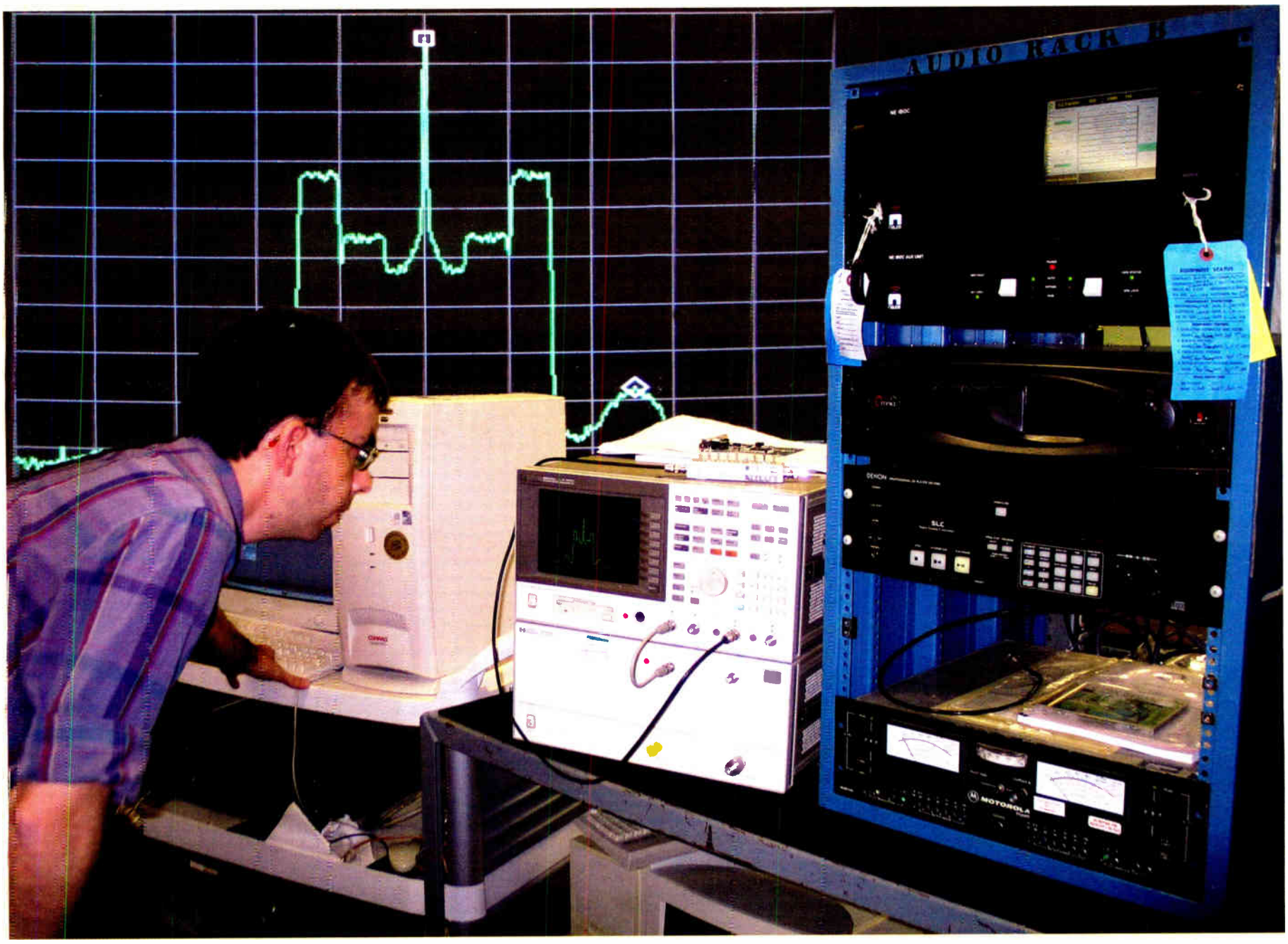
Radio Guide

Radio Technology for Engineers and Managers

December 2005

Digital Installations Doing it the Right way

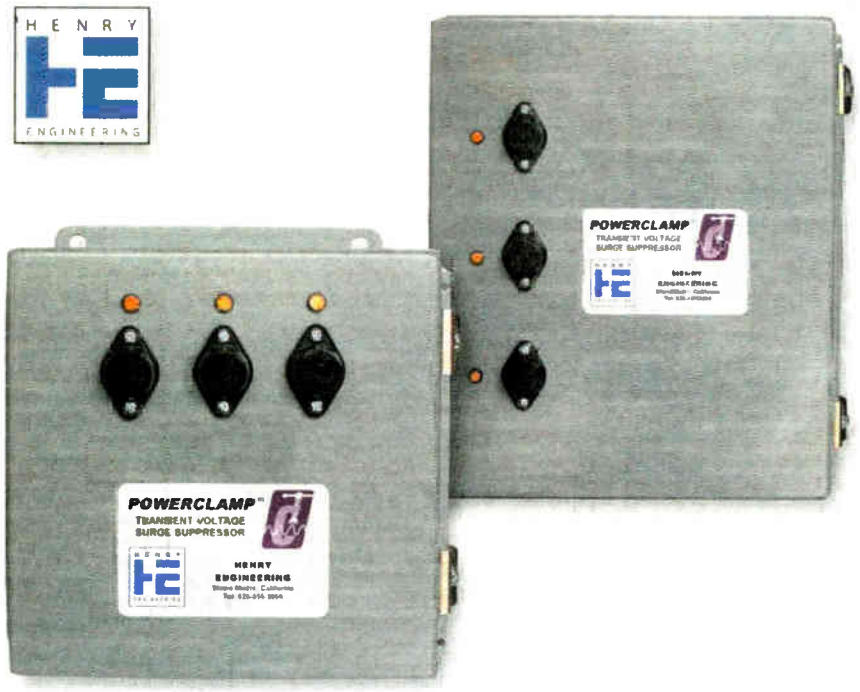


Inside Radio Guide

During the next few months, our plan is to discuss a number of items and strategies that may help you in planning and implementing your HD station upgrade/ installation. We will start with what you will need as an absolute minimum, what you really should have to do it right, how it all hooks together, the basics of setting it up, and what you will require for tools and test equipment to keep it playing nicely with other kids on the block – both analog and digital.

Furthermore, while including the technical information required for the average overworked station engineer to figure out what is needed, we have tried to provide some "layman terms" and background for those who do not spend their day staring at vector diagrams and performing Fourier analyses in their heads.

Don't Get Zapped!



PowerClamp surge suppressors clamp lightning-induced powerline transients to within a few volts of normal AC voltage!

PowerClamp will pay for itself by reducing expensive damage to transmitter site equipment caused by powerline spikes and surges.

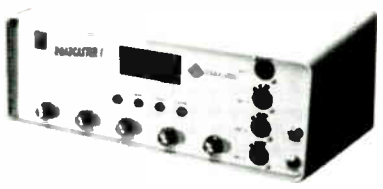
Protect your transmitter and
Stay On The Air with **PowerClamp!**

DISTRIBUTED BY
Broadcasters General Store

www.bgs.cc
1-352-622-7700

Innovative Equipment from Energy-Onix . . . .

Built in the USA with USA Quality and USA Factory Support.



The ROADCASTER® Series

Frequency Agile VHF/UHF
REMOTE PICK UP TRANSMITTER/RECEIVER

- 16 Channels Front Panel Selectable
- Transmitter Contains Built in Compressor
- Transmitter Contains Front Panel 4- Channel Microphone Mixer
- Rated for 40 watts Continuous Duty
- Compatible with "Marti"Systems
- Modern Solid State Circuitry
- Both Receiver and Transmitter have Front Panel Display of Frequency and Audio Level
- Portable Transmitter - Only 13 Pounds
- Transmitter can operate from 110/220 vac or 12 volt DC Power
- Rack Mountable Receiver with XLR Balanced Analog Output
- Unsurpassed performance specifications

Receiver $1,495 Transmitter $1,995

Player Selector Screen

Documentor - 2

- Two Independent Channels – ideal for AM/FM Combo or one stereo
- Basic Module for building block of Multiple audio logger
- 300 Day Storage Time – Exceeds FCC 60 day requirement
- Automatically Deletes Recording After 300 Days
- Recordings Can Be Selected For Playback by Month, Date, Hour and Minutes
- Can Be Connected to a LAN Which May Have As Many as *10 Computers*, each of which Simultaneously Can Select and Playback Any Specific Pre-Recorded Program at the Time Slot Selected
- Expandable with Option for Additional Audio Channels
- Can be used with the Internet to provide communication between remote recorders and players.

$1,295

ENERGY-ONIX
The Transmitter People

Box 801 • 1306 River Street • Valatie, New York 12184
518.758.1690 / 888.324.6649 • fax 518.758.1476 • energy-onix@energy-onix.com • www.energy-onix.com

Radio Guide

Contents

December 2005

Cover Photo: Jeff Welton tests a digital exciter in the Engineering Lab at Nautel's factory in Nova Scotia.

Radio Guide

Volume 13 – Issue 12

PO Box 20975, Sedona, AZ 86341
Phone: 928-284-3700 Fax: 866-728-5764

Ray Topp *(Publisher)*
Email: radio@rconnect.com

Barry Mishkind *(Editor)*
Email: editor@radio-guide.com

Radio Guide, ISSN 1061-7027, is published monthly, 12 times a year, by Media Magazines Inc., PO Box 20975, Sedona, AZ 86341. Radio Guide is copyright 2005, Media Magazines Inc., and may not be copied, reproduced, or stored in any format, without the written permission of the publisher.

Radio Waves

by Barry Mishkind – Editor

What was the "Big Story" at your facility during 2005?

Perhaps the continuing rollout of digital transmission installations reached your station. Perhaps it was Hurricane Katrina (or a tornado or flood) and how your stations accomplished disaster recovery. Perhaps you have something else in mind.

Either way, 2006 will see many companies evaluating their construction plans, as well as seeking ways to ensure their sites can withstand all but the most unlikely disaster scenarios.

If you are planning for IBOC in the new year, Jeff Welton's discussion (Page 4) covers points that will reduce problems and make your installation go more smoothly. If you are "on" with digital, Frank Foti's checklist (Page 14) will help ensure your audio sounds right. A new tower planned for 2006? Revision G standards info (Page 14) could save you some major hassles.

One of radio's strengths is its ability to react rapidly to local emergencies and broadcast warnings about storms, tornadoes, accidents, etc. to a public often desperate for information.

Unlike other media (TV, Internet, satellite), radio can reach into areas where the power is down or out to mobile people; it is natural to reach for a battery-powered or car radio to find out what is happening during an emergency situation, especially when it includes a blackout.

However, the station needs to be on the air. To keep a solid signal, regular maintenance is essential – including some things we might take for granted. Check out the battery Ray Vaughan found when his generator failed to start (Page 12); it will likely add a note on your "To-Do" list.

And while you review your emergency procedures, it might be helpful to review the key points in the FCC's FNPRM on EAS issues (Page 22).

We hope you will have a trouble free and safe 2006.

Digital Radio Crash Course

Part 1 – AM

by Jeff Welton, Nautel, LTD.

Okay, the boss came up to you and said, "Were you aware this new digital radio stuff they keep talking about doesn't just mean there are numbers on my radio display? This sounds like a cool idea; we need to jump on this right away!" My friend, it looks like you need a crash course in HD Radio™.

Over the past fifteen years or so, I have discovered a few things – one of which is that I am nowhere near as smart as I used to think I was.

During the next few months, my plan is to discuss a number of items and strategies that may help you in planning and implementing your HD station upgrade/installation. We will start with what you will need as an absolute minimum, what you really should have to do it right, how it all hooks together, the basics of setting it up, and what you will require for tools and test equipment to keep it playing nicely with the other kids on the block – both analog and digital.

I have picked up some of these tidbits of information in my travels around the country to help our customers install their HD gear. Where my knowledge falls short, I have consulted with others who have their own ideas and suggestions.

Furthermore, while including the technical information required for the average overworked station engineer to figure out what is needed, I have tried to provide some "layman terms" and background for those who do not spend their day staring at vector diagrams and performing Fourier analyses in their heads.

STARTING THE JOURNEY

As we go through this, keep one thought in the back of your mind: "It is transitional."

HD Radio as it is being implemented now is meant to bridge the gap between today's analog technology and a point in the future when digital receivers have sufficient market penetration that the analog signal can be shut off with minimal negative financial impact to the station.

Therefore, any changes you make today should be made with the thought that, at some point down the road, the analog signal may be going away and it would be nice to minimize the amount of equipment that goes with it.

One other thing – there are significant differences between AM and FM in what is required, in how to optimize the signal, and in the features and equipment available. Sometimes I will give my thoughts on both simultaneously, at other points focusing just on AM or FM.

NOTE TO THE GM

For the managers who are reading this, be aware that there are as many opinions on the following as there are different options and engineers to install them.

Please get the opinion of your local engineering experts (station, corporate, contract or consulting engineers) for final recommendations – they are the folks that will need to get it going, make it sound good and keep it running.

In addition, it is a good idea to get on speaking terms with the support personnel at the manufacturer(s) of your equipment – they may have insights and ideas that can facilitate the installation based on your particular needs and existing infrastructure.

FIRST THINGS FIRST

The first thing you are going to need to know, most likely, is the answer to: "How much is it going to cost?" A good answer may involve some work. Some things that are common to both AM and FM, but there are also several differences, depending on what you plan on doing. But at the very least, you will need an HD signal generator to convert the audio into a suitable data stream.

Depending on the age of your transmitter, you may also need to upgrade or replace it – this will necessitate a call to the transmitter manufacturer. Most of us have taken several of these calls already and can tell you pretty quickly if your specific unit can be upgraded or not and, if so, what amount of time and money will be required.

In many cases, newer transmitters may already be HD capable and just need an interface to connect the HD generator to them. If this is so, assuming the audio to the site is in a format the HD generator can accept (typically AES/EBU), you could be looking at fairly minimal costs.

THE ANTENNA

In addition to ensuring the transmitter is "digital ready," there may be antenna work required.

For an AM station, be advised that HD requires a fairly broadband antenna system with maximum SWR of 1.4:1 at +/- 15 kHz from the carrier frequency. In addition, the phase needs to be set to provide the proper sideband impedances to the final amplifier output of the transmitter. This will frequently mean at least some adjustment of the antenna system.

For FM stations, whether or not any antenna work needs to be done will be determined mostly by the type of combining used to put the HD signal on the analog. There are four ways to do this: low-level combining, mid-level (or split) combining, high-level combining and antenna (or space) combining.

Of these, only antenna combining requires any work on the tower, although if you are running your transmitter through a multi-station channel combiner, bandwidth in the combiner may also be an issue. We will discuss things to watch for in the FM antenna system in more detail later.

THE AUDIO CHAIN

Finally, since HD audio has different processing requirements from analog, you will either need two processors or one of the new HD-type processors with dual, independently processed outputs (analog and HD).

While you can process the HD audio the same as the analog, thus using only your existing processor, it certainly is not the recommended way to go – aggressive processing of the HD can lead to audible artifacts that will noticeably degrade the audio quality.

In the following listings of required equipment, I have separated each section into what you absolutely must have, what you should have as a recommended minimum and what would be nice to have if you have extra dollars in the budget.

AM AUDIO

AM HD is fairly straightforward. It is a simulcast of the analog audio, so a single audio feed from the studio to the transmitter site is all that is needed. (Dual paths for backup are always recommended, but not essential; if you have one, it can be used to increase redundancy and minimize off-air time due to audio problems).

Once the audio arrives at the transmitter site, it will need to be in AES/EBU format – if the link from the studio is analog, then the recovered audio at the transmitter site will need to go through an A/D (analog to digital) converter.

There are a variety of A/D converters on the market from which to choose. But do keep in mind that the AES format carries left and right channel information – if your A/D converter does not have an L+R (mono) input, you will need to split the audio to drive both the L and R analog inputs. In some cases, this may be done through the processor, if your processor has the capability of taking an analog input and delivering AES/EBU output.

BOTH SIDES NOW

Having been to more than a few HD installations over the past year or so, it is pretty clear: every one has been different. So use what you have when you can, but do not scrimp on the audio path for either the analog or digital. Remember, the analog is what pays the bills now, but the plan is for the digital to take over that job in the future.

Meanwhile, as you consider your digital side, remember that if the digital audio quality is less than stellar after people hear you on their friend's new radio, it is not going to entice new listeners to go out and get their own digital receiver. This is why separate processing is highly recommended.

In the above example, where I suggested running the analog input audio through a processor to obtain dual AES/EBU outputs, this processor would be set very lightly, and used to primarily process for the digital audio. A second processor with AES/EBU in and out would be required for additional processing of the analog audio. The audio outputs from both processors would then go through the HD generator and on to the transmitter as phase and magnitude signals.

It is important to remember that audio can be fragile and every conversion from analog to digital and back will cause artifacts that can eventually become noticeable. Therefore, it is in your best interest to get the incoming audio into an AES/EBU configuration as early as possible in the chain.

AES/EBU audio also can develop audible artifacts from repeated sample rate conversions. The sample rate in the input stage of the HD generator is 44.1 kbps, thus it would be best to employ this rate throughout the chain rather than changing from one rate to another to another.

Some HD generators do contain a sample rate converter in the package, so it does not necessarily require an additional purchase to get the sample rate consistent fairly early on in the process.

REAL WORLD EXAMPLES

Below, I have shown three diagrams giving the most common configurations I have seen.

The first scenario is shown in **Figure 1** – analog audio into the site over a mono (or stereo) STL, with a purely analog processor (no AES/EBU capability). This is the absolute bare minimum and is not recommended for long term use, as it will not deliver the best audio possible for both domains.

Keep in mind that HD audio must be processed very lightly to avoid generation of audible artifacts and you may wish to process the analog audio more aggressively – that will not be possible with this configuration. All audio is L+R balanced analog, except between the A/D converter and the HD generator, where it is 44.1kBps AES/EBU.

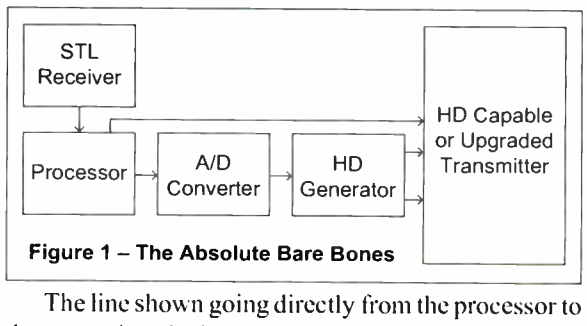


Figure 1 – The Absolute Bare Bones

The line shown going directly from the processor to the transmitter is the analog audio feed for the second exciter, if the transmitter is so equipped – this allows a fully redundant backup of the analog audio, in the event of a failure of any portion of the HD air chain.

(Continued on Page 6)

Digital Radio Crash Course

Part 1 – AM

Continued from Page 4

SEPARATE PROCESSORS

Next, we have a somewhat more ideal situation. Again we have analog audio into the site through the STL, but this time we have an additional processor to play with (or an HD processor with dual path processing for the analog and digital audio signals). In addition, our processors are more modern and have AES/EBU inputs and outputs (as well as balanced analog L+R for the analog feed to the transmitter).

Note the line between the HD generator and the A/D converter – in order to prevent lockups of the HD generator, it is critical that the analog audio and the digital audio be synchronized. This can be done in several ways, but my preference is to do it by synching the processors to the HD generator's clock signal, or as in **Figure 2**, to the incoming audio, which is externally synched to the HD generator clock.

Not having the analog and digital inputs synched to the HD generator can cause an increase in BER (bit error rate) and dropouts in the audio signal, as well as potential lockups of the HD generator.

In addition, if the HD generator has a status output indicating it has a failure (it is a computer, after all), I like to run this to the standby exciter select on the transmitter, allowing automatic transition to the purely analog, standby exciter, in the event of any problems with the HD chain. This is a reasonable baseline that is fairly simple to configure and maintain.

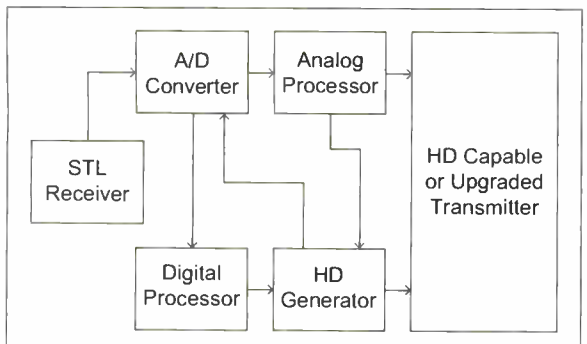


Figure 2 – A Pretty Good Starting Point

EVEN BETTER

Finally, we arrive at the ultimate arrangement, with audio delivered to the transmitter site in AES/EBU format, either via STL, ISDN or Ethernet connection. Again we have dual processors – one for analog and one for HD – or a dual purpose processor with HD and analog outputs, all in AES/EBU format.

If we have a dual purpose processor, as shown in **Figure 3**, we can synchronize it to the HD Generator clock. If we have two processors, we would need a sample rate converter (SRC) in front of them to split the audio, so the SRC could be configured to synchronize the audio. (In Nautel equipment, the SRC is part of the auxiliary unit which makes up the HD generator system.) Refer to your equipment manufacturer for details on specific configuration.

This configuration has the benefit of the absolute fewest number of pieces, reducing possible points of failure. Furthermore, fewer pieces mean fewer A/D or sample rate conversions, which will tend to reduce the amount of artifacts created on the digital signal. This should help you achieve a cleaner sound with a minimum of hair pulling.

AND OUT TO THE ANTENNA

Once we have the HD signal created at the output of the AM transmitter, all we need to do is get it up the antenna. Be forewarned that this is not always as simple as it sounds!

This is where a consultant with a sound knowledge of AM antenna systems will be worth his weight in gold – and then some. As previously mentioned, it is necessary that the antenna system be of sufficient bandwidth; the minimum specification is an SWR of 1.4:1 at ± 15 kHz from the carrier frequency.

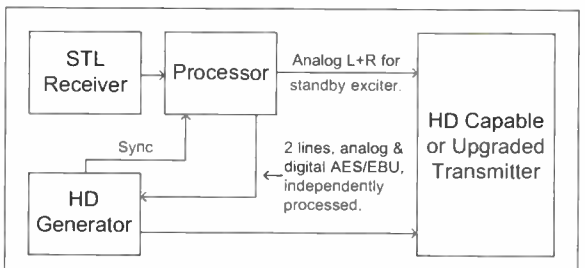


Figure 3 – Now We're Talking

If you can make it flatter, this is better for several reasons. First, it will help to reduce the amount of sideband emissions that are created, reducing interference to first and second adjacent channels. Secondly, it will have a direct effect on both the ability of a receiver to lock on to your HD signal, as well as the time it takes the receiver to acquire a lock. Both of these, of course, will have a direct impact on your "digital bottom line."

