Radio Guide

Radio Technology for Engineers and Managers

January 2006

Digital Radio Becomes More Accessible

Inside Radio Guide

The first commercial home IBOC receiver to become available in the commercial marketplace is now in the hands of both radio broadcasters and the public – the Boston Acoustics HD Recepter™.

The Recepter is a table clock radio with a satellite speaker for stereo reception; it tunes regular analog and digital stations on North American channels.

As shown in the photo, the overall design is very clean and simple. The display is large and easy to read. Operation is very simple and user friendly. Tuning is facilitated by means of a rotary encoder. This is great news for those who lament the lack of knobs on many products.

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

ENERGY-ONIX CONTINUES TO SELL AT LEAST ONE AM AND ONE FM TRANSMITTER EVERY DAY!

DRE

You can generate multiple digital stereo on your Existing FM Transmitter

System consists of:
(1) Encoder @ **$9,000.**
Receiver @ **$150.** ea.
No changes required in your present analog transmitter.

Sample Applications:

- Stereo Digital Channel For 2nd language
- Digital Channel for "Books for the Blind"
- Dedicated Channel for "Super Markets".
- STL for multiple station owners.
- Normal Radio programs within the 1 mv contour for both analog and digital.

Roadcaster

- Portable Solid State 40 watt VHF/UHF Transmitter and receiver
- 16 RF Channels Selectable
- 4 Channel Audio Mixer
- Can work from 115v/220v AC and 12 volts DC

Selling Prices:
Transmitter **$1,995.**
Receiver **$1,495.**

Tele-link 2

Stereo Quality STL Link permits duplex operation on the Internet or any other Ethernet connection.
Can be expanded to encode (3) stereo programs

Each terminal contains a LINUX based encoder and decoder with automatic adjustment to match useable bandwidth.

Cost per Stereo terminal including hardware and software **$3,000.**

Documentor 2

365 day audio Logger capable of driving 10 monitor terminals and selecting pre-recorded programs by minute, hour, day and month.
Can be configured with many Documentors to record and monitor multiple programs.
$1,295.

ENERGY-ONIX
The Transmitter People

Your Source for AM & FM Transmitters
Phone: 888.324.6649 / 518.758.1690 Fax: 518-758-1476
E-Mail: info@energy-onix.com www.energy-onix.com

Radio Guide

Contents

January 2006

Cover Photo: Boston Acoustics Recepter™ Radio

Radio Guide

Volume 14 – Issue 1

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

www.radio-guide.com – Radio Guide On-Line
www.radiopapers.net – White Papers On-Line
www.radio-classifieds.com – Used Equipment

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

Radio Waves

by Barry Mishkind – Editor

"Are We There Yet?"

It may be one of the worst clichés in family life, but every parent knows it is true – the plaintive question from the back seat starts almost before you leave the neighborhood.

By the hundreds of stations, broadcasters have started on a journey by installing digital transmission systems. After the capital expenditures, remodeling, and other costs, it only seems fair for broadcasters to call out from the back seat, "Are we there yet?" – in other words, "Where are the receivers (and listeners)?"

For the most part, the driver of the vehicle – iBiquity – tells us "just be patient, we'll get there soon." But the lack of anything but a few high priced radios and a nearly complete lack of knowledge about digital radio at many stores has led to disappointing penetration levels thus far.

Meanwhile, broadcasters continue the digital rollout, upgrading systems. Those who have receivers have started circulating their experiences with audio quality and signal reception. A number of early "bugs" are being worked out of the system and some have declared "We have arrived!"

Others see things differently. They feel the destination is still far ahead, past the debates over audio quality, processing theories, antenna bandwidth, and coverage issues.

In this issue, we offer you several articles relating to digital transmission technology that should help you toward your destination. Jeff Welton continues his Digital Radio Crash Course (Page 6), and Gary Liebisch helps clarify some of the issues relating to multicasting as IBOC moves to the third generation exciters (Page 12).

As you probably noticed on the cover, we also have something to share about the first tabletop HD radio to reach the marketplace. Robert Meuser's look at the Boston Acoustics Recepter is on Page 4.

"Are we there yet?" Not quite. But we are definitely on the road. – *Radio Guide* –

Desktop HD Receivers

The Recepter Arrives

by Robert Meuser

The first commercial home IBOC receiver to become available in the commercial marketplace is now in the hands of both radio broadcasters and the public – the Boston Acoustics HD Recepter™.

FIRST LOOK

The Recepter is a table clock-radio with a satellite speaker for stereo reception; it tunes regular analog and digital stations on North American channels.

Boston Acoustics Recepter™

As shown in the photos, the overall design is very clean and simple. The display is large and easy to read. Operation is very simple and user friendly. Tuning is facilitated by means of a rotary encoder. This is great news for those who lament the lack of knobs on many products.

The radio is very easy to set up. A small trap door on the set's top provides access to buttons that enable setting the clock, the two alarms, bass level, forced mono and display options. Once a certain mode is enabled, adjustment is by means of the tuning and volume rotary encoder on the front panel. The clock and alarms are both extremely easy to set with this arrangement. The forced mono option is intended for those who do not wish to use the satellite speaker.

As with similar products, this receiver is tuned in concert with its built-in speakers. The sound is smooth but possibly a little bass heavy for some listeners. Fortunately there is an adjustment to roll off the bass as much as 6 dB.

In many ways the receiver seems to be targeted to a market similar to the Bose Wave Radio. At $499 retail with no CD player, one really must want to listen to digital stations to justify the cost. Of course, as time goes on and more competition hits the market place, the early-adopter price will most certainly drop.

TUNING IN

Since no one is likely to purchase this unit just for the clock, we will focus on the radio. The first important point is the technology is fully digital for both analog and digital modes.

The built-in AM antenna is sensitive enough that the receiver picks up local stations quite well. Demodulation is base-band digital, which permits tight, precise bandpass filtering. The analog AM section performs quite well and according to Frank Barone, project manager for the Recepter, the response is good to about 4 kHz.

A unique feature in the AM section is muting. While the set is quite sensitive, there is no background noise on "empty" channels; stations that seem to be below 100 microvolts can be heard, but the radio is generally quiet tuning between stations.

Another interesting point is that adjacent channel splatter is noticeably suppressed when tuning one channel away from local stations. Even stations that are broadcasting with a digital signal do not cause an audible buzz on either side of their frequency with this radio.

The unit has an external loop antenna. When tested in Manhattan, use of the loop produced intermodulation problems. One local station was heard in the background of several stations across the dial. The factory is aware of this and is investigating.

