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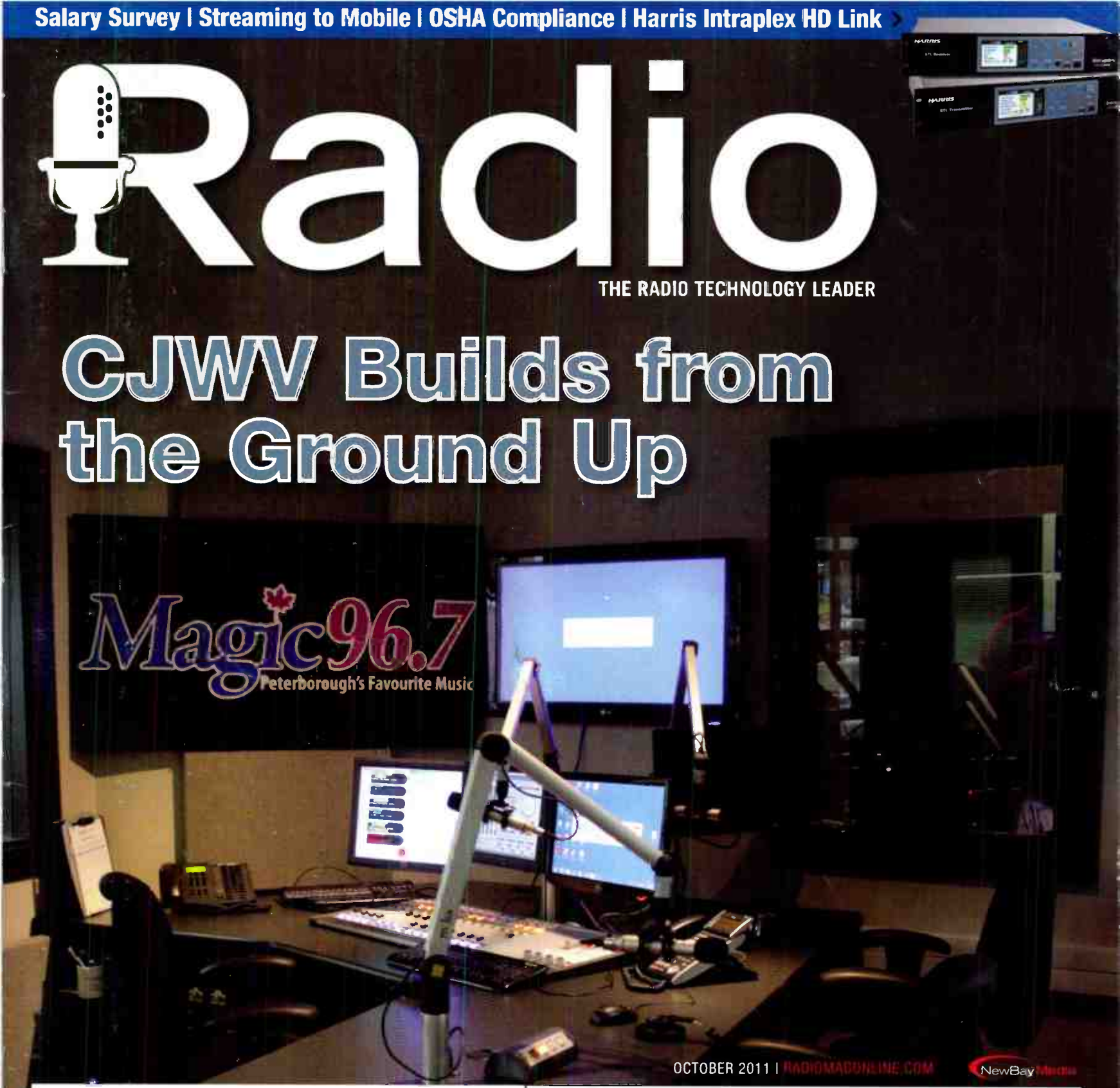

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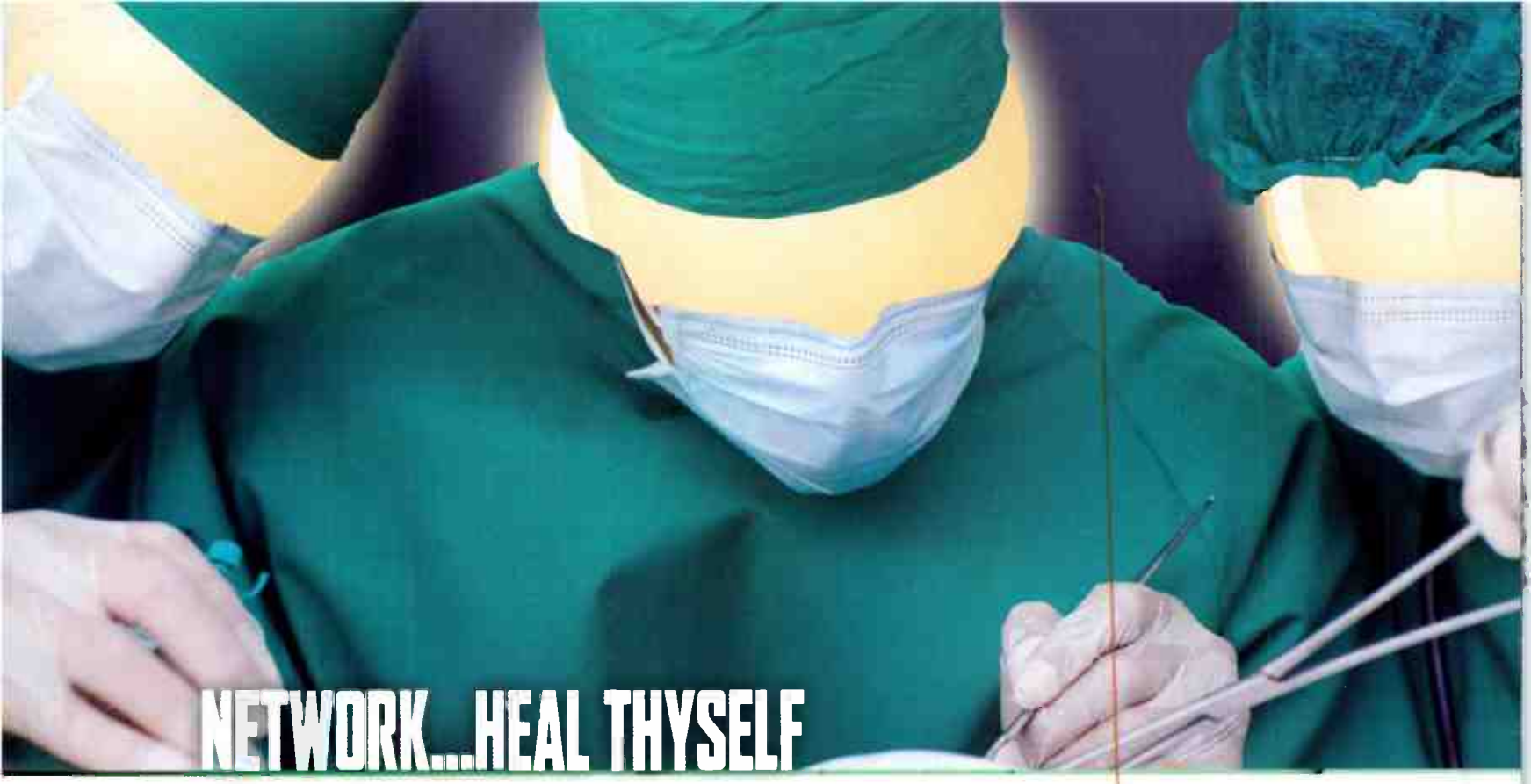

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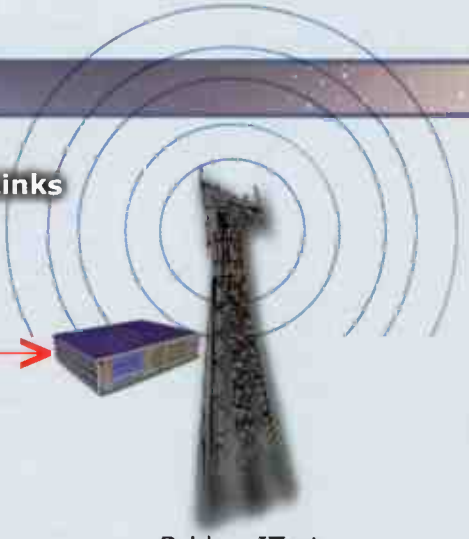

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FCC Extends EAS CAP Compliance Deadline - Again

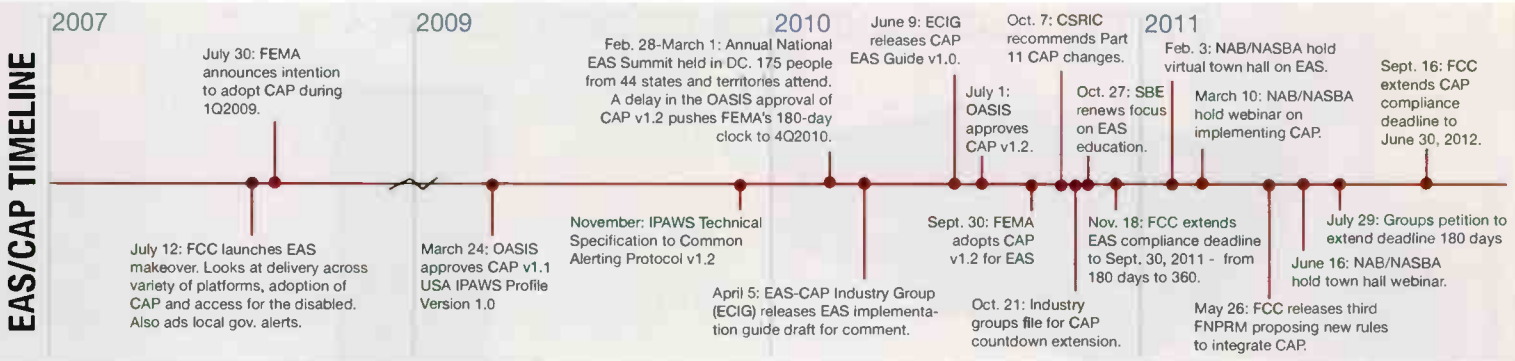
The Federal Communications Commission has extended the deadline for broadcast stations to have their Emergency Alert System equipment be CAP compliant to June 30, 2012. The previous deadline was Sept. 30, 2011.

The FCC said, "In this Fourth Report and Order, we have revised the rules to extend the date by which EAS participants must be able to receive CAP-formatted EAS alert to June 30, 2012."

The FCC explained that more time is needed to revise Part 11 of the FCC Rules so that it cannot impose a deadline by which EAS participants must receive CAP-formatted alerts.

> **EAS Equipment Rundown:** http://radiomagonline.com/studio_audio/EAS/eas-cap-equipment-2010/

> **EAS CAP/FAQ:** http://radiomagonline.com/studio_audio/EAS/eas-cap-faq-2010/



Radio magazine Wins 2011 ASBPE National Award

On Aug. 4, 2011, the American Society of Business Publication Editors (ASBPE) held its annual awards banquet during the ASBPE National Editorial Conference in Chicago. In July, Radio magazine was honored with a Regional Gold Award in the Regular Department category for Sign Off, the monthly feature at the end of each issue.

In the national Best Technical Article category, the March 2010 Trends in Technology article called "N/ACIP: Simplifying Codec Connections" by Doug Irwin, CPBE DRB AMD, was recognized. Congratulations to Doug Irwin for his recognition. Irwin has also received best article awards from the Society of Broadcast Engineers for his work.

2,206

Total number of registered attendees for the 2011 Radio Show in Chicago. This represents a 24 percent increase over the 2010 Radio Show.

The Federal Communicaitons Commission has released a 148 -page Draft Programmatic Environmental Assessment (PEA) of the Antenna Structure Registration Program.

The 131st AES convention education program includes case studies, tutorials and a one-on-one conversation with Ben Folds. The convention will be held in New York at the Javits Center Oct. 20-23.

Monroe Electronics and its Digital Alert Systems (DAS) subsidiary have appointed Jim Heminway as Monroe Electronics' COO.

During his comments at a webinar on public safety, FCC Commissioner Copps stressed the need to "find solutions that will protect our country in times of emergency."

The FCC has released a 148-page Draft Programmatic Environmental Assessment (PEA) of the Antenna Structure Registration Program.

NRSC Updates IBOC Digital Radio Standard

The National Radio Systems Committee (NRSC), co-sponsored by the National Association of Broadcasters (NAB) and the Consumer Electronics Association (CEA), adopted an updated version of its in-band/on-channel (IBOC) digital radio broadcasting standard, NRSC-5-C. The new version includes more than 70 modifications that address improvements and refinements to the HD Radio system benefitting both broadcasters and listeners.

The modifications in this new version include the ability to use asymmetric sidebands, new modes of operation, and updated RF masks. A major part of this work has been the update of "reference documents" by iBiquity Digital, which contain the technical details of the standard.

FIND THE MIC AND WIN!

Tell us where you think the mic icon is placed on this issue's cover and you could win Hosa HDC-800 headphones. Send your entry to radio@RadioMagOnline.com by Nov. 10. Be sure to include your guess, name, job title, company name, mailing address and phone number. No purchase necessary. For complete rules, go to RadioMagOnline.com

SMART:

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VIEWPOINT

A New Look and Feel

I am sure you noticed that *Radio* magazine looks different this month. It's a new design and we think you'll like it.

No doubt you first noticed that this issue is a little larger than our previous edition. It's still an easy-to-read magazine size, but we have a little more space to deliver the information you need. Now that you're inside I'm sure you'll see that the new look is fresher, bolder, more focused and easier to read. The cosmetic changes can be found throughout the issue, but the presentation itself is part of our ongoing commitment to you: We provide the relevant and important information you rely on to help you do your job better. Everything we do is focused on providing meaningful content.

You know that the latest industry news in posted daily at RadioMagOnline.com. Everything in print also appears online, but the monthly edition of *Radio* magazine provides insight and analysis with an expert voice. The print edition also provides practical context. Our seasoned contributors — Jeremy Ruck, Lee Petro, Kevin McNamara, Doug Irwin, Chris Wygal and many others — work in radio. It's their job and their passion, and they bring this experience to you every month.

So with the new design comes a renewed focus on the information we deliver. *Radio* magazine has been and always will be about the technology of radio broadcasting, from the mic to the transmitter or streaming server.

The seeds of this redesign were planted almost a year ago. We gathered ideas, talked to readers and refined the process to achieve what you are holding right now. We're proud of what we have achieved. Let us know what you think at radio@RadioMagOnline.com.

CAP DEADLINE EXTENSION

On Sept. 16, the FCC ruled to extend the Common Alerting Protocol compliance deadline from Sept. 30 until June 30, 2012. I think I heard a collective sigh of relief that afternoon. While the extension allows some leeway, there are those who think the extension was not necessary.

I talked to several people heavily involved with EAS at the Radio Show, including manufacturers. From a practical standpoint, the extension was needed. The rules say stations must have the ability to receive CAP-encoded messages, but in reality that was still theoretical. There was nothing for a station to connect to for the CAP Messages.

Manufacturers reported that while FEMA has a server online for them to test CAP compliance, the servers were not reliable and would go offline too often. It's hard to test a system that isn't there. The manufacturers also told me that many stations were still hesitant to purchase equipment because there were too many unknowns and undefined elements in the Rules.

The FCC admits there are lots of Part 11 updates that need to be put in place, which was the main reason for the extension. All these factors make the extension a logical move by the FCC.

But with the extension comes the chance of further delays. We all work on deadlines. As a deadline approaches, we work harder to meet it. The (now changed) looming deadline was stirring lots of action from stations. The manufacturers were already working hard on the problem. With the extension, I fear much of the station effort momentum will be lost. With nine months to go, many will ignore the situation until July 30, 2012.

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Chriss Scherer | Editor

Radio
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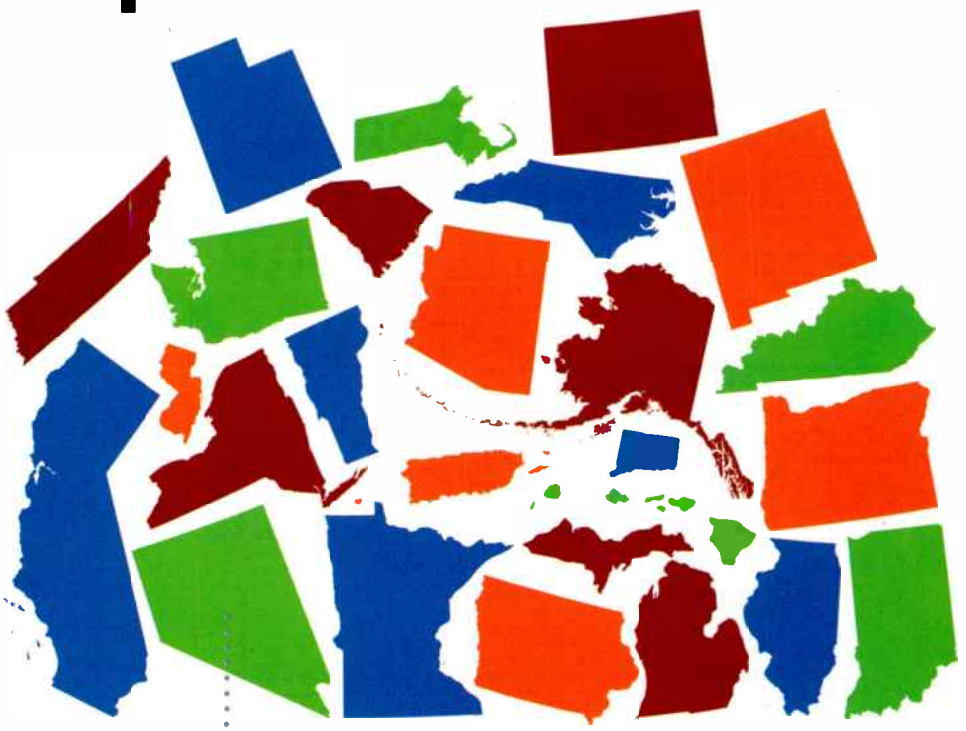
OSHA Compliance

by Kevin McNamara



These states and territories have approved State Plans: Alaska, Arizona, California, Connecticut, Hawaii, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Jersey, New Mexico, New York, North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virgin Islands (not pictured), Washington and Wyoming. The plans in Connecticut, Illinois, New Jersey, New York and the Virgin Islands cover public sector (state and local government) employment only.