This means that the bandwidth of the antenna, more than ever before, will have a significant impact on the amount of digital coverage you achieve.

BANDWIDTH IS CRUCIAL

There have been a few studies performed on this, one of which can be viewed at http://www.kintronic.com/site/techpapers/NRSC-PRESENTATION.pdf.

This paper illustrates the affect that antenna bandwidth and phase shift can have on the ability of a receiver to lock onto the digital signal and maintain that lock, in laboratory conditions. In the real world, these affects will be magnified, emphasizing the need to properly address the antenna system as part of the HD upgrade process.

As a general rule of thumb, if your AM station is capable of or is currently, broadcasting a C-QUAM AM stereo signal, it should have little trouble handling HD radio. However – especially for stations with complex directional arrays – it is good to be aware that significant antenna rework may be required.

SPECTRAL SAMPLES

To give an example of the differences that antenna system configurations can have, two spectrum analyzer waveforms follow. The first is from a single tower, broadband antenna, the second is from an omni directional (day)/three tower directional (night) with a narrower bandwidth.

In both cases, the HD signal passes the mask for emissions limitations; however, the first has significantly lower sideband products. Please note the first is not as accurate as it could be, since the measurement was taken with a 1 kHz resolution bandwidth (the measurement specs. call for a 300 Hz resolution bandwidth). However, that is not relevant for the purpose of this demonstration because the lower resolution bandwidth would only tend to magnify the difference between the two signals.

Figure 4 - Station #1, single tower, good bandwidth.

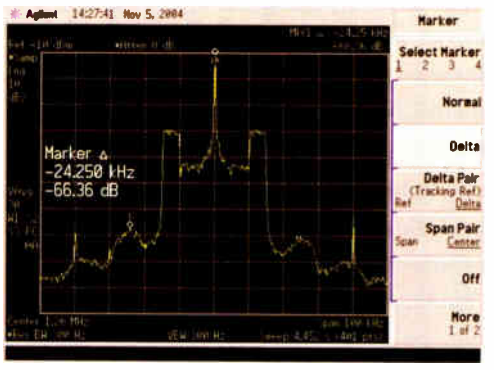


Figure 5 - Station #2, multi-tower, narrower bandwidth.

By comparing the screens, you can see that the second station is passing the mask, which specifies -65dB at the first order sideband product, but by not nearly as much as station #1. Another point to note is the irregularity in the levels of the sidebands on station #2 – the upper sidebands are noticeably lower than the lower sidebands.

TEST TECHNIQUE

This does raise an interesting point in that, in addition to having the correct test equipment, having the correct test *technique* is absolutely critical.

The measurement requirement is that the center frequency is set to carrier, with a 100 kHz span and a 300 Hz resolution bandwidth. In addition, trace detection must be set to sample mode if available and peak mode if not. Averaging must be on and set to a minimum of 16 (we frequently use 20-30 for improved clarity).

As a result of this, it is necessary to wait between adjustments to allow the averaging to be completed. Also, similar to AM stereo, while initial adjustments are usually made into a dummy load, it will be necessary for any final tweaking to be done with the system operating into the antenna.

MORE COMING

This should get you started on figuring out what you need to upgrade your AM plant. Next time around, we will look at the requirements for the FM facility, delving into the world of multicasting and the multitude of acronyms that accompany it. In subsequent issues we will address the basics of setting up your system to optimize transmission of the HD signal.

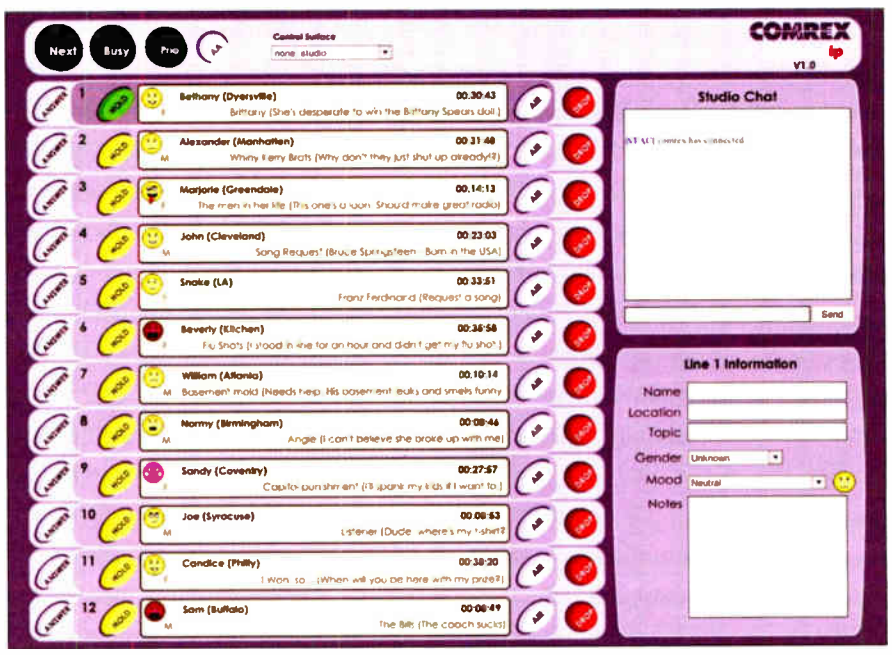
Jeff Welton, senior Customer Support Technician at Nautel, Ltd., has the benefit of hands-on experience at a variety of digital installations. He welcomes your questions and comments at jwelton@nautel.com

OT CALLERS? STAC 'EM!

No matter what they're talking about, STAC is the best way to manage your calls.

STAC (Studio Telephone Access Center) puts you in control of your talk shows, request/contest lines, call-ins and phoners with great sound, ease of operation and scalable configuration. Incorporating a pair of Comrex high-performance digital hybrids, STAC provides the most natural sounding telephone audio — even when conferencing up to four callers.

The STAC system is available in six (STAC 6) and twelve (STAC 12) line versions. Connect up to four control surfaces using standard CAT5 cable — no custom cabling required. Best of all, STAC is incredibly easy to use — anyone can master it in seconds.



Use STAC any place there's a web browser!

If you have a computer, you've already got all the hardware and software you need. Just log onto the internet using a standard web browser — NO SPECIAL SOFTWARE TO INSTALL — go to your STAC IP address, and you are there! STAC 'EM from home, the studio or that great beach in Cancun!

Cool features include:

STAC IP allows call control from multiple networked computers

Busy-All makes starting contests a breeze.

Auto-Attendant answers, plays your message and STACs callers on hold. Great stress relief for screeners and producers!

STAC
STUDIO TELEPHONE ACCESS CENTER

Got Calls? ut C re O T

Toll Free: 800-237-1776 • www.comrex.com • e-mail: info@comrex.com
19 Pine Road, Devens, MA 01434 USA • Tel: 978-784-1776 • Fax: 978-784-1717

COMREX

Transmission Guide

by Jerry Westberg
Senior RF Design Engineer
Broadcast Electronics

A Look Inside 4M Modulation and BE's New 50 kW AM Transmitter

If you had the opportunity to design it, what would the ultimate high-power AM transmitter be like?

THE "DREAM MACHINE"

Our dream machine would run close to 90% efficiency, and every component would be easily accessible – bar none. Our wish-list would include things like a cool GUI and complete diagnostics, all jammed into a chassis the size of a refrigerator.

However, all these desires were secondary to the real task at hand. We needed to develop an entirely new AM modulation scheme capable of handling the demands of HD Radio and DRM.

These signals require a more linear design than traditional modulation methods such as Pulse Width Modulation (PWM) could produce. At Broadcast Electronics, we were ready and willing to make that giant leap forward into true digital quality, but how?

A NEW DESIGN

We had been doing some work on an experimental power supply. The supply was designed to raise and lower its DC voltage at a 100 kHz rate. The switching frequency of the supply was 1 MHz.

It did not take too much thought to see that the difference between this power supply and an AM transmitter was the diodes that perform the rectification for a DC output. If the diodes were removed, 1 MHz RF power would be applied to the load.

The modulation technique was called 4M Modulation™, as in Fourier Modulation. We started the development of our first transmitter – a 50 kW unit – in a line of AM transmitters to be built on the technology.

4M MODULATION

What is 4M Modulation? In simple terms, 4M Modulation is a method of modulating the duty cycle of the RF waveform.

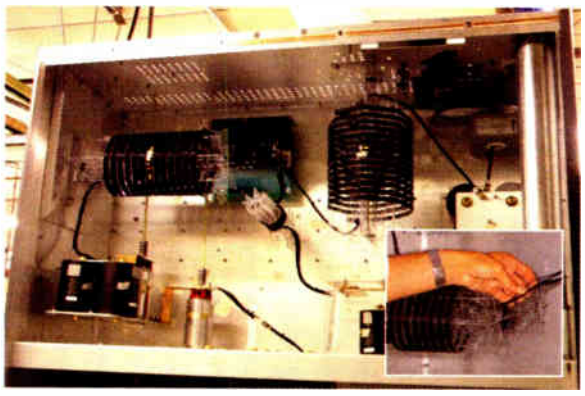
A single amplifier has all that is necessary for modulation. This allows the system to be scaled to any power level. The transmitter can then meet any daytime and nighttime power requirements.

As a result of this new typology we were able to design our dream 50 kW transmitter so it weighs a third of the PWM and digital models on the market today, and is half the size.

The author poses with a 4MX 50.

It is the only 50 kW transmitter that can pass through a typical doorway when it is tipped on its side.

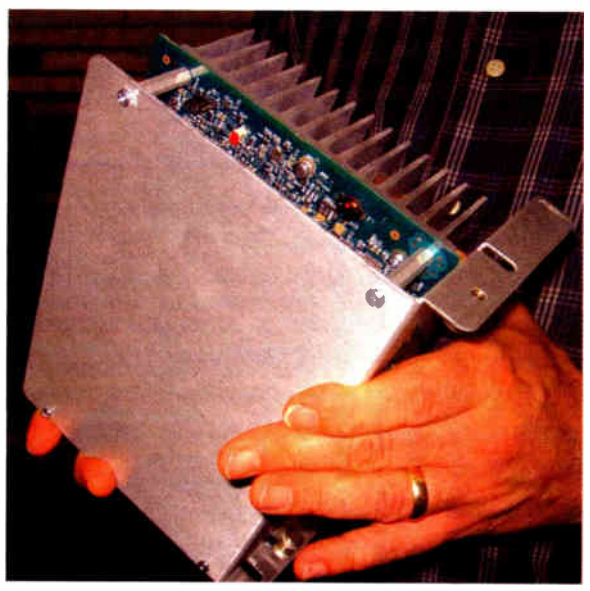
There are several reasons why the transmitter is so small, including efficient power supplies and the use of Litz wire coils for the output network. Litz is a multi-strand cable of small-gauge, precision-twisted, film-insulated wire. Since the coils are small, we need less space to fit them into the unit.



The 4MX 50 output network uses Litz wire.

The cable design also minimizes the power losses related to the "skin effect" of current at radio frequencies. Strands in the Litz cable carry equal currents because each is surrounded by the same amount of flux per unit length, unlike a solid conductor, which has a high concentration of current that flows to the surface or skin and therefore creates greater power losses.

In our 4MX 50 AM transmitter there is no need to perform modulation at some intermediate frequency, as is the case with Pulse Width Modulation transmitters. The duty cycle of the RF waveform is modulated directly, without the use of a modulator stage. Because there is no modulator, the transmitter has one less process necessary to produce the desired output power. This translates to less waste and more efficiency in the 4MX 50 transmitter.



A 4MX 50 output module.

Adding to the transmitter's efficiency are the power supplies used, which run as efficiently as current technology will allow. A power factor corrector circuit creates 400 volts easily and efficiently. All of these design characteristics contribute to the better than 88% typical efficiency.

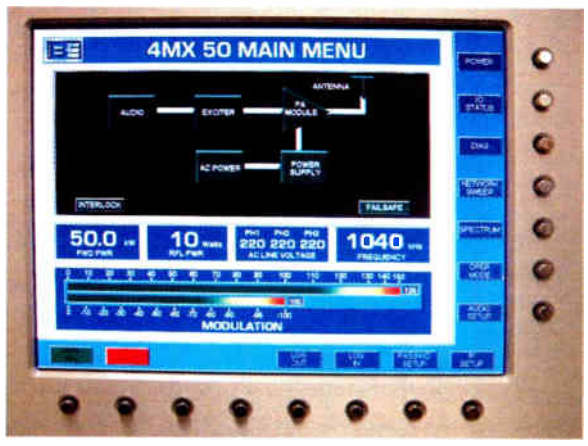
There is a one-to-one relationship between the power supplies and the power amplifiers, giving the transmitter built-in redundancy. The PAs are hot-pluggable, and can be removed and replaced while the transmitter is in operation.

BUILT FOR "HD"

While we were blazing new trails with this new modulation scheme, we decided to build in a few important features for AM HD Radio.

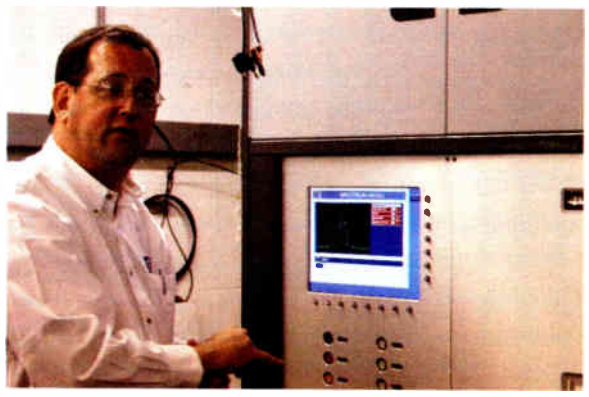
A universal problem has been how to pass the full frequency range of HD Radio through a transmitter designed for the limitations of today's analog AM. Stations need to limit the input frequency of the audio to 10 kHz. In broadcasting HD, it is desirable to have all audio paths at greater than 50 kHz. We decided to leave the standard audio path with its filters alone and bring the HD in directly to the exciter as an I and Q signal. A broadcaster can then switch from analog to HD without compromising the performance of either system.

The custom interface is a GUI with a 15" display.



The Main Menu on the BE 4MX 50.

The panel has soft-button controls with a full gamut of diagnostics and control features. The transmitter has the standard remote control features but includes an IP addressable port.



Chuck Kelly demonstrates one of the diagnostic screens.

All in all it has been a pleasure seeing this dream come into a reality.

Jerry Westberg is the Senior Design Engineer at Broadcast Electronics. For further information, you can contact him at: jwestber@bdcast.com, or call BE at: 217-224-9600

The 4MX in a Nutshell

The 4MX transmitter signal path consists of six major blocks.

1. AUDIO LOW PASS FILTER FOR ANALOG

The audio input filter for the analog signal limits the bandwidth for analog operation by protecting against unwanted high-frequency signals and noise.

2. I AND Q OR ETHERNET DATA INPUT FOR HD RADIO OPERATION

The I and Q or Ethernet data input provides a path for the HD Radio signals to pass directly into the processor in front of the exciter.

It is important to note that the usual path for entering the HD Radio amplitude signal is through the standard analog input. For PWM and digitally modulated transmitters, the analog filter has to be removed or modified in some way, which leaves the transmitter unprotected against undesirable audio or noise that may enter through this port during HD Radio operation.

(Continued on Page 10)

The 4MX in a Nutshell

Continued From Page 8

3. EXCITER

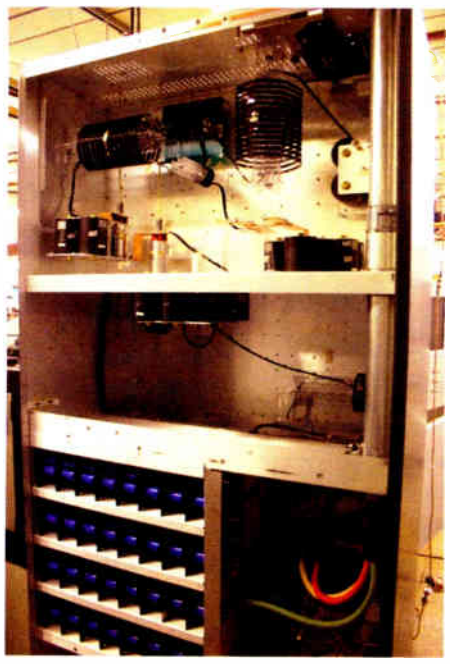
The exciter provides the drive signal to each PA to create the amplified output waveform. The drive characteristics determine the duty cycle of the amplified waveform.

4. POWER SUPPLY

The power supplies are an important feature of the 4MX transmitter design. They run as efficiently as the state-of-the-art will allow at 400 VDC. A power factor corrector supply creates this voltage easily and efficiently.

The supplies were overdesigned for efficiency and reliability. Two input diode bridges are used, even though the design requires only one. The FET used in the power factor corrector circuit delivers 2.85 kW maximum, even though it still operates at the stresses created by as much as a 6 kW output power. The power factor correction inductor was designed for twice the actual current to keep losses at a minimum.

The catch diode is the latest silicon-carbide diode, which improves the efficiency of the supply by half a percent. All these design implementations yield an efficient (97%) and reliable power supply. BE provides a one-to-one relationship between the power supplies and the power amplifiers. Each power supply operates only one PA with no busing of power supplies. This scheme provides optimum redundancy for the system.

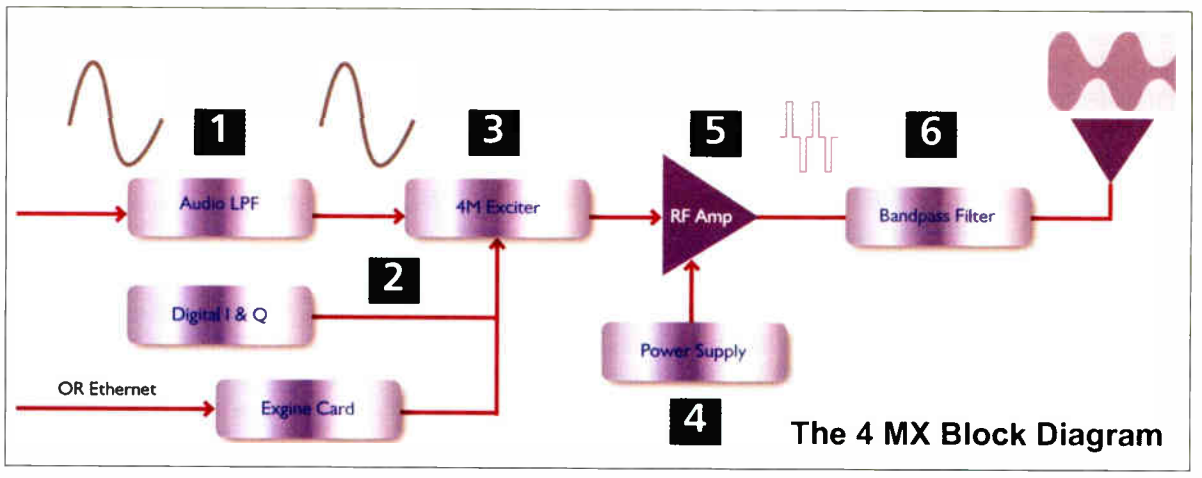


Rear view of the 4MX 50

5. POWER AMPLIFIER

Each power amplifier has an H-Bridge topology; each runs independently of the other amplifiers in the transmitter, and the output of each amplifier is in phase with all other modules. This is important because it allows the 4MX to operate on a single supply and power amplifier combination, resulting in excellent operation at very low powers.

In addition, the same drive signal is applied to all PA modules; the drive to the power amplifier is the key to the 4MX operation. The details of this drive circuitry are currently in the patent process and cannot be described in detail here. However, the system's results and benefits are described in the main article.



The 4 MX Block Diagram

6. BANDPASS FILTER

The bandpass filter was designed to reduce the harmonics of the carrier to an acceptable level. The 4MX transmitter uses a bandpass filter designed to be broadband, with approximately 210 degrees of phase shift between devices and the output port. The bandpass filter also matches the ideal PA load impedance of 10 ohms to the 50 ohm output impedance. – *Radio Guide* –

Maintenance Guide

by Ray Vaughan with Barry Mishkind

Giving Attention to the Generator Battery

I am sure you have seen those warnings on 12-volt automotive and generator batteries – that ones that remind folks of the potential dangers – and like me, ignored it.

THE WARNING

From the vantage point of experience, it now amazes me how blithely we read the "Danger" and "Poison" notices on these batteries, and just continue along doing what we are doing. It is almost as bad as working on a transmitter without using the J-sticks just because we did not draw any arcs the last time we had the cabinet open.

Worse, when the battery says "Maintenance Free," we can become even more complacent about regular inspections. But the dangers are real. Please allow me to relate what happened at work one day a couple of years ago.

We have a 50 kW Katolight standby power generator. It was powered by a heavy duty "Maintenance Free" battery. The system had always worked very reliably during every instance of power failure, at least up until that "memorable" day.

The Generator sitting on the roof.

It was about noon, when the generator usually does its weekly automatic exercise, when I heard a loud bang. I thought it was something simple, like a garbage truck dropping a dumpster – something explainable. So I did not think much about it.

THE ALARM

A few minutes later we got a call from someone who works near the transfer switch. A couple of years before, I had installed a visual and audible warning for the generator; its logic system gives a 12-volt output when any alarm is active, such as over-crank or when the generator tries to start, but times out.

This alarm was on, so I went up to the roof to investigate the cause.

The generator is located in an outdoor enclosure on the roof deck of a two-story building. The battery is in a battery case on the bottom of the enclosure. It appears that when the generator went to start up, some hydrogen gas in the battery ignited, casing it to explode.

THE MESS

The inside of the generator enclosure was covered with shrapnel from the battery, the battery box, and, of course, battery acid.

After surveying the scene, I immediately ran over to a hardware store to get some baking soda. Five small boxes later, most of the acid was neutralized. Then it was time for cleanup and a replacemernt battery.

It was important to make sure the right replacement battery was installed. It was also important to give the generator a complete inspection so as to try to determine what might have caused the explosion and take steps to prevent it from happening again.

Not a pretty sight.

To make sure it was done correctly, we had a generator maintenance company come in, do the inspection, and replace the battery.

THE LESSONS

Looking back at the incident and thinking about it produced a number of lessons that can be applied to any generator installation.

• "Maintenance Free" means: "When this thing goes bad, there is not going to be anything left to maintain."

• Just because the battery is working does not mean that it is healthy.

• The lack of refill covers makes the cells a nice pressure cooker. Even in a "closed" system, hydrogen gas can build up.

The top of the "Maintenance Free" battery.