ANALOG PERFORMANCE

While the radio is definitely not a DX machine, nor does it attempt to be "Super Hi-Fi," the performance of the DSP technology provides a pleasant overall listening experience on analog AM channels for an average listener.

A headphone jack on the rear of the radio allows listening without the frequency shaping that exists with the speakers. To the possible chagrin of some broadcasters, the radio is also promoted as IPOD ready by virtue of a rear panel auxiliary input.

The FM performance is equally pleasing; DSP circuitry keeps the signal clean under almost any condition and features such as blending to mono under poor reception conditions are included.

One thing the AM and FM analog section shares along with the digital reception is the general sound – the overall EQ favors bass to a degree. Most stations employing microphone processing do seem to favor the bass, but this is consistent in all modes. This has the effect of maintaining a degree of parity between analog AM and FM other than the obvious drop in high frequency response.

Comparing FM reception with a similar type radio, the experience is more pleasing due to the EQ curves chosen. The noticeable thing is that when tuning stations employing composite clipping, it is much less annoying than on other radios. There is also some RDBS capability

Besides the ability to tune AM and FM bands, there is a third option called presets. This is interesting because AM and FM live equally in presets. Once stored, it is possible to tune through a mix of favorite AM and FM stations stored as presets. This is important in the digital world where the stations from the two bands compare more equally.

GOING DIGITAL

Since this radio will be purchased to listen to digital broadcasts, how did it do? The most dramatic difference obviously is on AM.

When an AM station operating in digital mode is tuned, the receiver immediately is able to detect the digital information and displays the station's call letters. After the 8 second lock-on time, the signal blends from analog to digital.

On AM, not only is there a significant change in frequency response, but the quieting is quite obvious. When the local NPR station simulcasts, the Digital AM, Analog FM, and Digital FM all sound quite similar. The listening experience varies by station (NPR does not push their AM station as hard as some commercial AMs in the New York market).

PROCESSING EFFECTS

Stations using one of the newer audio processors with a common multi-band section pass along a lot of the aggressive processing to both chains. This has two effects – very smooth blending but with the digital sound somewhat compromised over what it could be.

There are three digital AM stations in New York as of this writing. Two are commercial and one is NPR. One of the commercial stations uses separate processing that has a more pleasing digital signal at some minor expense of the blend quality.

On both AM and FM frequencies, the Recepter blends very smoothly. The biggest difference in blend quality is a station's timing between analog and digital and whether or not there is some brief comb filtering or a signal drop, which is dependent on how a particular station is set up. There are conditions where on AM the Recepter will sense digital carriers and display the station's call but never lock to the digital signal or blend back and forth. This is usually due to low signal strength.

FM PERFORMANCE

Switching to FM, the Recepter's digital performance is equally smooth as on AM.

In New York there are ten stations broadcasting digital on the FM band. The FM experience is different in that the perceived change in quality is much less under most conditions, although there are occasions where a station playing material with some nasty L-R energy cleans up noticeably when it blends to digital.

The big news is the ability for stations to multicast. At this point, there is only one station in the city multicasting. When tuning a multicasting station, the identification is the station's call letters plus FM-1, FM-2, etc.

Multicast reception is as simple as turning the knob.

The Recepter tunes each channel a though it were a separate station. If tuning from the bottom of the dial up, FM-1 appears first. When tuning from the top down the highest-numbered multicast channel is tuned first. The one multicast station in town sounded good on both channels.

LOOKING FORWARD

As the digital roll out continues, there are bound to be more changes. The Recepter has a rear panel connection that facilitates an MCU (Micro-Controller Unit) update.

According to Frank Barone at Boston Acoustics, there is no program in place as yet for regular upgrades but the ability does exist as a hedge against what might happen down the road. As can be seen in the photos, the Recepter is a clean, simple user-friendly machine – digital reception adds no complication to the users interface and just works as advertised.

There is much more to the digital story and that will be discussed in the future. The primary intent here was focus on this new item important to the digital rollout. As more of these products come into the consumer chain, it will be interesting to see how stations respond in terms of audio presentation.

Robert Meuser has been waiting for a long time to get his hands on a working tabletop digital receiver. He welcomes your experiences and observations at robertm@broadcast.net

Indecency Processor

No, this product doesn't remove naughty words, but if you do run a profanity delay or simply have a buildup of digital latency, talent can't listen to the processed air signal. Instead, their feed is probably direct from the console. Compared to the air sound, this can seem weak, dull and lifeless.

Our Model 255 Triband Spectral Loading® processor has zero delay and can deliver a dense, tight, and punchy 'broadcast' sound to headphones and control room speakers... a sound you can't achieve with a general-purpose "utility compressor." Other 255 applications include the program feed to telephone hybrids and IFB processing.

Give talent and other house feeds a sound that's closer to your air sound. See your preferred equipment supplier for a demo of the 255 in your monitor channel.

Inovonics
1305 Fair Ave. • Santa Cruz, CA 95060
TEL: (831) 458-0552 • FAX: (831) 458-0554
www.inovon.com • e-mail: info@inovon.com

Model 255 - $2100

Visit www.inovon.com for full technical details

FM Broadcasters' First Choice

SHPX ROTOTILLER® FM Antenna

HD Radio Ready™

- Rugged brass construction
- Stainless steel brackets
- Reliable series fed elements
- Welded internally pressurized feed connection
- Multiplexed versions available

"HD Radio" is a trademark of iBiquity Digital Corporation

ERI® ELECTRONICS RESEARCH, INC.
(812) 925-6000 | www.eriinc.com

Remote Broadcasting over the Internet IS HERE

A/DSL, Cable IP Satellite, WiFi

With more flexibility than any other codec on the market, Tieline's latest development delivers high quality mono and stereo audio from remote locations over the internet. This includes DSL, ADSL, Wireless, cable and satellite IP networks.

Existing G3 customers can upgrade their software to try Audio over IP free for 30 days.

Make 2 remote connections at once! Connect one IP remote and the second over POTS, ISDN, GSM or IP at the same time.

Learn how to set up your studio for wired and wireless IP remotes and listen to Tieline Audio samples at www.tieline.com/ip

Contact your favorite dealer today to organize a free demo. Hurry, the demo schedule is filling fast!

800-780-4750

Tieline®
www.tieline.com

Digital Guide

by Jeff Welton, Nautel, Ltd.

