereas the original Flashman was a straight high-quality digital recorder, Flashman II adds the ability to simultaneously record and transmit audio. Flashman II records to SD cards and USB sticks, supports most modern networks and interfaces, and provides a wide range of the current coding algorithms. Flashman II is able to automatically recognize, and connect to almost any audio codec and format.

+49 811 55 16 0; www.mayah.com; info@mayah.com

FM receiver
Viaradio

BO3: The Viaradio BO3 FM rebroadcast receiver has AES/EBU digital and analog audio outputs, measures RF, Pilot, RDS, L, R, MPX, has RDS data output, alarm messages for RF, Pilot, L, R, MPX, optional MP3 output, remote firmware update, control via TCP/IP or serial, PC control software included and no maintenance is required. Its RF inputs impedance is 50ohm, power consumption is 20Vac and power supply is 115V, 60Hz or 230V, 50Hz.

321-242-0001; www.viaradio.com

IBOC 5kW filter
Myat

FMBP5000: Using Myat's Evanescent couple technology, these filters attenuate unwanted signals to reduce cross-modulation products generated at the transmitter. Myat's three-section filter with cross coupling allows close-spaced, two-station combining without the high losses associated with typical four-section filters. It is available in three and four section designs, with and without cross coupling, to meet a station's FM/IBOC needs. It is tunable through FM band and features temperature compensation.

201-767-5380; www.myat.com; sales@myat.com

USB microphone interface
Marshall Electronics

MicMate: With the MXL Micmate, any dynamic or condenser microphone can be connected to a personal computer. The Micmate requires no special drivers. The analog section of the device features a 20Hz to 20kHz frequency response and a three-position, switchable attenuation pad with settings for Hi (0dB), Medium (-5dB), and Lo (-10dB), making it easy to configure the attached microphone to virtually any sound source. The digital section features a 16-bit Delta Sigma A/D converter with a sampling rate of 44.1kHz and 48kHz.

800-800-6608; www.mxlmics.com
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800-524-2744; www.lcdarms.com
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Ueberstand: Folded, the Ueberstand is a compact accessory for a laptop. Unfolded, its industrial design comes to life and elevates a laptop above the workspace while providing a specially crafted shelf for any external hard-drive. The unit includes a 12" zipper bag, aircraft grade aluminum and stainless steel, and reusable plastic ties and Velcro.

800-558-7297; www.stantronracks.com

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M-Series: These self-powered active studio monitors consists of four models: the M505, M606, M808 and M10s. Sleekly designed, magnetically shielded and precision tuned to provide flat frequency response and sound clarity, each M-Series monitor is bi-amplified includes an adjustable HF cut/boost control, slotted ports for reduced distortion and improved imaging, red woven glass aramid fiber composite woofers and 1-inch soft dome tweeters.

www.ikey-audio.com

UPGRADES and UPDATES

Harris introduced a new software interface for its Intraplex Netxpress audio over IP platform at IBC2007. The new CCS Navigator control software is a Windows-based application that provides graphical tools to create user interfaces, visually representing operational environments. (www.broadcast.harris.com)...*Nautel* has released its NX Series of high power, medium wave radio transmitters. Nautel NX transmitters have been designed with DRM and HD Radio digital transmission as integral features. (www.nautel.com)...The *Netia* Radio-Assist 7.5 range of digital audio software programs now support 5.1 and 7.1 multichannel audio from acquisition through to broadcast. (www.netia.com)...*Comrex* has released a firmware upgrade for the Access codec. Version 2.3 firmware release offers a USB-based 3G modem, compatibility with other industry IP codecs using AAC, support for a greater range of 3G PC cards and USB modems, and enhanced network diagnostics. (www.comrex.com)

FM transmitter
Rohde & Schwarz

SR8000: This transmitter is equipped with a digital exciter, provides output power from 100W to 1kW. The digital exciter combines the specs of the analog exciters from the company with the reliability of modern digital signal processing. Due to their compact design, the transmitter occupies a maximum of four height units. All functions are integrated in one box; single frequency network operation is possible.

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E-mail: richardwoolley@btclick.com

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Joyce Nolan
Phone: 610-701-9993; Fax: 610-701-0580
E-mail: joyce.nolan@penton.com

Online Sales & Marketing
Angie Gates
Phone: 913-967-7516; Fax: 913-514-7516
E-mail: angie.gates@penton.com

Contributor Profile

Meet the professionals who write for *Radio* magazine.
This month:
Trends in Technology, page 16.

Alex Kosiorek
Director of Recording Services
Cleveland Institute of Music

An award-winning engineer who specializes in classical, jazz and acoustic music, Kosiorek's credits include projects for noted record labels, artists and ensembles. Kosiorek began his radio career for Radio Smithsonian and later for KUAT Communications. He delved into surround production recording the New World Symphony's European Tour in the great halls of Europe.