• Batteries can explode from several causes aside from jumping them or external sparks. An internal spark can be caused from drawing starter current or even from friction when tightening the clamps.

• If you have standby batteries, have baking soda nearby.

• Likewise, be sure to have gloves and goggles on hand.

• If you have to be near an exploding battery, plan to be two floors down, in an office, in another building. At least it worked for me!

Installing a new battery. This one has caps and will need to be refilled, but perhaps it will not explode as easily.

FINAL COMMENTS

All generators – whether at the studio or the transmitter – ought to be on a regular inspection schedule. A good rule of thumb would be monthly, but this certainly will depend upon location, climate, and accessibility issues.

Furthermore, as a part of the annual "load test" the battery condition should be carefully considered; no battery should be left in place more than three years.

Another suggestion: treat battery maintenance as carefully as you might work on high voltage systems. Let someone know where you are and what you are doing. Better yet, have someone nearby just in case you need someone to "wash" you down with a hose.

Ray Vaughan is a longtime radio and telecommunications contract engineer in the Miami area. His contact address is ray@rayvaughan.com

KinStar

The first electrically short AM antenna with FCC pre-approved efficiency and radiation characteristics for full time use in the U.S. market.

KinStar Features:

- Direct replacement for a quarter wave tower with 67% reduction in height.
- Approved for non-directional Class B, C or D full-time operations.
- Land requirement: Must accommodate 120-radial quarter wave ground system.
- Requires no lights or paint.
- Input bandwidth compatible with IBOC HD Radio.
- Enhanced survivability in hurricane zone due to short height.
- Excellent, low cost auxiliary antenna.
- Suitable for installation near airports.

423.878.3141 fax 423.878.4224 Email: ktl@kintronic.com www.kintronic.com

Model RFC-1/B Remote Facilites Controller
- control transmiter from any telephone
- 8-64 channels of telemetry and control
- programmable control by date and time
- optional printer and modem adapters
- programmable telemetry alarms
- integrated rack panel

Model RAK-1 Intelligent Rack Adapter
- parallel printer interface
- internal modem for data transfer
- front panel status indicators
- battery backed power supply
- rack mountable chassis
- accessory package for RFC-1/B

Model DAI-2 Dialup Audio Interface
- perform unattended remote broadcasts
- fully programmable output on any key press
- momentary and/or maintained relay outputs
- four logic inputs with programmable output
- balanced audio input and output wth ALC
- seven DPDT relays and one 4PDT relay

Model AFS-3 Audio Failsafe
- contact closure or status voltage on alarm
- adjustable delay period from 30 sec to 5 min
- positive delay adjustment via rotary switch
- internal audible alert--continuous or pulsing
- front panel status indicators and bypass
- dual, balanced audio inputs

Sine Systems, inc

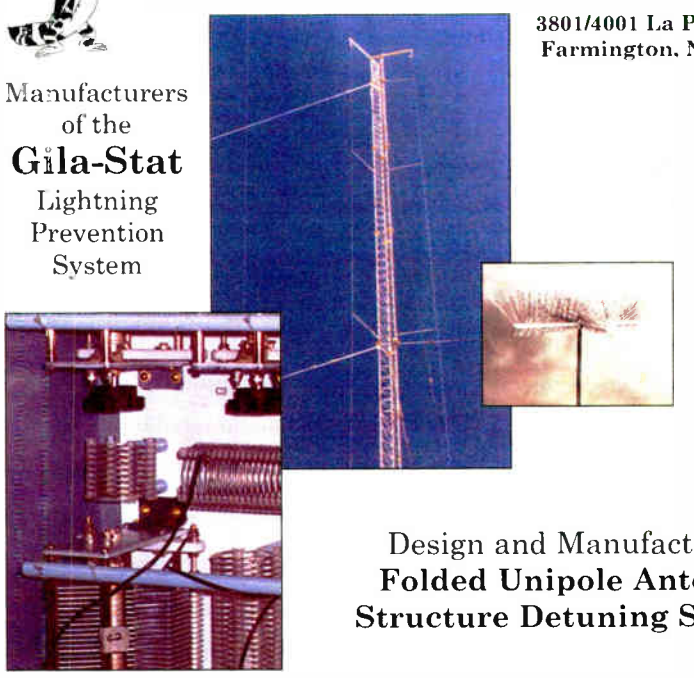
615.228.3500
www.sinesystems.com

Gila-Stat

nott ltd

3801/4001 La Plata Hwy
Farmington, NM 87401

Manufacturers of the **Gila-Stat** Lightning Prevention System



Design and Manufacture of
Folded Unipole Antennas
Structure Detuning Systems

Design and Manufacture of
Lightning Prevention Systems
ROHN Towers & Accessories

Phone: **505-327-5646**
Fax: **505-325-1142**
Website: **www.nottltd.com**
Email: **judyn@nottltd.com**

Over 40 Years Broadcasting Experience

Audio Guide

by Frank Foti
Omnia Audio

Operational Checklist for HD Radio

The deployment of new technology occurs in many stages. The first one is getting the tech off the ground – "Houston, we have lift-off." The next stages deal with refining – and in some cases redefining – the technology. HD Radio is no exception. Users must make sure the system is installed and operating to the best of its capability.

A CHECKLIST

Here is a simple and quick checklist to assist with HD Radio installations. While these recommendations seem elementary, they are the items that separate a decent sound from a great sounding installation.

It has been surprising to hear HD Stations sounding identical to the conventional FM signal, only to find the output of the audio processor was mistakenly set to feed conventional FM audio to both transmission paths. In that case, the fix was simple and easy: Reset the audio processor's HD output to route the proper audio signal to the HD exciter. The fix was literally a single button click in one sub-menu.

This is just one example, and the following list will describe why these issues are important.

☐ Monitoring

A good monitor is much more than the General Manager's car radio. It is the live "report card" that indicates how the station sounds at all times.

There are dedicated receivers/monitors available for HD Radio and those must be considered for this application. Adapting and rack mounting a car radio is not really sufficient because many car radios are optimized for the car environment.

A good monitor will offer AES and/or line-level outputs that can be easily integrated into the infrastructure. Subjective evaluations should be made using a good monitor speaker. The GM's car is always good as a secondary reference, but it is not *the* reference.

☐ Audio Routing

The example cited above is a true story. It actually has happened quite a few times and quite possibly is still going on at some installations.

Each station needs to make sure, when employing an audio processor offering combined processing for conventional and HD signals, that the correct signals are routed to the proper transmission paths. Conventional FM utilizes a 75 µs pre-emphasis and 15 kHz low pass filtering while HD Radio has no pre-emphasis requirement or need, and the audio bandwidth can be set out as far as 20 kHz if desired.

The combo processors offer routing options that select which processed signal will be connected to specific outputs, AES, electrical-analog, etc. Your owner's manual for the audio processor will describe how to select these.

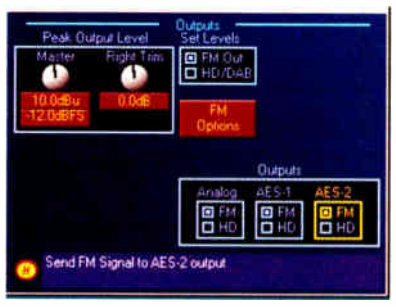


Figure 1 – Incorrect

Figure 1 is an example of an incorrectly set output for HD Radio.

Both AES outputs are set to the *FM* mode. This setting will route 75 µs preemphasized, 15 kHz band-limited audio to both the conventional and HD transmission paths. This configuration will cause the audio to sound identical in either mode, HD or conventional. Moreover, in this mode, the codec of the HD system is operating with hard limited audio, i.e. clipping. As a rule, codecs and clipping are not happy campers when operated together.

Figure 2 shows a corrected output for HD use.

In this example, the AES-1 output contains the conventional 75 µs emphasized and 15 kHz bandlimited audio. Meanwhile, AES-2 contains the codec provisioned flat 20 kHz, or less, signal for HD Radio.

☐ Blending Issues

At first glance, the blend issue would appear to merely involve correct matching of the diversity-delay function. But, there is another aspect that cannot be forgotten: absolute phase. Should a 180-degree phase reversal occur between the conventional and HD signals, the blend function will appear to sound like a drop-out in the audio.

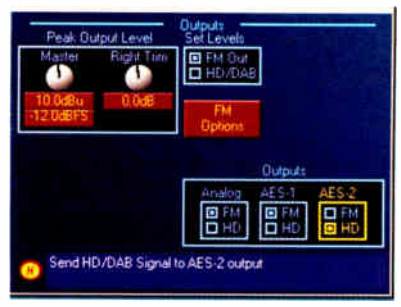


Figure 2 – Correct

This can be checked and observed with a scope connected to the outputs of the audio processor's HD and conventional signals. Another simple test is listening to a radio while forcing the switch between HD and conventional.

If the blend is smooth, then chances are the signals are in-phase; if the level momentarily drops or sounds like a dropout, then there is good chance a phase reversal has occurred between the output of the processing and one of the exciters.

☐ Read The Manual(s)

Believe it or not, the equipment manuals for audio processors, exciters and transmitters do contain information that will aid the installation and assist in yielding improved performance.

While many of our lifestyles may not allow enough time to read a manual cover-to-cover, most gear today offers a *Quick-Start Guide* designed to get the system up and on-the-air as soon as possible. Please do not discount this resource, as many times the answers to those frustrating problems lay right there inside the manual!

Please consider these items when performing an HD Radio installation. In the overall scheme, each of these requires very little time or material, yet the benefits far outweigh the time and effort expended.

Frank Foti is President of Omnia Audio. He can be emailed at ffoti@telos-systems.com

The Worst I've Ever Seen

A Visual Display of the Good, the Bad, and the Plain Hard-to-Believe

The ATU in the Jungle

Upon taking over the engineering duties for a two-tower directional radio station in a brackish marsh area Florida, an engineer who will only identify himself as "Annonie Mouse" decided to take a trip out to the antenna tuning units (ATU's).

After blazing a trail to the first ATU through the six foot high marsh grass, he was greeting by this less than thrilling sight:

This is an operating ATU!

Mr. Mouse (no relation to Mickey) reports "the scary part about this is that this ATU is operating. In this picture it is live with RF and the station is on the air." However, the ATU door was nowhere to be found; no one knew how long it had been missing.

In this next picture, one can see a true rat's nest under the output coil. Obviously the ATU needs to be rebuilt very soon and even sooner some of those "tenant" rats may be looking for a new home. One has to wonder if the RF close by in the ATU gives them a warm place to sleep at night.

This ATU even has some illegal "tenants."

Our intrepid engineer did not report seeing any movement in the ATU, but he also did not look real hard for them. This time.

Everyone eventually finds something at work that gives them "pause" to absorb. Please share your favorite pictures of this sort of sight that can surprise and amaze broadcasters. Email your best to: Editor@radio-guide.com

Things You Need to Know

Structural Standards Changing

If you are planning a new tower, January 1, 2006 brings with it some changes in the national standards that might have an effect on your plans.

On that date, Revision G (TIA/EIA-222-G) will go into effect, replacing Revision F, which had been the current standard. Many tower companies are already providing quotes for towers under both the F and G standards, but there are reasons to be "thinking ahead" if you are buying a tower.

COST ISSUE

Bob Groome, Domestic Sales Manager at Jampro Antennas and RF Systems in Sacramento, California, pointed out that new towers built to the Revision G standard will cost more than those under Revision F. This is because most towers will need to be built with more mass than under Revision F.

In addition to a heavier tower structure in order to handle new, mandatory ice-loading and top-loading specifications, this will require more concrete in the base than under the old specifications – especially in sub-standard soil – and, for AM/FM towers, possibly a bigger base insulator. At the same time, Revision G permits somewhat "lighter" guying system

According to Groome, the "more massive towers may have more effect on FM or TV patterns, so pattern measurements may become more important than in the past with the lighter towers." Furthermore, "coax sizing may be a more important consideration than in past years to keep the wind load down on marginal towers."

Groome also said that "antennas with wind load specified under RS222-F or earlier will have to be calculated for each site because the actual height above ground now comes into play. This may actually drive up the cost of these antennas a small amount due to the extra engineering time compared to the old specs."

A "VOLUNTARY" STANDARD

For the present, the 222-G standards are only voluntary, as they are not yet incorporated into the International Building Code (IBC), although that is expected later in mid-2006. Not until then will building and zoning agencies generally require adherence. Towers constructed between now and then can be built under either Rev F or Rev G.

However, if you have plans to consolidate sites or lease space to other stations, it might be prudent to ensure the structure meets RS222-G to avoid any unnecessary hassles with the local inspectors. Depending upon the city or state, Groome notes that "there are other issues that ME's will be concerned about. Older towers being retrofitted will probably require re-work to comply, even for minor changes on the tower like adding an STL dish. This may mean you will have to budget more for a tower study than in the past."

Groome concludes by offering help to any client to "run numbers on either standard for a given antenna, on a certain geographic location and at a given height for your situation." Jampro's phone number is 916-383-1177. – Radio Guide –

PHASETEK INC.

Quality

PHASETEK'S manufacturing facility and components expertise are available to design and fabricate any type of inductor or special RF component.

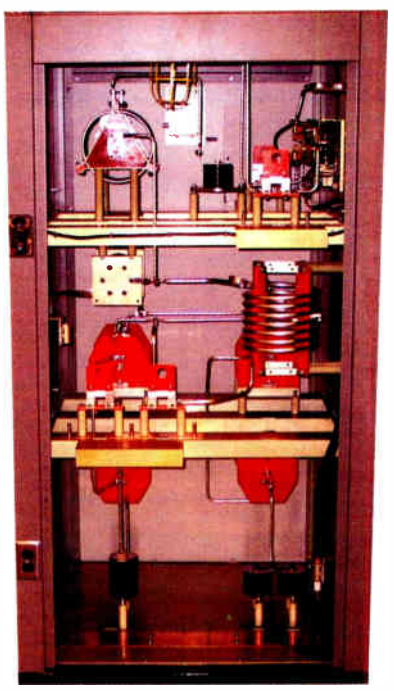
Our engineering and production staff's years of experience and commitment to quality are available to fill any special requirements.

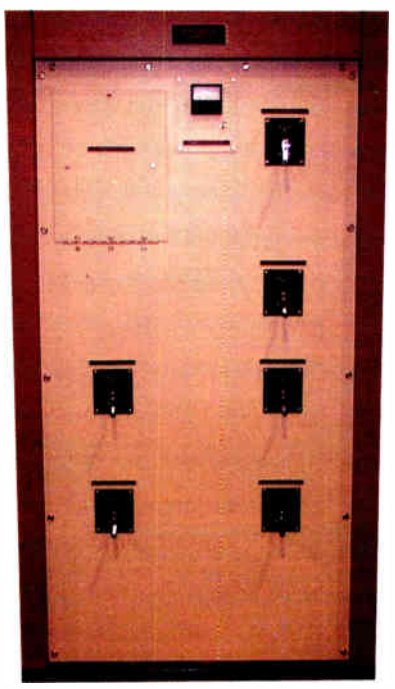
Dependable

RELIABLE & DEPENDABLE RF COMPONENTS & PARTS

Variable & Fixed Inductors
Variable & Fixed Vacuum Capacitors
Fixed Mica Capacitors
RF Contactors
Vacuum RF Contactors
Test Jacks and Accessories
Static Drain and Lighting Chokes
Isolation Inductors
Sampling Loops
Dial Counters and Couplers
Transmission Line Terminations
Ribbon Clips and Tubing Clamps
Horn Gaps
Toroidal Current Transformers
And More!

550 California Road, Unit 11
Quakertown, PA 18951
Phone: 800-742-7383 215-536-6648
Fax: 215-536-7180 Email: kgpti@epix.net
Website: www.phasetekinc.com





Custom Phasing Systems

Custom Manufactured

Antenna Phasing Systems
Control Systems
AM/MF Antenna Tuning Units
Diplexers (NDA/DA and expanded band)
Triplexers
Transmitter Combiners
Dummy Loads (with matching networks)
Tower Detuning Units/Skirts
Broadband Matching Networks
Tunable Skirt Assemblies (TSA's)
Isolation Transformers

Experience

Phasetek's experienced staff of engineers and production personnel are dedicated to provide the broadcast industry the highest quality, custom designed phasing equipment.

Value

OTHER SERVICES AVAILABLE:

Phasing System Design
Engineering & Technical Field Support
AM & FM Installations.

Freeland Products, Inc.

Rebuilder of Quality Tubes Since 1940.

75412 Highway 25 • Covington, LA 70435 - U.S.A.
800-624-7626 • 985-893-1243
Fax: 985-892-7323 • www.freeland-inc.com
Email: freeland-inc.com@freeland-inc.com

LOOKING TO CUT YOUR BUDGET?

LET US HELP REDUCE YOUR ENGINEERING COSTS WITH REBUILT TUBES.

WE OFFER A GREAT WARRANTY, QUICK SERVICE, AND A MONEY SAVING PRICE!

We also buy used tubes.
Recycle those unwanted duds for $$$ *CASH* $$$

We are a third generation,
American owned and operated company,
rebuilding quality tubes since 1940.

Freeland Products, Inc.

75412 Highway 25 • Covington, LA 70435
1-800-624-7626 • 985-893-1243 • freeland-inc.com@freeland-inc.com

Take 10% Off — **THE COST OF YOUR NEXT REBUILT TRANSMITTER TUBE.**

This original ***Radio Guide*** coupon must accompany the used tube when sending it in for rebuilding, for discount to apply.

This coupon is only valid for one rebuilt tube.
COUPON COPIES ARE NOT VALID

Digital and Analog Transmitter Audio Switching Solutions, Analog to IBOC!

The AES-302 Digital Audio Switcher/DA/D to A Converter

The CDS-300 Composite Audio Switcher/DA

The CDS-302 Automatic Composite Audio Switcher/DA

Introducing the next generation **transmitter audio switchers** from BDI. Now you can have complete confidence in your signal path with this series of switcher/DA systems. We have **composite** and **digital** solutions for your routing and distribution requirements. If you system is all digital, choose the AES-302 to automatically switch, distribute and monitor your transmitter audio feeds. Still running an analog STL or stereo generator? Use either the CDS-300 or 302 to switch and distribute your baseband audio signals. Select one of the optional modules for the CDS series and convert your analog signal path into an AES digital output suitable for digital exciters and IBOC implementations. Visit our web site and download complete information about these problem solver products.

Broadcast Devices, Inc.
Tel. (914) 737-5032 Fax. (914) 736-6916
Website: www.Broadcast-Devices.com

bdi

Safety Guide

by Richard Strickland

RFR Safety 101

RF radiation (RFR) and the issue of safety when working near RFR has been getting an increasing amount of press. Although the Federal Communications Commission (FCC) has not fined a large number of licensees, some of its most recent enforcement actions can be considered landmark cases.

These precedent-setting cases include:

• The first action involving personal injury to a tower climber.

• The first action involving multiple licensees that collectively generated enough energy on the ground to exceed the commission's Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled exposure.

• The commission's recent issuance of a Notice of Apparent Liability for Forfeiture (NAL) to a television station with a proposed fine of $25,000 – after establishing a $10,000 fine as the standard for RF radiation violations. A separate NAL involving another licensee at the same site has a proposed fine of $20,000.

These examples illustrate the three main reasons why you need to understand the safety issues of RFR:

1. Personal Safety: Minimize the risk to all personnel: employees, contractors, and visitors.

2. Regulatory Compliance: Comply with all FCC, OSHA, and local regulations.

3. Liability: Minimize liability risk.

RF RADIATION AND BIOLOGY

It is a well-documented fact that RF radiation can cause body tissue to heat. This fact became obvious during World War II with the widespread deployment of radar.

Research began in the 1950s, and by the 1970s the concept of Specific Absorption Rate (SAR) was developed to explain and quantify how RF energy is absorbed by the human body. SAR is measured in Watts per kilogram of body mass.

At its simplest, it turns out that the SAR level is essentially a function of how good an antenna you make. The major factors are frequency, your height, polarization versus your position, and whether or not you are grounded.

A "standard" man, defined as an individual that is 1.75 meters tall (about 5 feet, 9 inches for the metrically-challenged), is resonant at about 85 MHz providing that he is not grounded. Thus, a standard man makes a great Channel 6 television antenna! The average woman, who is somewhat shorter, makes a great FM radio antenna!

The other biological effect that is a concern and also impacts the standards and regulations is electrostimulation – RF shocks and burns. People who work around AM radio stations are usually quite familiar with this problem. Electrostimulation risks guide the standards below 30 MHz, while SAR is the basis of all the major worldwide standards at higher frequencies.

The heating effects of RF energy should be evaluated based on time-averaged exposure. Most of the major worldwide standards average exposure over six minutes. This is based on human physiology and studies done for heating, ventilation, and air-conditioning. The human body can deal with short-term extremes of heat and cold, but after about six minutes the internal thermal-regulatory system loses the ability to deal with the extremes.

FCC ISSUES

The FCC Regulations provide for two sets of MPE limits, one for Occupational/Controlled (occupational) exposure and one for General Population/Uncontrolled (i.e. public) exposure.

The MPE limits are frequency dependent, with the greatest restrictions occurring in the human resonance region, in which humans absorb the most energy, from 30 MHz to 300 MHz. The public limits are only one-fifth of the occupational limits for all frequencies above 3 MHz.

A common misconception is that the so-called "Public Limits" apply only to the "general public." Nothing could be further from the truth!

Although this area could be the subject of an entire article, the basics are that a *controlled* environment is an area covered by an RF safety program.

As part of such an RF safety program, qualified workers are allowed to enter controlled areas. Qualified workers, per the FCC Regulations, are *fully aware* and able to *exercise control*. Fully aware workers have received both written and verbal instruction in the area of RF safety and are able to exercise control over their exposure by using appropriate equipment such as RF personal monitors and RF protective garments.

On the other hand, the various tradespeople who might visit a rooftop RF environment – HVAC, elevator repair, window washer, building maintenance, and even some electronics types – cannot possibly be classified as fully aware and able to exercise control. In fact, it is very difficult to control an entire roof, much more so than to control a simple tower.

This is important to realize because it will influence the types and locations of signs that you should use.

"CONTROLLED" AREAS

Environmental health and safety professionals define a "controlled" environment as an area or workplace *controlled* by a safety program for a particular hazard. For example, if safety glasses are required in a machine shop, workers have received training, there is a written safety program, and the policy is enforced for employees, contractors, and visitors, then that would be considered a controlled environment for eye hazards.

Note that the official titles for the two FCC exposure scenarios involve the terms controlled and uncontrolled exposure. This is why the FCC allows time-averaging for Occupational/Controlled exposure but does not allow time-averaging for General Population/Uncontrolled exposure.