Digital Radio Crash Course

Part 2 – FM

Moving into digital transmission is still something of an unknown territory for many stations. Financial "land mines" lurk, ready to kill your budget. Jeff Welton continues his discussion of things to consider, even before the equipment arrives, to make your installation go much more smoothly.

Following up on our discussion of HD-AM, we are going to discuss what will likely be required, as well as delving into some of the technical aspects of the various choices for HD-FM.

It is important to understand that HD-FM is somewhat more complex with respect to the purchase phase – there are more choices that need to be made in advance and they must be well-informed choices with an eye to the future.

More so than for AM, HD-FM is a continuously evolving medium with many options. As we did with AM, we will start with a bare minimum system, progress through what we would like to have, then delve into the imaginary world of unlimited budgets.

In addition, we will add some more terms to your lexicon of acronyms. As we go, I will provide a glossary of all of the relevant terms and phrases I can remember, with definitions of each as they apply to HD Radio.

IT IS STILL EVOLVING

The key thing to remember (as I said last time) is that this phase of the HD rollout is transitional, leading toward a date somewhere in the future where the analog is turned off and it is all digital – all the time.

Therefore, depending on your resources, it may be in your best interest to minimize the system now and get it on-air and performing well, and then budget for any additional services you may wish to add in the future.

Do not, however, scrimp on what is needed now for proper operation. Remember that the bulk of the incentive to buy the receivers will be when friends of early adopters hear your station on their buddy's new car stereo or tabletop radio. The audio needs to stand out.

This comment follows several ongoing discussions on different Internet lists (such as the Broadcast List, found at www.radiolists.net), where one of the more frequent observations is that in many cases it is obvious when a station either uses the same processing for both the analog and digital signals or processes the two to sound identical.

MAKE IT AN UPGRADE

Ultimately, it is probably preferable to have the digital a little better – slightly brighter with a bit more dynamic range – so that it does stand out as better – but not to the point of being obviously unsettling when there is a blend between digital and analog.

This is a fine line that will need to be determined on various receivers, listening to various program material, from various locations, at various times of day (I think you see where this is going). If the end user does not perceive any improvement to the audio quality, there is little incentive to go out and buy a new receiver to hear it.

Note that the key words in the above sentence are "perceive" and "incentive." This is a highly subjective topic and there are several others much more versed in the processing end than I am. For starters, there are some good white papers from two major processor manufacturers available at (in no order of preference) http://www.orban.com/index.html (scroll down to "Downloads, Upgrades and Information) and http://www.omniaaudio.com/tech/default.htm.

I will leave it to you to decide what works best for your particular station's format and situation. Now onward to the nuts and bolts of our topic.

LOOKING AT ALTERNATIVES

Just as we did for AM last month, we will consider three scenarios: what you absolutely must have to get digital transmission going at all, what you probably should have as a good working baseline, and what you should try to include if there is room in the budget.

Keep in mind through all of this that there is one word you also need to remember for later – *multicasting* – one of the huge benefits of HD-FM. Effectively, multicasting is the ability to place one or more additional program feeds (Secondary Program Sources, or SPS for short) onto your primary digital signal (Main Program Source, or MPS).

There will be more detail later, but the decision to implement multicasting will have a direct impact on the equipment you will require. At the same time, because it rides on top of the digital base, multicasting will affect your installation the same whether you have a no frills or full-out installation.

The first thing you will need to decide is how you are going to get the analog signal combined with the digital signal. There are four ways to do this with the digital signal insertion point moving farther down the chain with each one. Each method has distinct advantages and disadvantages – I will try to explain as many aspects of each type as is possible.

HOW LOW CAN YOU GO?

First we have Low-Level Combining. In this method, both the analog and digital signals are generated in an HD signal generator and piped into a transmitter capable of transmitting both signals simultaneously (hybrid mode of operation). The name comes from the fact that the signals are mixed while they are still at a low level (i.e., in the exciter stage).

Low-Level Combining has several advantages in that it takes up much less space, operates more efficiently and will require no significant changes after the transition to full digital operation takes place – effectively all you should need to do is shut the analog modulation off in the HD signal generator and make whatever changes are necessary to convert the transmitter from hybrid (HD + analog) to full HD operation.

The main disadvantage is that the HD signal and the analog signal are carried over the same path – a failure of any HD component can cause loss of service for the analog as well. Furthermore, some older analog transmitters are not capable of being readily converted to operate in hybrid mode, in which case Low-Level Combining would require a new transmitter.

Finally, some required TPO (Transmitter Power Output) levels do not accommodate existing power levels of hybrid transmitter or your existing transmitter may not have the necessary power capability to operate in hybrid mode. Thus it may not be possible to produce the required TPO with low level designs.

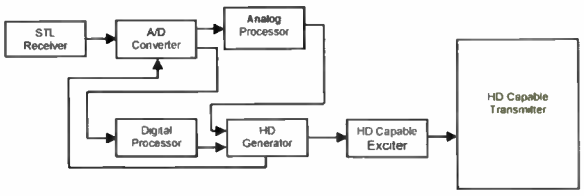


Figure 1: A basic Low-Level Combining system.

The basic (no frills) block diagram for a low level combined system is shown in **Figure 1**. This follows the recommended starting point from last month's article, but modified slightly to accommodate hybrid FM.

AUDIO SYNCHRONIZATION

You will notice that there is an output from the HD generator running back to the A/D converter. This allows synchronization of the digital and analog audio signals. Both processors are set to synch on incoming audio. If the processors do not have this feature, but can be set to synchronize externally, then the synch output from the HD generator could be connected directly to the synch input on the processors.

Either way, the audio coming into the HD generator *must* be synchronized to avoid dropouts of the audio or possible lockups of the generator – either of these will affect both the analog and digital audio, with the latter taking a station off the air.

Do not forget that the analog audio must be delayed. There are several points where this can be achieved with currently produced equipment: in the analog processor, in the exciter for the analog transmitter, or in the HD generator.

In addition, all elements of the chain should be on a UPS, but especially the HD generator and the transmitter's exciter. If a backup generator is used at the site in case of power outages, the UPS must be a dual-stage device, as some single-stage UPS's do not play nicely with the non-sinusoidal outputs of some AC generators.

These are all things that should be addressed in the planning process and apply no matter what combining level is chosen for the HD signal.

A SPLIT DECISION

There has been a novel approach developed by one of our competitors called Split-Level Combining. Effectively, the analog transmitter continues to operate in analog mode and a second transmitter is added operating in hybrid mode (both analog and HD). The two signals are then high level combined as normal, but the hybrid transmitter is handling the extra analog power required to compensate for combiner losses.