The Occupational Safety and Health Administration (OSHA) was formed under the Department of Labor in 1970. The agency is tasked with regulating the safety and health of employees in the workplace. Many people find the regulations promulgated by OSHA to be excessive and expensive to enforce, but the fact remains, these regulations exist and are enforceable by fines and possible jail time. As part of the original OHSA Act, individual states and territories are encouraged to form their own program if desired, "states must set job safety and health standards at least as effective as comparable federal standards." In many cases the state standards exceed those specified by the federal regulations.

All typical broadcast stations have portions of the operation that could trigger potential OSHA or state scrutiny. Obviously stations with old facilities, particularly transmitter sites are the most likely areas, but even the newest facilities could have hidden issues. Here are a few areas of safety to consider.

ASBESTOS

Any construction activities that might disturb materials containing asbestos are prohibited under law. The materials must be sampled and identified by a certified person prior to working in the subject area. Typical asbestos containing materials could include: insulation, roofing materials, fireproofing, plaster, drywall compounds, floor and ceiling tiles, etc.

People involved with the removal of asbestos materials must be trained and comply with all OSHA, EPA and state regulations. The federal OSHA standard requires that personnel working with asbestos be trained, monitored for exposure and medically evaluated. Personal Protective Equipment (PPE) and engineering controls must be used in the removal process. There are also extensive requirements for the subsequent handling and disposal of asbestos containing material.

LOCKOUT TAGOUT (LOTO)

Making sure the power is de-energized from a cabinet you are working on seems obvious, but from my years in the business, that may not always be the case. Over the years, engineer fatalities and injuries have occurred when engineers were called to the transmitter site and tried to quickly fix something only to touch an energized component while grounded. LOTO takes this to a higher level, requiring a worker to physically lock and tag circuit breakers and disconnects to prevent another person from inadvertently turning it back on. Even the minimum OSHA requirement for LOTO requires this process as well as ensuring the discharge of any stored energy, such as that from a dc power supply.

CONFINED SPACES

Not as common in a broadcast facility but worth talking about is working in a confined space, which is characterized as a space large enough for a person to enter, but with limited egress. The space may also contain some form of hazard such and toxic gasses, electrical equipment, potential to fall or a mechanical hazard. Activities occurring in a confined space required a permit, which can be obtain upon proper showing that all conditions have been met for safe entry and that an emergency plan has been devised.

TOWER CLIMBING

According to Wireless Estimator (www.wirelessestimator.com) there have been five deaths so far in 2011 as a result of climbing communications towers. Two of the reported fatalities were the result of a rigging failure with a gin pole during the construction of a 500' broadcast tower in Indiana.

This is perhaps why tower climbing is ranked among the most dangerous jobs in the United States. OSHA addresses the issue of fall protection under OSHA Fall Protection Code 1910.66 App C, which outlines the compliance of fall protection requirements for climbers on communications towers and other structures. The American National Standards Institute (ANSI) has developed a more comprehensive standard that incorporates all of the requirements in the OSHA regulation and clearly defines issues generally not fully defined within OSHA law, such as hazard analysis, rescue plans, and anchorage requirements for fall restraint systems and work positioning systems. This is known as ANSI Z359.2 and is the generally accepted standard most tower climber training and safety programs utilize. All personnel climbing towers should be certified by a recognized certification organization such as NATE or Comtrain. Always ask to see proof of certification (typically called a climb card).

HEARING PROTECTION

Many on-air personalities have mild to severe hearing loss as a result of spending their shift with monitors and headphones cranked. OSHA specifies the maximum amount of sound exposure in CFR 1910.95.

According to the rule: When employees are subjected to sound exceeding those listed in Table G-16, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of Table G-16, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.

Duration per day (hours)	Sound level (in dB A weight, slow response)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

Table 1. Permissible noise exposure as per OSHA Table G-16. Exposure to impulsive or impact noise should not exceed 140dB peak SPL.

You can find the entire text of this OSHA regulation at http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9735.

It might make sense to measure the maximum sound levels from studio monitors and headphones, then lock-down the power amplifiers to the prescribed limits.

There are several more areas that are regulated by OSHA and/or your local state such as the use of personal protective equipment, non-ionizing radiation, exposure to computer monitors and hazard communication to name a few. There are several good evaluation tools that can be searched online to help identify your risks and put together a good workplace compliance program.

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

National EAS Test and CAP Compliance Extension

by Lee Petro

With one month left to go before the National EAS Test, the FCC and FEMA are in full-court press mode to get the word out and get broadcasters in position to make the test run as smoothly as possible. In addition, the Commission recently took the immediate pressure off broadcasters to implement the Common Alert Protocol (CAP).

First, FEMA and the FCC are holding a series of events in advance of Oct. 3, 2011, when they will release the final version of the Best Practices Guide for the National EAS Test. The first-ever initiation of a national EAS test will be held on Nov. 9, 2011, for three minutes. Subsequent to the test, the Commission is requiring all participants to submit a report by Dec. 24, 2011, which must include the following information:

- Whether they received the alert message during the designated test;
- Whether they retransmitted the alert;
- If they were not able to receive and/or transmit the alert, their "best effort" diagnostic analysis regarding the cause(s) for such failure;
- A description of station identification and level of designation (PEP, LP-1, etc.);
- The date and time of:
- Receipt of the EAN message by all stations;
- PEP station acknowledgement of receipt of the EAN message to FEMA;
- Initiation of actual broadcast of the Presidential message;
- Receipt of the EAT message by all stations; and
- Who they were monitoring at the time of the test, and the make and model number of the EAS equipment they utilized.

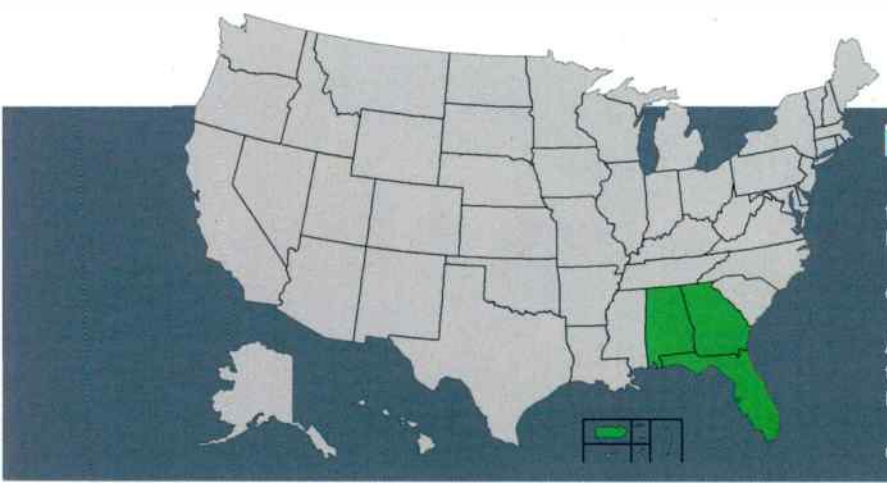
The Commission will not use the information against any participant in an enforcement action or other proceeding, but will be analyzing the information to determine the necessary steps to improve the process. At this point, the reports must be submitted on paper, but an electronic version of the report may be ready for use by the deadline.

Next, the Commission had set a Sept. 30, 2011, deadline for the installation of equipment that was capable of receiving and interpreting CAP-related messages. The standards had been adopted by FEMA in 2007, and the Commission previously granted two extensions of the deadline. However, the Commission released a Notice of Proposed Rulemaking that sought comment on a bevy of EAS-related questions. One matter raised was whether the Commission would require the certification of CAP-enabled devices before they could be marketed and sold. Thus it became clear that the Commission could not let the Sept. 30, 2011, EAS CAP deadline remain when its own procedures had yet to be adopted, let alone provide broadcasters sufficient time for implementation.

Therefore, with two weeks to spare, the Commission extended the deadline until June 30, 2012, a time by which the Commission believes it will have concluded the pending rulemaking, adopted certifications standards, if any, and provided sufficient time for the devices to be manufactured, tested, sold and installed. The Commission also issued a warning to those broadcasters that had purchased "intermediary devices" (think DTV Converter boxes for EAS) that such devices had not yet been approved by the Commission, and that these devices may not satisfy the final standards adopted by the Commission. In other words, don't toss the receipt yet.

It is clear that the FCC and FEMA are serious about testing EAS and upgrading the country's emergency messaging capabilities. It is likely that the end result from the National EAS Test and the completion of the pending rulemaking proceeding will lead to a substantial overhaul of the current EAS program, especially in light of the ability for new technologies to rapidly disseminate information. All broadcasters should review the Best Practices manual after it is released and take reasonable steps to prepare for the National EAS Test.

Petro is a member of Fletcher, Heald & Hildreth, PLC, Arlington, VA. Email: petro@fhhlaw.com.



DATELINE

October 16: Radio stations in Florida, Puerto Rico and Virgin Islands continue running License Renewal Post-Filing Announcements, continuing on Nov. 1 and Nov. 16.

October 16: Radio stations in Georgia and Alabama continue running License Renewal Pre-Filing Announcements on Oct. 16, Nov. 1, and Nov. 16.

December 1: Radio stations in Georgia and Alabama file License Renewal Application and EEO Program Report. Noncommercial radio stations also file their Biennial Ownership Report (FCC 323-E). Begin running License Renewal Post-Filing Announcements.

December 1: Commercial radio and television stations, including LPTV and Class A television stations, file Biennial Ownership Report (FCC Form 323).

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Going Mobile

The challenges of streaming audio to mobile devices and moving vehicles

By Doug Irwin, CPBE DRB AMD

This month we revisit the topic of streaming audio to mobile devices – with an emphasis on vehicles. What does it take to stream audio into a car "radio?"

Unlike over-the-air transmission (with a single standard of 75kHz deviation, and 75µs pre-emphasis), there are multiple ways to stream to mobile devices, and the data rate depends on the device's network. Table 1 provides some insight.

Phone type	Protocol	Codec	Data rate
iPhone	HTTP	MP4 (AAC)	64 or 40kb/s
Blackberry	HTTP	MP4 (AAC)	64 or 40kb/s
Android	RTSP	MP4 (AAC)	32kb/s
Flash encoder	RTMP	MP4 (AAC)	64 or 32kb/s

Table 1. Various data rates and protocols for mobile devices.

The bottom line is that you will have at least one and perhaps more computers generating streams targeted for the different platforms out there. More on that a little later.

With respect to a particular platform, you will work with an application developer in determining the protocol (such as HTTP or RTSP [or RTMP if using Adobe Flash]). You will chose the data rate likely in conjunction with the network provider and network type (i.e., UMTS or CDMA2000 [EV-DO]). You will chose the lossy codec (such as AAC) based on what you want the stream to sound like to the end user. Once you come up with those specifications, the app developer will build the app around those basic parameters. And speaking of applications developers, very few broadcasting companies have the wherewithal to have their own in-house; that's where a company such as Airkast comes in to the picture. Its product called TuneKast is specifically for broadcasters; think of it as a turnkey solution that

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Handheld Spectrum Analyzers (HSA)				
Key Specs	N9344C	N9343C	N9342C	N9340B
Frequency	1 MHz - 20 GHz	1 MHz - 13.6 GHz	100 kHz - 7 GHz	100 kHz - 3 GHz
DANL	-155 dBm/Hz	-155 dBm/Hz	-164 dBm/Hz	-164 dBm/Hz
Sweep time	< 0.9 s	< 0.7 s	< 0.4 s	< 0.1 s
Weight with battery	3.6 kg (7.9 lbs)	3.6 kg (7.9 lbs)	3.6 kg (7.9 lbs)	3.5 kg (7.7 lbs)

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encompasses necessary applications, trafficked ad-insertion, title and artist displays, and finally distribution via CDN.

StreamOn is another provider of streaming services. It provides a small appliance (running on Unix) to the radio station that encodes the audio in AAC+, Ogg Vorbis and in some cases MP3. This appliance then sends the stream outbound for subsequent distribution to end users. If the radio station provides the appropriate metadata, then the StreamOn player will show title and artist information. StreamOn can also build custom iPhone apps, or integrate with existing third-party apps. Perhaps most importantly, StreamOn offers Ad Tools, which is a way to generate revenue from the streaming content.

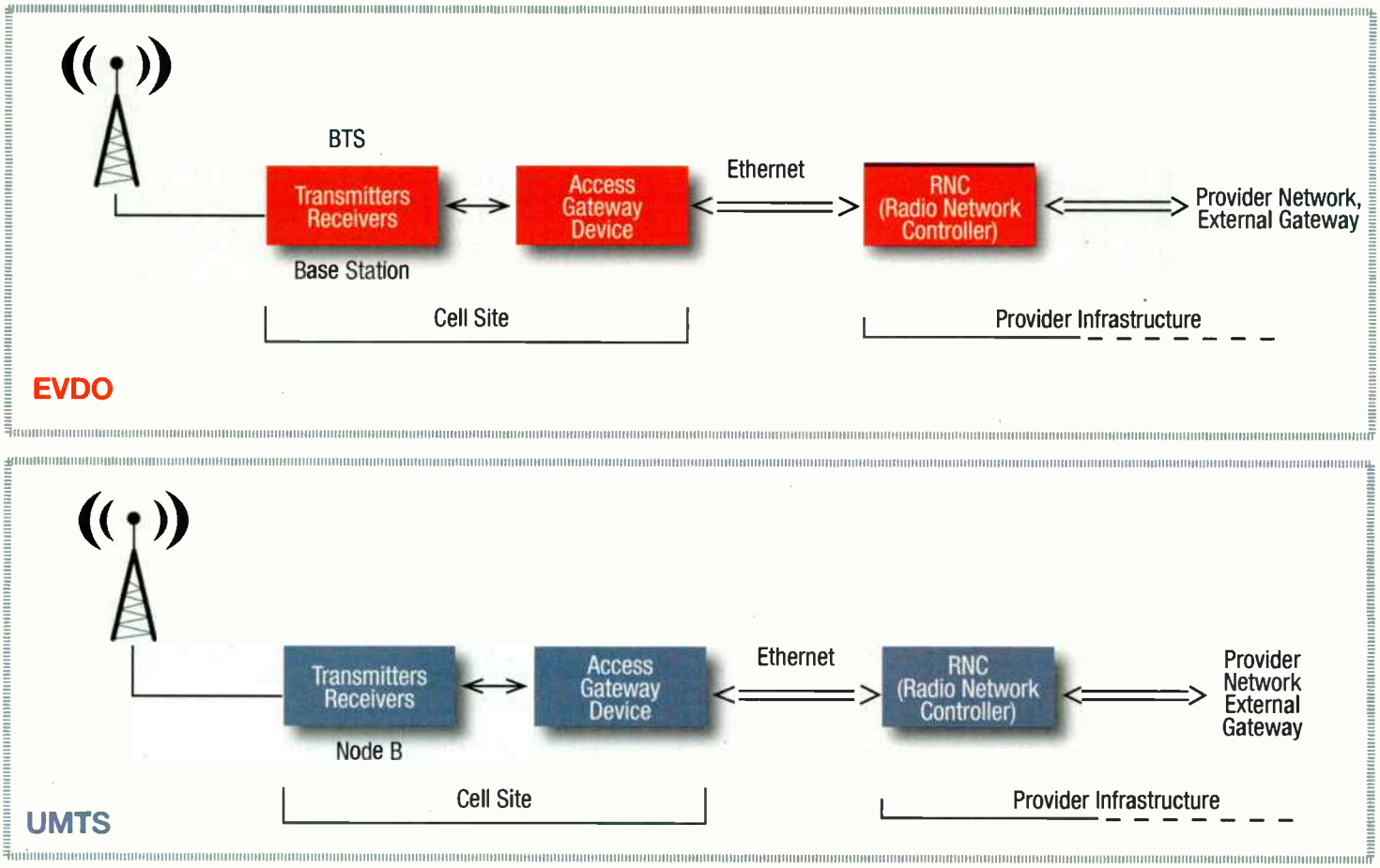
Liquid Compass also offers custom apps for mobile phones in addition to their support of desktop players. Some of the features it offers: now-playing (of course); social media integration; on-demand access to local weather and news; and finally a favorites repository for the end user, along with music history. Naturally, it offers a means by which ad-insertion can be done as well through a partnership with AdsWizz.

INSERTING ADS

Ad-insertion technology is the subject of its own article, and we covered it in "Streaming Audio Ad Insertion" in the September 2010 issue of *Radio* magazine. However you decide to accomplish that, there will be a point in your content delivery chain that you'll need to get audio into a CPU for generation of said streams. Clearly you'll need a sound-card, and likely some audio processing optimized for lossy codecs. Most likely you'll want to send along metadata as well – at the very least "now playing" information.

One possible choice for those functions is the Orban Opticodec. The Opticodec can be used to generate streams using HTTP, RTP or RTSP, compatible with Winamp/Shoutcast/Icecast, using MP4/AAC or HE-AAC for the lossy codec. Multiple streams can be generated simultaneously on one CPU, and the number of (unicast) streams depends upon the CPU power. I should note also that the Opticodec comes coupled with the Orban PC1101, which not only plays the role of sound card, but audio processor (among other things). You can enter your metadata into the Opticodec by means of a text file, serial connection or Ethernet.