This comes into play at sites such as Mt. Wilson outside of Los Angeles. The RF field levels on the public road used to exceed the public limits. Broadcasters tried to argue that the time-averaged exposure would be less than the MPE limits since people would only be in the high field area for a brief period while driving. But the FCC's position is that since the environment is not controlled – nobody is controlling what the public does in this area – then nothing would stop somebody from stopping the car, getting out, and having a picnic.

RF exposure is also an issue for the Occupational Safety and Health Administration (OSHA), just as for any other risk. There is an expectation that a company will have a program in place to manage these hazards. This means that you need a written policy, and your workers must receive training.

RESPONSIBILITIES AND LIABILITIES

Licensees have responsibilities and liabilities from several aspects:

• As a licensee, regardless of where the emitter is located – your own property or a shared site.

• As an employer.

• As a company that hires contractors.

• As a company that has visitors.

Furthermore, in terms of compliance, licensees must:

• Comply with FCC Regulations for public areas.

• Comply with FCC Regulations regarding employees and contractors.

• Comply with OSHA Regulations regarding employees.

These are the reasons why you need to pay attention. In practice, doing the things described in the following paragraphs should satisfy all of these needs in a way that both makes sense and does not cost you a fortune.

ACHIEVING COMPLIANCE

How do you comply with regulations, minimize liability, and prevent overexposure? Use this simple checklist as a guide and you will be in very good shape:

1. Determine where the potential hazards are located.

2. Quantify the magnitude of RF fields on the ground and in other areas that are easily accessible.

3. Establish rules for access to areas where significant RF field levels may exist.

4. Restrict access to towers and other areas with significant RF field levels.

5. Install *appropriate* RF safety signs and physical barriers.

6. Train your workers.

7. Document all of the above.

There are several ways to determine the magnitude of RF fields. These include:

• Calculating ground levels at simple sites with a small number of antennas. Calculations are conservative, and if everything is clearly below the public MPE limits, you should be fine. Formulas are given in FCC Bulletin OET-65.

• Measuring complex sites and sites where calculations indicate there may be a problem.

• Making sure that anyone who climbs a tower is protected, since there is limited value to making measurements on towers.

• Documenting all of the above.

THE RIGHT SIGNS

Installing the correct RF safety signs is an important aspect of achieving compliance, reducing liability exposure, and reducing risk to personnel.

At first glance it seems to be simple – just install a few signs around the site, everybody will be satisfied, and you can move on to doing something really important. Unfortunately, this wrong viewpoint appears to be the prevailing attitude at many of the broadcast and wireless sites that I visit to conduct RF safety surveys.

The purpose of RF safety signs is to *communicate useful information!* Therefore, if you install the wrong sign or even the correct sign in the wrong location, the message will be wrong. In addition, if you install signs and do not control access in accordance with the information contained on the sign, you have inadvertently communicated something else – that the signs are meaningless!

QUANTIFYING THE HAZARD

The three most common signs that I use relate to RF field levels. The message panel of these "NOTICE," "CAUTION," and "WARNING" signs all start with "Beyond this point: Radio frequency fields at this site..." with the remainder of each message declaring a different field level. It is important to know and understand the differences:

• NOTICE – the RF field may exceed the FCC general public exposure limit.

(Continued on Page 18)

GORMAN-REDLICH

30 Years Experience with Alerting Equipment

257 W. Union Street, Athens, OH 45701
Phone: 740-593-3150 – Fax: 740-592-3898

Model CRW-S Weather Receiver

Model CRW-S Weather Receiver

For receiving alerts from the National Weather Service (NWS).

Redesign of our Model CRW now with the "SAME" decoder feature.

Easy to Use and Reliable EAS Equipment*

- *Pre-programmed for your location.*
- *Program interrupt relays built in.*
- *Six audio inputs.*
- *2 minutes stored audio.*
- *All operations via keypad.*

EAS1 Encoder-Decoder

EAS1 *Encoder-Decoder*
EAS1 *Decoder*
EAS1-CG *Encoder Decoder with built-in character generator.*
**Optional DTMF interface available.*

Model CMR Digital Antenna Monitor

Model CMR Digital Antenna Monitor

- *Remote Controllable*
- *True ratio readings.*
- *Phase sign automatic, no extra operation.*

Contact Jim Gorman at: 740-593-3150
jimg@gorman-redlich.com – www.gorman-redlich.com

Remotes fast & easy from anywhere in the USA!

CD quality digital stereo
audio to GO!

- Mounts on most vehicles or trailers, folds flat
- Great for news, special events, and remotes
- Finds satellite in minutes with no engineer
- Use it as a backup STL when not out making money
- Go where your station has never gone before and give YOUR station a competitive edge!

Satellite Lynx

888-SAT-LYNX

728-5969
sales@satellitelynx.com
Satellite Lynx LLC
205 River Road
Waddington NY 13686

"CAN YOU BELIEVE IT?"

— Joe Castiglione on WEEI Boston announcing the Red Sox's first World Series Championship since 1918. October 27, 2004

THIS ECSTATIC MOMENT IN RADIO HISTORY
is brought to you by Dielectric where our talent and experience is rivaled only by our love and respect for the power of radio.

You can't predict when the next historic moment is going to happen at your station, but you can depend on Dielectric to help deliver it to your listeners the instant it does.

NEVER UNDERESTIMATE THE POWER OF RADIO™

Dielectric
COMMUNICATIONS
Engineering Excellence from Base to Beacon™

1-866-DIELECTRIC
www.dielectric.com

A Rectifier To Fit Your Transmitter

HVCA

No matter what transmitter you own, we can provide quality rectifiers from stock. We have a reliable, cost-effective solution to meet the requirements of most AM and FM transmitters built since the 1950s at prices better than the manufacturers'.

We Have CCA Rectifiers

- **Rectifier Upgrades Available**
- **Same Day Shipments**

CKE

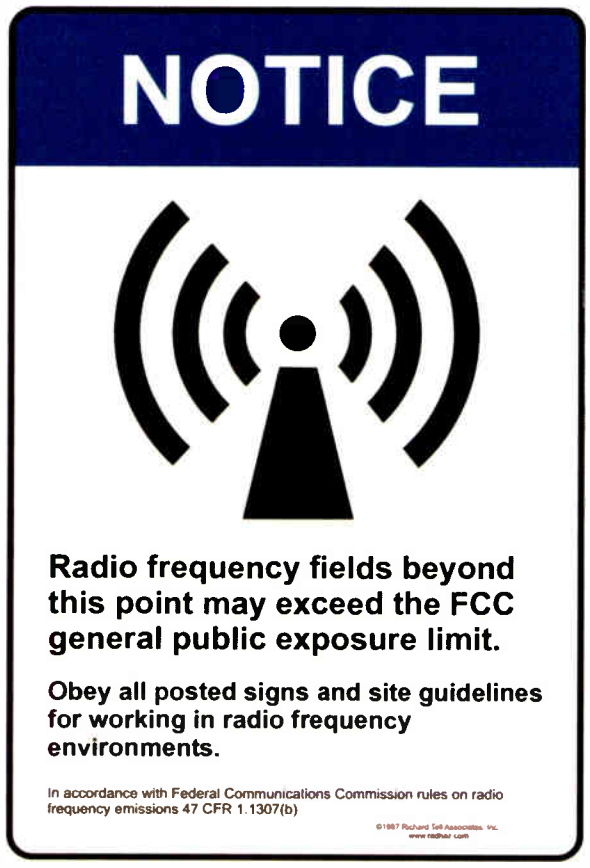
HVCA

www.rectifiers.com ■ 800-649-6370

Safety Guide

by Richard Strickland

Continued From Page 16



A "Notice" sign indicates potential RFR exposure.

• CAUTION – the RF field may exceed FCC Rules for human exposure.

• WARNING – the RF field exceeds FCC Rules for human exposure.

Perhaps the sign that I recommend most often is one that I refer to as a "Tower CAUTION" sign. The message panel on this sign states "On this tower: Radio frequency fields near some antennas may exceed FCC Rules for human exposure."

A "Caution" sign alerts RFR may be over the human limit.

There are also other commonly used RF safety signs that include those warning of the burn hazards from touching a hot AM tower or hot guy wires.

A CORRECT SIGN FOR EACH LOCATION

Used correctly, NOTICE signs should identify all areas where the RF field levels may exceed the public limits, but are below the human or occupational limits. Officially, only qualified workers should be allowed past this point, although this is a gray area. Many treat the NOTICE sign as a pre-warning.

A CAUTION sign is meant to identify an area that has RF field levels that generally exceed the public limits with a few isolated hot spots that exceed the human or occupational limits. Only qualified workers, workers who are *fully aware* and able to *exercise control*, should be allowed to enter these areas.

Used correctly, a WARNING sign identifies areas where the RF field levels exceed the human or occupational limits. One should never enter such areas without shutting systems off and/or reducing power, and having equipment such as a personal RF monitor to verify that the field levels have been reduced below the human limits.

A "Danger" sign alerts workers to potential burns from RF voltage.

It is important to remember that AM radio sites present an additional potential danger and are a sore spot with FCC inspectors. AM sites should have both RF field level signs and DANGER signs that warn of the serious potential for RF burns should one contact the tower or feed line. Furthermore, in addition to fencing to keep intruders from climbing the tower, AM fencing should prevent intruders from touching the tower.

TIME-AVERAGING

Many broadcasters seem to have the wrong idea about time-averaging. Yes, the heating effects take some time to do any harm but it is a short interval. RF energy, which is a form of non-ionizing radiation, does not accumulate like the ionizing radiation in the form of X-rays, gamma rays, and cosmic rays. It is a threshold effect that takes a few minutes to have an impact.

You may see custom signs indicating the time limits that a worker can spend in a given area, based on the RFR. These signs are *never* a good idea for two reasons:

• The FCC does not allow time-averaging for areas that must comply with the public MPE limits.

• It depends entirely too much on human behavior.

For example, if the field levels are 300 percent of the occupational MPE limit, it is both biologically and legally OK to have the person remain in the field for two minutes (one third of six minutes) providing there is no substantial exposure for the next four minutes. But this is a risky approach that no safety professional would ever condone because it unnecessarily increases the risk.

It is far better to treat the MPE limits as absolutes and reserve time-averaging for analyzing an exposure incident.

MEASUREMENTS

If you have a simple site and calculations made in accordance with Bulletin OET-65 indicate that the field levels are well below the MPE limit, then measurements may not be needed.

An accurate RF survey of the transmission site – one that will actually do you some good and satisfy the FCC requirements – can be a very good investment. And if nothing changes at the site, there is little reason to repeat the survey. But if things change on site because of a new licensee, a different antenna, or new structures that could result in reflections, a new survey is indicated.

This survey should include the areas around the tower(s) and inside the transmitter building itself. It is a good idea to check the areas around the tube(s) for leaks. Even solid-state amplifiers can leak due to bad connections. It is particularly important to check around equipment at AM stations. Some phasors and tuning circuits can have very high RF fields around them.

The survey should be conducted by someone who knows what they are doing and uses appropriate and accurate survey equipment. This survey normally takes some time to do properly; it is not just a matter of holding up a meter and taking a quick reading.

A MEANINGFUL SURVEY

It is important to "seek out" pockets of high RFR and document them carefully. The technique used varies with the magnitude of the fields.

I usually move my arm holding the probe in windmill fashion while trying to cover the largest volume of space. When I find a spatial peak field that is a significant percentage of the MPE limit, I stop and make a series of spatially-averaged measurements. The FCC bases its exposure limits on spatially-averaged exposure although it has not yet defined where and how to make such measurements.

The report should then clearly define what was measured, under what conditions, by whom, their qualifications, and the spatially-averaged field levels in terms of percent of the public MPE limits.

Of course, the subject of measurements – which specific equipment, the measuring techniques, how much accuracy can be attained and with how much error, etc. – is a big topic and cannot be completely covered in this overview article.

This completes your RFR Safety 101 course. If you are interested in continuing your education with higher-level courses, you can find more information on the web including at www.rfsafetysolutions.com.

Richard Strickland has more than 15 years of experience in the field of RF safety. He heads RF Safety Solutions LLC, which focuses entirely on RF safety issues for companies and government agencies. In addition to consulting, the company supplies RF safety signs and RF personal monitors. Contact Richard at: RStrick@RFSafetySolutions.com.

Remote Broadcast Solutions

Amplified Mic/Line to Telephone Interface

- Outputs & Inputs for telephone handset, cellular phone or balanced line level at up to +10dBm.
- Operates up to 36+ hours on two 9V alkaline batteries.
- High quality, user-switchable, internal limiter prevents clipping.
- External power input with silent, auto-switching battery backup.
- Individual gain controls for send, receive and headphones levels.

Unattended Dial-Up Broadcasts with the DR-10

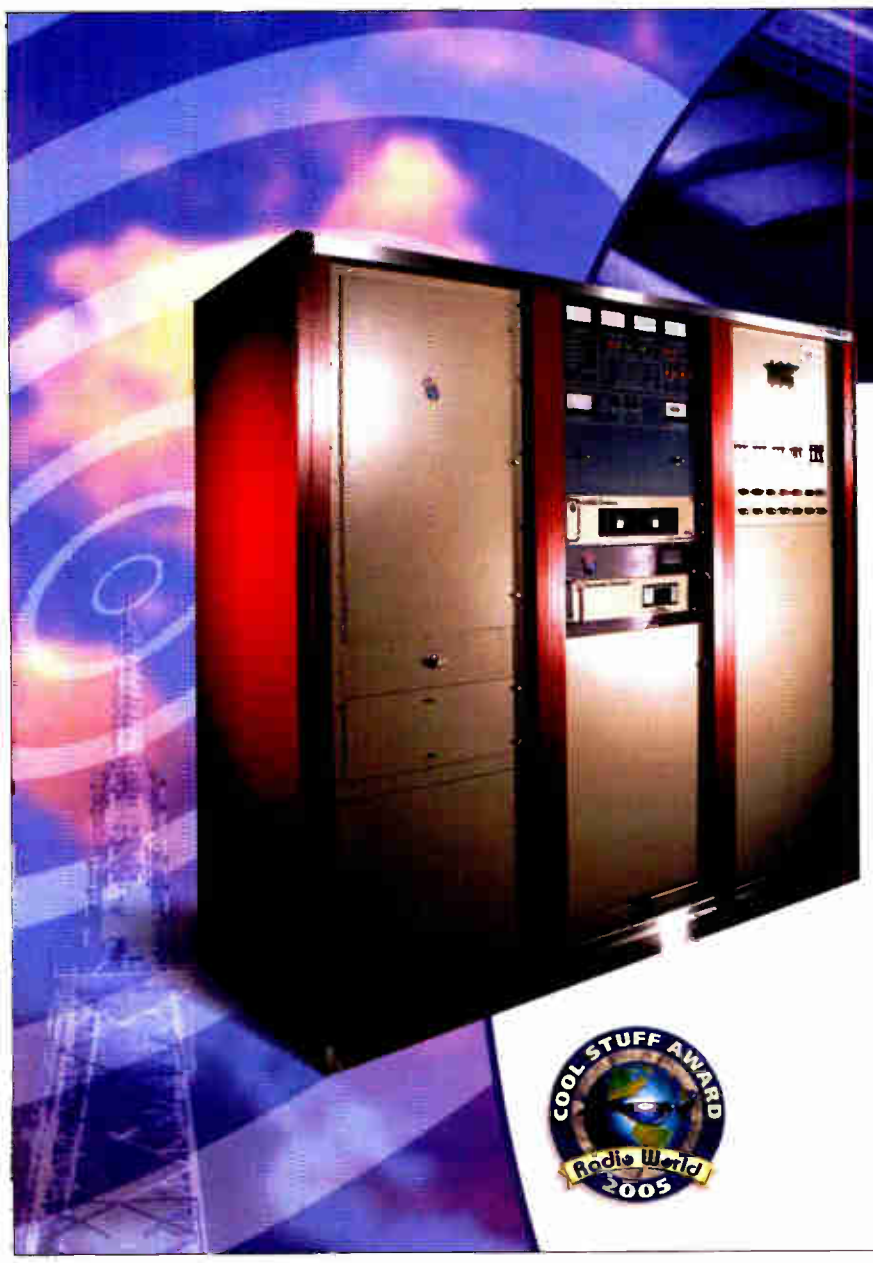
- The DR-10 is a Dial-Up remote control with balanced, telephone audio input & output that can control many automation systems or your audio console for unattended remote broadcasts.
- Our Silencer™ option removes control tones from the audio path.
- Use the DPDT relays to insert the phone audio directly into the program path when necessary, especially for emergencies.

TelTap Pocket-Sized Manual Telephone Coupler

- Can be used as a phone tap or a passive manual telephone coupler.
- Send or receive telephone audio.
- Compact size & low cost makes the TelTap a great addition to your remote kit for main or backup capabilities.

Discover more online at www.circuitwerkes.com

CircuitWerkes, Inc. - 2805 NW 6th Street, Gainesville, Florida 32609, USA. 352-335-6555



Continental Electronics

HD Radio the way it should be done

HD Radio and Analog FM in a single box. Continental Electronics stands alone with the proven and most efficient HD solution. Upgrade your existing Continental Electronics 816R-C FM transmitter now or buy a new Analog FM Transmitter upgradeable when you need HD.

And, don't forget its "Built Continental Tough".

COOL STUFF AWARD Radio World 2005

HD Radio
Licensed Manufacturer

800.733.5011 • www.contelec.com

Operations Guide

by Bob Burnham

How to Syndicate Your Own Radio Show

Part 3: The Audio Chain

In our previous discussions (***Radio Guide*** August 2005, September 2005), we covered some of the basics in getting started, including costs and key equipment.

THEIR GEAR OR YOURS?

In those discussions, we assumed the potential syndicator is *not* relying on whatever equipment their local station has available. Many stations in larger markets are extremely well equipped, especially those who devote some portion of their broadcast day to some form of live programming originating from their studios.

On the other hand, smaller markets and especially the stations selling brokered time in hourly blocks (if that is the route you have taken to launch your show) are not always very well equipped.

Naturally, there are always exceptions, but if you expect to deliver your show to reasonable-sized markets, you may be better off setting aside that spare room in your office building or your home as the studio and origination point.

USE GOOD GEAR

Using broadcast-standard telephone equipment (***Radio Guide***, September 2005) is crucial to interactive talk shows. Just as important are the microphones and related equipment used by the host (that would be you, if you are "doing it all") and the related equipment in your broadcast chain.

On the other hand, my philosophy for originating audio for broadcast syndication is different from what would be used in a typical AM or FM station. In general, a single phrase sums it up: Keep it Clean and Simple.

Most program providers should have some gentle automatic gain control, but let the individual radio stations handle the real processing.

FOR EXAMPLE

In the mid-1980s, I was doing a form of syndication through Bill Bragg's Dallas-based "Yesterday USA" Superstation. My philosophy then was the same as it is now in preserving the integrity of the audio of the program: "Don't smash it to bits;" the show was produced with good equipment, no added equalization, and only some very conservative compression.

"Yesterday USA" primarily served listeners with home backyard satellite dishes back then. A host like myself "transmitted" the audio to the station on regular cassettes through the mail.

The author playing the classic hits.

My audio chain was not much different than today, though the specific equipment I recommend and use now is obviously completely different.

By the way, Bill Bragg, a respected Dallas radio and television engineer never had a complaint about show quality either, despite using an Edison Cylinder player – right out of the 1800's – as one of his "source" machines! He is still doing his thing at www.yesterdayusa.com.

MICROPHONE CONSIDERATIONS

Among the inexperienced, there is a tendency to use some kind of high-end condenser microphone that a favorite musician supply house recommends. The recording and live music industry use some wonderful products to capture musical performances. For the most part, these are *not* what you want for broadcast.

Such microphones will capture nuances and highs that are beyond even the hearing range of your favorite family pet. Those highs will never make it to your listeners' radios, and even if they did, with the advent of HD radio, the average middle-aged human would never hear them anyway.

Remember, too, that the primary source of a broadcast microphone is a human voice speaking in normal tones. Unless you are recording a female singing opera directly feeding a digital recording device, you likely do not need those expensive studio microphones to capture the high frequencies.

Another point to consider: audio often must make a few conversions back and forth to and from the digital format before it gets to the local station's transmitter and your listeners' radios. Artifacts of those peaky performance microphones can easily creep in during its journey.

Source audio should be tastefully generated, figuratively, not literally! After all, who wants to hear the saliva in your mouth or licking lips after taking a sip of water? Well, maybe you would in some situations, but not on a mainstream family-oriented talk show!

I think the point has been well driven into the ground as to why you do not want or need that phantom-powered microphone.

SOLID BROADCAST MICROPHONES

I always recommend the use of dynamic microphones for general broadcast use. You want intelligibility, brightness, and fullness in a good broadcast microphone. Shure and Electro-Voice make the industry standards. Sennheiser also makes an excellent product.

Rush Limbaugh has been promoted as using a "gold plated" EV RE-20. You do not need gold plating, but this microphone is all you will ever need. I have relied on them for over twenty years.

A close second is the Shure SM-7. The Shure is not as durable, is slightly less expensive, but preferred by some over the EV product. If you need a hand-held microphone (or have a tight budget), the Shure "Beta" series is a good choice, but not as forgiving of less than perfect microphone technique.

In a broadcast station, it is common to use some sort of outboard microphone processing. For syndication, this is probably an unnecessary expense. If you have a good microphone at the front end, you want to keep the tonal balance as flat as possible and not introduce any more hiss than necessary. The first stage would then be the microphone pre-amp on your mixer or console.

MIXING CONSOLES

Mackie mixers have been widely accepted for broadcast remote use. Mackie microphone pre-amps are as good as the ads claim, but if you have the budget for a small broadcast console, use that instead.

From a functionality standpoint – including easier to implement muting solutions – a broadcast console is definitely the way to go, but do not use something old that is beyond its years. I strongly suggest you avoid used broadcast consoles.

Here is why: companies like RCA, Gates and many others manufactured some fine products "back in the day," but the aging process and the more primitive technology from that era will only inject hiss, hum or other artifacts into what is supposed to be pristine audio. Consider them museum pieces and nothing more.

I do not mean to offend any small stations that still may have one of these gems in service. I am only advising readers not to expect to produce a syndicated show with one of these. They may look cool, and may help to put the host in "the mood" for a 1950s oldies show. But a "nostalgia piece" will also be less than reliable and cost a fortune to maintain – those old, dried out capacitors and the scratchy step-attenuators will produce annoying artifacts.

If you are fortunate enough to have a classic console, make sure that it is in a display case in the lobby of your office. Do not connect it to the outside world.

BUDGET ALTERNATIVE

If your budget is tight, use a Mackie and add the Broadcast Tools' product, "Console Controller." It will give your Mackie some of the functions of a standard broadcast console. No one will notice the difference in audio.