The significant advantage to this is for stations where the existing analog transmitter is not capable of being converted to handle hybrid operation and is near the limits of its power capability so the headroom is not present to deal with the excess power needed to deal with combiner losses if high level combined. It does require addition of another piece of equipment to the transmitter room, but is somewhat more efficient than High-Level Combining and does allow use of the existing analog transmitter.

As this combining method was developed by a competitor, I am afraid I cannot offer a lot of detail, except to say that it certainly is a viable solution in some situations. There was a very good article on all combining methods, including Split-Level, by Jeff Johnson in the November 2004 ***Radio Guide*** – highly recommended reading for the planning stages!

HIGHER AND HIGHER

The last method of combining that takes place indoors is High-Level Combining. In this configuration, we have both the existing analog transmitter and a new digital-only transmitter. The two are combined through a hybrid combiner at their RF outputs.

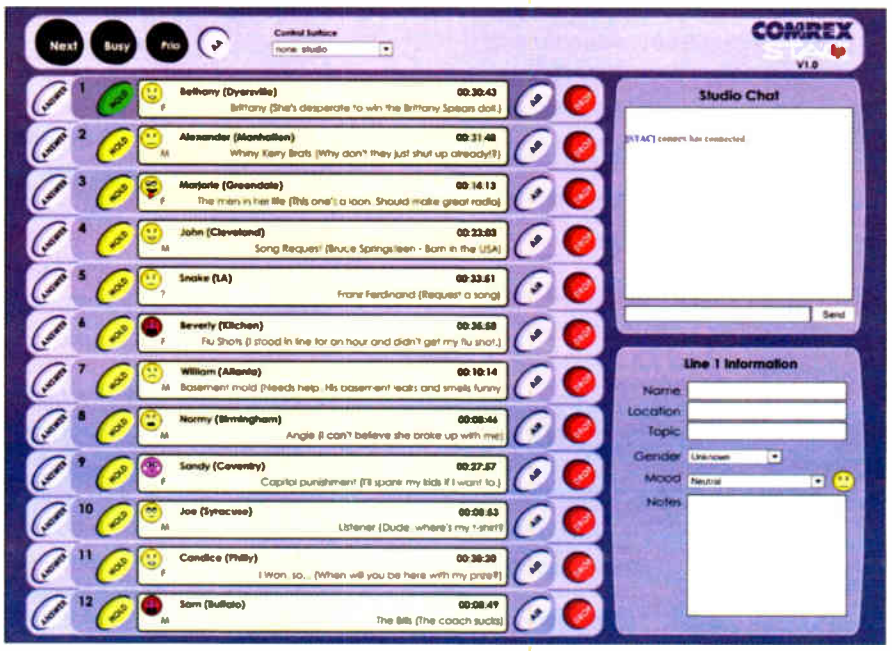
(Continued on Page 8)

GOT 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 scalab e 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? Put Comrex On The Line.

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

Continued From Page 6

Digital Radio Crash Course

Part 2 – FM

In situations where the existing transmitter cannot be converted to handle hybrid operation or in systems where there is ample floor space this is a very cost-effective solution, as it keeps both transmitters operating at peak efficiency for their respective modes of operation and does not require any tower work (see the next method).

However, High-Level Combining does require a suitably-sized reject load and does dissipate a significant quantity of heat. Effectively, the combiner will lose 10% of the analog signal as heat and 90% of the digital signal. Before you get too upset about it, remember that the digital signal being broadcast is 1/100 of the analog, so this may not be as terrible as it sounds.

CALCULATING THE LOSSES

As an example, a station with a 20 kW analog TPO, going with High-Level Combining would require that the analog transmitter be capable of 22 kW, to make up for combiner losses. Then we need to add a digital transmitter. As the digital signal is 1/100 of the analog, we need 200W of digital power going up the antenna.

With 90% losses in the combiner, this means that we need roughly 2 kW of digital power. Furthermore, keep in mind that digital power is a peak power product, rather than RMS (the way we traditionally refer to power). This means that we need to be looking at a transmitter capable of making 8 kW in analog mode to handle 2 kW digital power.

To handle the reject losses, we would need a reject load capable of a bare minimum of 3,800 W (2 kW from the analog transmitter and 1,800 W from the digital). Altronics, among others, make an outdoor load that reduces building heating – a highly recommended option for many sites.

BALANCING THE OPTION

The advantages to High-Level Combining are that it requires the absolute least amount of change to the existing analog operation – simply plumbing the combiner into the output of the existing transmitter and increasing the power 10%. At the same time, it provides maximum separation between the digital and analog signal paths, making them purely parallel to the digital combiner.

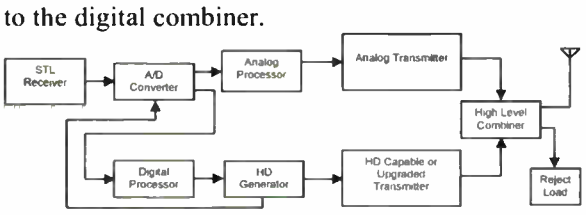


Figure 2: A "middle of the road" approach using High-Level Combining.

The disadvantages are that it requires a fairly extensive list of equipment, significantly increases building heating, and does take up a fair amount of floor space. In addition, there may be requirements for additional equipment, in the form of circulators and/or isolators, to keep the analog RF from entering the output connection of the digital transmitter, causing false SWR indications and associated protection events.

As you look at **Figure 2**, you can see that, with this system, the analog and digital audio paths are totally separate up to the high-level combiner, with the only single points of failure being the STL receiver and the A/D converter.

This is the maximum level of redundancy we can achieve but, once again, it comes at the cost of higher heat load from the reject load and more floor space required, as well as having a somewhat higher equipment cost.

SPACE COMBINING

Finally, we have Space Combining, where the two signals are transmitted totally independently to separate antennas. These antennas may be interleaved on the same tower, installed as separate antennas on the same tower, or installed on totally different towers.

Each of these three Space Combining configurations will have different impacts on tower loading, engineering requirements and antenna parts required – check your engineering consultant on what is the optimum antenna for your installation.

Space combining has the advantage of not requiring the high-level combiner and reject load with their attendant heat loss. This means that the digital transmitter can be sized based on the digital TPO needed and the analog transmitter does not need to have additional headroom to cover combiner losses.

In our previous example, the case of the 20 kW analog TPO, the analog transmitter would be unchanged and we would only require 200 W of digital power. This way we get maximum redundancy with maximum efficiency. A diagram of our high level combined system operating as a space-combined system can be seen in the **Figure 3**.