Another option is the Telos ProStream. This is a 1RU device that takes audio in (via Livewire, analog or optionally AES) and generates an MP3 stream, an MPEG-AAC stream or a Wowza stream. On-board audio processing was developed by Omnia. The device has several outputs: one for processed, un-encoded audio, and one with



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processed, coded audio. It has two Ethernet connections: One is meant for local network connections (including metadata) and the other for the WAN/streaming out. The unit is controlled via a Web browser, though it has front-panel controls in addition.

AudioTX offers Webstream, a 1RU encoder that can play the role of stream generator. This device can encode up to six streams with different format/bitrate combinations. Two of the lossy codecs available are HE-AAC and MP4/AAC; and it's Winamp/Shoutcast/Icecast capable. Metadata access is via RS-232 or an IP text-based interface. According to AudioTX, you can locate the Webstream at your ISP and stream up to 25,000 users.

It is vitally important to make use of and optimize every means at our disposal so that listeners can get our content in the way they prefer, whether that is via terrestrial radio or via streaming over the Internet.

If you were to use your own streaming encoder barefoot you would certainly need some sort of outboard audio processing; in that case you might want to consider the Vorsis VP8+ from Wheatstone. It has two processing modes optimized for lossy-codecs used in streaming: MP3/AAC greater-than 48kb/s and MP3/AAC less-than 48kb/s. It's a single rack-unit, with analog and AES inputs, and it's configured via the front-panel or via a computer, using a windows-based GUI.

ACCESSIBILITY

Once the stream is generated it's clearly very important to make it easily accessible to all the end-users. You could plant a server yourself at an ISP, and make use of the ISP's high-speed connection and peering with other ISPs, but that isn't typically how it's done. In order to provide the best user-experience, you need to minimize the number of hops the stream must transit on its way to the user. Let me explain why.

The public Internet is basically made up of connections between

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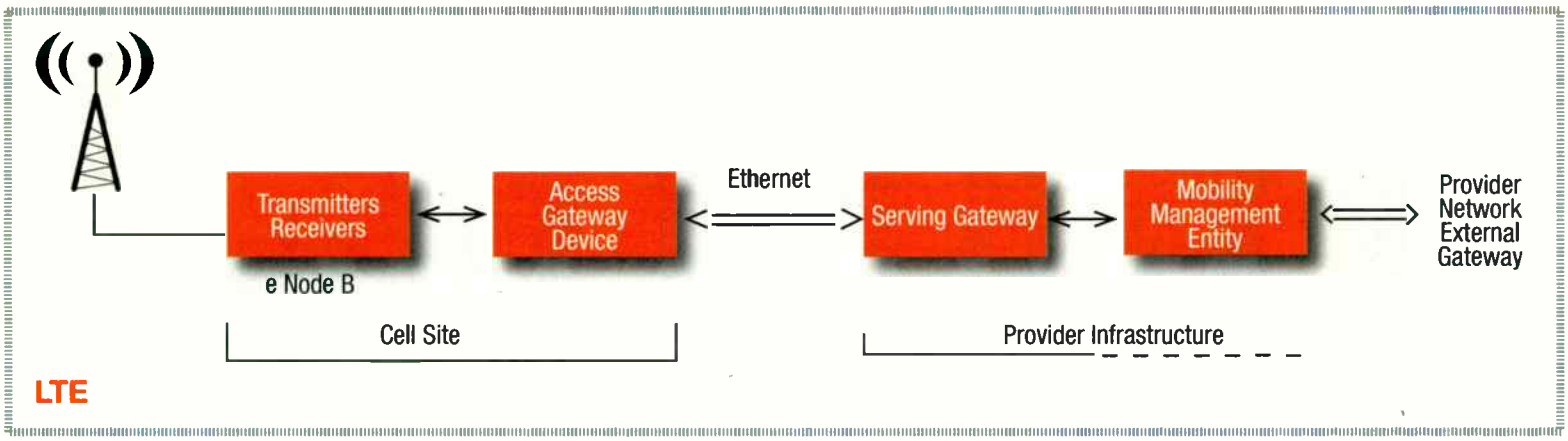


ISPs (and other large users). These connections are made between larger routers – or peers – at many, many locations. In certain circumstances there may be multiple routes between organizations and ISPs; some connections may be done via load-sharing, meaning that packet streams are broken up, and literally routed over more than one route between points A and Z.

Streaming such as we are talking about uses UDP – the best effort methodology in IP communications. Packet sequences are numbered, so that at the far end they can be re-assembled in the right order. A couple things can happen along the way for these packets as they transit the Internet. For one thing, it takes a finite amount of time to make the trip, and transiting more hops extends the time. Secondly,

in the event that the packets are sent along different routes (load sharing) they may arrive at the far end way out of order. Of course the decoder at the far end uses a buffer stage to give itself a little time to re-organize packets that come in out of order, but it cannot make up for packets that are simply lost and never make it. More hops increase the chances of lost packets; too many lost packets means a noticeable drop-out in the audio. No user likes that of course.

One way to overcome these issues is to make use of a content delivery network (CDN). CDNs make use of private connections (often spread out over the entire globe) so that they can provide a much greater level of control in how the packets get from point A to a point very near the end-user. This to a very great extent mitigates the packet loss and/or delay issues just described. Plus, it's a very practical way to serve thousands upon thousands of end users, something that is hardly practical for radio station to do (via IP anyway). A few of the more well-known CDNs are Akamai, Limelight, Level 3and CDNetworks.

Now let's look at streaming to mobile devices in greater detail. We have a stream of packets that originate at your studio location, and find themselves peered from a CDN in to the IP network of one of the large cell phone providers, such as AT&T, Verizon or Sprint. They're just about ready to make that last-mile journey to a listener's smartphone. Verizon and Sprint use EVDO, and AT&T uses UMTS. In either case, the backend of the network is built to handle IP traffic. The way this is done has changed as well; in the days of 2G and even for 3G, many base stations were connected back to the base station controllers via T1s. Today that isn't really fast enough. The cell companies are building new IP-based backhauls to accommodate more and more users with more and more smartphones.

Even though the terminology is slightly different from system to system, they each use three common devices. First, and what's most familiar to us, is the base station. This is the last mile link done via radio. The base stations find themselves under a radio network controller, which performs several different functions, not least of which is instructing the base stations to hand-off the phone from one cell to the next as required. (For LTE, we have two devices: the serving gateway, and the mobility management entity.) Finally the data itself is connected to and from the IP network by way of a gateway. Routing of that data all the way back to the peering connection is what gets us back to the CDN (or perhaps the public Internet).

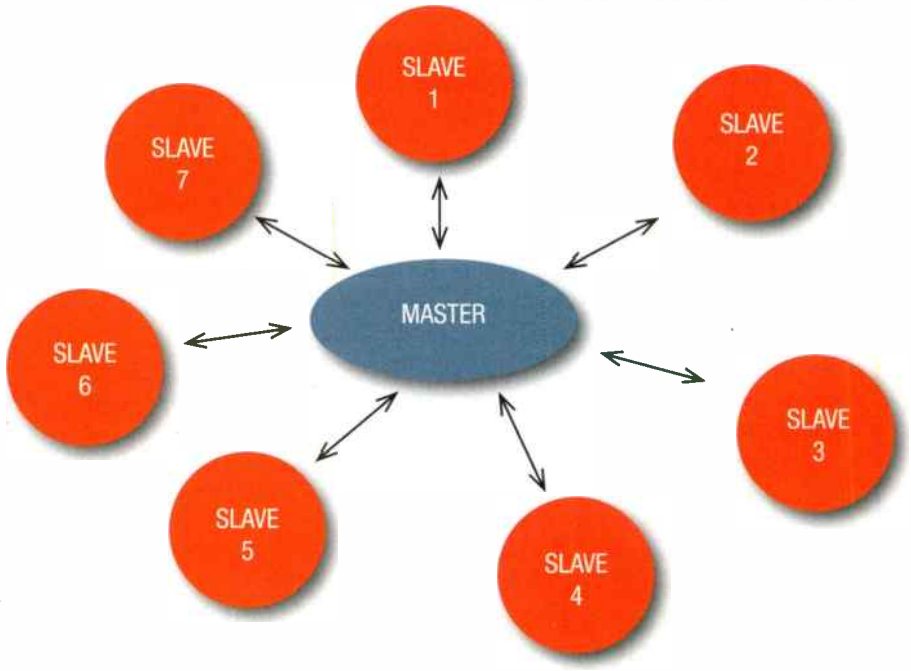
When the data itself makes its way to your smartphone, you could of course listen to the tiny built-in speaker, ear-buds or a headset. To make the connection to your car's audio system you could simply make a short cable connection, by way of a mini-stereo jack on the radio itself, or an adaptor of some sort (such as an FM modulator). But let's go with

the most up-to-date way: Bluetooth. Many vehicle audio systems now come with Bluetooth as a means of connection to other devices. Bluetooth isn't really new (it was developed back in the mid-1990s) but it clearly has a lot of marketing presence now.

Bluetooth is simply a technology used to make a small ad-hoc network (known more regularly as a piconet) that can consist of up to eight devices. The devices communicate via frequency-hopping spread-spectrum in the 2.4GHz ISM band. One of the devices operates as the master, and the others are slaves. The master synchronizes the system, addressing each slave in turn, in a round-robin fashion. With a transmit power of 0dBm, the range is expected to be less than 15'; data throughput is on the order of 2Mb/s.

To complete the connection, it's necessary that the car audio system and smartphone have A2DP (Advanced Audio Distribution Profile) capability. A2DP is a Bluetooth profile that allows for streaming stereo audio between devices that are members of the piconet. Makers of car audio systems that support A2DP include the well-known brands Pioneer, JVC, Sony, Alpine and several others.

Ad-hoc Bluetooth network



Communication via round-robin FHSS 2-4 GHz ISM band

AM/FM VS. STREAMING AUDIO TO A VEHICLE

So now that we see what is involved in getting streaming audio into a vehicle, here's a short comparison of the steps involved with respect to each technology.

For AM or FM:

> Generation of program audio
> Relaying program audio to transmitter site
> RF signal generated, radiated
> RF signal received by car stereo, demodulated, played out to user

FOR STREAMING AUDIO:

> Generation of program audio
> Generation of stream (or streams) by computer-hosted codec
> Relaying of stream to CDN by means of IP network
> CDN peering to major wireless provider
> IP connection from peering location to base station, as directed by base station controller
> RF signal generated, radiated
> RF signal received, data decoded
> Decoded data used by A2DP over Bluetooth connection to car stereo
> Data taken from A2DP stream, decoded, played out to user

While it's clear that the technology to stream audio to a moving vehicle exists, it seems pretty clear that there is much more to it than there is in getting plain old radio into a vehicle. As the technology moves forward, and more applications become available for vehicles, more data throughput will become necessary, and from plain old economics (the law of supply and demand) it seems obvious the cost of streaming will go from zero to some (at least) modest amount. This will become a headwind for the increasing acceptance of streaming audio in-vehicle; some people will pay, and not care; others will be more frugal. It will also be quite some time before enough new vehicles with Internet access and/or Bluetooth capability make their way to end users for this transmission means to have a substantial impact; car sales are certainly not what they were prior to the recession. Older vehicles with old-fashioned radios are going to be on the road longer due to the economic situation.

With all that said, I still believe it is vitally important to make use of and optimize every means at our disposal so that listeners can get our content in the way they prefer, whether that is via terrestrial radio or via streaming over the Internet. 0

Irwin is transmission systems supervisor for Clear Channel NYC and chief engineer of WKTU, New York. Contact him at doug@dougirwin.net.

From the Ground Up

Canadian Magic 96.7 signs on in Peterborough, and makes the move to digital

By Shawn Smith

Master control room

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Want to know more about the author of this article? Read more about Shawn Smith online at RadioMagOnline.com

On June 8, 2011, Pineridge Broadcasting launched CJWV, Magic 96.7 in Peterborough, ON, operating at 96.7MHz at a maximum ERP of 7kW. CJWV is a brand new license and a third FM station for Pineridge, which operates Star 93.3 and 107.9 The Breeze in nearby Cobourg.

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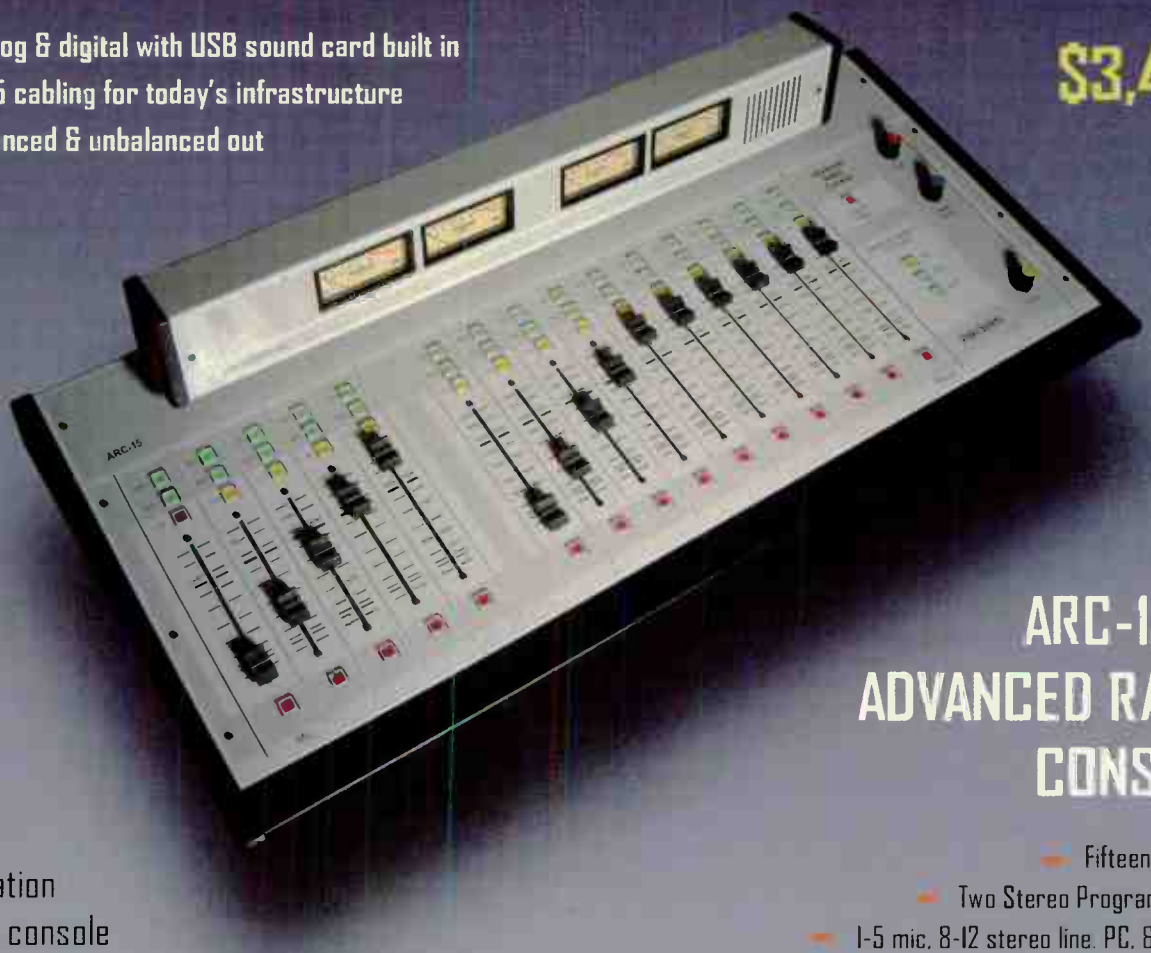

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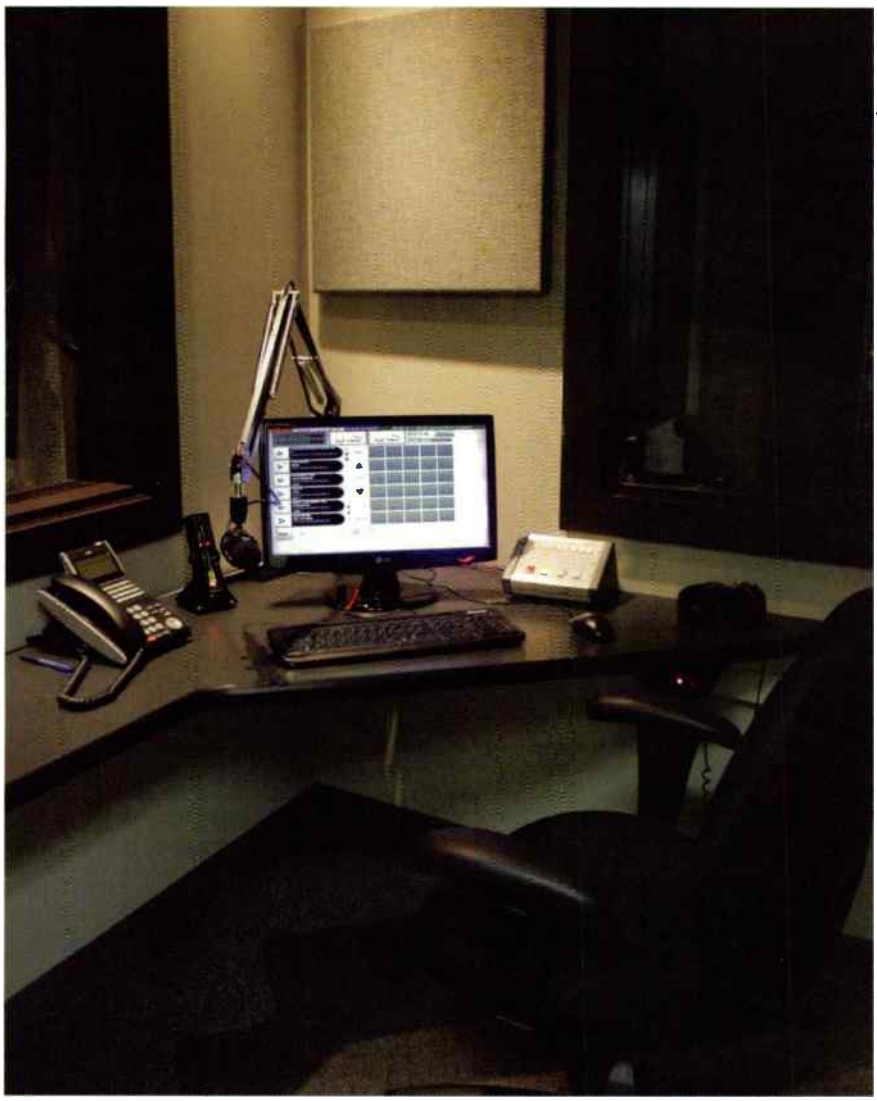


Voice Booth

Launching Magic 96.7 required a complete studio and transmitter build from the ground up. The studios, including office space are located in Peterborough Square, right in the heart of downtown Peterborough. The transmitter facilities are co-located at Corus Entertainment's CHEX-TV tower, situated 4km northeast of the studio location providing superb coverage of Peterborough and the surrounding area.