Broadcast Tools "Console Controller"

But, again, if at all "remotely" possible (no pun intended), get a small *broadcast* console from your favorite ***Radio Guide*** advertiser. You do not necessarily need the digital model to start out. Autogram, Radio Systems, and others also offer scaled down versions of their full-blown broadcast consoles.

As anyone knows who has been involved in the design of a broadcast studio, there are multiple outputs from the mixer or console. There is at least one set of outputs strictly for monitoring, and another for the Program, Audition, and so on. The Program bus traditionally feeds the broadcast chain. Probably a first stop for the audio is a protective stop, not from peaks necessarily, but cuss words!

PROTECT YOURSELF

A talk show environment in this day of close FCC scrutiny demands a Profanity Delay.

There are some new computer-based technologies that are said to automatically detect and censor the famous seven "nasty" words that will get each of your affiliates an instant FCC fine and a lot of trouble for you. Such computer-based systems likely will be the basis for Profanity Delay in the future.

Starting out fresh today, however, a hardware-based delay is probably the simplest that has proven reliability. There is nothing like a real human sitting with their finger poised above the famous "DUMP" button.

Eventide invented this technology and still manufactures the most popular version. The current model is the BD-960. Do not scrimp in this area. The oldest models may have various problems such as distortion and unreliability.

(History buffs may remember the defunct cart manufacturers who produced cart machine models intended for broadcast delay use. They were great in their time, as long as you had a good supply of cotton swabs and alcohol to constantly clean the heads. If someone gives you one of those for free, keep it only as a museum piece – add it to your RCA all-tube console!)

The only good "used" broadcast delay I would recommend is the Symetrix 610. Though discontinued, it was a reliable box. As long as you made sure there was no musical program content when you were entering or exiting the delay, it sounded good.

ALMOST "OUT THE DOOR"

The last stop in the audio chain before it leaves on its way to your clients is the only processing I would recommend – a simple wideband compressor/limiter to very gently ride gain and catch some peaks.

Many codecs have some form of built-in automatic gain control. However, for visual control I prefer to feed audio (with a processor) just below the threshold of the codec AGC. More on this discussion will follow in a future article.

All in all, these ideas give you some more of the basics of how to originate a radio show from any location; have your local station pick it off the satellite and have it sound exactly the same (or better) than if they originated the show from their studios.

Bob Burnham has spent his entire life keeping AM and FM stations on the air. He actually listens to them and tries to figure out how to make them sound better. He can be reached at the Specs Howard School of Broadcast Arts in Southfield, MI at bburnham@specshoward.edu.

EAS Q&A

by Clay Freinwald and Barry Mishkind

At a recent FCC meeting, a Report and Order and a Further Notice of Proposed Rulemaking were announced relating to EAS matters. Designated 05-191, it is part of EB Docket 04-296. To learn more about the key points, we turned to our friend, Clay Freinwald.

Barry - Clay just how much of this R&O on EAS Rules affects radio stations?

Clay - The impact on Radio is actually minimal and the new requirements do not even become official until the end of 2006. But I see two things that especially affect radio stations:

1. We have generally assumed that because HD Radio broadcasts follow the programming of the analog that EAS messages on analog would automatically be carried on HD. Not only is this the way the hardware works, but now the FCC has seen to it to make it a requirement. This way, HD listeners are insured that they will receive EAS messages.

2. Just in time for those that have begun Multicasting or broadcasting one or more additional audio channels (streams) comes the requirement that EAS messages must be carried on all streams.

Barry - What was addressed by the rest of the R&O?

Clay - There are a number of other services that are going to be joining the EAS – Satellite Radio and TV, Cable TV, and Digital TV will all be participating in the future.

Barry - Will these changes require radio stations to upgrade their firmware or EAS equipment to be in compliance?

Clay - Generally no; the firmware in most EAS Encoder/Decoders is not impacted by this change. However, if a station is operating HD and Multicasting there may well be some "hardware" changes required. It will be up to the station to provide a means of connecting their EAS unit so that EAS messages received will be relayed onto all their streams.

Some makers of EAS equipment will have new models and add-ons but, of course, stations are welcome to make their own devices – many already share an EAS unit between two or more stations with off the shelf devices from the manufacturers of EAS equipment.

DHS, CONGRESS AND THE NFPRM

Barry - There has been a lot of talk about Homeland Security taking over EAS and making new demands upon broadcasters. What do you know about this?

Clay - In the previous NPRM the Commission raised a number of questions that led many to believe the FCC was going to increase the number of EAS items broadcasters would be "forced" to carry. Thus far, there are no major changes as to what is required and what is voluntary.

I do not think this matter is completely settled as there seems to be some thinking other kinds of messages should be added to the EAS "must carry" Rules that are presently now limited to Presidential Messages.

For example, there are many advancing the idea that Homeland Security and/or State Governors should be able to use EAS in emergencies and broadcasters should be required to air these messages as well. Time will tell where this ends up, but for now there are no immediate changes.

Barry - Is there not also some action in Congress on this front?

Clay - Yes, there is. A bill was introduced in the US Senate proposing changes in our nation's public warning system (S-1753). It is my understanding the House also will be proposing similar legislation.

Barry - Did the Hurricanes on the Gulf Coast have a bearing on all this interest?

Clay - Katrina and Rita have had a profound impact on a number of government agencies and systems, with many of them coming under review. In times like these politicians historically have become involved as they attempt to find out what is right and wrong and what needs changing.

Barry - Will the FCC and Congress find common ground?

Clay - To some extent they already have. At this point it is too early to say how this is going to look downstream. I would bet on further changes being made in the next year or two.

WHAT THE FCC WANTS

Barry - Is the FCC done making changes for a while?

Clay - No, not at all. In fact the Commission made it clear there were a number of issues remaining unresolved and asked a number of questions as part of this Further Notice of Proposed Rulemaking. This means there are more changes coming, the specific nature of which will be determined after they have received the input they seek in the FNPRM.

Barry - Can you give us some specifics about what the FCC is thinking?

(Continued on Page 24)

EAS Q&A

by Clay Freinwald and Barry Mishkind

Continued from Page 22

Clay - The FCC made it clear they are looking for input that will yield a more comprehensive public warning system. For example, they recognize the necessity for text crawls that provide more specific information about the nature of an emergency. And, thankfully, they recognize the need for more robust means of distributing EAS messages to the electronic media.

Barry - The National Weather Service (NWS) has recently announced that they are going to be installing more transmitters and initiating more alerts. Will this replace radio stations as a source for the public to receive warnings?

Clay - NOAA Weather Radio (NWR) has been adding transmitters for some time as they proceed with their goal of providing coverage for everyone.

In addition to the increased signal coverage, NWR has been moving in the direction of becoming a distribution point for civil emergencies as well as weather forecasts and bulletins. The goal is to become an "All Hazards" public warning system; other efforts taking place behind the scenes will considerably enhance the NWR role and viability.

Will NWR replace radio stations as a source of public warnings? The answer to this is "No." We need only to read the comments in the latest FCC R&O about EAS where they made it clear that our best public warning system is one that has every possible electronic communications system participating – in parallel – to have the best chance of reaching everyone with the official word.

Radio will continue to have a valuable role in public warning distribution. It is just that we are being joined in this effort by others.

OTHER CONDUITS

Barry - Might the mix include a "mass text message" to all cell phones?

Clay - This is up to the vendors of cell phone service. Already there has been some selected voluntary participation; there is certain to be more of this kind of thing. The Commission acknowledges that wireless products are becoming an equal to radio and TV as an avenue to reach the public and have asked for input as to how EAS and wireless products should work together in the distribution of public warnings.

Barry - Will it be possible for a radio station to use the Internet as one of its monitoring assignments for EAS?

Clay - The FCC gives the authority to the State and Local EAS Committees to come up with a means of distributing EAS messages and the Internet can certainly bring something to the table in this effort. This was proven most recently during the Gulf Coast hurricanes.

While I would not recommend any land-line based system be used for this purpose – due to the tendency of such circuits to fail in disasters – an SECC or LECC somewhere may already using an Internet based link if no wireless alternatives are available. The FCC is asking in the FNPRM how this communications system should be integrated.

GETTING MORE INFORMATION

Barry - How can a person get more details on the FNPRM and the underlying NPRM?

Clay - You can download the entire action from the fcc.gov by looking for 05-191 and 04-296. If you elect to print it, be sure you have lots of paper in your printer! You can also obtain a summary of this activity from the SBE Web Site under *EAS*.

Barry - What will SBE be doing relative to the FNPRM?

Clay - SBE has historically been very involved in EAS and will likely file comments.

Barry - How can SBE members be a part of this activity?

Clay - Anyone is welcome to contact me directly; I will fill you in on how you can participate.

Barry - Is there some part of this FNPRM that you are most passionate about?

Clay - Yes, there is; the SBE has argued that there is a great disconnect between the Header provided messages used to generate TV crawls and the specifics contained in the Voice Portion of the EAS message. This discontinuity can have a significant negative impact on those with hearing or vision disabilities by transmitting to them what could be two very different messages.

Let me provide an example: If an emergency manager transmits an EVI (Evacuation warning) for – one square block – of his city, the TV crawl will indicate that an evacuation notice has been called for the *entire county*.

This can and must be corrected by changing the EAS message format so that a text messages can be created by EAS message sources and relayed through the system. This change will enable other digital devices to receive and relay the textual information as well. Hopefully the FCC will see the wisdom of making this change.

Clay Freinwald is Vice President of the Society of Broadcast Engineers and chairs the EAS Committee. He can be contacted via email at k7cr@wolfenet.com

RADIO ROUNDUP

The Radio Guide Industry Date and Event Register

List your radio dates, events, meetings and conventions here.
Email your information to: ***radio@rconnect.com***

International CES (Consumer Electronics Show)
January 5-8, 2006
Las Vegas, Nevada
www.cesweb.org

RAB2006
February 1-3, 2006
Dallas, Texas
www.rab06.com

National Association of Tower Erectors Expo
February 13-16, 2006
Orlando, Florida
www.natehome.com

National Religious Broadcasters Annual Conv.
February 17-22, 2006
Dallas/Fort Worth, Texas
www.nrb.org

Great Lakes Broadcasting Conference
March 7-8, 2006
Lansing, Michigan
www.michmab.com

Oklahoma Assoc. of Broadcasters Convention
March 31- April 1, 2006
Oklahoma City, Oklahoma
www.oabok.org

Email your dates to: radio@rconnect.com

NAB 2006
April 22-27, 2006
Las Vegas, Nevada
www.nabshow.com

Mid-Atlantic Broadcasters Conference
June 5-6, 2006
Atlantic City, New Jersey
www.njba.com

SBE Certification Exam Dates

Exam Dates	Location	App. Deadline
February 10-20	Local Chapters	Dec. 30, 2005
April 25 NAB	Las Vegas	March 3, 2006
June 2-12	Local Chapters	April 21, 2006
August 11-21	Local Chapters	June 9, 2006
November 10-20	Local Chapters	Sep. 22, 2006

State of the Art

Radio Industry News

by Chip Morgan

FCC Eases Short AM tower Requirements

The FCC has announced simplified procedures for AM stations applying for the use of specialized non-directional antennas manufactured by Kintronics Labs and Star-H Corporation. Use of this short AM tower previously required detailed engineering studies for the construction permit application and for the application for license after it was constructed.

The Commission noted that such a system meets the requirements for omnidirectional patterns and in particular the minimum efficiency requirements for Class B, C, and D stations. The antenna system uses vertical wires arranged around a central support structure, generally about one-third the height of a typical quarter wave AM tower for a given frequency and utilizes a standard 120-radial, 1/4 wavelength ground system.

More info:
http://www.star-h.com/products/reduced.html

Low Power AMs Coming to an Area Near You?

The FCC is considering a low power AM service which would allow LPAM stations with power levels from 100 watts to 1,000 watts. The FCC recently docketed a Petition for Rulemaking jointly filed by the Amherst Alliance, Michigan Music is World Class!, the LPAM Network, Don Shellhardt, and co-author of one of the two LPFM petitions, Nickolaus Leggett. This petition was recently assigned RM-11287 by the FCC. The comment period ended on November 21, 2005. The Petition requested that the service be designated as a commercial service, in contrast to the LPFM service, which is non-commercial. A primary goal of the Petition is "achieving balance in Low Power Radio, by making room in community-focused broadcasting for those individuals and small businesses who were left out of Low Power Radio on the FM side," according to Schellhardt.

More info:
http://www.amherstalliance.net/html/comments.html

NAB Says LPAM is a Bad Idea

The National Association of Broadcasters submitted comments in opposition to the Petition for Rulemaking requesting that the FCC establish a low power service in the AM band. NAB states that the LPAM petition fails to illustrate how the proposed service is technically feasible and does not provide any justification that LPAM is any more warranted than it was during the LPFM proceedings when the Commission rejected low power service in the AM band.

NAB submitted that the LPAM petition threatens to undermine the FCC's efforts to clean up and improve the AM band. It also said that anything that might compromise the service quality of AM stations will hinder AM broadcasters ability to respond to competitive threats and that interference created by additional stations in the AM band has the potential to delay, if not cripple, the transition to digital AM by forcing receiver manufacturers to reconsider product development.

More info:
http://www.nab.org/newsroom/pressrel/filings/LPAMComs112105.pdf

FCC EAS Responsibilities Moving to Office of Homeland Security

FCC Chairman Kevin Martin recently announced plans to move the commission's EAS responsibilities out of the Enforcement Bureau, where EAS is regulated now.

Meanwhile, the FCC released details of an EAS review expanding the Emergency Alert System Rules to include digital radio and TV stations as well as satellite radio, satellite TV and direct broadcast satellite services.

In a Further Notice of Proposed Rulemaking, the commission seeks comments on ways to develop a comprehensive digital EAS system, and how EAS can more effectively reach people who do not speak English and/or have vision and hearing disabilities. The FCC said without elaboration that it was contemplating an extension of the alert system to the Internet, wireless systems and video delivered over fiber. The EAS system has encountered criticism as an expensive government boondoggle that is less necessary in the age of readily available news.

For example, the system was never activated on Sept. 11, 2001, even in the New York and Washington metropolitan areas. And local and state governments did not activate the system for Hurricane Katrina.

More info:
http://www.govtech.net/news/news.php?id=97216

Auction 62 Yields 253 FM Applications

The FCC accepted 253 applications were accepted for filing in the upcoming auction of 171 frequencies. Auction 62 was delayed due to Hurricane Katrina. The Commission said that five applications were rejected because they were non-commercial applications for commercial frequencies. Eighty-one applications were considered incomplete. Auction 62 is scheduled to begin on January 12th 2006.

More info:
http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=62

DAB Radio Listening in UK Exceeds DTV and Internet

Radio listening via digital radio receivers (DAB) has, for the first time, overtaken combined listening via digital television (DTV) in the UK. The findings were revealed in a RAJAR (Radio Joint Audience Research Limited) survey announced recently. In addition, the number of radio listeners, who claim to own a DAB receiver or who listen to the radio via DTV or the Internet, has increased by 4.7 million or 25% when compared to a RAJAR survey undertaken a year ago.

Total listening hours via DAB have grown by 165% during the past year, substantially more than DTV (42%) and the Internet (84%). DAB also recorded the largest increase in reach (95%), when compared to that of DTV (28%) and Internet listening (30%). Results from this survey, when equated to the main RAJAR survey, suggest that 10.5% of all radio listening in the UK is now via digital platforms.

The survey was the second to be undertaken by RAJAR since 2004 and was designed to track listening via platforms including DAB, DTV and the Internet. Respondents aged 15+ were asked to record their radio listening by quarter-hour periods as well as the stations tuned and platform for each listening occasion.

More info:
http://www.worlddab.org/images/RAJAR-pressrelease21-11-05.pdf

iBiquity Gets Cash from Intel Capital

iBiquity Digital Corporation announced that Intel Capital, Intel's strategic investment program, has invested in the company. Financial terms were not disclosed. "Intel Capital's investment further reinforces today's significant HD Radio momentum," said Robert Struble, President and CEO of iBiquity Digital Corporation. "We look forward to working with Intel Capital to accelerate the commercialization of HD Radio particularly in the area of portable HD Radio devices.

Future HD Radio products will include not only millions of traditional radio products but new portable digital media devices such as mobile phones and digital media players." "This investment signals Intel Capital's support for HD Radio," said Sriram Viswanathan, Managing Director for Intel Capital's Mobility investments. "We view HD Radio as an exciting new addition to the digital media landscape and look forward to evaluating a host of exciting opportunities to enable affordable, portable and low-power digital media devices that include HD Radio."

More info:
http://www.ibiquity.com

Chip Morgan produces an (almost) daily email with a special dose of "big picture" news that affects the broadcast industry. More info at www.cmbe.com

Radio History

by Frank Absher

KMOX – 80 Years Old and Moving Ahead

Nothing really rattles Paul Grundhauser, the chief engineer at Infinity's KMOX in St. Louis. Having worked for the late Robert Hyland, whose high standards and demands imposed on his staff are legendary, Grundhauser thrives on the unexpected.

About 15 months ago he was told KMOX was on the short list to get a new transmitter by the end of 2004. The station began filling out the ever-necessary paperwork, but then they were told the new equipment would not arrive until sometime in 2005.

On December 1st, another note came just as the Grundhauser family was getting ready to go on vacation. This time he was told the new transmitter would ship in the next three weeks. Thus began the transformation of one of the nation's blowtorches from analog to HD/digital transmissions.

KMOX Letterhead c. 1925

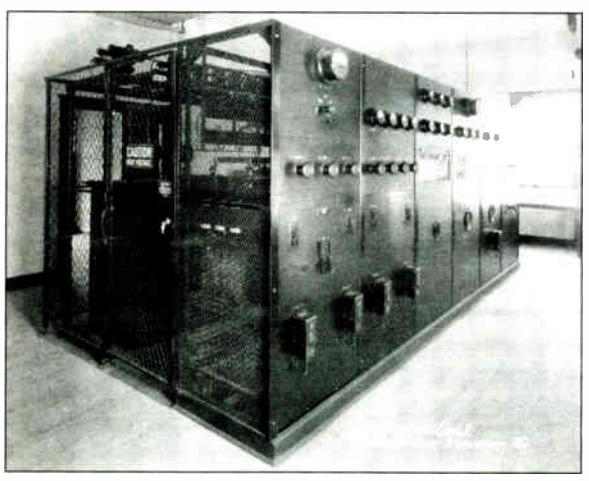
A LONG HISTORY

It was 80 years ago this month that KMOX first went on the air.

St. Louis had several radio stations by then, but this one was to be the city's biggest and best yet. A consortium of major business owners organized as "The Voice of St. Louis, Incorporated," and pooled their money to build what was then called a "super station."

The station's studios would be in the downtown district, housed on the mezzanine level of the Mayfair Hotel, but a distant, rural site was chosen for the towers some 16 air miles away in far suburban Kirkwood.

It was there that the new Western Electric 104-A transmitter was installed.



KMOX' first transmitter, a WE 104-A.

The WE 104-A was an upgrade from the earlier design and included water-cooled finals, improved fidelity, reduced harmonic distortion and crystal-determined frequency, according to renowned transmitter historian Stanley Adams.

A LOCAL POWERHOUSE

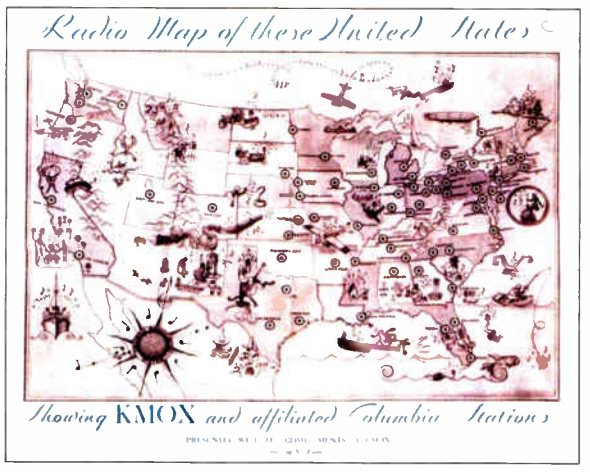
Most transmitters built in this era were 500 watts or less, Adams says, with those stations "owned by the privileged few operating groups" getting the 1,000 and 5,000 watt systems. The 5,000 watt unit at KMOX placed the new station among the nation's elite.

As was always the case in those early days, Western Electric sent a team of engineers from their New York City manufacturing plant to the St. Louis site to do ground surveys prior to the transmitter's manufacture. W.A. Butler from Western Electric was quoted in a 1925 article in *Radio Age* as saying the 5,000 watt transmitter would have, "an effective range throughout the entire nation."

Listener response bore out his prediction. The *St. Louis Globe-Democrat* printed a letter from George Munro of University College in Auckland, New Zealand in which he said he had heard KMOX during nighttime transmitter tests on December 16.

EVEN MORE POWERFUL

Within four years of signing on, KMOX was given permission to experiment with 25,000 watts and soon a WE 107-A transmitter was in place. Power was again increased in 1931, putting KMOX into the true superstation category with 50,000 watts.



KMOX Radio Map

In 1947, the station moved its transmitter site to its present location in rural Stallings, Ill., to the northeast of the station's downtown St. Louis studios. (The original building and towers were sold to Thomas Convey's KWK radio.) The "new" tower was a hand-me-down from sister station WBBM in Chicago.

The new KMOX transmitter site from a 1949 drawing.

During construction of the new transmitter site, a new Westinghouse 50-HG-1 was installed. As a backup, a Continental 316B, 10kW auxiliary transmitter was also added.

Westinghouse 50HG-1

Over time, a Gates MW-50 was installed (in 1976), followed by a Harris DX-50 in 1993, and the new 3DX-50 this year.

The transmitter building, surrounded by corn fields, is a two-story bunker with 5,400 square feet of floor area. Built immediately following World War II, the structure has required very little modification over the years. The first floor housed a fallout shelter, complete with a fully functioning broadcast studio, two-way communications with Civil Defense Headquarters and enough survival supplies to support five men for two weeks.

MOVING TO DIGITAL

Paul Grundhauser was aware that parent company Infinity had cut a deal with Harris to buy a certain number of the new digital transmitters by a certain date. At that point, no one in the trenches knew anything about delivery dates. So he was not really surprised when he learned the date for the new KMOX transmitter delivery was fluid. He says corporate had an agreement to "take delivery on a certain number of transmitters by the end of 2004; we evidently jumped onto the list, got pushed off, and then got pushed back on."

The installation process for the Harris 3DX-50 was leisurely. Market chief engineer Joe Geerling was involved, as was contract engineer Bruce Cavins. Grundhauser says, "Our consulting engineer, Jack Sellmeyer, [was] crucial to the implementation of the HD side of the install, and we contracted out the electric install for the transmitter. That was done by the Debber Company."