Radio
THE RADIO TECHNOLOGY LEADER

Written by radio professionals
Written for radio professionals

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ADVERTISER INDEX

This index is a service to readers. Every effort is made to ensure accuracy, but *Radio* magazine cannot assume responsibility for errors or omissions.

by Erin Shipps, associate editor

Do you remember?

In 1987, Otari introduced the MX-55, as seen in this ad from the September 1988 issue of *Broadcast Engineering*.

Founded in 1965 in Tokyo, Otari was responsible for producing a great deal of audio equipment throughout the growth of the radio industry, and is still making audio equipment today.

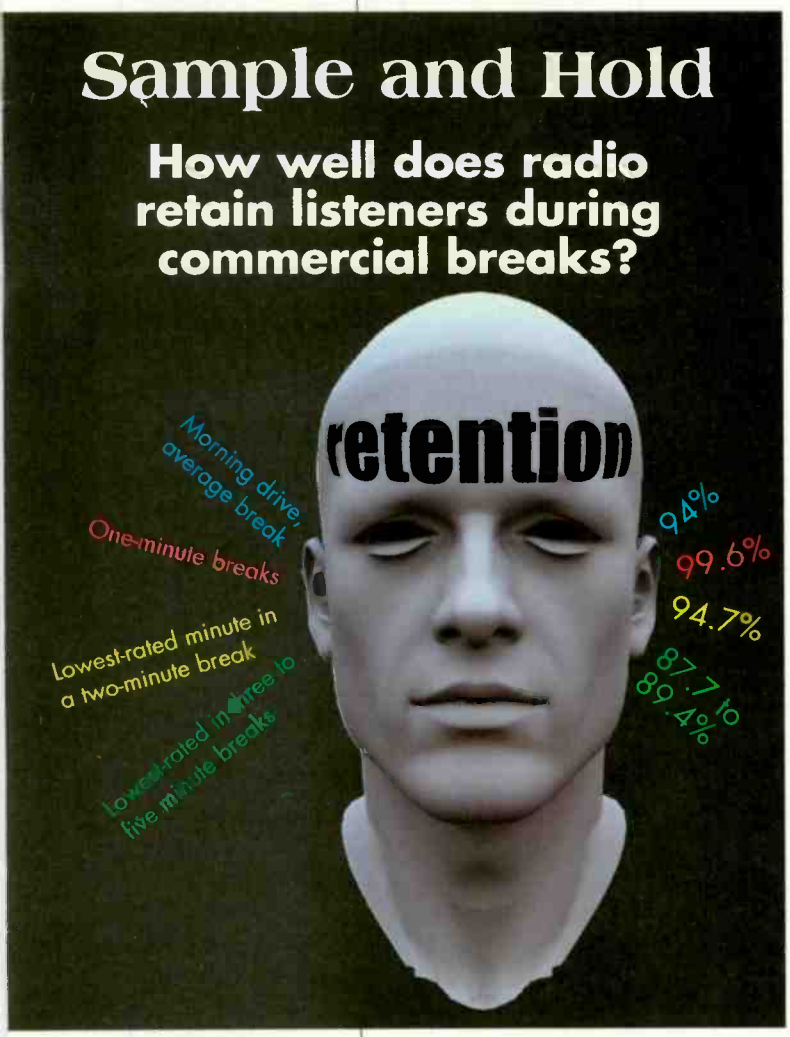
Six years prior to the MX-55, Otari implemented the MX-5050BII, a recorder the company was not trying to replace with the MX-55, but improve upon it. As the ad states, the BII was a workhorse standard for two-channel audio machines, but the MX-55 offered many additional features including "An integral auto locator; a voice editing mode that allows 2× speed playback at normal pitch; a built-in cue speaker; GSPIPO (gapless, seamless, punch-in, punch-out), and all adjustments are available through the front panel!"

The MX-55 proves there is always room for improvement and new does not always mean the demise of old.

Do you still have a working reel-to-reel machine in your station? Tell me how you keep it running (and why).

Sample and Hold

How well does radio retain listeners during commercial breaks?



Source: Arbitron, Media Monitors and Coleman

That was then

In 1973, Dan Steffen (Plano, TX) posed for this publicity shot in the WVQM studio, located on a mountaintop just outside Huntington, WV. The station broadcast a 100kW signal that could reach as far as Virginia, Tennessee, Kentucky and Ohio. The format at the time was middle of the road and it operated at 103.3MHz. The station still operates at this output.

The WVQM studio during construction (right).