Once Trevelyan Architect completed design drawings, John Kraetzer of Beavermead Construction was brought in to complete the construction of the new studios and office space. Richard Sondermeyer of GS Broadcast Technical Services Ltd. installed and commissioned the studios. Siegi Purkott of Homeworthy Products built and installed custom millwork in the studios. I was Pineridge/Durham Radio's project manager for the build, overseeing design, construction and installation of the studios, offices and transmitter systems.

One of the first questions faced when designing a new facility was whether to install analog audio systems that we have been using for years or make the leap to a digital IP-based system. The system had to be easy for the staff to use, extremely reliable and supported well by the manufacturer. After a great deal of research we felt that digital IP systems had matured enough over the last few years, and are so feature rich that it was time to go digital, and specifically Wheatstone's Wheatnet IP system. It has become the heart of the audio system and proven to be as tough and reliable as any quality analog system. On the few occasions we have needed support, Kelly Parker and his team at Wheatstone have provided exceptional service. The automation system

Production

Production Room B

chosen for CJWV is Scott Studios to match the Cobourg operation and to easily share files and facilitate remote voicetracking.

AROUND THE STATION

The studios consist of a master control room, newsroom, production studio, voice booth, and engineering room. At the center of the master control room (MCR) is a Wheatstone Evolution E6 console with 12 faders in a 16-channel frame. Using the programmable buttons the operator can reconfigure the E6 console for the specific needs of the morning, midday, drive shows or voicetracking with a single button press. There are three monitors above the console: to the left is the SS32v5 playout

system; the center monitor is connected to the E6, which displays audio meters and allows for configuration; and the monitor on the right is for an Internet/production system, which can be used for voicetracking, show prep, recording and editing of phone calls, etc. A Telos Desktop Director routes phone calls from the Telos NX6 through to the E6.

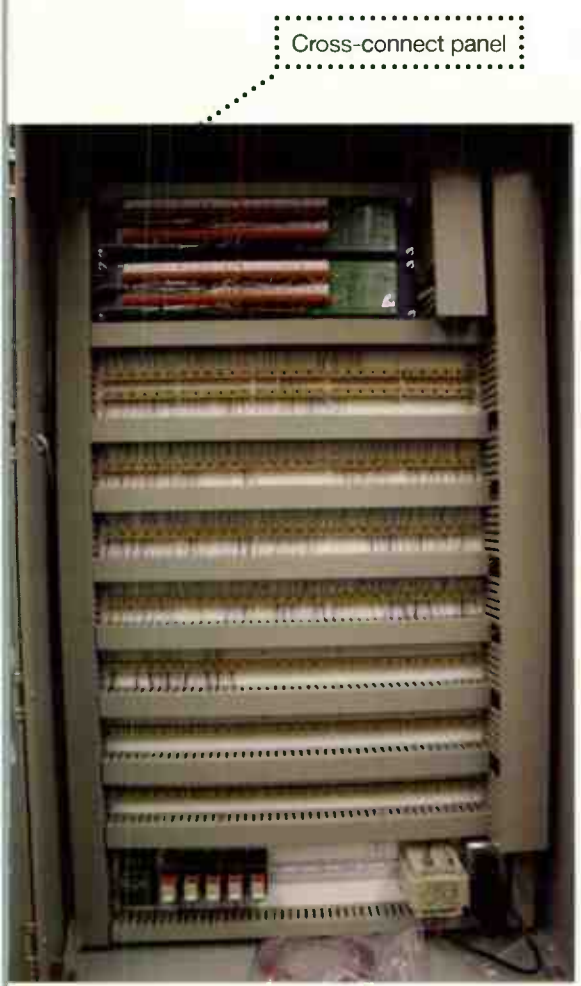
There are three microphones in MCR, one for the host/operator, one for the co-host and the third for a guest. Wheatstone GP-4S mic on/off/cough/talkback panels mounted in custom turrets give the co-host and guest control of their respective microphones. The co-host position is also equipped with an Internet computer workstation.

To the host's right is the newsroom, complete with two edit stations that are both capable of producing news elements and going to air. In lieu of a traditional news mixer, Wheatstone SBC-4F four-channel sideboards were installed. While normally selected to sources within the newsroom each fader on the

Engineering racks

Sideboard is capable of bringing up anything connected to the Wheatnet IP system. Burli Newsroom System software facilitates writing and recording of news stories and interviews and allows easy collaboration between the newsrooms in Cobourg and Peterborough.

To the host's left is the voice booth. The voice booth was designed to work with MCR, the production studio or in stand-alone mode for voicetracking. A Wheatstone GP-8 control panel, complete with custom scripts, allows the vocal booth operator to select one of the three modes. When MCR mode is selected, the microphone, talkback and headphone feeds are routed to MCR. When Prod is selected, the microphone, talkback and headphone feeds are removed from MCR and routed to the Production studio. When Voicetrack is selected, the microphone and headphone feeds are removed from both studios and routed to the voicetracker workstation via utility mixers in the Wheatstone Blades. Talkback is disabled.



Newsroom

The production studio is equipped with a Wheatstone Evolution E1 console, which can be switched to air in the event MCR is offline. Adobe Audition CS5.5 was chosen as the audio editing software for production.

BEHIND THE SCENES

Engineering is home to the bulk of the broadcast equipment, network switches and office servers. It has a dedicated HVAC unit to keep the temperature at a constant 74 degrees year round. All of the workstations used in the studios are here, connected to their

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FACILITY FOCUS

Wheatstone SideBoard

Wheatstone's SideBoard ultra-compact control surface is an ideal alternative to standalone "news mixers." Available in four- and eight-fader versions, SideBoard acts as a controller for the eight-channel stereo utility mixers built into each WheatNet-IP Blade. Each channel features a fader with channel on/off switch, program and audition bus assign buttons, a Set button for configuration of the channel, a source name display, and a programmable button. In the master section are six programmable buttons, a rotary source selector and display, a headphone jack with built-in amplifier and volume control, and a stereo bargraph meter.

"Each Blade provides two mixers, each of which can be controlled by its own SideBoard," says Canadian dealer Ron Paley (866-460-3119, www.ronpaleybroadcast.com). "This greatly simplified the newsroom portion of the project."

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EQUIPMENT LIST

Adobe Audition CS5.5
APT Horizon
Beavermead Construction
Burli Newsroom System
Davicom Mac 208, Mac 216
GS Broadcast Technical Services
Homeworthy Products furniture
Junger Levelmagic LT
Nautel VS 2.5
Omnia 6EX, Omnia 1
Scott Studios SS32v5
Telos Desktop Director, NX6
Trevelyan Architect
Wheatstone Wheatnet IP, Evolution E6, Evolution E1, SBC-4F

respective studios by KVM extenders. A workstation loaded with Wheatstone's Navigator software is used for configuration and backup of the Wheatnet IP system. A Davicom Mac 208 monitors program and off-air feeds, room temperature, power, etc. and reports alarms to technical staff via email and phone. It can also be used to switch studios, or put the play out system directly to air. Switching sources to air can also be triggered from a pushbutton panel by staff on site.

AGC level control of program audio is provided by Junger Levelmagic LT processors. The studios are linked to the transmitter site by a dedicated Ethernet point-to-point T1 circuit. Program audio moves from the AGC stage across the T1 via redundant APT Horizon audio codecs. Once at the transmitter site audio is processed primarily by an Omnia 6EX, backed up by an Omnia 1. The T1 also allows technical staff to take control of equipment at the transmitter site from the studios.

A pair of Nautel VS 2.5 transmitters in a main/standby configuration produce the 1.85kW required to transmit 7kW max ERP. The control system was designed and programmed by independent contractor John McCloy and uses a Davicom Mac 216 to monitor and remotely control all systems at the transmitter site. It will automatically change transmitters or STLs/processors in the event of a failure and report alarms to engineering staff by email and phone.

Since the launch, Magic 96.7 has been well received by listeners in Peterborough. As with every new build there have been minor technical issues to work through, but overall systems have performed quite well. Charlie Toner and I provide technical support to CJWV and the Cobourg stations on an ongoing basis.

Smith is technical manager of Pineridge Broadcasting, Peterborough, ON.
All Photos by Shane Macaulay

IBOC Mask Compliance

BY GREG BEST, PE

A hybrid signal has challenges, but one method simplifies the process.

Measurement of your transmitter's hybrid FM IBOC mask for emission mask compliance is not a monumental task but requires some strategy and attention to a few key parameters. This article will walk through the process and identify those key parameters and give examples of steps throughout the process so the mystery is removed. With more than 1,600 FM hybrid IBOC stations on the air and 207 operating above the nominal –20dB power level, emission mask compliance measurements will become more important.

As a primer, it's important to have some understanding of how a spectrum analyzer (SA) measures digital signals. So a small amount of introduction will first be devoted to this. First, let's show the spectrum to be measured. Figure 1 shows a hybrid FM IBOC spectrum with no modulation on the analog signal.

The analog carrier signal level is a coherent carrier (bandwidth ~100Hz) so its displayed amplitude is not dependent on the resolution bandwidth used. However, as the SA sweeps through the IBOC signal, the amount of IBOC signal energy displayed is dependent upon the resolution bandwidth filter employed because the IBOC signal is essentially noise-like. This can be seen in Figure 1, as the blue trace uses a 1kHz RBW filter and the black trace utilizes a 3kHz resolution bandwidth (RBW) filter. It looks like the IBOC signal with the 3kHz RBW filter has a greater

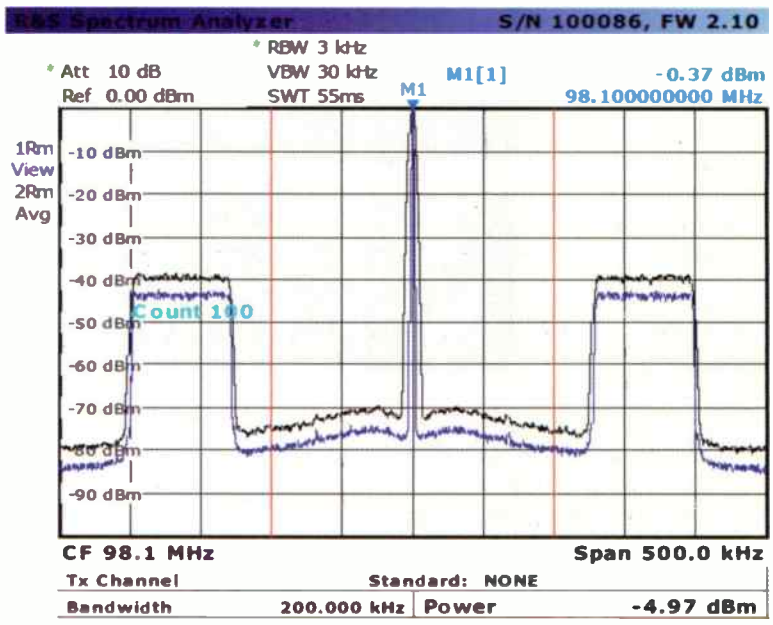

Figure 1. FM hybrid IBOC signal without modulation

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So, it's time to upgrade your studio. Hey, let's be real - it's way past time. You knew those analog consoles were only good for 10 years when you bought them... 15 years ago. They need resuscitation so often, you keep a defibrillator in your tool kit.

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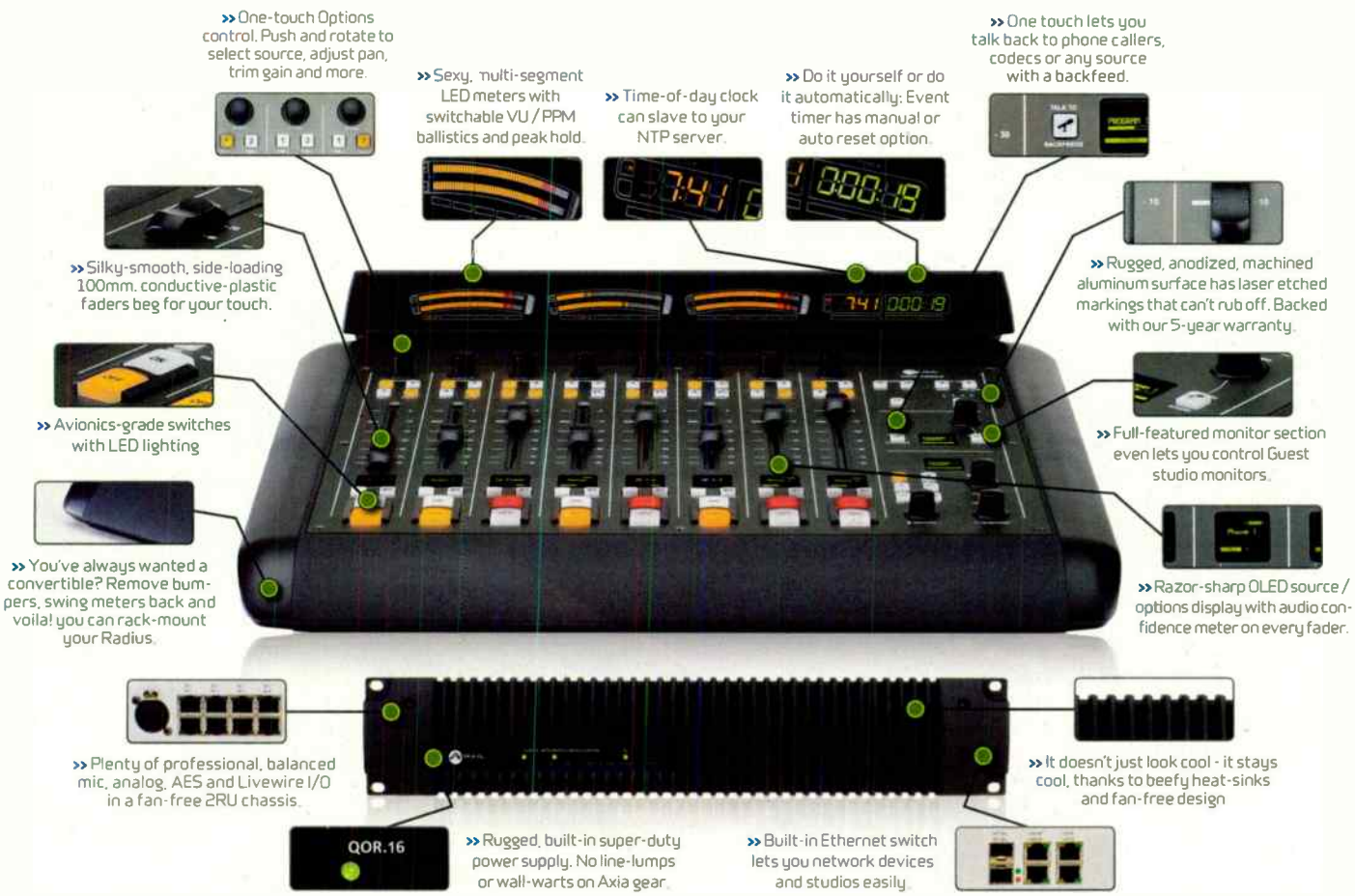

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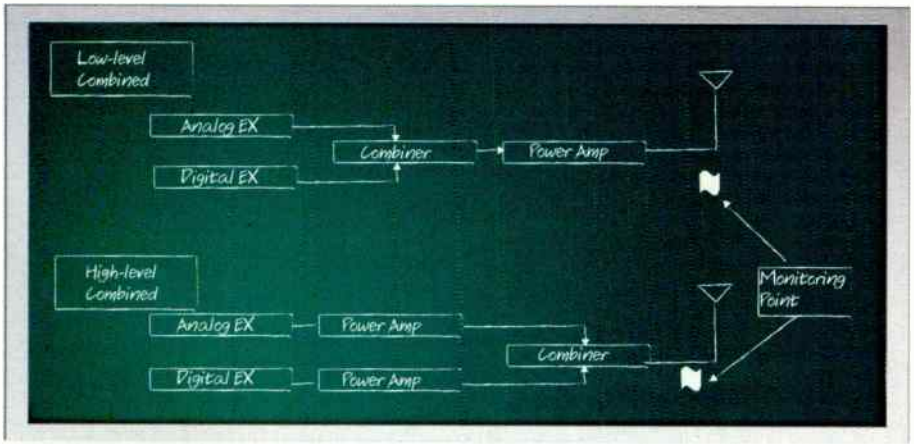

Figure 2. Combined transmitter configurations

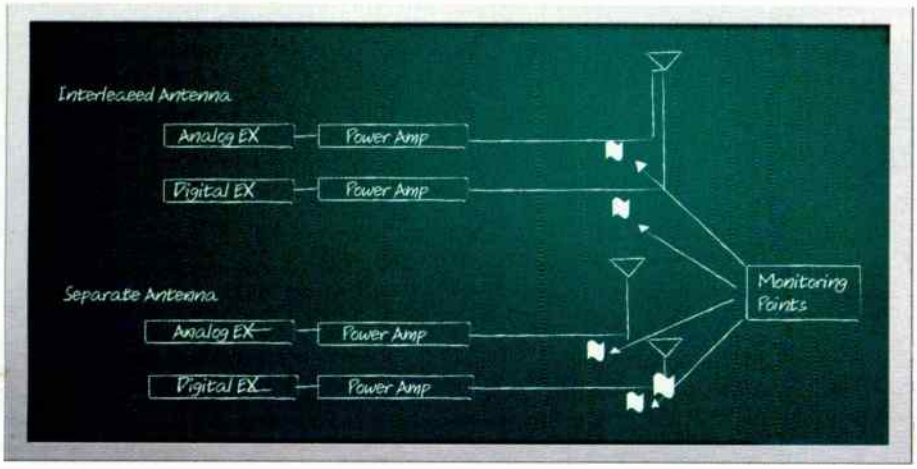

Figure 3. Separate transmitter configurations

amplitude. Notice also that the noise floor of the SA has also risen due to the same reason. To determine the total power of the IBOC spectrum being evaluated, simply multiply the ratio of the total bandwidth of the spectrum to the RBW being used for display on the analyzer. For example, the power of the lower sideband signal of ~70kHz spectrum of the IBOC signal is 70 times the power of the power displayed using the 1kHz RBW filter (or +18.45dB).