MOVING THE "FURNITURE"

Obviously, there was some "housecleaning" that had to be done during installation. Grundhauser took advantage of the opportunity to move out a couple of the old back-up units: the 10 kW Continental and the Gates MW50.

Paul Grundhauser holding the last piece left from the Continental 316B 10 kW transmitter.

(Continued on Page 30)

Radio History

by Frank Absher

Continued from Page 28

The new transmitter was then hooked up to the Continental's old RF connections. "We got the power, RF and analog audio connections done in June," says Grundhauser, "and Harris came down and ran through their test sequence on the transmitter. It worked fine, except for a little more reflected power than we would have liked." A little bit of post-installation tweaking is expected to resolve that issue.

The building's massive air-handling equipment could also go, since the new transmitter recirculates indoor air instead of relying on the big fans bringing in outside air for pressurization to cool the old units.

80 YEARS OLD AND UP-TO-DATE

If things go according to plan, digital transmissions of the 50,000 watt KMOX signal will be a reality by year's end.

Consulting engineer Sellmeyer designed a new main tower Antenna Tuning Unit as well as phase rotation networks for installation in the building. The 476-foot Utility Tower, erected five years ago by the Jessie Craig Company, has a 3 foot face and an impedance of 68 ohms.

The KMOX tower reaches up and out.

KMOX' new Harris Destiny during installation.

The Harris 3DX50 is set up for a 50 ohm transmission, necessitating the installation of capacitors and coils to minimize noise in analog receivers.

WAVE OF THE FUTURE

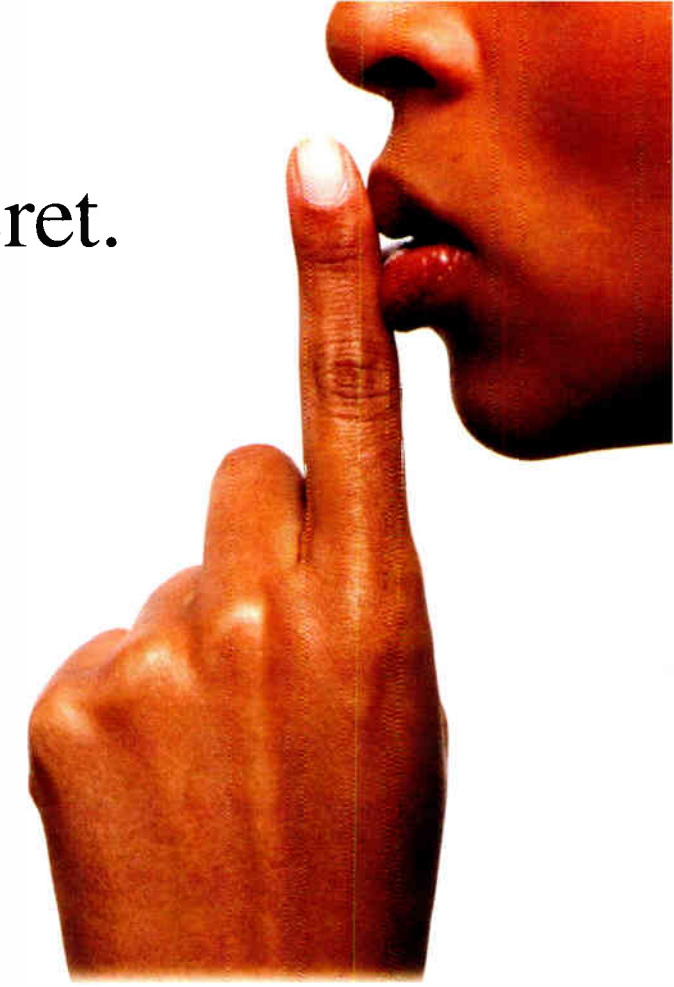
Infinity's director of engineering for the St. Louis cluster, Joe Geerling, is optimistic about the big picture, and he believes digital represents AM radio's future. "We are in a pioneering time – taking the process from the lab and into the marketplace. For AM stations there is an incredible audio quality increase when receiving the digital broadcast," he says.

Geerling notes the process of going digital has involved much more than the transmitter. "The process to go digital at KMOX includes sweeping changes in the way we create, edit and move the audio. Going digital also includes using the latest technology to analyze and improve the transmission system – and some very expensive replacements of the station's ground system and adjustments to the tower. We also installed a new transmitter and supporting equipment."

The ultimate result, according to Geerling is that all this activity "places KMOX in the forefront of AM broadcasting, allowing us to better serve our listeners, just as we did so many years ago when we were among a select few to get licensed at 50 kW."

Frank Absher is a broadcast journalist, teacher and historian based St. Louis, MO. He can be contacted at fabsher@stlradio.com

Our client list is secret.



Every day, more than 750 broadcasters rely on TWOx12 twelve-line phone systems to insure their critical talk radio programming. Two advanced digital hybrids deliver the best caller audio possible, thanks to our famous Digital Dynamic EQ. Status Symbols visual call management (a Telos exclusive) helps producers screen calls easily, without guesswork.

Planning a big, consolidated build-out? Consolidate your phones as well with Series 2101, the world's only multi-studio talkshow system. Series 2101 lets you expand your facility's call capacity when needed — allows control of up to 96 callers and 32 studios. Not only that, Series 2101 uses high-quality digital phone lines to deliver caller audio that's next-room clear (and help reduce Telco wiring, too).

At Telos, we're all about choices. Take our Desktop Director (right), it works with TWOx12 and Series 2101 systems, can be expanded to control up to four hybrids or up to 24 lines when used with Series 2101, and has a built-in handset, speakerphone and headset jack. Or, choose the new Call Controller (left) and "bring your own phone" for screening... even works with wireless phonesets.

ONE-x-Six is perhaps the world's most popular auto-nulling multi-line phone system. Also the world's most affordable! Like all Telos talkshow systems, ONE-x-Six integrates with our optional Assistant Producer software to allow fast, intuitive remote screening via LAN or WAN connections.

Naturally, we are obligated to protect the identity of clients who use Telos talkshow systems. We would no doubt get a Stern warning from any user whose name we revealed.

But rather than Rush to superlatives, let us just be Frank'n get to the point. When you're ready for the world's best talkshow system, the answer is Clear; it's as easy as ABC. Whether your station is located in Salem or Susquehanna, Telos has a broadcast phone system just right for you. Why, the possibilities approach Infinity.

In our eyes, reliability is King. After all, if there's a failure, you can Kiss your ratings goodbye. You need your phone system to be a Citadel of Mega reliability. Not to Mix metaphors, but you need something Hot, Lite on the pocketbook, and full of Power. Really, it's Radio One-oh-one.

And unlike gear with tech as dated as an old Bonneville, Telos talkshow systems undergo constant improvement. With us, it's a never-ending Saga of advancement.

Telos. Striving for Greater Media through advanced technology.

(And don't worry... we'll keep your secret.)

Telos

AUDIO | NETWORKS

www.Telos-Systems.com

Radio.edu

A Non-Comm View

by John Devecka

Education, Charity, and a Show

I have this wacky view of what we are supposed to do as members of the "educational community." I think we ought to make it a mission to broaden the horizons and experiences of our students and educate them properly so they can learn to filter what is and is not important.

Yep, I know it is wacky. So I am admitting it from the start.

I say this as someone working at a school with a predominantly white upper/middle class student population from the Mid-Atlantic region. Our students do not have a lot of exposure to those that are less fortunate than they, and our school strives to change that. I think we have a basic mission to do that, too, at the campus station, and to that end have come up with a plan. Yes, now is the time you should start to worry.

A GOAL YOU CAN SET

There are a lot of things that we can do with a college radio station (or even a high school, middle school or elementary school one) that cannot easily be done by a commercial station – including some that they would not want to do anyway.

But here is an idea that benefits others, expands the horizons of your students, and makes the station organization look very good in the process. In fact, it can make your whole school look good.

You may recall that we had some hurricanes along the Gulf Coast recently. I say that knowing the attention span of the "News Media" is about 39 seconds and that there is very little coverage of the ongoing situation now.

Well, those hurricanes did some incredible damage to a couple of colleges in the New Orleans area. The bigger name schools – Tulane, Loyola New Orleans, etc., were mostly uptown and received "relatively" minor damage. The lesser known Historically Black Colleges, Dillard University and Xavier University suffered severe damage.

Both schools had virtually all of their structures under six feet (or more) of water for prolonged periods and are struggling to bring usable space on-line for the spring semester.

FINANCIAL SQUEEZE

These schools traditionally serve a lower economic class of students, offering them access to an education that might otherwise be unavailable. They have long traditions of producing excellent students and have some highly rated programs.

However, they also have low endowments, compared to most of the schools in town. There is little chance that FEMA and insurance will cover all of the losses that they have sustained. Predictions for their finances are dire, and the potential loss of returning students in the spring would be a massive blow. It is likely that both schools will need to spend some of their endowments to keep open and return to full operations.

What does that have to do with you? Glad you asked. Because here is that dangerous little idea of mine. We have the power, be it milliwatts or microvolts, to help out *and* give something to our students at the same time.

A BETTER WAY TO HELP

I am not talking about just telling everyone to give these schools money, although I suppose that would work. I am talking about doing something on your campus that would draw attention to the issue, your station, and your students in a very positive way – a concert. Yes, it is that simple.

We are already working on it here at Loyola College in Maryland and several members of the Collegiate Broadcasters, Inc. (www.collegebroadcasters.org) have stood up to help take the idea nationwide. I have taken the idea to several departments on my campus in search of funding to make it a "really big show" and have had universal support.

So, now we turn the idea over to you. Would you like to do it, too?

A PLAN

Our plan is simple, if you ignore the logistical nightmare with which you will be engulfed, and should work out pretty well. Let us throw a party for XULA (as Xavier's on-line presence is XULA.edu) with a few bands, a bunch of food, and donations at the door (coming and going we hope). Seems easy, right?

Now the logistics. Here are the sorts of things you will need in order to make this happen:

1. **Money**
2. **Venue**
3. **Bands**
4. **Food**
5. **Willpower**

Please note: #5 is important. You are probably setting out to do something that is not often attempted at your campus and you will probably find people who think you are nuts for trying (of course, in my case they already think I am nuts). You will need to break down barriers and get other campus organizations involved if you want to really make a difference.

BREAKING IT DOWN

Money. We will start here because without this, nothing is going to happen.

If you have organizations on campus that are dedicated to Service, they are a good place to start. Additionally, organizations that focus on Education, Minority Students, Outreach, Campus Ministry, Future Leaders, etc. all have a logical tie to this plan.

You will have to guess at what you will need to start, unless you have access to booking agents and can get a pretty firm number in place. We use www.celebrityaccess.com to find out fees and contact points. There may be better deals, but this one has worked out very well for us.

REALISTIC NUMBERS

As an example, perhaps you have decided you want The Brazilian Girls as your concert band. You will need about $5,000 to book them (or less, but better to plan for more and come out ahead) and probably another $2,000 for production costs (lights, sound, staging, etc.).

If you have a campus organization that handles events, they can probably give you a good cost guess for the space you want. You will need to promote like crazy, so figure another $500 for posters, flyers, etc.

Total it up. Be safe and budget $10,000 for the event. That gives you a target to raise the costs to hold the show around campus.

You may be a station that can just whip that money out and have the show, but most of us are not, so just pipe down and wait a moment. Now you have an approximate cost to stage the show, but what do you expect to produce as a donation? If you are targeting $5,000, then you need to figure the show must return $15,000 to do that. Maybe not if all your supporters on campus are willing to lose the money, but do plan appropriately.

Let us assume that you want to bring in $15,000. OK, since this is either a straight donation deal or pre-priced tickets, you need to set an attendance level. Perhaps your students would be willing to kick up $10 each to see the band. Now you know you need a space on campus for 1,500 students to see the show, *and* you need to make sure they show up! So, now you are into the gym for your show. Which brings us to #2 – the venue.

THE VENUE

Fifteen hundred people will require a big room. This usually means a performance auditorium or a gym to hold them all.

The next task is to find out if the target date(s) for the show provide for an open time for that venue. Get on that *right away*! With sports and other events fighting for room, you will be surprised how far ahead the space is booked.

We will make a leap of faith here that you have found financial resources on campus and the gym is available. Now you have to get the band.

THE BAND

The funny thing is most bands do not just hang out waiting for you to call; they are on the road somewhere. You need to reach their booking agents and find out if they are available for your specific dates.

I would suggest at least two backup bands before you start, because booking is tricky. If the band is already on tour your costs will be lower (especially if you are lucky enough to catch them between area shows) than if you have to bring them to campus for a "one off" show.

For the purposes of this example, we will assume you have managed to find that The Brazilian Girls are not only available, but they really like your idea for the show and will play for $5,000 including backline (all the gear that you have to rent for them locally) and expenses (food, hotel, local transport).

GOOD FOOD IDEAS

We are adding a food court to our idea here, in the hopes of luring in both the campus vendor (Sodexho) and local restaurants that have supported the station in the past. By getting them to donate their food and asking students for an additional donation to eat, we hope to fill in the total raised for the event nicely.

Get small plates, so they do not overload, and get as diverse a group of foods as you can. This is a great time for local shops to show off. Schedule them in waves, so that after the show is done, there are tables full of coffee/tea and desserts.

Of course we are talking about 1,500 people here, so there is a limit to how much food will be available. But, that scarcity will make it more appealing and get your donations up. And the local shops will be assured of clearing out their table(s) and getting attention. Make sure the shops have signs (you make them) on their tables and piles of menus, business cards, or other information.

PROMOTING THE EVENT

I suppose #4.5 on the list should be promotions, but I think that is kind of self-evident. If you do not promote the crud out of the show, you will not land 1,500 people and you will not make your target donation.

Make sure you promote all of the supporting vendors and campus organizations *heavily*. Do this on your websites, on your on-air underwriting announcements, etc., to make sure that their involvement and donation of all the food is acknowledged.

At the same time, *do not* violate the underwriting Rules; but make sure you cover the support you get. If you want more details on underwriting do's/do not's go to http://www.collegebroadcasters.org/under.shtml This page includes links to the FCC as well.

KEEP IT ROLLING!

Now, back to that willpower thing – look, there is no way to sugar coat that what you are attempting will be very difficult. It is a challenge for a professional promoter to manage this kind of thing so, as a "mere" mortal, it could really be rough.

Why do it? Well, assuming you are involved in education for something other than the paycheck (you can stop giggling now), then you want to do this for the reasons I already stated – to expand the horizons of your students, to increase the prestige of your station (maybe even the school), and to help out another educational institution in dire need.

Keep telling yourself that it is worth the effort and eventually you will believe it too. The result will be worth all the effort. Trust me.

John Devecka manages WLOY on the Loyola Campus in Baltimore, MD. Contact John at wloy@loyola.edu

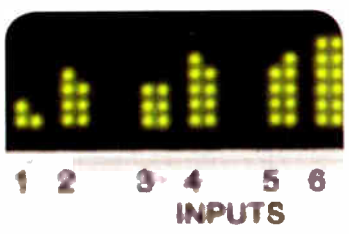
"IP-Audio in New York City? Not on my station."

"Buckley Radio decided to move WOR to a new location, leaving behind studios we'd called home for over 50 years.

"My staff and I had spent months carefully planning new facilities, and we were more than halfway through preparations — then, the rug got pulled from under us.

"Quotes to build new studios were astronomical! I had to cut our equipment budget *in half.* And the huge amount of syndicated, network and local programming WOR produces *demanded* digital audio routing and consoles.

"I'd heard that the Axia IP-Audio system could give us the high-end features we needed. And they said our budget wasn't a problem; Axia costs less because they use standard Ethernet for audio routing instead of expensive proprietary mainframes.



"Using Ethernet for Audio was certainly new and different, and I had some concerns. But moving from cart to PC was a big change, too — and for the better. In our industry, change is natural.

"The more I learned about Axia, the more impressed I became with their routing switcher and consoles, and how well their network topology was designed. I began thinking that this Ethernet stuff might just work!

"So I decided to break new ground and order the Axia consoles and routing setup, nine studios worth. It's been on the air half a year now, and we love it. Our operators keep raving about how easy things are to operate. Even our listeners tell us how good WOR sounds.

"And from the day the Axia surfaces, engines and IP-Audio nodes were hooked up, we've had zero downtime. Zilch. Zip. Nada. Axia works — end of story."

— Thomas R. Ray III, CPBE, Vice President / Corporate Director of Engineering, Buckley Radio

AXIA
A TELOS COMPANY

www.AxiaAudio.com

FCC Focus

by Cary Tepper

The Main Studio and its Staffing

Everyone knows there are dozens of FCC Rules and policies regulating the day to day operation of broadcast stations. Although every Rule and Regulation is important, two of these are widely misunderstood – the Main Studio Location Rule and the Meaningful Management Presence Policy.

THE MAIN STUDIO

In 1998 the FCC adopted a new Main Studio Location Rule – Section 73.1125 – that is designed to afford broadcasters more flexibility in locating their main studios within their own media market.

The Rule combines a signal contour and a mileage standard. You are permitted to locate your main studio anywhere within 25 miles from the reference coordinates of the center of your community of license or within the city-grade contour of any AM, FM or TV station licensed to your community of license.

For many broadcasters, the reference coordinates of the center of your community is the location of the Post Office. With regard to using the city-grade contour of another AM, FM or TV station, you must be certain that the other broadcast station is actually licensed to the same community as your station. Just being in the same media market is not sufficient; your *city of license must be the same.*

FLEXIBILITY

The signal contour standard is most helpful if there is a TV or high-powered radio station licensed to your community.

TV stations and high powered FM stations often have city-grade contours that extend as much as twenty or thirty miles farther out than most AM city-grade contours, thereby affording you a wider area in which to locate your main studio.

Once you are sure your main studio is properly situated, you should notify the FCC by letter of the station's address and telephone number. If your station utilizes any FCC-licensed wireless studio-transmitter links or remote pick up facilities, you should make sure that the paths of these facilities are properly licensed, too.

A MEANINGFUL PRESENCE

Although a proper studio location is very important, you must also ascertain if the station is properly staffed. Established FCC policy requires that all commercial and noncommercial full power AM, FM and TV stations to maintain a "meaningful management presence."

Each full-powered commercial and noncommercial broadcast station must have at least one full-time management person and, in most circumstances, another part-time staffer present during normal weekday business hours. Generally, the FCC expects you to maintain a meaningful management presence at least Monday through Friday, from approximately 9:00 AM until 5:00 PM.

Since management personnel need *not* be chained to their desks, a second staff person is expected to oversee the studios when the manager leaves the premises to visit merchants and sponsors, attend community events, or travel out of town. However, management personnel must report to work at the Main Studio on a regular basis, spend a substantial amount of time there, and use the main studio as a "home base" in order to be considered a legitimate manager.

If there are no managers in the studio at any given time during regular business hours, the FCC requires, at a minimum, that a non-management staff person be on duty to oversee the station's Public File and entertain telephone and walk-in inquiries from the FCC and the general public.

The FCC does not require you maintain "paid" managers. For many colleges and universities, a rotating staff of faculty and student volunteer managers will suffice so long as these volunteers are knowledgeable about the station's operations, know the contents of the station's Public File, and can maintain basic station operations by using the FCC's Self-Inspection Booklets.

BE INFORMED, PREPARED

It would be prudent that all station managers, paid or unpaid, be required to read and understand the FCC's Self-Inspection Booklet so that you ensure there is a basic level of competency of the FCC's day-to-day Rules and Regulations.

With regard to automated broadcast operations, there is a widespread misconception in the broadcast industry that if a broadcast station is fully automated and capable of "unattended operation," then a meaningful management presence need not be maintained. *This is not correct.*

During normal business hours – generally, Monday through Friday from about 9:00 AM to 5:00 PM – all stations must maintain a meaningful management presence. At all other times a fully automated broadcast station can remain unattended so long as there is a capability to shut down the station at any time (night or day) should the FCC make such a demand.

Cary S. Tepper is a principal of the law firm Booth, Freret, Imlay & Tepper, PC in Bethesda, Maryland. He represents hundreds of commercial and noncommercial radio and TV stations. Contact Cary Tepperat: 301-718-1818 or law@aol.com.

BROADCAST tools®

The Preferred Choice

for Automation and Switching Solutions

SS 16.16

The SS 16.16 provides audio routing of 16 stereo inputs to 16 stereo outputs. This type of routing allows any one stereo input to be assigned to any/or all stereo outputs. The SS 16.16 may be controlled via front panel encoder controls and/or a multi-drop RS-232 serial port. A 40 x 4 LCD back lit display provides for input descriptions and macro setup. Additional features: headphone amplifier with front panel jack and level control, front panel monitor speaker with mute switch and level control internal audio activity/silence sensor with a front panel ACT indicator and rear panel open collector, and a 16 GPIO port. FREE Windows NetSwitch remote control software, which supports Serial, USB and Ethernet with the optional ESS-1 Ethernet to serial converter, is available for download. Installation is simplified w th plug-in euroblock screw terminals.

ACS 8.2

The ACS 8.2 provides matrix audio switching of 8 stereo inputs to 2 stereo plus 2 mono outputs. Any input assigned to output one has fading capabilities. Matrix switching allows any/or all inputs to be assigned to any/or all outputs. The ACS 8.2 may be controlled via front panel switches, contact closures, 5-volt TTL/CMOS logic and/or the multi-drop RS-232 serial port along with 16 GPI's, eight relays, eight open collector outputs, and input expansion port. Installation is simplified with plug-in euroblock screw terminals.

SS 4.2

The SS 4.2 provides matrix audio switching of 4 stereo inputs to 2 stereo plus 2 mono outputs. Matrix switching allows any/or all inputs to be assigned to any/or all outputs. The SS 4.2 may be controlled via front panel switches, contact closures, 5-volt TTL/CMOS logic and/or the multi-drop RS-232 serial port along with 16 GPI's, eight GPO's, and input expansion port. Installation is simplified with plug-in euroblock screw terminals.

SS 16.4

The 16.4 provides matrix audio switching of 16 stereo inputs to 4 stereo plus 4 monaural outputs Matrix switching allows any/or all inputs to be assigned to any/or all outputs. The SS 16.4 may be controlled via front panel switches, contact closures, 5-volt TTL/CMOS logic and/or the multi-drop RS-232 or RS-485 serial port along with 24 GPIO's and input expansion port. Installation is simplified with plug-in euroblock screw terminals.

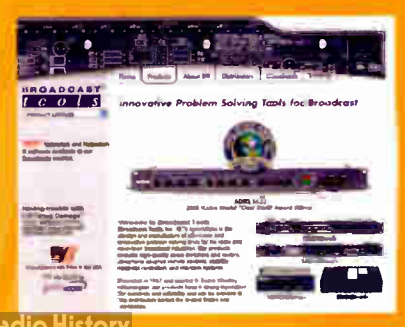
SS 8.2

The SS 8.2 provides crosspoint switching/routing with 8 stereo inputs, 2 stereo plus 2 mono outputs. 3 switching modes, I/O trimmers, internal silence sensor, selectable headphone and powered speaker level controls and outputs. LED VU meters, 16 GPI's, eight relays and eight open collector outputs. Multi-drop RS-232 and RS-485 serial ports, plug-in euroblock screw terminals and input expansion port .