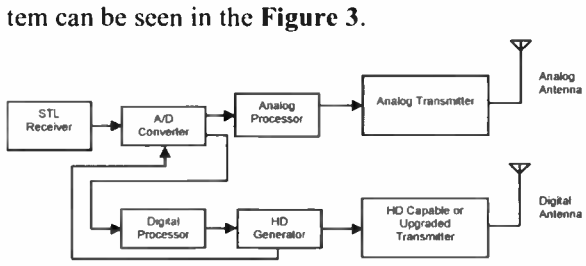


Figure 3: Space Combining uses two separate transmission systems.

As you can see, Space Combining gives us the absolute maximum redundancy and efficiency, but it does come at the cost of requiring some tower work in most cases.

If you are fortunate enough to have an auxiliary antenna, it may be possible to use it for the digital signal. Or, perhaps you have a second site and might install the digital transmitter at this location – check with your antenna consultant.

The primary advantage of HD from the installation viewpoint is that it is as flexible as possible – with a pile of different options for how to put it in you can pick what works best for your situation.

MORE IMPORTANT DECISIONS TO MAKE

With all this discussion of combining methods, you may well be totally confused with all of the options and configurations spinning around in your head. Perhaps you are just hoping that if you toss a dart and pick one, it is all done and you do not have to think of spending any more capital budget on more new equipment during the next three years. Right?

Wrong. We still have not looked at what may be the major "Oh, wow!" factor for HD-FM – multicasting. As previously mentioned, multicasting is the ability to broadcast multiple audio signals on your digital audio feed – simultaneously. (Note that each additional program stream does come at the price of reducing the bandwidth available for other programs, so choose carefully.)

Gary Liebisch of Harris Broadcast has an article on that topic in this issue (Page 12), so once you are done with this paragraph, go read it. If you have already read it, go back and read it again, looking at it from the system perspective.

MULTICASTING SUMMARY

From the equipment perspective, multicasting requires at least one more piece of equipment and possibly two, depending on manufacturer and hardware/software versions of equipment available.

You will, at the very least require a device known as an Importer, which is basically a PC with multiple audio cards in it; it takes the audio sources and "imports" them into a form that can be transmitted to the transmitter site on a single Ethernet (or digital STL) feed. You may also require an Exporter, which takes the SPS (secondary program source) signal, adds the MPS (main program source) and "exports" it in HD format to the digital transmitter's exciter.

Some equipment is configured such that your HD generator may be converted to serve as an exporter by means of a software change. In addition, some digital exciters may be capable of taking the importer data stream directly, negating the requirement for both the exporter and HD generator. All of this is a fairly new addition to the HD family, although it has been in the planning stage for quite a while; so it is rapidly evolving.

BE INFORMED, PREPARED

It is an excellent idea to check with the various manufacturers during your planning stage – and again at order time – to see what is available. If possible, leave a little flexibility in your installation plan to cover any changes. It may be that something becomes available in three months to greatly streamline the process.

One piece of equipment that is rapidly becoming a necessary item at the transmitter plant is a router. With all of the digital equipment going in these days, it may be possible to control almost every piece of equipment in the plant over the Internet.

By the same token, security is going to mean a whole bunch more than a chain link fence and a combination lock. This is another area in which a lot of learning needs to be done as we progress through the transition from analog to digital.

PREVIEW

That about sums up what you may require for your new installment will be oriented a bit more toward the technical terminology and we will look at the various terms we have used in these two articles, as well as a bunch of terms we have not yet used – and put together a glossary of what it all means.

In addition, we will look at some of the aspects of setting up the HD generator and the various ways of setting the audio delay. Finally, we will tie everything together and deal with anything I think I have forgotten – or anything you think I have forgotten (just email me to let me know).

As the senior Customer Support Technician at Nautel, Jeff Welton has assisted in a variety of digital transmission installations. Comment or question? Contact Jeff at jwelton@nautel.com

REMOTE CONTROL PHONE BOOK. FLASH MEMORY. AUTO-ANSWER.

innkeeper 2 & 4 multiple digital hybrids kinda redefine the entire concept of "work..."

The remote interface provides remote control of the Call and Drop buttons, as well as providing LED confirmation of the keypress.

There are times when a single digital hybrid just isn't enough, but rack space is at a premium. No sweat. Innkeeper 2 and innkeeper 4 squeeze two or four independent digital hybrids (respectively) into a 1U rack space.

The front panel keypad, display, and handset jacks provide easy speed dialing and call setup. Digital hybrids allow you to send signals into the phone line while maintaining excellent separation between your voice and the caller. The balanced XLR output jacks contain only the caller's voice. The Digital Signal Processor (DSP) continuously monitors both the phone line and audio signals to deliver excellent separation. This proprietary, dual-convergence echo canceller algorithm can achieve excellent separation without any setup and without sending a noise burst down the line.

Innkeeper 2 and 4 feature Auto-Answer/Auto Disconnect for use in on-air applications such as telephone interviews and talk shows as well as behind the scenes applications like intercom, monitoring and conference room full duplex applications.

When your application calls for multiple digital hybrids that are smart enough to know how to handle the workload, innkeeper 2 or innkeeper 4 are your best choice - by a long shot.

JK Audio
TOOLS FOR SUCCESSFUL RADIO

JK Audio, Inc. Sandwich, IL 60548 USA • Toll Free: 800-552-8346 • Tel: 815-786-2929 • Fax: 815-786-8502 • www.jkaudio.com • info@jkaudio.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

DA Q&A

by Ron Rackley

Theoretical vs Operating Parameters

Question: The antenna monitor parameters of my DA do not agree with the theoretical parameters of the pattern according to the FCC's on-line engineering database. Should I try to readjust my phasor to try to get them to agree?

Answer: No! If your antenna monitor parameters remain at the values shown for them on your station license and your monitor points are all within their limits, your DA system is operating properly.

The antenna monitor parameters do not agree with the theoretical parameters listed in the FCC database because they are entirely different things.

THEORETICAL PARAMETERS

The theoretical parameters of a pattern are specified at the time of its design and they do not change. They are kept in the FCC database for calculating standard pattern radiation values toward other stations when allocation studies are run. They specify the relationships between the far-field contributions of the towers of the array in terms of ratio and phase – which are used in conjunction with the tower geometry to determine the pattern shape. A more descriptive name for them would be "Theoretical Field Parameters."

It is commonly believed that the theoretical ratios and phases of a DA are the same as the ratios and phases of its tower currents, but this is rarely true.