There are a couple of other important factors associated with the SA setup. One is the type of detector selected. Most newer SAs have an RMS detector and this is the detector mode that should be used. If an older SA with a logarithmic detector is used, there will be a 2.5dB error introduced that must be accounted for. The video bandwidth (VBW) filter should be at least 10 times the RBW filter selected so that peaks in the baseband signal are accurately reproduced. If the SA has a channel power (CP) mode function, it enables relatively easy measurements to determine the power of the signal in a given bandwidth, which is a fundamental part of making emission mask compliance measurements. So, a word to the wise, use an SA that has both a RMS detector and a CP function and you will get reliable numbers and will not waste a lot of time.

IBOC BASICS

Hybrid IBOC transmitters either combine the analog and IBOC signal at some level and apply them to the antenna (called a combined configuration shown in Figure 2) or the analog and digital transmitter signals are applied separately to an antenna (called a separate configuration shown in Figure 3). Whichever configuration you operate will determine the steps necessary to measure compliance with emission masks.

There are two emission masks that are important to check for compliance: The FCC emission mask and the NRSC emission mask.

The FCC emission mask is defined in FCC Rule 73.317 and deals with the analog waveform. This article will focus on the NRSC emission mask. The NRSC emission mask definition and other important documents can be found at the NRSC website (www.nrscstandards.org). NRSC-G201-A, An RF Mask Compliance Measurement Methods and Practice document was published in April 2010, providing guidance on how to demonstrate compliance. There are many ways to make compliance measurements and the benefit of the NRSC-G201-A document is that it simplifies the process,

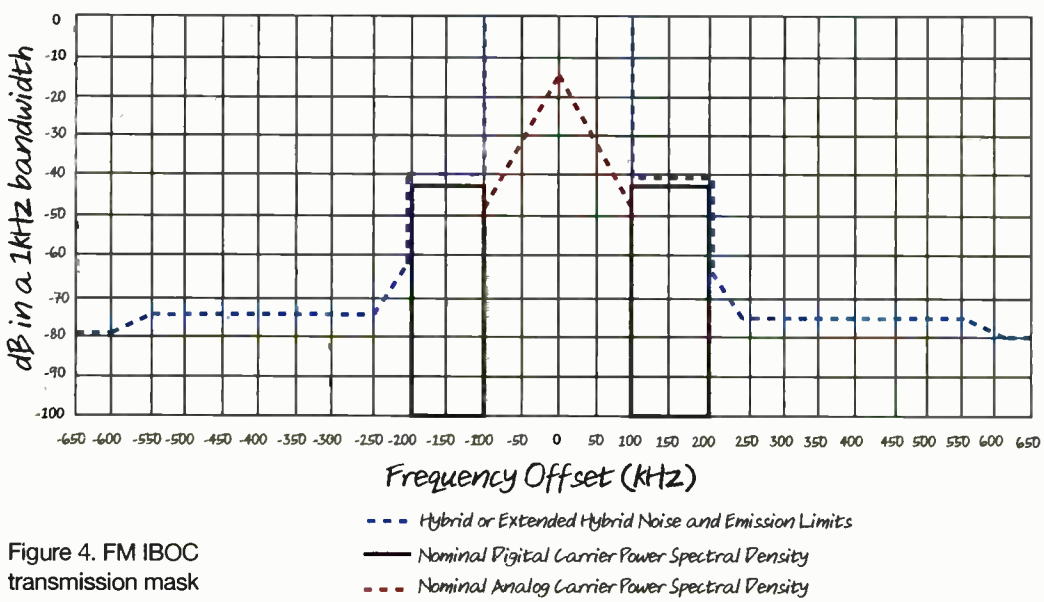

Figure 4. FM IBOC transmission mask

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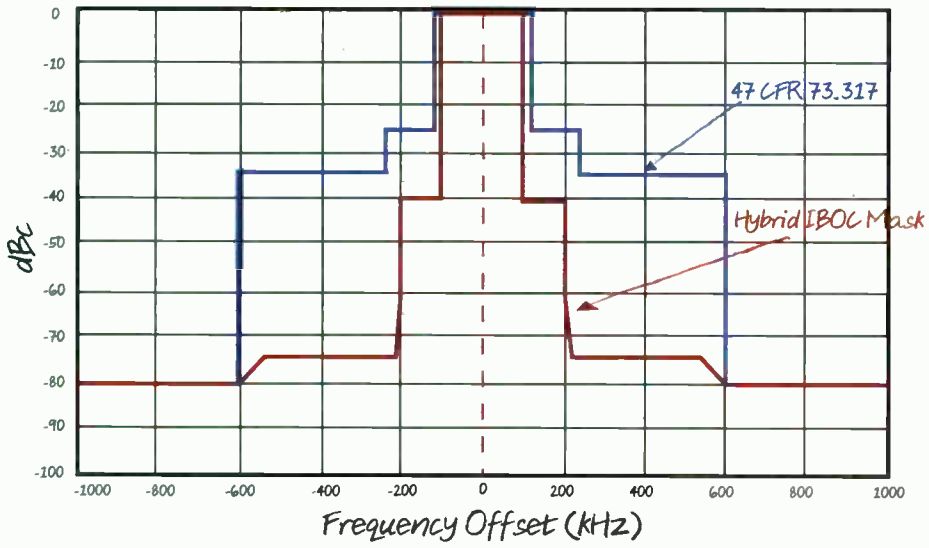

Figure 5. Comparison of FM hybrid mask and FCC mask

MEASUREMENT METHOD

If you look back at the separate transmitter configuration in Figure 3, there is no place to monitor the combined signal, only the independent analog and IBOC signals. So what happens if you happen to be one of the lucky people using separate transmitters? Necessity is the mother of invention, and a simple but great idea was introduced: By utilizing a Combined Hybrid IBOC Measurement Package, known as the CHIMP, it essentially makes a combined transmitter measurement possible even though separate transmitters are used. As shown in Figure 7, a directional coupler sample from each transmitter with attenuation to isolate the signals from each other and to ensure the proper ratio is used. Those signals are fed to a 3dB hybrid and the output result is the FM IBOC hybrid signal. This allows accurate measurements that can be made as if a

makes it easier to understand, and reduces the amount of time and measurement points for reliable compliance measurements.

Figure 4 (previous page) shows the FM IBOC NRSC mask and Figure 5 shows the comparison, at least in a graphical way, to the FCC emission mask. The documents associated with both masks are important to read and understand before doing the compliance measurements. Table 1 provides the NRSC emission mask limits expressed in dBc/kHz values.

Frequency offset relative to carrier (kHz)	Level relative to unmodulated carrier (dBc/kHz)
100 – 200	–40
200 – 250	–61.4 – ((freq. in kHz) – 200) × 0.260
250 – 540	-74.4
540 – 600	–74.4 – ((freq. in kHz) – 540) × 0.293
> 600	–80

Table 1. NRSC-5-B hybrid FM IBOC waveform noise and emission limits.

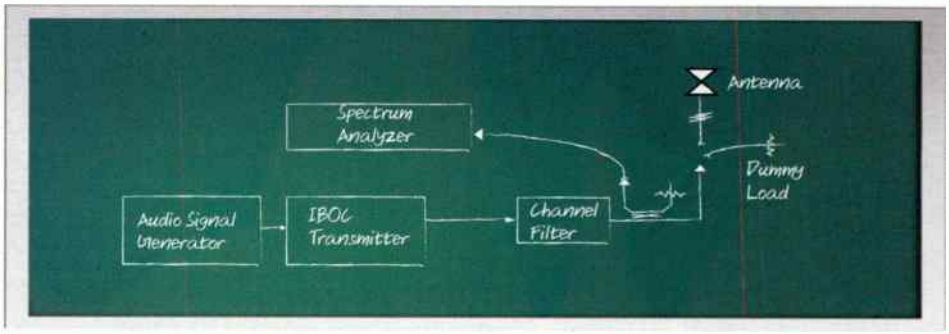

Figure 6. Measurement setup for combined transmitter operation

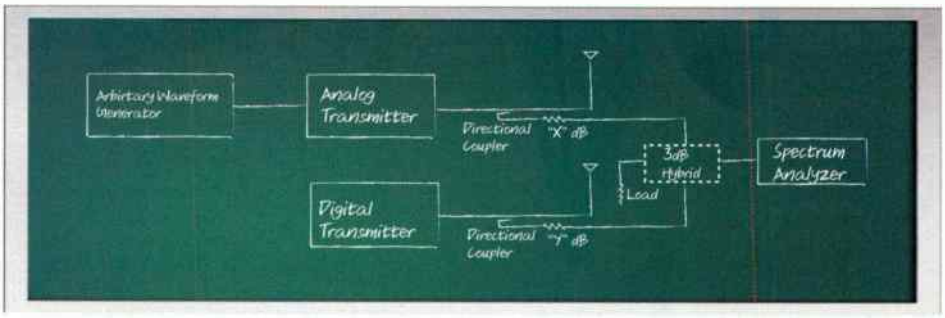

Figure 7. Measurement setup for separate transmitter configuration

The basic transmission system and setup of an emission mask measurement task is shown in Figure 6. For discussion, first assume a combined configuration is used. The hybrid IBOC signal is sampled using a directional coupler after all transmitter filtering to observe the signal. As seen by the diagram, measurements can be made into dummy load or the antenna. In general more reliable measurements are made into a dummy load.

combined transmitter were used. The separate transmitter measurement configuration using a CHIMP is shown in Figure 7.

When the indicated measurement points are used and if there is not enough isolation between the transmitters in a separate transmitter configuration, or if the combined signal transmitter is not linear enough, you will see the unwanted signals products on the SA display. In reality, there is always *some* undesired energy there but the real question is whether that undesired energy is below the power limits identified by

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the emission mask. Because of modulation of the analog signal, the unwanted signals are further spread out in frequency.

A real spectrum with analog modulation and undesired signals is shown in Figure 8. When this spectrum is observed, it can be due to one of two sources: Either the SA is being overdriven and causing the distortion or the distortion is really there and the transmitter is at fault. Here again, it is important to know how much total energy is being fed to the SA because you cannot determine that just by looking at the amplitude on the display.

Unless your measurement is near the SA noise floor, you can determine whether the analyzer is being overloaded by adding 5 or 10dB of additional attenuation. If the signal amplitudes relative to each other do not change when the attenuation is changed then the problem is with the transmitter.

Assuming this is not a problem, the steps to determine compliance with the emission mask are straightforward.

Connect the transmitter(s) to a dummy load and accurately measure analog power and digital power. If it is a combined transmitter, you will have to use the spectrum analyzer to ensure the digital power is correct. (Remember to set the analog power reference on the SA with no modulation on it.)

> Ensure analog to digital power ratio is correct and apply analog modulation

> Optimize transmitter linearity if required and recheck power ratio.

> Define the measurement points and bandwidths for the NRSC mask

> Record data at each point using 1kHz RBW and SA channel power mode.

> Apply any correction factors for bandwidth necessary.

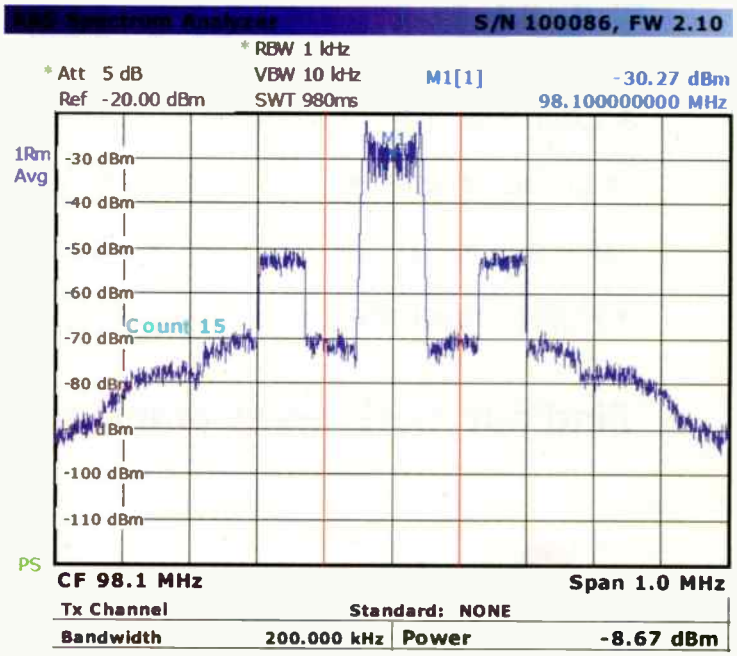

Figure 8. Combined IBOC and modulated analog signal with undesired energy.

> Compare emission measurements to the NRSC emission mask.

Table 2 shows an example of an NRSC emission mask spreadsheet with measured results. Where did those numbers come from? The

NRSC EMISSION MASK COMPLIANCE TEST

Channel Power (dBm)	0.0
Center Frequency (MHz)	98.1

Spectrum Analyzer 1kHz RBW Noise Floor (dBm)	–101.0
Noise Floor Proximity Upper Threshold (dBm)	–91.0
Noise Floor Proximity Lower Threshold (dBm)	–98.0
Minimum RF Sample Level (dBm)	–21.0

Delta Frequency (MHz)	Frequency (MHz)	Measurement BW (kHz)	Measured Amplitude (dBm)	Bandwidth Corrected Amplitude (dBm)	Noise Floor Corrected Value (dBm)	Amplitude Below Channel Power (dB)	NRSC Limit (dB)	Pass/Fail
0.150	98.250	100	–26.0	–46.0	–46.0	46.0	40.0	Pass
0.225	98.325	50	–65.2	–82.2	–82.2	82.2	61.3	Pass
0.395	98.495	290	–61.4	–86.0	–86.0	86.0	74.4	Pass
0.570	98.670	60	–70.6	–88.4	–88.4	88.4	77.2	Pass
0.700	98.800	200	–65.8	–88.8	–88.8	88.8	80.0	Pass
–0.150	97.950	100	–25.9	–45.9	–45.9	45.9	40.0	Pass
–0.225	97.875	50	–65.2	–82.2	–82.2	82.2	61.3	Pass
–0.395	97.705	290	–69.6	–94.2	–95.2	95.2	74.4	Pass
–0.570	97.530	60	–71.0	–88.8	–88.8	88.8	77.2	Pass
–0.700	97.400	200	–66.5	–89.5	–89.5	89.5	80.0	Pass

Table 2. FM IBOC transmission NRSC test report

top of the spreadsheet takes steps to ensure that your SA has its noise floor below where you plan the weakest signal measurement. The noise floor can be found by removing all signals to the SA, terminating the SA input with 50Ω load, setting the RF attenuation to zero, the reference level to approximately –40dBm, the RBW to 1kHz , the detector mode to RMS, and observing the noise floor in dBm of the SA. Now add a minimum of 80dB to it and that will equal the minimum RF sample level for the analog power reference. If the analog RF sample from the directional coupler is more than that number, then your SA is capable of making the measurement from a dynamic range point of view. To remember this, take the SA noise floor (1kHz RBW) + 80dB + measurement headroom (reasonable value is 10dB) and that is what the transmitter analog RF sample power should be. The same equation applies for combined or separate transmitters but remember to add the attenuators of the CHIMP.

Next measure the analog total power reference with an unmodulated carrier. This was found to be 0.0dBm in the example case. Then apply modulation to the analog transmitter (the digital transmitter is generating its spectrum with or without modulation applied). The recommended modulating signal for the analog transmitter is a 1kHz tone with the transmitter modulation at 75kHz deviation. If the transmitter is equipped with linearity correction, now is the time to engage and optimize it. Once that is done, remember to double check the analog power reference and the digital power ratio to make sure they are correct. The next step is to measure the power in the IBOC primary spectrum defined by the NRSC mask (e.g. +100 to +200kHz) at the frequency midpoint of the required mask level (i.e. +150kHz from F_o - the carrier frequency). The total measurement bandwidth is 100kHz (200-100), so that number is used to set up the channel power measurement (CP) mode of the SA. In the case below, the recorded power is –26dBm. That is the power in a 100kHz bandwidth matching the first line of NRSC mask as listed in Table 1. This measurement reflects the "plus" side of the center frequency so the measurement needs to be repeated for the "minus" side of center frequency. The next mask section starts at 200kHz and goes to 250kHz so the measurement frequency is the midpoint, or 225kHz, and the CP bandwidth will be set at (250–200), or 50kHz. In this case, the value measured was –65.2dBm. Because the mask limit line is sloped at the measurement frequency, the limit value must be calculated using Table 1 to determine the pass/fail threshold value. Again, the same measurement should be made for the "minus" side of F_o. The next section of the mask goes from 250kHz to 540kHz so the measurement point is the midpoint, or 395kHz + F_o, and the bandwidth is 290kHz so the SA CP mode is reconfigured for 290kHz, the value measured was –61.4dBm.