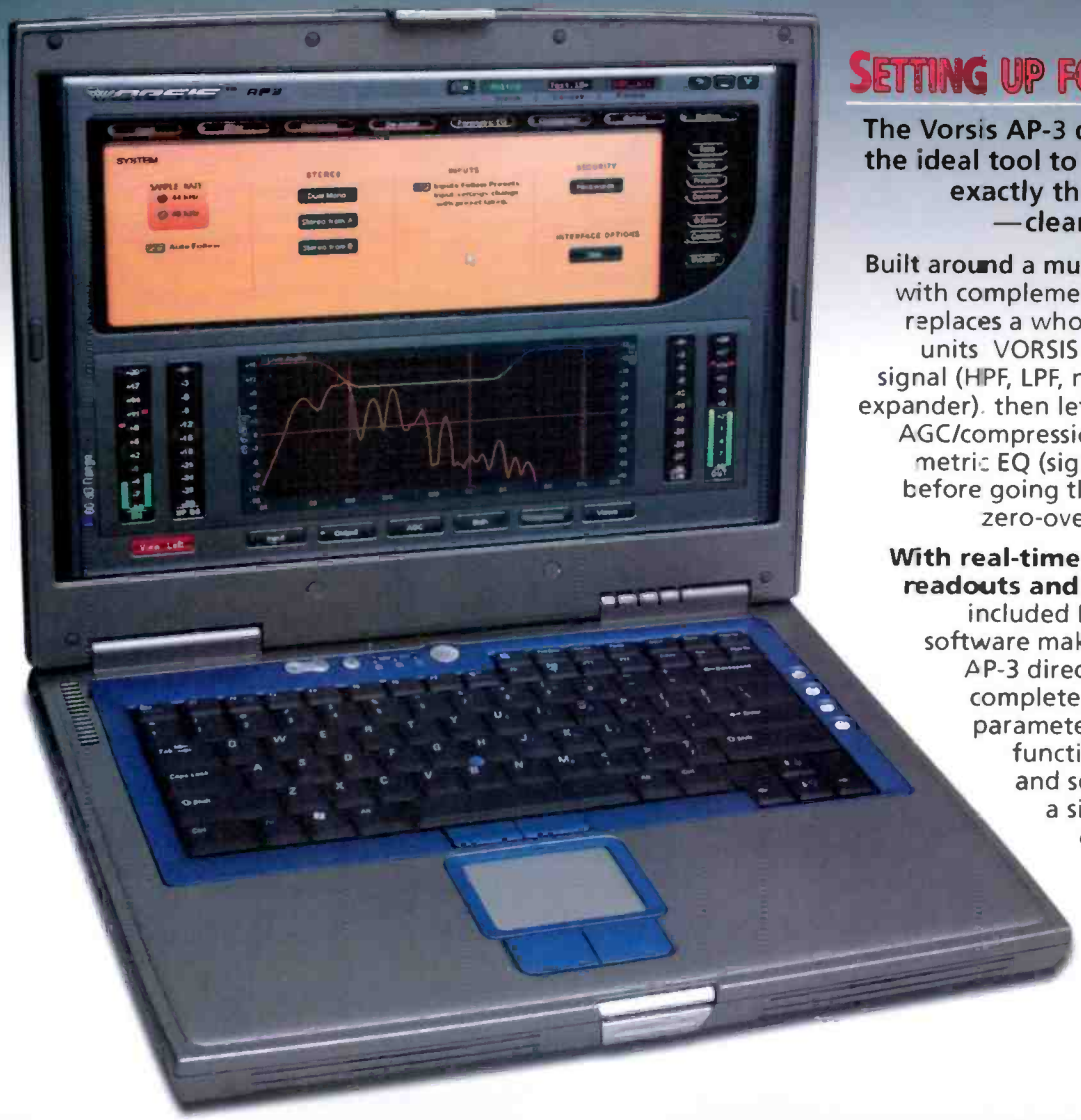
The equipment, both studio and transmitter, were almost exclusively RCA. Steffen thinks the consoles were RCA BC7s. The mics were all RCA 77DXs, now collector's items. The reel-to-reel decks were Ampex 1/2-track stereo and the cart machines were Spotmaster.

Steffan has fond memories from working at the station, including the fact that from the studio window, he could see the transmitter room through another glass window on the other side of the studio in between and when a storm would blow up and the VSWR would get out of whack, the fluorescent lights in the transmitter room would come on, whether they were turned on or not.

This Little Unit

Can Do BIG Things!

Our new AP-3 is the perfect HD Processor:



SETTING UP FOR HD RADIO?

The Vorsis AP-3 digital processor is the ideal tool to shape your sound exactly the way you want it —cleanly and efficiently.

Built around a multi-band compressor with complementary AGC, the AP-3 replaces a whole *rack* of dedicated units. VORSIS pre-conditions your signal (HPF, LPF, notch filter, de-esser, expander), then let's you apply 3-band AGC/compression *and* 4-band parametric EQ (signal chain reversible) before going through a final stage zero-overshoot peak limiter.

With real-time spectrum density readouts and full metering, our included PC graphic interface software makes operation of the AP-3 direct and easy, offering complete control of all audio parameters, presets, monitor functions, system settings and security—all through a single RJ-45 ethernet connection that lets you control one or many AP-3 units.

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All in a package of stainless steel and aluminum designed for years of 24/7 service, with a familiar look and feel that will ***help your talent make years of great radio.***

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