BROADCAST tools

Ph: 360.854.9559 • Fax: 360.854.9479

support@broadcasttools.com • www.broadcasttools.com



Be sure to visit our website at **www.broadcasttools.com** for downloadable manuals, complete product information, and a list of dealers.

INNOVATIVE PROBLEM SOLVING TOOLS FOR BROADCAST

Manufactured with Pride in the USA

The Real Story

by Donna L. Halper

The "Nemo"

Broadcasters have always spoken a different language. For example, in radio's early years Jack Dodge of WNAC was known as one of Boston's best "pick-up men."

That did not mean he was popular with the ladies (although he might have been – he was young, handsome and single); it meant he was an engineer experienced at handling broadcasts at places away from the main studios – "pick-ups."

Those events had another special name too: from the mid-1920s into the 1950s, what we now call a "remote broadcast" was called a "nemo." How the name came about is the subject of much debate among media historians.

EARLY USE

One thing is certain: "Nemo" was already very well-known in popular culture during the 19-teens and early 20s. School children studying *The Odyssey* learned that Odysseus used "Nemo" (Latin for "no-one" or "no man") when asked his name by the monster Cyclops.

In addition to "Captain Nemo," the enigmatic protagonist in Jules Vernes's famous adventure story "*20,000 Leagues Under the Sea*," in 1905, cartoonist Winsor McCay drew a critically-acclaimed comic strip called "Little Nemo" about a little boy who had amazing adventures in a mythical place called Slumberland.

Syndicated in major newspapers for over a decade, "Little Nemo" became an animated film, as well as a children's game.

ADAPTED TO RADIO

How did "nemo" enter the world of broadcasting? Contrary to some stories, it does not seem to have been the initials for "not emanating [from] main office," an explanation suggested years after the term was in common use.

Exactly when "nemo" was first used in broadcasting is difficult to say, but we do know that in 1925 the local New York papers noted the appearance of the "Nemo Male Quartet" (possibly from the Nemo Theater at 110th and Broadway).

Further media attention came from several 1927 articles from the RCA/NBC publicity department appearing in major newspapers like the Washington Post and the New York Times. These stories claimed "nemo" came from a comment by an NBC engineer at WEAF in New York.

The story is that he was hurriedly giving instructions in preparation for a remote broadcast and stumbled over some of his words; what he said sounded like "nemo," which evidently struck his colleague as amusing. Soon "nemo" was being repeated around the station whenever it was time to do a remote.

CLARIFICATION?

In February of 1932 a New York Times article asserted the NBC engineer had not stumbled at all. The staff could not agree on what to call the button on the control panel bringing in the remote broadcasts, so he impatiently told his colleagues they might as well choose the word "nemo," because it meant "no name."

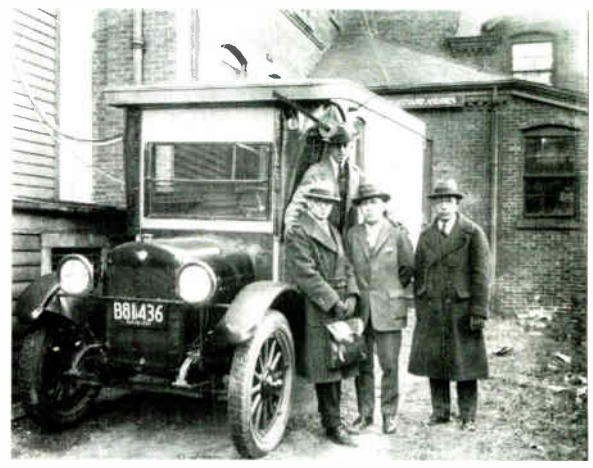
Whether or not the engineer really did suggest the Latin word, this usage of "nemo" actually makes sense. The person standing in the studio could not *see* the performers at the remote location, so the music or voice coming through the control panel would have seemed as if "no-one" was broadcasting.

"Nemo" was widely used as radio slang by the early 1930s. For example, a reporter for the Los Angeles Times went to the KHJ studios in 1932 to do a behind-the-scenes look at how broadcasting took place.

The reporter described the duties of the announcer and noted what each button on the control panel did: "Button number six was called 'nemo' at KHJ, for some unknown reason. It takes care of all the network programs and the remote broadcasts."

INTEGRAL PART OF RADIO

Whatever you call them, remote broadcasts have been around since radio's inception. Aside from a few exceptions at sites with studios, broadcasters have been putting their equipment into trucks, driving out to the remote site, and setting up for the day.



An early remote truck from 1924.

The setup was more complicated in those early years when audiotape did not exist and all broadcasts were done "live." The engineers had to be at the location at least an hour beforehand to make sure everything was working.

Those "pick-up men" would check all the microphones and telephone lines to be used – at New York City's Capitol Theater, where the popular show "Roxy and His Gang" originated, sometimes as many as sixteen mikes were in use during the broadcasts. And everything had to be coordinated with the announcer back at the studio so he or she would know when to break in with a station ID or a commercial.

Sometimes a wrong button was pushed or a cue was missed, but even when it was not perfect, the "nemo" became one of radio's most popular features. And to this day, although we now call it a "remote" rather than a "nemo," people will still gather to watch their favorite announcers broadcasting live, just as they did back in the early 1920s.

Media Historian Donna L. Halper writes on a variety of radio historical topics when she is not consulting radio stations or teaching at Emerson College in Boston. Contact her at: dlh@donnahalper.com

MASTER CONTROL™

The On-Air Digital Studio

The best use the best.™

"There is no way that I could possibly have accomplished the excellent results of building my first digital radio station without the exceptional coordination and teamwork of the folks at RCS."

Doug Varner
Chief Engineer
WMUG-FM 105.1
Indiana, PA

RCS® Sound Software™
www.rcsworks.com

Studio Guide

by Mark Shander

The Great Dynamic Microphone Shootout

Part-2: And the Winner is ...

[Whispered voice of off-stage announcer:] This is your off-stage announcer welcoming you back to Mark Shander's Great Dynamic Microphone Shootout. When we last left our plucky microphonist, he was observing the singing team of Harry and Selma as they prepared to record using the three contending microphones. Now, sit back and relax as we return to the studio in beautiful downtown Newark, NJ. Engineer Ted is ready to proceed:

We are comparing the Sennheiser MD421, the Shure SM-7, and the Electrovoice RE-20 – some of the most talked about and compared microphones in broadcast history.

SHOWTIME

Harry and Selma are ready to do their thing. As he listens through his headset, Ted announces which microphones are "hot" while controlling the mix to my ISDN feed and the recorder. I get to watch the action on a Webcam.

After the artists leave, we again listen to the playback and evaluate the performance of the three microphones.

We realize that this will be subjective, not scientific, and that my participation will be limited until the digital files arrive for me to use to compare.

LEVELING THE AUDIO FIELD

First we listened to the Sennheiser MD421; it has a nice, silky smooth sound. As we listened to the analog track, at first I detected what appeared to be a very high noise floor and some pumping on the ISDN feed.

It turned out that Ted had recorded the tracks using external noise reduction equipment, but it did not decode correctly. After changing few patch cables, he was back in business.

Meanwhile, I asked Ted about the digital tracks; if the session had noise reduction on the digital samples I was going to scrap the results. This was supposed to be a clean shoot-out – no processing, no EQ, no tuning just a clean microphone feed. However, Ted assured us the digital tracks were right from the microphone preamps.

Ted stopped the playback as I asked why he chose to add noise reduction to the analog recording. My point was that, between the speed and width of the tape, one would think there was a low enough noise floor and adequate dynamic range not to require any noise reduction.

Ted fast-forwarded to a blank spot on the tape and brought the MD421 into the control room. He plugged it in to a microphone stand and instructed us to be quiet and listen. Then he started singing into it.

For the first time, I realized that Ted was envious of Harry and Selma and wanted to be in the limelight.

THE SINGING ENGINEER

Ted sang for 30 seconds, then stopped and sang the same song again, recording on another track so the tracks could be compared side-by-side – one with noise reduction, one without. We listened to Ted's song over and over for 15 minutes.

Over ISDN, it was very difficult to hear a difference but, when Ted did a test and asked me to identify which was which, I was able to select correctly about 90% of the time.

To me, the noise reduction flattened the frequency response as it appeared to tighten the sound. Looking for other clues to identifying the differences was difficult; the noise floor was almost audible over ISDN when the analog tracks were played.

We agreed to use the analog recording as a reference, keeping in mind that each of the microphones was recorded the same way and that noise reduction is supposed to be transparent in relationship to content. Meanwhile, as we continued to evaluate the MD421 analog track, the digital track was being downloaded from the Internet.

COMPARING THE MICROPHONES

Next we heard the Shure SM-7. It had less presence and more low end. The bass roll-off switch was set to flat. Ted assured us that while he normally likes to roll off the bass on that microphone at the mixer, all the microphones were recorded flat.

Next we switched to the RE-20, which sounded more live during playback, with a certain punch and presence the others lacked. It was very clean.

After comparing the microphones on the ISDN feed, I spent about an hour listening to the digital files. They were fantastic. They were clean with almost no noise and, since they were uncompressed audio files, they had very few artifacts that I could pinpoint.

AND THE WINNER IS ...

After analyzing both the analog and digital tracks, we all agreed that for this particular shoot-out – with the conditions as we set them – the RE-20 was the winner, with the MD421 coming in second and the SM-7 a close third.

Of course, there are many other ways to test microphones besides recording a duet. In other environments the results may have been very different.

All in all, this particular shoot-out suggests that the price and performance of the Electrovoice RE-20 make it an excellent choice when considering which microphone to use for vocal recordings that require the use of a dynamic microphone.

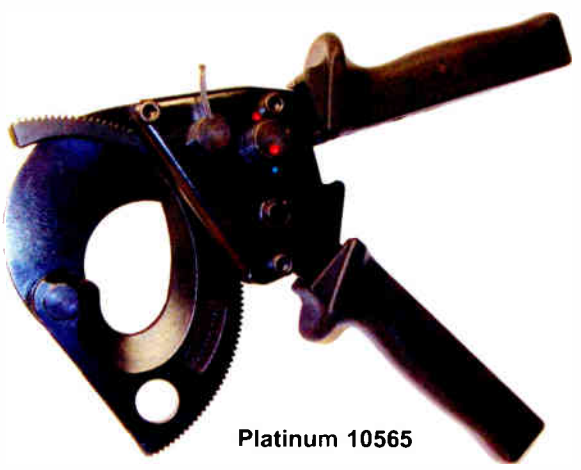
Mark Shander loves to listen to microphones. But, no, he did not get to go to New York City (or even Newark) for this story. You can commiserate with him at: mark@shander.com

Tool Guide

Test, Tools, Tips and Applications

Platinum Tools Ratcheting Cable Cutters

Cutting cable may seem like a mundane low tech task, but the importance of doing it right is frequently overlooked. The latest technology for radio broadcast equipment and installation infrastructure commonly utilizes multipair CAT5 or snake cables, and specialized connectors that require wires to be cut near perfectly square and with no stress or distortion to assure a proper gas tight connection.



Platinum 10565

The long incorrect traditions of cutting cables with bolt cutters, nibbling away at individual strands with side cutters, nip and bend back and forth until the wire yields, or even using a hack saw (ever hear of an axe being used?), are now completely out of date and unacceptable.

Proper procedures for cutting large diameter cables require a ratcheting cutter. One with blade geometry that provides the clean, square and undistorted cut required, but does not require the strength of Goliath to use. Such ratcheting cable cutters are provided by several manufacturers, but all are a variation on a theme.

Excellent examples are manufactured by Platinum Tools, a company whose stated motto is "First, develop and source the absolute best possible solutions for the preparation, installation and hand termination of wire and cable. Second, implement an operational infrastructure that can deliver these products in an efficient, timely and high quality manner." Platinum cable cutters all utilize high carbon tool steel and are heat treated for long life. All lock closed for safe storage.

The Platinum 10568 Cable Cutter will cut cable up to 500 MCM (MCM stands for Mill Circular Mill, or in layman's terms – mm^2) which equates to cables just under one inch in diameter. It fits in any toolbox, and is particularly well suited for working in tight spaces.

For bigger jobs and improved ease of operation, the Platinum 10565 Cable Cutter will cut cable up to 750 MCM, which equates to approximately 1-1/2" diameter. There is also an optional Boot that can be anchored to a work surface. With one handle of the tool placed into the boot, additional leverage can be applied to cut quickly and smoothly.

Or, if you absolutely have to have the biggest, the Platinum 10560 Cable Cutter, similar in design to the 10565, cuts up to 2,700 pair telephone cable. That's not something that we see in broadcast – yet – but who knows what the future may bring.

So how much does it cost to cut cable the right way? Anywhere from about $140 to a little over $200. That is not really much when you consider the extra work – and risks – of doing it the "old way."

Platinum 10568

Consultant Guide

Radio Consulting Engineers

P.O. Box 728 Apex, NC 27502 (919) 387-0099

FlipJack FJ-500

NEW!

CELL PHONE INTERFACE MIXER

The FlipJack is the latest addition to the Conex line of cell phone interface products. The FlipJack is designed to interface most hand held phones that have a 2.5 mm hands-free adapter jack.

FOR MORE INFORMATION
1-800-645-1061
www.conex-electro.com

FEATURES:

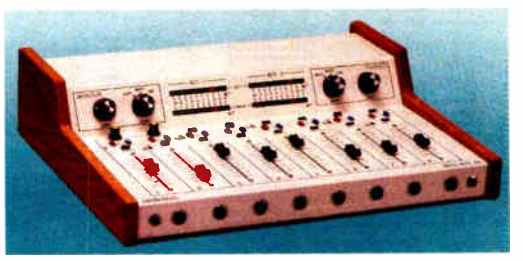
- Two headphone jacks ... each with it's own volume control.
- Two Mic inputs and a seperate Line Input
- Connection To A Standard Telephone Line.
- Separate headphone cue switch for more flexibility
- Operates on "AA' batteries (Included) or external power (Optional)
- Balanced Line Level Output
- Slots for shoulder straps.
- All IC's socketed for easy maintenance
- Tuner input for off-air monitoring
- LED level indicator

CONEX ELECTRO SYSTEMS

1602 Carolina St PO Box 1342 Bellingham WA 98227
phone: 360.734.4323 fax: 360.676.4822

AUTOGRAM CONSOLES

Pick One!



Small
Mini-Mix 8A

Medium
PM 828

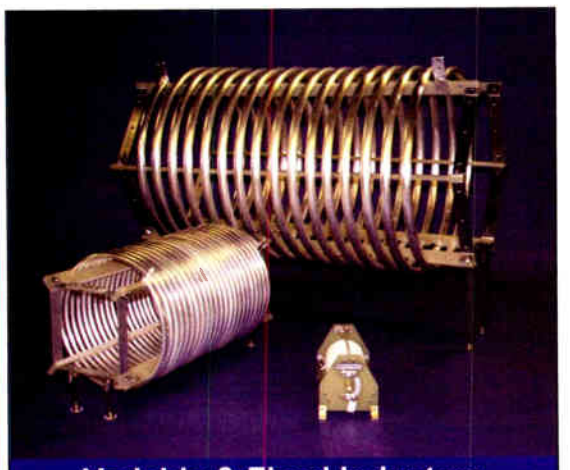
Large
PM 228

Autogram Corporation
800-327-6901 • Fax 972-423-6334
www.autogramcorp.com

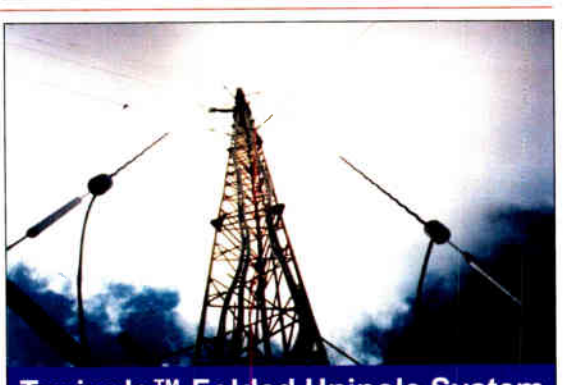
AM Antenna Solutions

Components to Complete RF Systems


High Power ATU


Variable & Fixed Inductors


AM Triplexer


Tunipole™ Folded Unipole System

LBA Technology, Inc. is your proven supplier of innovative, digital ready, AM antenna systems. Our products include tuning units, phasing systems, multiplexers, folded unipoles and components for every power level. Turn key services available.

Used by hundreds of broadcasters in the US and worldwide for over 40 years.

Call us for your next project. Quotes provided promptly and without obligation.

Reach farther - sound better!

LBA Technology, Inc.

3400 Tupper Drive • Greenville, NC 27834 • 252.757.0279
FAX 252.752.9155 • 1.800.522.4464 • e-mail: lbatech@lbagroup.com

www.lbagroup.com

Gear Guide: Automation, Digital Audio Studio Control Equipment

Audion

VoxPro Version 4.0

www.audionlabs.com • 206-842-5202

VoxPro version 4.0 is here. Optimized for speed and ease of use, VoxPro's software and control panel records and edits phone and stereo audio for quick turn-around to air.

Ideal for control, news and production rooms, version 4.0 brings many new features including built in AGC on caller, host or both channels with consistent levels the result. A peak program meter with a 72 dB range helps monitor levels. A robust marker system allows marker placement with notes while recording or playing back. 100 times Zoom.

Auto-Networking allows VoxPro workstations connected to your station's LAN, to automatically detect each other and stay connected. Users can access their accounts from other studios and transfer files quickly from room to room as WAV, MP3, MP2 or other popular formats. Auto Import scans a designated folder and imports any sound file placed there automatically.

Broadcast Electronics

AudioVAULT Version 9.0

www.bdcast.com • 217-224-9600

Flexibility and stability are the two terms that are used most often to describe the AudioVAULT digital audio storage and playback system from Broadcast Electronics. With the recently released version 9.0, those terms are more accurate than ever.

AudioVAULT 9.0 includes support for Windows XP Pro SP2, playback failover through dual/redundant remote file servers and improvements to AudioVAULT's play-while-record capability.

AudioVAULT is more than an automation system, with powerful features for live, live-assist and satellite operations. Completely scalable, AudioVAULT is equally adaptable to stand-alone stations and large groups wishing to share content.

AudioVAULT also gives you a head start on emerging technologies, with built in support for datacasting and HD Radio implementation. Only AudioVAULT offers the complete range of tools that today's operations require. AudioVAULT also delivers the convenience and support you have come to expect from Broadcast Electronics.

Broadcast Tools

SS 16.4 Matrix Audio Switcher

www.broadcasttools.com • 360-854-9559

The Broadcast Tools® SS 16.4 provides true matrix audio switching of any or all of the 16 stereo inputs to any or all of the 4 stereo plus 4 monaural outputs. Additional features include: multiple units may be cascaded to expand inputs; sixteen user configured macros; remote control via front panel input selection switches for each input channel with separate output indicator LED's, contact closures, 5-volt TTL/CMOS logic and/or the multi-drop RS-232 or RS-485 serial port; Interlock, overlap and mix switching modes; internal audio activity/silence sensors monitor all four-output channels, each equipped with front panel "ACT" LED indicators and adjustable alarm delay and restore duration; power-up selection of inputs to outputs, mute or last source selected; 24 input GPI port (remote control or PIP) with LED indicator; 16 open collector channel status outputs or programmable via burst commands; 8 SPST relay outputs programmable via burst commands; multi-turn input and output level controls; electronically balanced inputs and outputs; plug-in euroblock screw terminals; 2-RU chassis.

Broadcast Electronics

Now Playing

www.bdcast.com • 217-224-9600

The Radio Experience is an expanding suite of tools designed to help you take advantage of emerging datacasting technologies. Its keystone application is Now Playing , which is compatible with practically all digital automation systems, especially the industry leading AudioVAULT system from BE.

Datacasting Artist and Title information (PAD or Program Associated Data) is just the beginning. Now Playing expands the capabilities of datacasting, allowing broadcasters to interleave station promotional announcements with existing PAD. On-line scheduling tools allow you to set up blocks of messages (similar to rotating carts) and change the messages hour to hour.

Now Playing can even interface with manual CD players with our exclusive LiveCD option. NewsFlash Pro, which allows operators to send custom messages to RDS, HD Radio receivers and your web site is another example of the diverse and powerful options available.

Broadcast Software Intl. (BSI)

SkimmerPlus and Simian Upgrade

www.bsiusa.com • 888-274-8721

NAB 2005 witnessed the launch of BSI's newest application, SkimmerPlus, and the announced release of the latest upgrade to the flagship digital automation system, Simian.

SkimmerPlus records up to eight stereo channels of high-quality uncompressed and compressed audio simultaneously. A built-in web server allows audio files to be replayed using any web browser.

Simian 1.7 builds on the success of previous versions of the software, including new command macros adding the ability to insert a program log within an existing program log on-the-fly. It's also now easier to deal with 'ball games' with floating ends or 'rain stopped play' with the new GOTO function.

Those using Simian's built-in dynamic HTML generator get a whole host of new functions including the ability to insert any HTML text from Simian itself, and there also are changes to better support XML users.

CircuitWerkes

Transcon-16 Contact Transporter

www.circuitwerkes.com • 352-335-6555

Have you ever needed to get a bunch of relay or switch contacts from one room to another without using a mess of wires? Now you can move contacts around anywhere using a standard serial cable or even just a standard balanced audio cable and a couple of DB-9 connectors.

The CircuitWerkes Transcon-16 is a bi-directional contact transporter that uses standard serial communications which can be routed over any three conductor cable. One Transcon-16 is required at each end of the cable. Each unit has 16 optically-isolated inputs and sixteen relay outputs on each device. Whenever one of the inputs is grounded, the corresponding relay closes on the second unit. Serial data rates can be switched from 9600 bps to 1200 bps for noisy or rugged environments, or extremely long runs. Inputs and outputs appear on standard D-25 connectors. Suggested list price is just $269.00 each.

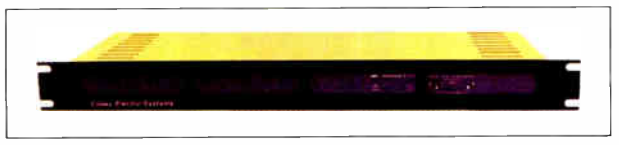
Gear Guide: Automation, Digital Audio Studio Control Equipment

Conex

CS-25B Tone Sensor

www.conex-electro.com • 360-734-4323

The CS-25B sensor provides a simple, economical method for sensing tones from satellite systems, reel-to-reel tape machines, etc. The CS-25B is based on a modular concept that allows you to build a sensor system that exactly meets your needs. The controls for the modules are adjustable from the front panel.