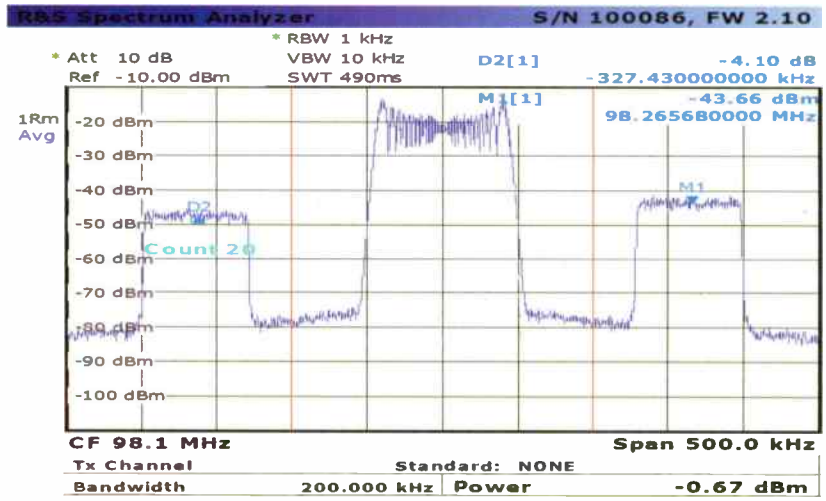

Figure 9. Asymmetric FM hybrid spectrum

This process is repeated until all measurements have been made. As long as all measurements were at least 10dB above the SA noise floor, good engineering practice would indicate that the noise floor has not impacted the data and no correction for measurements near the noise floor is necessary. If the noise floor is 6dB or less compared to the measured level, good engineering practice would dictate that the noise floor power should be subtracted from the measured value. Remember that the only way to do this is to find the equivalent linear value power (not dBm) of the measured value and subtract the equivalent linear value noise floor power from it. Then convert the net power back to a logarithmic (dBm) value. If you find that the measured value is equal or lower than 3dB of the noise floor, just use the value that is equal to 3dB above the noise floor measurement. The reason for this is that it is uncertain which is being measured — signal or noise. Plus, whenever a very small number is subtracted from another very small number, the accuracy of the measurement is in jeopardy.

The NRSC emission mask limit values in Table 1 are all referenced to a 1kHz measurement bandwidth. But the measurements in the spreadsheet were made in different bandwidths (100kHz, 50kHz, 390kHz, etc.). To convert these measured values to a 1kHz bandwidth for comparison, it is necessary to scale the measured powers. To do that, simply add 10 log * (1kHz/measurement BW) in dB to each measured power to get the values in a 1kHz bandwidth. This scaling will reduce the amplitude values.

Once each measured value is corrected for measurement near the noise floor and for bandwidth, it is subtracted from the analog power. In this example, the power was 0dBm. So 0.0dBm – (–46dBm) yields a value of 46dB. This can be compared to the mask value of 40dB. Since the value is greater than the mask limit, the waveform passes the mask limit. To complete the rest of the spreadsheet for the entire IBOC channel measurement and comparison to the mask, the same process is followed.

INCREASED DIGITAL LEVELS

The above analysis reflects the case for when the standard –20dBc IBOC digital power is used. Now that the FCC has authorized blanket power level increases to –14dBc, you might ask how that affects the mask value. The only mask change (refer to page 16, Table 6 of NRSC G202, at the NRSC website) is with respect to the area of spectrum containing the primary IBOC sidebands. Instead of being 40dB, the limit is decreased 1dB for every 1dB increase in operating power. For example, if the digital power is –17dB relative to the analog power, then the first limit of the mask would be 37dB instead of 40dB.

Although the FCC has only authorized experimental FM IBOC stations for operation with asymmetric sidebands, NRSC G202 also addresses how to make these measurements. The purpose of using asymmetrical sidebands is to maximize digital reception while not causing interference to a lower or upper adjacent channel. Figure 9 shows an example of asymmetric sideband operation on an SA.

If you operate a station with asymmetric sidebands, the process is essentially the same with a small twist. The twist is to first determine the total digital power relative to the analog power. NRSC G202 provides a table for doing this for various degrees of sideband asymmetry. Once that detail is known, then the emission mask is measured as if symmetric sidebands of the total digital power were used. For example, assuming that only MP1 mode is used, and one sideband is at –20dB and the other sideband is at –17dB, Table 2 identifies the total digital power relative to the analog carrier as –15.2dB. From there, the emission mask compliance measurements are conducted as if the total digital power was –15.2dB relative to the analog power.

This is quite a bit of information to absorb in one reading, but keeping the key points in spectrum analyzer use and focusing on the process steps will help guide you through these measurements on your own. Hopefully this information will allow you to approach measurement of your hybrid FM IBOC station for emission mask compliance with some confidence. Keep resources at your disposal so that accurate results can be achieved, and digital and analog stations will continue to operate without interference.

Best is president of Greg Best Consulting, Inc., Kansas City.

by Doug Irwin,
CPBE DRB AMD

Gaining expertise in soldering

I remember when I took electronics in high school; one of the first things we learned was how to solder. Now this was a while ago (1976 actually) and I realize that not everyone learns how to solder today. If you fall into this category you might want to check out the soldering tutorial on the Best Electronics Soldering Technologies website (www.solder.net). The site seems to be very comprehensive on the subject.

Sage level setting

The Sept. 30 CAP deadline has been extended until June 2012, but this tidbit from Sage (sent by way of Kirk Chestnut, CPBE, of Entercom in Kansas City) might be of use to you. Christopher Vournazos of Sage says that for the new Sage Digital Endec, the default audio gain settings are too high. The advice is to set Playback for 30 and set Record 1 and Record 2 for 16. Vournazos says a firmware update is due shortly that will make the level setting more intuitive for the end-user. The levels can be set using the ENDECSetD software or through the front-panel controls (Menu → Levels →).

WE NEED YOUR TIPS

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Setting up shop

I've had an occasion or two when I started at a new radio station and found the RF componentry at the shop to be, shall we say, somewhat lacking. It's hard to be the transmitter guy without all the proper items readily at hand. When things are a little slow around the radio ranch, make use of the time to ensure the shop is ready to go for the times that you are busy. Nothing cuts efficiency more than having to run around looking for a cable or adapter. So, here are some of my favorite sources for these types of items.

Ready-made cables and adapters. Of course you can always make your own but if you prefer factory made cables, try Pasternack (www.pasternack.com). I always need type N to BNC adapters, or cables with the different connectors on each end. Pasternack has a great selection of adapters. Grab some N to BNC, and have some UHF or TNC/SMA/SMB to BNC adapters around for that special occasion.

Power dividers, attenuators. If you have any RF test equipment at hand then you invariably need attenuators. Power dividers are handy for any number of projects. When I need stuff like this I usually go to Mini-Circuits (www.minicircuits.com).

Filter sets. If you have an RF proof to perform you'll likely need either a bandpass or a notch filter. For these items I usually go to Microwave Filter (www.microwavefilter.com). The company makes custom filters for any number of applications, and I've called upon it countless times.

RF amplifiers. Sometimes you have a receiver with a front-end that needs a little extra help. I've had occasion to add some extra gain ahead of 950 receivers – and typically I use Advanced Receiver Research for that application(www.advancedreceiver.com). I also built a building-wide wireless mic system one time, and using common antennas with power dividers, some filtering and some extra system gain, it worked well. That particular time I needed a very hot gain block, so I turned to Miteq (www.miteq.com). These filters, dividers and amps can be part of your bag of tricks that is well-stocked and at-the-ready when the occasion calls.

Irwin is transmission systems supervisor for Clear Channel NYC and chief engineer of WKTU, New York. Contact him at doug@dougirwin.net.

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Harris Intraplex HD Link

by Doug Irwin, CPBE DRB AMD

The Intraplex HD Link is a 950MHz radio system that passes not only the typical program audio, but also HD Radio traffic between a studio location and a transmitter site. If integrated with an IP return path from the transmitter site back to the studio, the system will pass TCP traffic between the two ends, and it will manage packet routing based on the user configuration and path accessibility. The HD Link has all the features we've come to expect from an STL system, and more.

The first thing I do with a radio system (or any for that matter) that has as much capability as the HD Link is put it on the bench and back-to-back the units. I did this by just putting a dummy load on the transmitter, and a small whip on the back of the receiver. After powering the units, they came right up with all their default settings in place. Read the Quick Start Guide (pages three and four in the manual) so that you can configure the system to meet your requirements. Specifically, you'll need to go to the RF profile and to put the system on the correct frequency; and you'll need to set the RF bandwidth so that it matches the emission designator you used in the license application (for example, 500KD7W for 500kHz of bandwidth).

You may want to change the parameters of the two audio pathways from their defaults. One of the default RF profile settings is "any modulation," which allows the unit to change from 32, to 64, to 128 or even 256 QAM depending upon what you ask the system to do. There is only so much data-handling capability available for a given system bandwidth and it's clear that as you ask for more, the QAM number goes higher. For example: With both audio pathways set for 48kHz sampling/stereo/linear, and with the user-IP bandwidth set for 256kb/s, the system modulation scheme goes up to 256 QAM. Changing audio path two to mono (as one example) immediately changes the modulation scheme to 128 QAM. These parameters have a finite number of choices obviously and the system will prevent you from trying to make changes that don't work. As another example: If I leave audio pathway one at 48kHz sampling/stereo/linear, and change audio pathway two to match that, I find that (at 256 QAM) I can get 320kb/s through on the user-IP link; trying to get more than that results in an invalid error message back from the radio.

By the way, all the configuration changes I've suggested so far can be done via the front panel. You can also make all those changes and many others by using the Ethernet interface. That allows me to segue nicely into the next important feature of this radio system: its ability to be integrated with a full-duplex IP network between the transmitter site and the studio site.

ALL ABOUT THE DATA

The system supports two separate LANs, the idea primarily being that the LAN known as HD carries E2X (exporter to exciter) UDP traffic. (You would make use of this if you had both the importer and exporter back at the studio.) The other LAN will also carry traffic in one direction (i.e., UDP). It's important to note that the HD traffic is given priority over any traffic you try to send to the far end via the (lower priority) LAN port. In this way you can ensure that the E2X traffic makes it.

So you may wonder then how you would access the receiver via IP if the traffic only flows in one direction? Of course the answer is that you can't, unless you integrate a full-duplex IP connection into the system. The HD Link is built to do that, and it's a wonderful feature.

To test this feature on my bench, I had to build up the system as best I could, simulating the E2X traffic. The goal of the test then was to pass the UDP traffic along the HD LAN port,

and to pass TCP traffic on the lower priority LAN at the same time. It's important to note however that the system can be configured to totally re-route all the LAN traffic, plus all of the audio links, to the duplex connection, should the RF link fail.

See Figure 1 (below). To generate traffic for the E2X link, I set up a Barix pair: the Instreamer was connected to the HD LAN port on the transmit side. Conversely, the Exstreamer was connected to the HD LAN port on the receiver end. The other LAN configuration simulates a typical LAN connection in the rack room of the radio station. The LAN port of the HD Link transmitter connects to a switch-port on a Layer 2 switch. Another port on that same switch (same VLAN) connects to a gateway that gives you access to some type of duplex IP connection to the transmitter site. For my test I used a couple of Cisco routers connected via a T1. On the far end, the other router becomes the gateway for the receiver side. It connects directly to the LAN port of the HD Link receiver.

Now there is some simple configuration necessary to make this arrangement work. You need to configure proxy ARP (Address Resolution Protocol) on the transmitter side with the address of the target on the far end.

In my test configuration I considered the HD LAN to have only the ability to pass traffic in on direction; so for this reason, proxy ARP needs to be used at the transmit end on the HD LAN. When the traffic generator (in my case the Barix) sends an ARP request, the HD Link transmitter actually responds with its own MAC address. That way, the Barix can actually build all the frames correctly. The transmitter then sends that data to the far end.

In the path redundancy table on the transmit side, tell the system to use both the forward and return IP path, and configure the peer address (which is the address of the LAN link port on the far end receiver). On the transmit side, configure the Ethernet service to fail over from RF to IP. In the path redundancy table on the receive side, tell the system to use forward and return IP path, and configure the peer address (which is the address of the HD Link LAN port on the transmit side).

So now with the RF and IP links up and running, the system is accomplishing all the following:

- Passing two separate audio paths from transmitter to receiver
- Passing the E2X traffic along the HD LAN
- Passing TCP traffic over the other LAN

In the event that the RF path fails, traffic gets moved completely onto the IP link. When the RF link comes back up, traffic flow reverts.

So sitting in your office you can browse into both the receiver and transmitter, which is especially handy if you want to make other changes in the configuration, or perhaps more importantly, look at the real-time performance of the system.

OBSERVATIONS

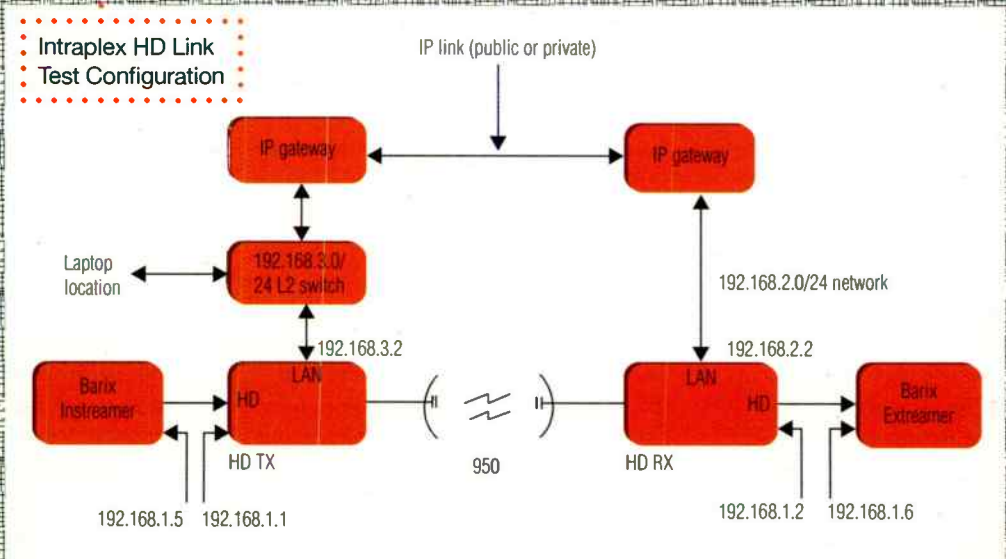
A couple of items that I want to mention about this system that you should know about: The transmitter is a little noisy, because of fan noise – so you won't be able to put it in a spot that must be quiet. The system takes a large fraction of a minute to boot up – so I would recommend having a UPS on both ends of the link.

For my evaluation, I used a beta version of the software that will be released for the product in September. In this final release you'll find a new feature that allows the user to configure a backup profile with reduce audio coding rate as well disabling of non-essential services. This allows the user to use a lower speed IP path for a backup or allows the RF link to automatically adjust (increasing channel coding or reducing modulation) when receiver experiences degradation.

I've barely scratched the surface on the features that this radio system has; but I can tell you that in the testing I carried out, the system performed very well, doing everything advertised. I'd also like to thank Keyur Parikh and Jeff Merrow from Harris for their help in this evaluation.

Irwin is transmission systems supervisor for Clear Channel NYC and chief engineer of WKTU, New York.

Intraplex HD Link Test Configuration



Blue Microphones Yeti Pro

by Gil T. Wilson

Blue Microphones always have a unique silhouette to their mics, but the company puts as much thought into the sound as it does the appearance. This shows in all its products, but it actually glows with the latest mic, the Yeti Pro. While attached to the included stand, it is almost a foot tall; with textured black and silver metal enclosing the body, the massive grill and Blue logo, it almost looks like a mic from the early days of studio recording. Yet it maintains a completely modern look.

Moving on from how cool this mic looks, I put it to test. The Yeti Pro mic is a USB and XLR mic in one. It includes a stereo mic cable. The USB connection requires Mac OSX (10.6.4 or higher) or Windows XP or higher. If you use the mic on one of the Windows systems, a driver (available through the Blue Mic website) must be downloaded.

When using the mic in XLR mode phantom power is required. I should also note here that the mic operates one mode (XLR or USB) at a time, so only have the mic plugged into one destination at a time. All mic functions operate in digital mode, while in analog mode, the mute (which is activated by a button mounted on the front of the mic) and headphone out functions do not operate.

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Once I had the driver installed and mic plugged in I went straight to my production software and started recording. I first explored the various settings/patterns for the mic: stereo, omni, cardioid and bi-directional. What grabbed me most was the quality of the stereo setting. I listened to the playback using the built-in headphone jack (the headphone amplifier works like a charm, it's almost like I had a complete studio with just this mic and my computer) and the stereo separation was perfect. I set the mic in the center of my living room and recorded a few minutes of audio. At one point in the recording a grandfather clock chimed, and the mic was set in place so that the clock was to the right. From where I was sitting the clock was on the left, but when I heard the chime on the recording, I was startled and looked to my right trying to find the clock. The sound was so clear that it was as if I was placed back in time to the time of the recording.

The other settings work great in recording various aspects. For my vocal recordings I used the cardioid for recording straight scripted audio (in a podcast and for vocals for a spot to be aired) and the pattern worked great at eliminating side noise. It worked so well that I have now made this the permanent mic for my studio. I have a standby USB cable extension ready to use for when I want to directly record into my computer for tasks such as my podcasts. Blue just recently came out with a shock mount named the Radius. It is sold separately but works like a charm. The custom shockmount for the Yeti and Yeti Pro USB microphones combines cool vintage styling with rugged durability. The Radius isolates the microphone from ambient vibration. Used in conjunction with "the Pop" (Blue Mic's pop filter/windscreen) makes your recordings come out clean.

When I first started working with this mic I was using it in USB connection mode. I first thought that the mic was a bit much for USB. It is extremely rugged, in fact it feels like the casing is cast iron. The base that comes incorporated with the mic structure

makes the mic have even more of a fixed mic system. But then I started using the mic in the XLR mode and I became overwhelmed with the excellence and versatility of this mic. Using the Radius shock mount, the Yeti Pro looked now like it was built exclusively for the studio and the sound captured by the mic further enforced that aspect.