For arrays with equal height towers, it may be a good first-order approximation – and it would be true if all of the towers had identical sinusoidal current distributions. (Current distribution is a description of how the current varies with height along the length of an antenna element. The far field that the element produces is related to the mathematical integral of the current distribution.)

MUTUAL COUPLING

Mutual coupling effects cause the current distributions of the towers of a DA to differ from one another and, at the same time, cause the ratios and phases of the tower currents at the places where antenna monitor sampling devices are normally placed to be different than those of the theoretical fields.

Therefore the tower currents sampled by the antenna monitor are not expected to represent the theoretical parameters except when the towers are all identical and the sampling loops have been placed on them at a carefully determined height – something usually planned with the kind of moment-method modeling that was not in use when most of the existing DA systems were constructed.

So, with the exception of such antenna systems where the current ratios and phases are identical to the far-field ratios and phases (such sampling not being at the "maximum current point" one-quarter wavelength below the tower top – where sampling loops have been historically placed – except for the rare coincidence that occurs with towers approximately 135 degrees in height), antenna monitor parameters are *expected* to differ from theoretical parameters.

UNEQUAL SAMPLING

Other physical factors that can keep the antenna monitor parameters from being the same as the theoretical parameters include unequal height towers, towers of unequal cross-section within an array, sampling devices that are not identical for all of the towers of an array, and unequal length sampling lines.

Such physical factors are very common. Besides the obvious cases where towers are not identical, "hidden" factors often can cause antenna monitor parameters to read values that are far from the theoretical parameters.

The installation of unequal length sampling lines has been, and continues to be, a fairly common practice. Where temperature variations will not produce significantly unequal phase changes, it is possible to minimize the sampling line cost – and not have to bury long segments of excess line – by installing only the lengths of sampling that are necessary to reach the towers of an array and then apply corrections to the expected antenna monitor phases based on measured line lengths.

Variations in current and phase samples also can come from systems intentionally constructed with sampling devices having different sensitivities to make their low current towers have higher antenna monitor ratios.

OTHER FACTORS

Beside the physical factors, there are often other non-specific factors external to the array that have to be "adjusted around" before a satisfactory proof can be run.

These additional factors – such as re-radiating objects and non-homogenous terrain within the areas where radial field strength measurements must be made – can result in significant additional deviations from theoretical parameters during the adjustment process before a new system is proofed. They are accounted for when the license is issued based on the parameters from the proof.

Unfortunately, the theoretical parameters for AM DAs in the United States – although readily available from the FCC's Internet website – are not of much practical use for the station engineer.

Theoretical pattern calculations may be made with FCC data by those having the necessary software, but the operating antenna parameters that appear on the most recently issued station license must be used to determine if a DA is functioning properly. Unfortunately this license information is not available on-line for all stations. For this reason, station licenses should be meticulously maintained.

Ron Rackley has solved problems for many stations over the years. He especially loves designing and talking about directional antennas, and is happy to share his thoughts. If you have any questions about directional antennas, please send them to: editor@radio-guide.com

Field Guide

by Mike Erickson

A Sequel *Not* to be Missed

Sequel. The dictionary says "something that follows; a continuation." It also says "a result or consequence" – sort of like Jaws 3-D (you did see that right?).

The point is that sometimes you end up with a bad sequel (like the box office dud above) or, sometimes, you end up with something great, like "The Empire Strikes Back" or "The Digital Ariane," otherwise known as the Ariane Sequel.

ORIGINAL PRODUCT

I did not think it could get much better than the original Ariane; I was a real skeptic at first.

David Reaves and Jim Huste of TransLanTech Sound developed the idea for the Ariane after their experiences in modifying the Audio Prism, a popular analog multiband AGC from the 1980's and early 1990's.

After reading an article on the original Ariane and her creators, I was interested in trying one. Then I saw the price and was hesitant. What could this unit possibly bring to the table that I could not get for half that price?

After a demo, it was clear. Unlike any other analog AGC on the market at the time, the original Ariane had the ability to inflict tremendous control over audio and remain virtually inaudible.

In fact, any audible side-effects were positive (like smoother bass, better tonal quality over various audio sources and correcting for sloppy console operation). It was these abilities that made it a valued asset in my airchain and the new "secret weapon" in many others.

A DIGITAL NEED UPDATE

But what about translating the effectiveness of the original into the digital domain? As cool as the original Ariane sounded, it did not have digital I/O's; for those broadcasters who wanted to use it in an all-digital chain, outboard DA converters were needed.

That was until now. Thanks to a mutual agreement between TransLanTech and Broadcast Warehouse, a digital version of the popular Ariane audio leveler has become a reality.

TransLanTech's Ariane Sequel

Bringing the product from idea to fruition was not easy and early versions of the software were rough. But the processing knowledge of TransLanTech and Broadcast Warehouse's Scott Incz soon yielded a product that beat my expectations again!

A REAL UPGRADE

The new Ariane Sequel retains that classic sound (or lack thereof) of the original, but adds important features not found in the original.

Since the interface is digital, user presets are possible. The box comes with factory presets that are great starting points; users can save separate matrix, stereo and mono presets for quick recall. Also, many of the features you had to "lift the hood" to access on the original Ariane – like the release times for the AGC's – are now accessible in the main processing menus.

The Sequel can be set to process in the matrix mode like the original, true stereo (discreet) or as a dual-mono leveler. You can couple the processing bands to further tailor your sound and there are even easier ways to extract a wider stereo effect in the matrix adjustments of the processor.

METERING AND MENU NOTES

A big improvement is the addition of more metering options – selectable between gain reduction and input/output levels.

Speaking of the metering, features retained from the original Ariane include the special "light show" LED display that demonstrates what each band is doing and the IDR (Instantaneous Dynamic Range) style of leveling that put the original on the map.

As for navigating the menus: if you are familiar with the successful DSP-X audio processor from Broadcast Warehouse, the menu structure is very similar. They have made the most out of the small display in the one rack-unit processor. For those who do not want to look at the small display, there is a well-designed remote application that operates from any Windows PC with selectable serial or Ethernet connection.

A GOOD CHOICE

The Sequel should not be viewed as just the "Ariane with digital I/O's." It is an upgrade in sound and convenience over the original offering and works well for both FM and AM applications – the Sequel does wonders for talk radio in balancing audio between the host and callers as well as adding just the right mix of crowd noise to sports broadcasts.