The modules that are currently available for the CS-25B include: DS-25 dual sensor module (Each half of the module can be tuned to 25 Hz, 35 Hz, 50 Hz or 75 Hz), HPF25 high pass filter that features balanced audio in and out, PS3 power supply that can power a mix of up to 7 other modules, DTA dual tone adaptor (used to detect 25 Hz, 35 Hz and 25/35 Hz)

You can mix a variety of these modules in one package depending on your requirements.

Henry Engineering

Digital D.A. 2X8 AES/EBU Distribution

www.henryeng.com • 626-355-3656

Henry Engineering's new Digital D.A. 2X8 is a dual-mode distribution system for AES/EBU digital audio signals. It is ideally suited for any application where AES/EBU digital audio needs to be routed to multiple destinations.

Digital D.A. 2x8

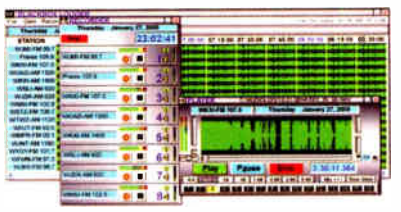
The Digital D.A. 2X8 has 2 inputs and 8 outputs, which are all individually transformer isolated. The unit can operate in "Single" mode as a 1-in, 8-out DA, or in "Dual" mode, as a pair of 1-in, 4-out DAs. In Single mode, the digital source fed to input #1 is distributed to all 8 outputs. In Dual mode, the 8 output are "split" into two groups of 4, producing 4 outputs from each input.

The output signals are bit-accurate "clones" of the inputs signals, with no added delay or latency. The unit includes automatic correction for low input levels and rolloff caused by long cable runs.

Pristine

Blackbox Digital Audio Logger & Monitor

www.blackboxlogger.com • 800-795-7234



BLACKBOX Digital Audio Logger, Monitor, and Alert System is a comprehensive radio and television audio logging product designed to meet compliance, proof, audit, programming, management, and engineering needs.

Up to 16 stereo (or 32 virtual mono) channels of logging are available. Choose from a variety of wav audio devices, and AM, FM, and TV tuner boards. Most popular audio storage formats are supported.

Advanced tools provide the Program Director or Consultant with everything needed for quick review or detailed analysis of the entire market. Of course, time based and microphone Skimmer modes are included.

A "Virtual Radio" style player allows switching between multiple stations during playback as though listening to a radio in real-time.

Real-time monitoring of Audio Level and RF Signal Strength (when equipped with ASI Tuner Boards), with an extensive alarm, system provides quick alerts to help avoid lost air time.

Prophet Systems (PSI)

Radio Automation Systems

www.prophetsys.com • 877-774-1010

From major market sites to Internet operations, Prophet Systems has created solutions that are powerful and yet user-friendly and affordable enough for any station.

Prophet Systems provides everything from complete digital automation solutions (NexGen Digital and NexGen101) to standalone modules that will work with any radio automation system.

All software packages include a fully-functional 30 day trial program allowing you to try before you buy. Our goal is helping our customers design the best digital solution for their unique needs. With software starting at $495 and non-proprietary hardware and audio cards, now anyone can afford professional radio automation. Operating System Platforms Windows 2000/XP, Windows NT 4.0.

Check out our one stop online shop at Store.prophetsys.com.

Sine Systems

CAS-1 – Air Monitor Control

www.sinesystems.com • 615-228-3500

The Sine Systems CAS-1 is a solution to the signal delay problem caused by digital processing and transmission equipment.

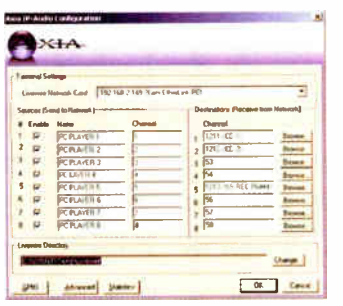
Digital broadcasting devices have a very short inherent delay. When installed in the "air" feed, there is a very short delay between the live audio and the air audio monitor. This delay is particularly noticeable, and most annoying, during live breaks when the air staff hears their own voice delayed in the monitor.

The CAS-1 substitutes a local audio feed (not delayed) in place of the (delayed) air feed to the monitor when the mic is on. An audio correlation circuit compares the two audio signals and switches the monitor to the air feed if the signals are not similar. Additionally, controls for equalization and compression can be used to tweak the monitor audio so that it sounds like the live air feed.

Telos-Axia

IP-Audio Driver

www.axiaaudio.com • 216-241-7225



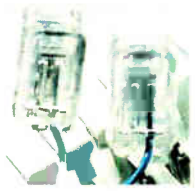
The components that comprise the Axia system are completely modular – "building blocks" that you can mix, match and combine. One of these Axia components is the IP-Audio Driver.

The Axia IP-Audio Driver lets PC's exchange digital audio directly with Livewire networks using their standard Ethernet NIC – eliminating the need for sound cards or expensive outboard boxes. The IP-Audio Driver installs on any Windows PC and works with delivery systems, audio editors and other applications that support Windows audio. The standard IP-Audio driver gives you one stereo input and one stereo output. Need more I/O? Multi-channel versions that provide up to eight outputs are available from Axia development partners: visit www.axiaaudio.com for a complete list.

Axia, a Telos company, builds network-based professional audio products for broadcast, production, and other audio applications. Products include digital audio routers, DSP mixers and processors, and software for networked audio systems.

Service Guide: Radio Equipment Products and Services

Service Guide: Radio Equipment Products and Services



ST Connectors for 66 Blocks...

Bag of 10: $ 6.95
Bag of 100: $65.00
(Ridiculously Expensive!)

Squeeze them on Jumper Wire. Great for temporary or permanent jumpers.
You need 2 per pair!

We also have Punching Doubiers, 66 Blocks, Single Pair Jumper Wire in Assorted Colors, 66 Block & Modular Attenuators, and many other Unique, Problem Solving Telecom Products.

Fix RF Problems!

99% Success Rate!

RF Filter

Handset Modular:	$18.95
1 Pair Modular:	$14.95
2 Pair Modular:	$18.95
1 Pair Hard Wire:	$ 8.95

Choose the frequency range for maximum rejection:
• 5 to 3m hz (AM) • 3 to 30m hz • 26 to 60m hz • 60 to 150m hz (FM)
Now Available... Combination AM & FM Filters!
See the **RF Troubleshooting Flow Chart** and four page **RF Tech Bulletin** at:
www.sandman.com
Mike Sandman... Chicago's Telecom Expert
Call for FREE Catalog: **630-980-7710**

Maximize your FM Station

Use the Software that works as hard as you do!

rfInvestigator-FM v2.5

The Industry Leader in Innovative Engineering Tools

Make Your Work Easier and Faster

Display and Printing Improvements
- *Set Colors and Line Weights
- *Invert Colors easily
- *Display ESRI Shape Files

Completely redesigned "DA Design Tool"
- *Set your own Antenna Design Limits
- *New Booster Designer

rfSoftware, Inc.

innovative engineering tools
Visit **www.rfsoftware.com** Today
Call **352-336-7223**

MOORETRONIX

BROADCAST & INDUSTRIAL ELECTRONICS

Our 5th Year

Our client list continues to grow.
Thank you for your confidence and equipment purchases.

We Re-Condition

Pacific Recorders BMX I-II-III, AMX, ABX and RMX, Stereo-Mixer and Mixer News-Mixer products.

Solve Your System Wiring Problems Fast!

With ***STEREOTRACER***
See our Web News-Update page, for details.

Tel: 800-300-0733 Fax: 231-924-7812
WWW.MOORETRONIX.COM

rfEngineers, Inc.

Coverage modeling
RF exposure limit reports
STL & microwave path analysis
Collocation and interference studies
Expert witness testimony by P.E s
For information call: 352-367-1725 or
Visit www.rfengineers.com today!

DANGER

NO ENTRY FOR ANY PURPOSE
RF TRAINED PERSONNEL ONLY
DO NOT TOUCH TOWER
HIGH RF VOLTAGES
OPTIONAL- PHONE OR ASR HERE

ANTENNA ID PRODUCTS 610-458-8418
FCC compliance signs for AM & FM tower sites
ASR signs - Guy wire protectors - Antenna tags
www.antennaID.com *antennaID@msn.com*

BESCO INTERNACIONAL

"Now in Our 34th Year"

World Leader in AM-FM Transmitters

AM & FM Pre-Owned Units in Stock

All Powers and Manufacturers
Instruction Books - Spares - Complete

Visit our Website: www.besco-int.com
Or Call Rob Malany at: 321-960-4001

Digital Weatherman

Never Dub Weather Again

- Accurate weather forecasts 24/7
- Totally automated - no dubbing
- Works great with satellite or voice-tracked stations
- Perfect for local sponsorship

For information
visit www.digitalweatherman.com
or call 800-391-5726

Bay Country Broadcast Equipment

Your #1 Source for Quality Used Broadcast Equipment

Call us for our latest list of quality, in stock radio broadcast equipment, or view it at our website:

Bay Country Broadcast Equipment
http://www.baycountry.com
(Website Updated Daily)
E-mail: sales@baycountry.com
877-722-1031 (Toll Free) 443-596-0212 (Fax)

Professional Equipment Repair

at Lightner Electronics, Inc.

- Consoles
- Exciters
- STLS
- Automation Systems
- Audio Processors
- Transmitters
- Remote Equipment

Toll Free: 866-239-3888
www.LightnerElectronics.com

McPherson Radio

Specializing in pre-owned QEI transmitter products.

QEI – *6 Month Warranty* – QEI

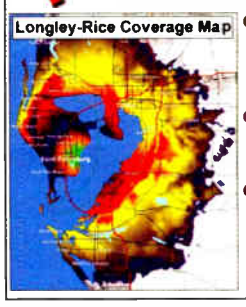
All equipment tuned and tested on your frequency.
MRC has a repair facility to meet your broadcast needs, for repair of QEI exciters and low power transmitters.
Other broadcast manufacturer products are welcomed too.

Bob Brown at 856-232-1625 Fax: 856-232-2075
Email: mcphersonradio@comcast.net

VSoft COMMUNICATIONS

R.F. Communications Software and Engineering Consulting

Innovative and Reliable R.F. Engineering Software



- Create stunning "real-world" coverage maps and interference studies using Longley-Rice, PTP, Okamura/Hata and FCC with Probe 3™
- Search FM channels under spacings and contour protection using FMCommander™
- Prepare AM skywave and groundwave allocations studies and map AM FCC contour coverage with AM-Pro™

The Leader in Broadcast Engineering Software
www.v-soft.com info@v-soft.com (800)743-3684

www.digitalradioengineering.com
Phone: 845-355-4001

digitalradio engineering

Professional Broadcast Engineering Services

Consulting • Project Management • Contract Engineering
FCC Alternative Inspections • Due Diligence Inspections
Engineering Staff Oversight • Engineering Staff Assistance
Facility Inventory • Broadcast Equipment Acquisition
New & Pre-owned Broadcast Equipment Sales

Zonum Industries

Quality Rebuilt Tubes
4,000 Hour Guarantee

– Se Habla Español –

Phone: 530-476-2400 Fax: 530-476-3210
zonumindustries@yahoo.com
www.zonumindustries.com

AFFORDABLE EQUIPMENT REPAIR

Gizmonic COMMUNICATIONS SERVICES LLC.

Professional Repair, Tuning and Love for All Broadcast Gizmos. No Job Too Small!
STL's, TSL's, Exciters, Cavities Tuned, Processors, Mixers, What-Have-You!
Over 35 Years Experience
John Alan: 616-897-2503 Email: Gizmonic@sbcglobal.net

Final Stage

Send your information for publication to: **radio@rconnect.com**

Radio Guide Ads: December -2005

Advertiser - Page	Website
AM Ground Systems - 21	www.amgroundsystems.com
Armstrong Transmitters - 5	www.armstrongtx.com
Audemat-Aztec - 25	www.audemat-aztec.com
Audion - 39	www.audionlabs.com
Autogram - 41	www.autogramcorp.com
Axia - 33	www.axiaaudio.com
Belar - 25	www.belar.com
BEXT - 38	www.bext.com
Broadcast Devices - 15	www.broadcast-devices.com
Broadcast Electronics - 10	www.bdcast.com
Broadcast Software Intl. - 3	www.bsiusa.com
Broadcast Tools - 35	www.broadcasttools.com
Broadcast Warehouse - 24	www.bwbroadcast.com
CircuitWerkes - 19	www.circuitwerkes.com
CKE - 17	www.rectifiers.com
Comrex - 7	www.comrex.com
Conex Electro Systems - 41	www.conex-electro.com
Continental - 19	www.contelec.com
D&H Antennas - 27	www.dhsatellite.com
Dielectric - 17	www.dielectric.com
Econco Tubes - 25, 44	www.econco.com
Energy Onix - 2	www.energy-onix.com
ERI - 5	www.eriinc.com
Fanfare - 39	www.fanfare.com
Freeland Products - 15	www.freeland-inc.com
Gorman Redlich - 17	www.gorman-redlich.com
Harris - 48	www.broadcast.harris.com
Heil Sound - 36	www.heilsound.com
Henry Engineering - 2	www.henryeng.com
Inovonics - 1, 9	www.inovon.com
Jampro - 27	www.jampro.com
JK Audio - 9	www.jkaudio.com
Kintronic Labs - 13	www.kintronic.com
LBA Technology - 41	www.lbagroup.com
Lightner Electronics - 9	www.lightnerelectronics.com
Micro Communications - 27	www.mcibroadcast.com
Moseley - 22	www.moseleysb.com
Nautel - 30	www.nautel.com
Nott Ltd. - 13	www.nottltd.com
OMB America - 27	www.omb.com
Omnia - 47	www.omniaaudio.com
Orban - 48	www.orban.com
Peter Dahl - 23	www.pwdahl.com
Phasetek - 15	www.phasetekinc.com
Prophet Systems - 29	www.prophetsys.com
PTEK - 21	www.ptekpower.com
Pristine - 29	www.pristinesys.com
RAM Broadcast Sys. - 21	www.ramsyscom.com
Radio Systems - 34	www.radiosystems.com
RCS - 37	www.rcsworks.com
RF Specialties - 11	www.rfspec.com
Satellite Lynx - 17	www.satellitelynx.com
SCMS Inc. - 23	www.scmsinc.com
Shively Labs - 11	www.shively.com
Sine Systems - 13	www.sinesystems.com
Superior - 38	www.superiorbroadcast.com
Telos - 31	www.telos-systems.com
TFT - 39	www.tftinc.com
Tieline - 5	www.tieline.com
Transcom - 39	www.fmamtv.com
WIT Inc. - 23	www.witinc.net

Wanted: Test Engineer

Operate/test AM/FM transmitters to determine compliance with broadcast standards, published ratings, and customer requirements. Duties: test control system for correct voltage of filament supplies, low voltage and high voltage supplies; troubleshoot, correct, and verify deviations; test/tune Radio Frequency circuits; perform "Truth of Performance Tests" using electronic test equipment (Audio Signal Generators, Audio Distortion Meters, Spectrum Analyzers, and Vector Impedance Bridge); test transmitter response to audio frequency spectrum; test operating frequency of the transmitter, center frequency, side bands, bandwidth, and harmonics generated at proper modulation levels.

REQUIREMENTS: Bachelor's degree in Electronics Engineering or related discipline.

Please send resume and cover letter to Energy-Onix, Inc., Attn: Bernard Wise, 1306 River Street, Valatie, NY 12184

From Our Readers

Stanley Swanson wrote:

The article on hidden batteries [**Radio Guide**, Nov. 2005, Page 36] makes me cautious about buying new consoles or transmitters that may contain batteries. Perhaps the instructions should say "some maintenance required." I should add that another type of equipment that should be checked regularly is UPS supplies. The life of their batteries is probably about 5 years at most.

Stanley Swanson
KYRM Radio – Yuma, AZ

Author Alan Alsobrook replies:

Ahhh, so true. Actually, from my experience after two years, if the UPS is run down it will never come back and after three years the battery is probably shot. It is for this reason I have got a pretty good selection of UPS batteries on the shelf at my shop. I had to do some wholesale changes of them last year after Francis wandered by and knocked out the power for days.

Alan Alsobrook, CSRE, AMD, CBNT
St. Augustine, FL

New Radio Guide Website
White Papers and Tech Manuals

www.radiopapers.net

Dale Cook wrote:

Thank you very much for adding that [web] page. I see many white papers there that I had already found and bookmarked, and others that I had not seen. When I have a chance I will go through my technical bookmarks and notes to see whether there are any links that I can contribute.

Thanks also for the email service for that page – that is a very convenient service for a busy engineer.

Dale H. Cook, Chief Engineer
Centennial Broadcasting, Roanoke/Lynchburg, VA

Prophet Systems Releases Digilogger Version 2.0

Program directors, general managers, account executives and traffic managers often need to document what was on the air, and now that task has become much easier, thanks to the newest version of Prophet Systems' DigiLogger. Whether your station has clients who want to hear their commercial, or a listener questions something your morning show host said, or it is time to critique the airstaff, DigiLogger can help.

One unique aspect of version 2.0 is its "flex skim technology." In addition to having the traditional method of recording only when the microphone is on, Digilogger 2.0 also gives the option of listening to the whole show, or just the skimmed portions.

PDs can also monitor multiple stations and record up to 16 audio sources per work station simultaneously. Among other features, Digilogger 2.0 lets the PD select and then review audio elements using XML export capability, aircheck any of the announcers instantly, and show a client that the right commercial played at the right time on the right day. PDs can keep as much or as little of the audio as they wish.

In a media environment where controversial programming is getting more scrutiny, DigiLogger can provide protection by making it easy for stations to verify their program content. But logging software serves many other useful functions. Sales departments will like the fact that DigiLogger makes it easy to capture a commercial as it aired and then play it for a client. Announcers can hear whatever portion of their show they want to listen to. Production directors can gain quick access to show material to build station promos. The software provides easy access any on-air content, and it can then be reviewed from any internet-ready computer.

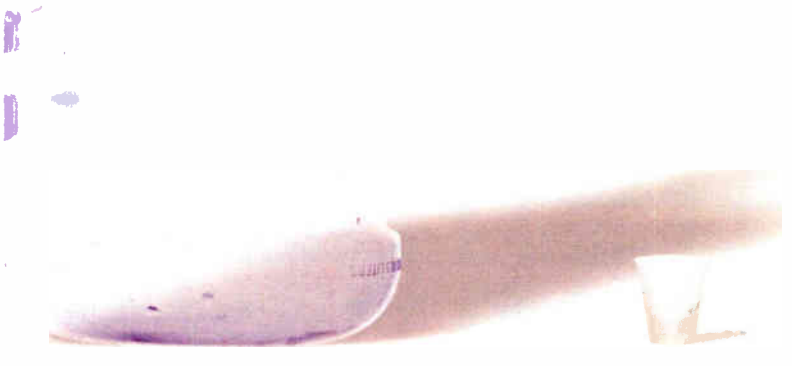
Engineers find a lot to like about DigiLogger too, especially how easy it is to use. Chris Karb is the chief engineer of the Clear Channel cluster in Asheville NC. "We get a lot of requests to e-mail live reads to clients," he says. "We needed software that could do it. We also use DigiLogger to skim three of our stations, for critiques and for sending audio to clients. Our operations manager can get the files and listen to them on our website. DigiLogger works very well for us."

In addition to providing remote access via a web page, DigiLogger 2.0 can produce audio in a number of formats, including MP3s and WMA files. It uses multiple bit-rate storage per recording channel, and recording lengths and times are user-configurable. DigiLogger can record in either compressed or non-compressed formats. And it is compatible with most automation systems. It was designed to run on Windows XP, and the starting price for a license is only $595. Learn more at: www.prophetsys.com

Multicasting.

It's like trying to fit —

well, you know.



Management has decided to multicast. Which seems like a terrific idea — until you consider just how little bandwidth each channel will get. How will the sound of your station(s) survive these shrinking bitrates? Omnia can help.

New Omnia Multicast with SENSUS™ restores the fullness and depth that bit-reduction steals. Our DSP gurus teamed up with the codec experts at Telos (the folks who introduced broadcasters to MP3 and MPEG AAC). Together, they developed a unique suite of tools to pre-condition audio for HD Radio™ multicasting.

Omnia Multicast with SENSUS codec conditioning, Omnia Bass Management system and distributed look-ahead limiter significantly improves the sound of HD multicast and other bit-reduced streams.

SENSUS technology enhances punch, preserves presence, and reduces artifacts. Even heavily bit-reduced channels (like multicast) can be significantly improved by Omnia running SENSUS. And like all Omnia processors, Omnia Multicast delivers the smooth, clean, pure signature sound that grabs your listeners and holds them hour after hour. No wonder the top stations around the world choose Omnia over all other processor brands.

Multicast like you mean it... with Omnia Multicast.

Omnia
A Telos Company

OmniaAudio.com

SOMETIMES...

the price of progress is lower than you think.

Five-Band Optimod-FM 5300

Optimod-FM 5300 puts coveted five-band and two-band Optimod processing into a ***single rack unit*** package and brings it to you at the ***most affordable price ever***. The 5300's five-band processing is ideal for any pop music format (even the most competitive and aggressive CHR), while phase-linear two-band processing yields ultra-transparent sound for classical, classic jazz, and fine arts formats. Regardless of your choice, 5300's optimized technology ensures unusually high average modulation and coverage for a given level of subjective quality. Unlike many lesser processors, the 5300 handles speech particularly well — it's always clean, even when you process for loudness.

Big Optimod Sound. Affordable Price.

- Automated dayparting
- Ultra-low delay five-band processing
- GPI, Ethernet, RS-232 serial remote control
- Advanced PC software
- Dual composite outputs with independent level controls
- Orban's patented "Half-Cosine Interpolation" composite limiter
- ***...and, most importantly, the five-band Optimod-FM 5300 offers that inimitable, consistent Optimod sound.***

HARRIS

For more information on complete end-to-end digital radio solutions including the Orban Optimod-FM 5300 ***call us today at 1-800-622-0022***

www.Broadcast.Harris.com

orban crl

www.orban.com

Right on the money

Not long ago, stepping up to the 5300's level cost thousands more. Now it's a feasible option for many non-commercial and small/medium market broadcasters. So before you buy a processor, you owe it to yourself to check out the new price of progress. We think you'll find that the Optimod-FM 5300 is right on the money.

PRSRT STD
U.S. POSTAGE
PAID
PERMIT NO. 410
BEAVER DAM WI