HANDY USES

This mic came in handy when recording music because of the versatility of the settings: stereo for instruments or live recording, cardiod for vocals. The bands I recorded seemed impressed with the quality they were getting from just one mic. All we had to do was move one mic around rather than have several different mics to manipulate. I really liked the portability that the USB connection provides, in that I could just hook it up to my computer and do a multitrack recording literally in the field.

The omnidirectional mode was a feature I used while conducting an interview. When I heard the playback I was impressed by the entire ambiance sounds captured without over emphasizing the hisses and buzzes around the room. Even better was when I switched the mic to bi-directional figure 8. I conducted an interview with the mic between the subject and myself and nearly all ambient sounds were excluded and the interview sounded as if I was using two different mics.

When I recorded musicians I found out the mic was being limited to 16-bit/48Hz by the software. I quickly changed it to 24-bit/96Hz and the difference hit me like a brick wall. The sound coming out of the finished recordings with the higher resolution was a wall of sound hitting me.

This microphone is a pure professional microphone. Wheter at home podcasting, producing audio via the USB connection, or in a studio using the XLR stereo out (with phantom power required), it reproduces true sound, looks good and is durable. This mic will be the choice mic for any production professional. 0

Wilson is an announcer, producer, webmaster and promotions guy at WAKO-AM/FM, Lawrenceville, IL, and an independent producer/voice talent.

SIDEBYSIDE

Video recorders

You might be wondering, *"Video recorders? But this is radio."* You're right. This is radio, but radio is much more than audio now. Radio in a way is one of the original social networks. Our personalities interact with the public all the time. We create events to bring listeners together. While we can't use video on the air, we can use it online.

There are lots of choices in consumer video cameras. Any of these will work to post content online, but remembering our audio roots, we looked for cameras that offer something more than the basic point-and-shoot with whatever audio can be obtained. Cost is certainly a factor, especially if several cameras will be deployed. Ease of use is important. But we also looked for some choices that provide better audio than the bargain-basement special, which includes high-quality stereo mics or an audio input.

It's easy to capture video of your station's events and post the coverage on your website or social networking sites. Basic free or inexpensive video editing software can clean things up to provide a new element to your station's content and new life to your station's image.

	Cisco UltraHD	Alesis VideoTrack	Samson Zoom Q3HD	ION Audio Twin Video
MSRP	$99	$299	$299	$119
Internal Memory	8GB	None	None	None
External Memory	None	2GB SD card, SDHC, up to 16GB	2GB SD card, up to 32GB	SD Card/SDHC memory slot
Record Time	2 hours	1-2 hours	45 minutes (2GB), 7 hours (32GB)	4 hours
Video Quality	1280×720 720p HD at 30fps	640×480 at 25-30fps	720p at 30 or 60fps or 1080p at 30fps	640×480 at 30fps
Video Format	MP4	MP4	MP4	MP4
Lens	Digital zoom	Digital zoom	4× Digital zoom	Front and back lenses, 3× digital zoom
Battery	Flip Video Lithium-ion Battery Pack (included) or 3 AAA Lithium Batteries	Rechargeable, user-replaceable lithium-ion	Two standard AA batteries or NiMH rechargeable batteries	Rechargeable lithium-ion battery
Screen size	2"	2.4"	2.4-inch 320×240 color LCD display	2.4" TFT
Dimensions	4.16" × 2.11" × 0.88"	4.5 × 2.5 × 1"	2.16" × 5.2" × 1.26" (W × D × H)	5.5" (H)
Software	FlipShare software	ArcSoft MediaImpression with direct YouTube upload for PC	Includes HandyShare editing and, YouTube uploader software, Apple QuickTime	Apple Quicktime
Microphone	Built-in wide-range stereo microphone	Built-in stereo condenser microphones	Built-in stereo condenser, external line in	Built-in mono
Outputs	HDMI	USB, analog video, headphone, NTSC/PAL switchable	NTSC/PAL TV and HDMI output , USB	USB, Audio (RCA), Composite (Video), SD/MMC Memory Card, S-Video, NTSC, PAL
Operating Systems	Windows XP, Windows 7, Windows Vista	Windows XP SP2, Vista, Windows 7, Mac	Windows, Mac OS	Windows XP SP2, Vista, Windows 7, Mac OS X 10.3.9 or later
Out of the box	Camera, rechargeable battery pack, wrist strap, soft protective case, user guide	Camera, USB cable, composite video cable, software CD, battery, hand strap, handle/grip, user guide	2GB SD card, batteries, camera, user guide	Camera, USB cable, remote switch, software CD, battery, handle/grip

MORE ONLINE For more on these recorders' features and optional accessories, visit RadioMagOnline.com.

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NEWPRODUCTS

Shure | Condenser microphone

KSM44A: This large-diaphragm, side-address condenser microphone can be used for a variety of live and studio applications. The microphone features: Multiple polar patterns -- cardioid, omnidirectional and bidirectional -- for maximum flexibility in a wide variety of recording applications; dual 1", externally biased, ultra-thin, 2.5 micron, 24-karat gold-layered, low-mass diaphragms that offer superior frequency response; premium electronic components and gold-plated internal and external connectors; subsonic filter, which eliminates rumble from mechanical vibration below 17Hz; three-position switchable low-frequency filter that helps reduce unwanted stand vibration noise or counteract proximity effect; and integrated three-stage pop protection grille that reduces breath noise.
www.shure.com

Samson Technologies | Handy recorder

Zoom H2n: The H2n features Samson's best microphones yet and is the only portable recorder with five studio-quality microphones onboard. This design enables the H2n to offer four unique recording modes: Mid-side (MS) stereo, 90-degree X/Y stereo, two-channel and four-channel surround sound. With its newly designed user interface, 1.8" backlit LCD display for crystal-clear monitoring and built-in reference speaker that allows playback of recordings on the spot, the H2n is remarkably easy to use in any application. The H2n provides more than 20 hours of continuous operation on two standard AA alkaline batteries. In addition, the H2n features a new data recovery function and a high-speed USB 2.0 interface. The H2n can even be used as a USB microphone to record directly to a computer.
www.samsontech.com

Focusrite Audio Engineering | Audio networking system

RedNet: At this professional audio networking system's heart is digital audio networking technology Dante by Audinate. Dante uses conventional IP-based Ethernet switches to carry up to 256 channels (128 inputs and 128 outputs) of high-resolution digital audio over a single, standard Ethernet network. RedNet provides extremely low latency: under 3ms analog-to-analog at any sample rate when using the optional Focusrite RedNet PCIe card. The scalable system features a range of digital audio interfaces and components. These provide a diversity of input and output options, with the simplicity and practicalities of Ethernet connectivity. Each RedNet I/O device includes JetPLL jitter-elimination technology, and delivers dynamic range of 120dB, with 24-bit resolution at sample rates up to 192kHz.
www.focusrite.com

Beyerdynamic | Headphones

DT 1350: DT 1350 is the first professional monitoring headphone in Beyerdynamic's new generation of headphones that feature Tesla technology. The completely re-engineered Tesla drivers create a headphone that delivers an enormous degree of efficiency with low levels of distortion. A combination of ambient noise reduction and a maximum sound pressure level of 129dB make the DT 1350 an ideal compact over-ear headphone for any environment.
www.beyerdynamic-usa.com

Burk Technology | Server room environmental monitor

Climate Guard: Drawing on more than 25 years of facilities monitoring experience, Burk Technology designed Climate Guard to monitor critical environmental conditions that can lead to downtime, equipment failure and data loss in server rooms and data centers of all sizes. Climate Guard uses a built-in Web interface and requires no software installation or browser plug-ins, allowing use from any computer, tablet or smartphone. Email, SMS and SNMP notifications ensure that responsible personnel can respond to problems quickly and effectively.
www.burk.com

Auralex Acoustics | Foam panels

SonoLite: A 2' × 2' × 1" fabric-wrapped StudiofoamPro panel, SonoLite specifically targets those on limited budgets. Panels are available in black or beige, with squared edges that provide an overall Noise Coefficient Rating (NRC) of 0.75. The panels retail $24.99 each.
www.auralex.com

Hosa Technology | Powered speaker cables

PPC-100 Series: Incorporating both shielded power and shielded audio lines into a single cable, the new PPC-100 Series cables interconnect mixing consoles and powered studio reference monitors. Offering XLR3F and NEMA 5-15P to XLR3M and IEC C13 connectivity, these cables incorporate a UL-approved, 14 AWG shielded power cord to deliver ac power, coupled with a shielded 24AWG audio interconnect featuring Neutrik X-series XLR connectors (male/female) to deliver line-level audio signals. Three-foot fans are featured on both ends of the snake.

www.hosatech.com

Lavry Engineering | D/A converter

Black DA11: Features like a USB input, programmable settings, infrared remote capability and Playback Image Control make the DA11 a versatile DA converter. The patent-pending Playback Image Control allows the listener to adjust his position within the stereo sound field, such as adjusting the stereo width to create a headphone listening experience more like listening in a room with speakers, or moving the sweet spot with asymmetrical speaker placement. A full complement of USB, XLR, RCA and optical digital audio inputs offer flexibility. With the addition of infrared remote capability, the DA11 allows the listener to easily control important functions from the listening position with the added benefit of working with most universal remotes. The remote mute function controls both headphone and main outputs, while a separate main output on/off setting makes private headphone listening convenient.

www.lavryengineering.com

Audio-Technica | Headset

BPHS1-XF4: The rugged BPHS1-XF4 offers natural, highly intelligible stereo reproduction, featuring closed-back circumaural (around-the-ear) ear cups designed to provide maximum comfort and ambient noise rejection with minimal ear fatigue. The BPHS1-XF4 also has a professional boom-mounted moving coil dynamic microphone that can be positioned for use on either side of the mouth. The BPHS1-XF4's microphone has a unidirectional polar pattern tailored for pickup of speech with maximum voice intelligibility over a wide frequency range. A high-performance neodymium magnet in the microphone ensures a high output level and detailed sound reproduction. The headset's dual earphones offer an extended frequency response of 20Hz - 20kHz for smooth, natural sound reproduction. At the heart of each earpiece, a 40mm neodymium driver offers power handling ideal for high maximum sound pressure levels. Generously padded circumaural ear cups provide acoustic isolation and long-wearing comfort; the adjustable headband is also crafted and cushioned for listening comfort.

www.audio-technica.com

Studer | Digital mixing console

OnAir 1500: A 12-channel, six-fader console (expandable to 12 faders), the OnAir 1500 digital mixing console is for studios needing an additional professional-grade fader unit and additional I/O or a compact and cost-effective mixing console for a production room or on-air studio. Integrated USB playback and record functions make the console a very compact yet complete production unit and mixer. With simple point-to-point connectivity it can be moved around as a backup or secondary unit. Flexibility is increased with the addition of a six-fader extension bay, creating either a 12-fader surface, or an additional six faders that can be remotely placed in a producer's bay or used as a redundant surface. Channel parameters such as EQ and dynamics can be edited using console controls in combination with the OLED channel displays without requiring an additional screen or PC. For more advanced operation and configuration, the console provides interfaces for connecting a PC screen, keyboard and mouse. The master section gives the operator access to the signal monitoring and switching for control room and studio with an internal speaker preconfigured to output cue and talkback signals.

www.studer.ch

DBX Professional Products | Signal processors

S Series: The newly updated dbx S Series products feature a platinum front panel. This series includes 231s dual 31-band graphic equalizer, 215s dual 15-band graphic equalizer, 131s single 31-band graphic equalizer, 266xs compressor/gate, and 166xs compressor/limiter/gate. The graphic equalizers offer 1/3-octave constant Q equalization with switchable boost/cut ranges of ±6 or ±12dB, with a ±12dB input gain range. The compressors feature patented Overeasy compression technology that transparently smooths out fluctuating vocal and instrumental levels. Both models offer exclusive dbx AutoDynamic scalable program-dependent attack and release controls.

www.dbxpro.com

Henry Engineering | Mic and headphone controller

Talent Pod: Talent Pod gives an announcer control of his mic and headphones. It lets the announcer turn his mic on and off, and also lets him create a mix of local and return (IFB) audio in his headphones. There are two headphone volume controls, one for local audio (from the remote site mixer) and another for return audio. The return/IFB audio is normally sent to the remote site from the main studio. To prevent confusion between the local and return audio, Talent Pod has two PAN switches, so the announcer can position the local and return audio in the center, left or right channel of his headphones. For broadcasts with multiple announcers, several Talent Pods can be linked together using CAT-5 cables, eliminating the need for multiple power sources, DAs and complicated wiring.

www.henryeng.com

L-com Global Connectivity | Field termination connectors

Male D-sub Line: Male D-sub field termination connectors expand L-Com's D-sub offerings. These connectors, available in DB9, DB15, DB25, and HD15 sizes, are now available to complement the existing female D-sub field

termination connectors. One notable difference between the new male connectors and existing female connectors is that L-com has rotated the male connectors' terminal blocks 90 degrees, simplifying termination because the wires will not have to be routed so many different distances. The new male connectors also have two holes at the back of the PCB to allow for a tie-wrap to lock down wire or cable.

www.l-com.com

Drawmer | Active signal splitter

4x4R: The 4x4R offers four inputs, each switchable between a mic and line. Each of four input sections offers a six-LED meter, 48V phantom switch, 66dB of mic gain and a listen function to monitor any of the four input sections through the front panel headphone amp. In addition, each input section can be linked to the adjacent input section offering four different input-to-output options. Optional transformer isolation is available.

www.drawmerusa.com

ContestFM | Automated call-in contests

ContestFM: Aiming to make running and participating in call-in contests fun, ContestFM allows radio stations to essentially outsource the running of a call-in contest to an automated service. A radio station gets its own dedicated contest line backed by a highly available telephony infrastructure. Contests are created and managed using a Web-based application. Once a contest is started, call-ins on the contest line are handled by a completely automated system. The winning call can be forwarded to a radio station phone line for further processing.

www.contestfm.com

Cerwin-Vega | Powered desktop speakers

XD3: The XD3 speakers are compact at 8" × 5.5" × 6.5", weighing 6.5lbs. Features include appearance that matches laptops and LCD monitors, magnetically shielded to prevent interference, rich and natural sound of a real wood enclosure, 3" woofer, 3/4" tweeter, and 15W per channel amp with built-in crossover.

www.cerwin-vega.com

Broadcast Electronics | Mobile marketing tool

SMS Campaign Manager: SMS Campaign Manager takes the mystery out of creating successful mobile marketing campaigns for advertisers. Users can quickly build a database of mobile text subscribers using a variety of keywords. SMS Campaign Manager creates an unlimited number of keyword-based campaigns for targeting mobile users, who then opt-in as subscribers for additional messaging. It easily sends text messages using BE's list of short-code numbers (for example, text keyword "Lunch Deals" and the short-code 1234) or users can create their own. Users can also send SMS messages in bulk or to only a few and track campaigns in realtime. Also, prevent text fatigue and schedule outbound messages for only those times when customers are likely to welcome the text, for example, texting lunch specials during lunchtime.

www.bdcast.com

Sanyo | Digital sound recorder

Xacti ICR-XPSO1M: The ICR-XPS01M offers two recording formats: Linear PCM format and MP3 format. Linear PCM records at 44.1kHz, 16-bit sampling rate enabling sound reproduction up to a maximum of 21kHz. MP3 recording captures sound quality of 44.1kHz, 320k-bit sampling which enables sound reproduction up to a maximum of 20KHz. The recorder features a touch sensor panel for transport control functions (play, pause, forward, rewind), menu and mode functions. The unit features a large, full dot matrix LCD display which can be operated with backlight on or off for additional power savings. A 2GB microSD card is included.

us.sanyo.com

AETA Audio Systems | Recording app

eScoop: An audio recording and broadcasting tool for devices including iPhones, iPads, Macs, and PCs, eScoop provides facilities for recording, editing, transmitting and publishing audio for live broadcasting. It allows users to record and transmit simultaneously through mobile wireless networks and on desk-based IP networks as a client or a server. Developed in collaboration Technica Del Arte (TDA), eScoop supports many protocols such as SIP as well as both one-way SHOUTcast/Icecast streaming and two-way streaming when a return channel is required. In addition to broadcasting live material, eScoop also enables the playout of prerecorded material while broadcasting. A simple editing tool allows the user to isolate any item being used.

www.aeta-audio.com

Allen & Heath | Studio recording mixer

GS-R24: An analog console combined with a choice of interface modules, the GS-R24 features motorized faders for automated mixing, and MIDI controllers for tactile interfacing with software DAWs. With a mic pre-amp and 4-band fully parametric EQ, the GS-R24 has 24 mono mic/line channels, two dual input stereo channels, two mono valve pre-amp channels, six aux buses (two switched pre/post EQ), four audio sub-group buses, a master stereo and master mono bus. There are two studio output sub-mix sections with individual level adjustment, which source monitor signals.

www.allen-heath.com/US

Jensen Transformers | Multimedia DI

ISO-MAX MMDI-Mini, MMDI-Pro: The MMDI-MINI has a 3.5mm stereo jack for typical laptop sources and comes with a pigtail adapter for stereo RCA sources. The output is a mono summed mic level signal. The MMDI-PRO has a female XLR input for professional balanced +4dBu sources. Both models have a ground lift switch on the front and a terminal block on the rear for connection to a mic input on the house A/V system. These units fit in standard single gang wallboxes and use Decora-style cover plates.

www.jensen-transformers.com

iKan Corporation | Grip solution

Elements Pinch Clamp: The ikan Elements Pinch Clamp is an ultra lightweight and compact grip solution. The Pinch Clamp's padded jaw provides a stronger hold on round, square and flat objects than a traditional clamp. With 1/4"-20 and 3/8"-16 female sockets, it is for use with ikan Elements, articulating arms, LED on-camera lighting, HD on-camera monitors and accessory mounting. Features include: robust and durable jaws made out of aluminum extrusion, ergonomic aluminum casting knob, and twist knob operation.