For those looking to beef up their air chain at a time when the AGC's in the all-in-one boxes leave – in this writer's opinion – a lot to be desired, the Sequel is a product you should seriously consider to help improve your audio.

The best part of the Sequel (and for your bottom line) is the fact that the price is less than the original analog unit.

Trivia question/answer: The Ariane is named for David Reaves' wife.

When he is not at work at WFAN (and even when he is), Mike Erickson loves the art of manipulating audio and has auditioned and stretched the limits of many audio processors over the years.

You may contact Mike at wirelessmedia@gmail.com

by Gary Liebisch
Radio Product Line Engineer
Harris Broadcast Communications Division

Building a Multicasting Platform

U.S. radio broadcasters are in the midst of perhaps the most challenging transition in the history of the medium – the conversion to HD radio. With the recent announcement that Infinity's WUSN-FM Chicago had launched the first fulltime multicast – and other stations following suit – it is a good time to review the technology and components of making multicast viable, and the architecture that supports it.

Throughout this article, I will refer to two generations of HD architecture: G2 (or Generation 2) is the single exciter architecture that has been commercially deployed over the past three years. G3 (Generation 3, also known as "Exgine") is the newer generation of hardware now being introduced; it is the Importer-Exporter-Exciter model. G1 (or Generation 1) was never sold commercially and existed only as iBiquity prototypes.

MULTICASTING

Multicasting as we know it today began as the Tomorrow Radio Project. Conceived within NPR, Harris and receiver manufacturer Kenwood worked very closely with them to pioneer and test the concept.

NPR, with its wealth of on-air material, has traditionally had more content then they could deliver to listeners. The ability to deliver multi-channel audio was clearly in line with NPR's reputation for reaching diverse audiences and would allow them to deliver more content.

The concept was to offer supplementary audio channels over a single existing radio channel as part of the HD Radio platform. These channels, along with the main digital channel and associated data, would be delivered within the 96 kbps bit stream of the mode designated as MP1.

Commercial radio, which had already implemented single-channel HD Radio, has taken notice and understands the viability of multicasting down the road, even if it is not commercially profitable today.

SPS AND AAS

There is more to multicasting than audio within the HD Radio standard. iBiquity Digital technically describes multicasting as a supplemental program service (SPS) – a subset of what they call AAS, or Advanced Application Services.

AAS describes the use of all data capacity within the HD Radio signal above and beyond the data capacity already set aside for the main program service (MPS) and Program Associated Data, or PAD.

Now that the first generation of HD Radio transmitters are field-proven, next-generation (G3) equipment specifically suited for multicasting is beginning to emerge.

IMPORTER OPTIONS

The key component to multicasting is the HD Radio Importer the hardware device that manages all AAS including supplemental audio.

The Importer is essentially a Windows XP PC, with a high end multi-channel audio card, and iBiquity software. An Importer can be added to any current (G2) HD Radio installation for under $10,000. It is generally the only hardware difference between a standard single-channel HD Radio installation and a multicast platform.

Installation of the Importer can take place at either the studio or transmitter site. In the standard "Exgine" (G3) architecture model (see Fig 1), the importer resides at the studio, and communicates bi-directionally (via UDP – User Datagram Protocol – or more recently, TCP/IP) with the Exporter alongside it.

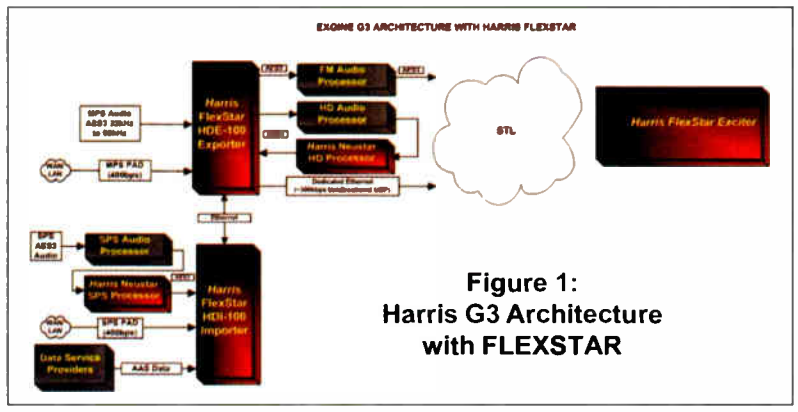


Figure 1: Harris G3 Architecture with FLEXSTAR

However, the Importer can also communicate directly with G2 exciters (without Exporter) provided a reliable bidirectional Ethernet link can be established between the Importer and the Exciter. In many cases, this may mean co-locating the Importer at the transmitter site with the Exciter, at least for the short run (see Fig 2).

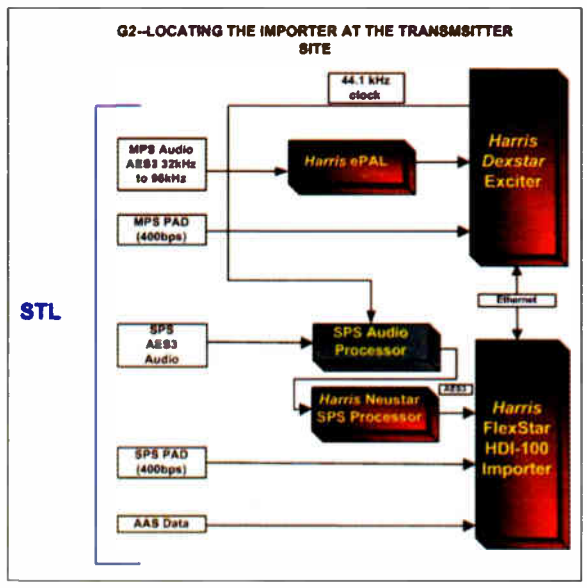


Figure 2: Locating the Importer at the transmitter with a G2 Exciter.

This configuration extracts a burden in that the multi-channel audio source (and any other services you add) must find a way to the transmitter site. But to get on the air quickly with multi-channel for minimum investment, this may be the way to go for some existing HD installations.

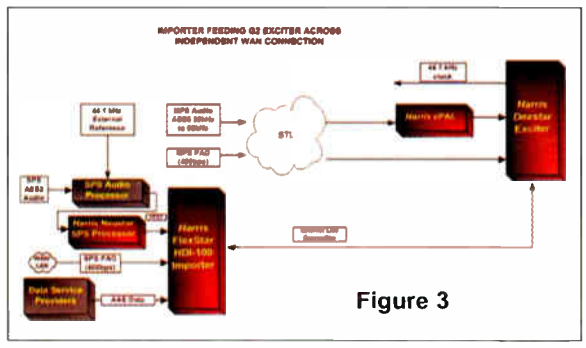


Figure 3

Using an independent WAN to feed Importer data.