www.ikancorp.com

ARX Systems | Mic preamp

PC-pre2: Adding an extra channel for stereo operation, the PC-pre2 features studio quality microphone preamps built into a compact, computer-friendly package. It also features left and right output jack connectors. Summed mono outputs on single RCA and jack connectors are also provided. Internally, the PC-pre2 is fitted with ultra low-noise and distortion mic preamp ICs. It also has a high current +48V dc phantom power, for driving condenser microphones, while a full bi-polar power supply provides maximum headroom. Audio inputs are combo connectors, providing both XLR mic and 6.5mm jack line inputs on the one connector. Input gain is individually variable from 10dB through to 60dB.

www.arxamerica.com

Crenlo | Remote case

Emcor Rolling Transit Case: Made from a virtually indestructible polycarbonate mold, this case is designed to withstand abuse in tough environments, while the two-stage telescoping extension handle and in-line wheels offer easy transportability of sensitive electronic equipment. The transit case can be purchased empty and used for carrying cables and cords, or it can be purchased with one of two polyurethane foam insert options: A cubed, layered option or a solid, layered option. The 0.5" × 0.5" × 1" rectangular cubes can be removed to create three-dimensional pockets for protecting equipment, while the solid option can easily be customized by cutting with a utility knife. With interior dimensions measuring 18.13" × 24.38" × 12", the case is ideal for protecting small electronics, such as test and measurement instruments, cameras, audio/video and broadcast equipment, and monitoring equipment.

www.crenlo.com

WorldCast Systems | Audio multiplexer

APT Worldcast Oslo AoIP NextGen: Fully compatible with existing Oslo units, the AoIP NextGen card combines audio, IP transport and auxiliary data on a single module providing the user with audio over IP performance, as well as scalability and flexibility. It also features SureStream, which enables broadcast-quality audio over public Internet links. With six cards per Oslo and four channels per card, the unit is able to decode up to 24 streams, even discrete mono channels with independent bit rates and algorithms, from independent locations. The IP performance is increased because each AoIP NextGen card handles its own IP traffic, avoiding any bottlenecks in the system, and embedded aux data means there is no need for to invest in additional cards.

www.aptcodecs.com

Tascam | Audio interface

US-1800: This audio interface offers up to 16 inputs and four outputs transmitted to Mac or Windows over a high-speed USB 2.0 connection. The US-1800 features eight XLR microphone inputs with phantom power and 60dB of clean gain. Six balanced line inputs are also provided, as well as stereo S/PDIF digital and MIDI in and out. Included with the US-1800 is Cubase LE5. This 48-track audio workstation includes features like automation, plug-ins, mixing, editing and MIDI tracks. Cubase LE5 uses standard VST plug-ins for adding virtual instruments and effects.

www.tascam.com

Lehmann Audio | Hi-fi headphone amp

Studio Cube: The Studio Cube has functionality and features required for both studio and live applications, along with isolation fidelity and accuracy. It is smaller and linkable, allowing multiple units to daisy chain. Its two Neutrik 1/4" TRS headphone outputs are suitable for all headphone types, and its stereo inputs are Neutrik XLR/TRS. An input selector switches between mono and stereo source, and front-panel LEDs monitor input signal presence and overload for quick diagnostics. The output is Class A and all units are crafted with selected components in Germany. Users may also purchase a microphone stand mount to attach the unit to a microphone stand or under a table.

www.lehmannaudio.com

Mackie | Reference monitors

MRmk2 Series: The MRmk2 Series, featuring MR5mk2 and MR8mk2, are high-resolution powered studio monitors featuring ultra low-distortion LF drivers (5.25" and 8"). They also feature high-output 1" soft dome tweeters, precision class A/B amplification, seamless transition of HF and LF, minimum-diffraction molded baffle, adjustable HF/LF acoustic controls, flexible inputs (XLR, TRS and RCA), magnetic shielding and tuned to work interchangeably with one another.

www.mackie.com

P.I. Engineering | Computer shortcut keys

XK-12 + Jog and Shuttle: The XK-12+ Jog and Shuttle is suitable for handheld or desktop use. Features include: relegendable keys with assignable blue and red back lighting; freesoftware for Windows and Mac users; free software development kit for programmers; and comprehensive technical support for hardware and software.

www.piengineering.com

Autotelics | Telephone interface

Call In Studio: This cloud-based call-in platform eliminates the need for high-tech equipment to host callers into a radio station or live podcasting environment. The host (or show producer) will call into the Call In Studio system over a regular phone line. Listeners call in via a unique call-in number for each show. Using the company's Web interface, the host and/or screener of the show can see a list of all calls on hold, reject them, screen them, and/or place calls "live" on the show with the click of a mouse. When calling a show, the line automatically picks up and places the call on hold. The listener will hear the audio from the show until he or she talks to the call screener (if there is one) and/or talks to the host. The system handles 1 to 35 simultaneous callers; the host controls how many callers to have on "hold" at any given time; once lines are full, additional callers will hear a busy signal; shows may have a PIN-protected guest line for special guests; one or more people can screen calls; make an outbound call to a guest directly from the console and connect them to a show; when a show is offline, listeners can leave a voicemail; and all telephone prompts are customizable.

www.callinstudio.com

M-Audio | Mobile USB audio/MIDI interface

Fast Track Pro: This interface features front-panel mic/line inputs with phantom power for condenser microphones, inserts for outboard effects balanced and unbalanced analog outputs, S/PDIF digital I/O, MIDI I/O, and more. Fast Track Pro also features near-zero latency direct hardware monitoring and low-latency ASIO software monitoring, plus an A/B source switch and dual output pairs. It is compatible with most popular PC and Mac music software.

www.m-audio.com

Barix | IP audio device with amplifier

Extreamer 205: Building on its existing IP audio receiver technology, Barix has released the Exstreamer 205 IP, which adds dual 25W power amplifiers and a local, line-level stereo input. Originally designed for retail installations, the added features could be useful for radio remotes when multiple areas need to be covered, or used as an in-house monitoring system. The unit also includes a MicroSD slot for local playout of encrypted content directly from the device. The Exstreamer 205 decodes and plays multi-protocol and multi-format audio streams, including MP3, AACplusV2, WMA, PCM, G.711 and EtherSound.

www.barix.com

Crown Audio | Amplifiers for portable PA

Xti 2 Series: Offering increased control, an enhanced feature set and a sleeker design, the XTi 2 Series amplifiers provide a complete suite of integrated speaker processing, featuring PeakX Plus limiters. A subharmonic synthesizer offers more accurate control over which frequencies are targeted and can be tailored for a specific system or room setup. Advanced Thermal Control gives the ability to tailor the fan performance to their specific application. XTi 2 also increases the amount of presets a user can save and recall from 20 to 30. Enhancing power management, a new status section on the amplifier allows for the monitoring of power supply temperature and ac line voltage.

www.crownaudio.com

Sealevel | PCI Express serial interface

Ultra COMM+8.PCIE: This serial interface delivers flexibility for expanding serial communications. Compatible with any PCI Express slot, the board provides eight multifunction serial ports, each individually field-configurable for RS-232, RS-422 or RS-485. The Ultra COMM+8.PCIE utilizes 16C954 UARTs with 128-byte Tx/Rx FIFOs, which enable data rates to 921.6kb/s for reliable high-speed communications in data intensive applications. This high-performance UART includes 9-bit framing support and is register compatible with legacy 16550 software applications. In addition, the board derives a 62.5MHz clock from the PCI Express bus. In RS-485 mode, the board provides automatic control of the RS-485 driver in hardware. In RS-232 mode, all modem control signals are implemented for maximum compatibility with a variety of serial peripherals

www.sealevel.com

Warfedale Pro | Speakers

Titan 8A MKII: New features and improved amplifier technology make the Titan 8A MKII an even better solution for portable sound and fixed installation applications. The two-band EQ allows fine tuning of the overall sound and a rear-mounted mounted horn LED defeat switch switches off the throat-mounted power LED. Class D technology is now used for both the LF and HF sections, and the 8A MKII is bi-amplified with independent LF and HF signal limiting.

www.wharfedalepro.com

Fostex | Headphones

TH-Series: Featuring all-new ear pads, headband and cable, the TH-Series headphones have been designed for comfort and extended use. The cable comes with a stereo mini plug, ideal for use with a portable audio player, and also a 1.5m extension cable, complete with a ¼" stereo adapter for studio applications.

www.fostexinternational.com

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Continental Electronics	20	800-733-5011	www.contelec.com
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Digital Alert Systems	29	585-765-1155	www.digitalalertsystems.com
Dixon Systems	63	416-261-3773	www.dixonsystems.com
DM Engineering	60	805-987-0487	www.dmengineering.com
Enco	1, 17	800-ENCO-SYS	www.enco.com
ESE	28	310-322-2136	www.ese-web.com
Gorman Redlich	62	740-593-3150	www.gorman-redlich.com
Heil Sound	23	618-257-3000	www.heilsound.com
Henry Engineering	28	626-355-3656	www.henryeng.com
Inovonics	22	800-733-0552	www.inovon.com
Kintronic Labs	18	423-878-3141	www.kintronic.com
Logitek	7	800-231-5870	www.logitekaudio.com
Mooretronix	61	800-300-0733	www.mooretronix.com
Myat	13	201-767-5380	www.myat.com
Nagra	49	800-813-1663	www.nagraaudio.com
Nautel Electronics	3, 31	902-823-5131	www.nautel.com
Nott Ltd.	63	505-327-5646	www.nottltd.com
OMB Broadcast	43	305-477-0973	www.omb.com
Omnia	39	216-622-0247	www.omniaaudio.com
Progressive Concepts	60	630-736-9822	www.progressive-concepts.com
Ram Systems	58	800-779-7575	www.ramsystemsonline.com
Ramsey Electronics	63	800-446-2295	www.ramseybroadcast.com
RDL-Radio Design Labs	57	800-281-2683	www.rdlnet.com
RF Parts	62	800-737-2787	www.rfparts.com
Riverview Software Solutions	63	256-486-3397	www.riverviewsoftwaresollutions.com
Sage Alerting Systems	53	914-872-4069	www.sagealertingsystems.com
Sandies	53	215-547-2570	www.sandiesusa.com
Satellite Center	53	504-915-8244	www.satctr.com
SCMS	21	800-438-6040	www.scmsinc.com
Shively Labs	11, 60	888-744-8359	www.shively.com
Sierra Multimedia	42	479-876-7250	www.sierramultimedia.com
Studio Items Inc.	64	815-669-2070	www.ramsystemsonline.com
Telos Systems	31	216-241-7225	www.telos-systems.com
The Studio Hawk	62	662-324-2769	www.thestudiohawk.com
Thermobond Buildings	63	800-356-2686	www.thermobond.com
TieLine Technology	5	317-845-8000	www.tieline.com
TLS Corp	37	216-241-7225	www.telosalliance.com/now
Transcom Corporation	64	800-441-8545	www.fmamtv.com
V-Soft Communications	60	800-743-3684	www.v-soft.com
Wheatstone	2, 30, 68	252-638-7000	www.wheatstone.com
Yellowtec	41	+49 2173-967 30	www.yellowtec.com

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

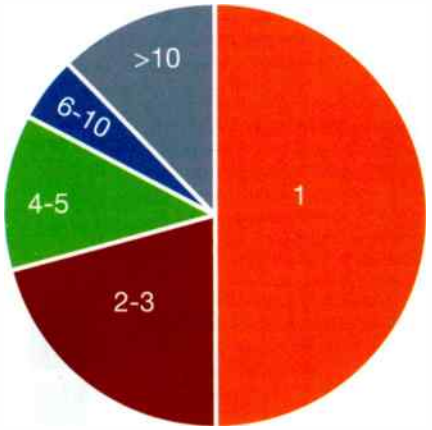
CLASSIFIEDS

MORE ONLINE Find out what respondents would change about their jobs at RadioMagOnline.com

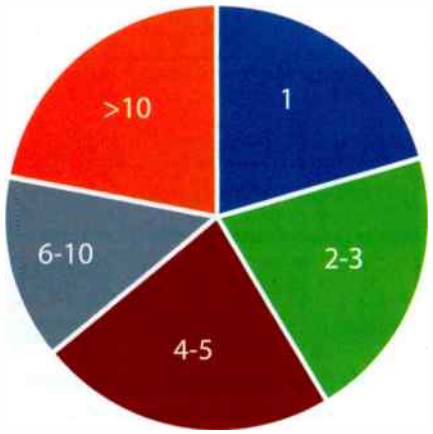
2011 Salary Survey

by Erin Shipps

MARKETS YOU ARE RESPONSIBLE FOR



STATIONS YOUR DEPARTMENT IS RESPONSIBLE FOR



SALARY BY SBE CERTIFICATION

BY THE NUMBERS

12
Average years in current position

27
Average years in the broadcast engineering field

35
Percent belonging to no organizations

Memberships:
54% SBE
5% AES
4% IEEE
4% NARTE
16% ARRL
6% Other

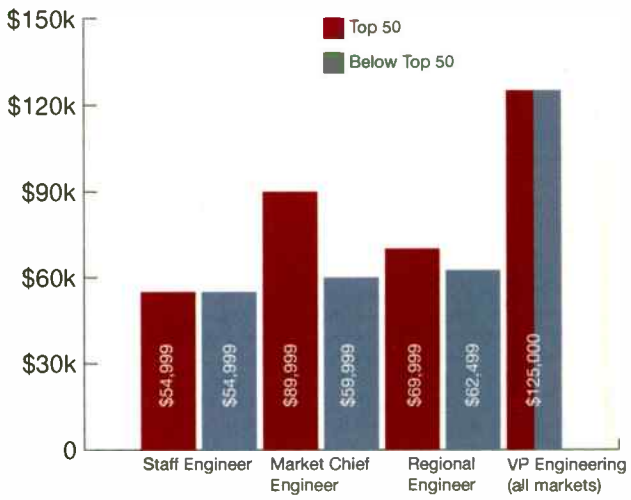
54.4
Percent who did not receive a raise in the past 12 months. Median salary increase was 3%; average was 5.11%.

55
Percent age 55 and older

57
percent are not certified
35% are SBE certified
5% are NARTE certified
5% are Microsoft certified
8% Other (FCC, PCIA)

Certification level:
1% CEA
10% CBNT
9% CBT
8% CBRE
8%CSRE
9% CPBE
3% AMD
1% DRB
5% CRO

ESTIMATED MEDIAN SALARY



STAFF ENGINEER MEDIAN SALARIES

Year	Top 50	Below Top 50
2002	$64,999	$43,749
2003	$61,428	$41,250
2004	$65,333	$44,249
2005	$64,999	$48,000
2006	$65,833	$46,111
2007	$64,999	$49,999
2008	$71,250	$50,714
2009	$62,500	$52,500
2010	$71,250	$49,166
2011	$54,999	$54,999

CONTRACTING

14% Are contractors
Average hourly rate **$61**
20 Hours booked/week
Charge emergency rate **41%**
$95 Avg. emergency rate

Methodology: From Aug. 15, 2011-Sept. 15, 2011, *Radio* magazine solicited responses to an online survey by posting a link at RadioMagOnline.com and noting the link in various email newsletters.

ARRAKIS SYSTEMS INC.

MARC-15-15
on sale $6,499

ARC-8
only $799

COOL STUFF AWARD WORLD 2010

2 mic, 4 stereo line,
PC USB , and Phone input
both balanced & unbalanced IO

15 channel modular console
supports two phone hybrids
USB sound card modules
control room & studio

XTREME
automation
only $300
per month

Live On Air,
Hard disk & Satellite
16 stereo input switcher
with logic

ARC-10
three models

ARC-15
only $3,495

1-5 mic inputs,
PC USB and Phone inputs
both balanced & unbalanced IO

ARC 10U: $1,599 unbalanced
ARC 10UP: $1,999 unbal w USB
ARC-10BP: $2,495 balanced w USB

2 mic inputs,
PC USB , and Phone inputs.
both balanced & unbalanced
models.

'ACCENT'
studio furniture

all ARC consoles
(except ARC-10U) feature built in
PC USB sound cards and come with
'Xtreme -Studios' live on air software

'Pre-End of the World Sale'
the Mayan calendar predicts the end of
the world in 2012... so Accent Furniture
is 25% off until Dec 31st, 2011

ACCENT is a contemporary blend of brushed metals, pleasing colors, and interesting textures. The metal structure is artfully integrated into the visible design decor of the cabinetry. Cabinetry and electronic equipment complement each other to create a bold visual environment for talent, guests, and clients alike.

www.arrakis-systems.com

all prices are msrp

CLEANUP
YOUR ON-AIR SOUND & IN THE RATINGS

AirAura's **31-Band Limiter** Delivers FAR More Clean Sound Detail than ANY Other Limiter on the Market. Here's Why This Is Important...

In a traditional processor with 5-band limiting, selecting 3 bands results in 60% of the audio being affected. It's clear to see how such a coarse adjustment can adversely affect the overall audio.

In the AirAura, with 31-band limiting, only the narrow bands that need limiting are affected (just 9.5% of the audio spectrum). This allows MUCH more natural sound and the ability to tune-in your audio with near surgical precision.

In a side-by-side listening comparison, you'll hear that this difference is HUGE. 31-Band Limiting is also relevant because it's a natural division – each band represents one third-octave of the audio spectrum. This makes processing more natural and more musical.

AirAura has a lot of other tricks up its sleeve, all of which reduce or refine the amount of processing to reduce distortion, artifacts and overblown sound. All we ask is that you listen...we know you'll be blown away.

GET THE RADIO CLEAN MACHINE

AIRAURA IS THE BEST ON-AIR PROCESSOR YOU CAN BUY

Put the Vorsis CleanUp Crew to Work In YOUR Studio. You Won't Believe The Difference In Your On-Air Sound Or Listenership.

WHEATSTONE VORSIS

phone 1.252.638-7000 | vorsis.com | sales@wheatstone.com

AIRAURA THE RADIO CLEAN MACHINE

Download a FREE whitepaper or watch video about AirAura at RadioCleanMachine.com