If you have Ethernet connectivity already at your transmitter site, it might be tempting put the Importer back at the studio (Fig 3).

But be aware – UDP is not a "guaranteed delivery" protocol like TCP/IP is, so network congestion resulting in dropped packets can mean holes being punched in your audio. At this writing, iBiquity will be supporting TCP/IP for this in the forthcoming release, so reliability should improve dramatically.

Also, punching through secure firewalls to get the stream from studio to transmitter can be a consideration. This is usually fixed by leaving specific ports open in the IT network. These ports will allow the signals to pass through security firewalls to the exporter or exciter when they are not co-located.

FUTURE ENHANCEMENTS

When Exgine G3 architecture becomes widely deployed (with separate Exporter and Exciter) a single 300 kbps data stream across the STL will encapsulate the HD Main Program Service (MPS) and all AAS services, including future modes with higher throughput. It will not matter whether you run a single SPS channel or a combination of SPS channels and data services, it all will compress nicely into this relatively low bandwidth capacity stream at the studio.

We are frequently asked how many SPS channels can be implemented. The system's theoretical maximum is eight, although the listener's tolerance for ultra low-bandwidth audio may be a more practical limit. The current software supports a maximum of two channels.

You should probably be deploying the Exgine architecture if you are deploying HD Radio for the first time. FLEXSTAR is the Harris implementation of Exgine, offering a DSP-based Exciter (not a PC) at the transmitter and an HDE-100 Exporter and HDI-100 Importer at the studio. All processing is done back at the studio since the HDC encoding of MPS and diversity delay of the host are now done in the Exporter.

In effect, your studio output of the entire HD Radio payload becomes a single Ethernet connection.

Here are some other considerations in setting up a multicast system:

CODEC PRE-CONDITIONING

Codec pre-conditioning is not the same as audio processing. Although codec pre-conditioners (such as the Neural NEUSTAR) may contain some audio processing modules, their primary function is to remove content on which the codec will potentially waste bits.

It is bit-inefficient to be coding noise, for example. Also, stereo feeds with mono material, unless perfectly balanced, can potentially waste bits coding what amounts to L minus R.

As lower bit rates are contemplated for multi-channel transmission, the importance of efficient coding becomes an important factor in reducing unwanted artifacts. Therefore we say that the codec pre-conditioner increases the *effective* throughput of the codec. Judicious use of audio processing in conjunction with codec pre-conditioning can yield a very high quality channel, even at low bit rates.

CLOCKING

Since Exgine architecture creates two boxes with AES inputs, the Exporter (for the MPS) and the Importer (for SPS audio), we need to assure that the 44.1 kHz clocks in both units are synchronized.

Fortunately, the GPS, which resides in the Exciter in the G2 architecture, is now integral to the Exporter in G3. A precision 44.1 clock, locked to GPS, is used as the reference for the incoming MPS and is also output to the back panel to synchronize the Importer's stream.

The place to insert the sync is the nearest upstream rate-converter-equipped device, which would normally be the audio processor ahead of the Importer. Synchronizing these two boxes can be an issue when the Exporter (or G2 Exciter) and Importer cannot be co-located. The system may function normally but, because no two clocks run at exactly the same frequency unless they have a common reference, the input buffer on the Exporter will have to absorb the difference in sample bits over time.

(Continued on Page 14)

Transmission Guide

by Gary Liebisch

Continued From Page 12

The system can handle this but only until it either overruns or empties and an audio "glitch" occurs. This period can be days or weeks, depending on the skew of the respective clock frequencies. This may not be a big issue during the early days of implementation, but ultimately you will want to sync these two boxes to the same reference through co-location.

Another way around this issue is to "stream" the input to the Importer instead of using the AES audio card port. This may be a viable solution if your hard disk system supports streaming to a specific IP address.

PAD

You will not need an Importer to implement Program Associated Data (title, artist, etc.) on your MPS channel. Just direct the PAD source (most hard disk systems support this) to the Exciter IP address (for G2 systems) or the Exporter IP address (for G3 Exgine systems).

SPS PAD for multi-channel audio, however, follows the audio and must be directed to the Importer.

STL ISSUES

As noted earlier, the integration of the Importer and Exporter within the studio processing chain and transporting every service as one multiplexed stream to the transmitter simplifies the HD Radio signal STL requirement.

However, remember that your conventional analog feed is not included in that bandwidth requirement. Stations may elect to keep their existing analog STL configurations intact (including composite systems) and look elsewhere for the needed 300 kbps bandwidth.

For T1 based STL systems such as the Harris Intraplex STL Plus, practical solutions to make room for the HD Radio stream include use of light main channel compression or uncompressed 32 kHz sampling. An uncompressed system at 44.1 kHz will consume more than 1.4 Mbps of the available 1.54 Mbps T1 capacity. Given that your host channel cannot reproduce anything beyond 15 kHz, there is little justification for 44.1 kHz sampling on the host channel.

Furthermore, 32 kHz sampling can reduce the bandwidth requirement to 1.088 Mbps, freeing 500 kbps for the HD Radio stream. Note that the 44.1 kHz sampling used on the HD channel at the Exporter is unaffected as it is already a data stream.

In the case for light compression, APTx100 or MPEG Layer II can yield comparable bandwidth gains to make room for the HD Radio stream. Before dismissing the concept of host channel compression, consider that we already embrace more aggressive compression on the HD Radio channel. Why would we have a different standard for the host-channel?

For 950 MHz RF systems, a "bandwidth budget" must be determined for each system to transport the host audio (uncompressed) and the 300 kbps stream on the same carrier. This requires trading off the sample rate (32 vs. 44.1), number of AES channels, QAM modulation level, and desired RF occupied bandwidth to insert it all into a 300 kHz wide RF channel. This also may require a higher order QAM level, possibly limiting the reliable path distance.

Some stations will elect to install a separate spread-spectrum solution, such as Moseley's LANLINK, which utilizes unlicensed spectrum in the 902-928 MHz band. The LANLINK can share antennas with the existing 950 MHz system with 500 kbps of bidirectional bandwidth, eliminating the need to erect new antennas.

WHAT ABOUT AM?

While it is technically possible to multicast on AM, the limitations are far greater with a bit stream of only 36 kbps. Most stations will go the practical route and dedicate all of that bandwidth to the main channel to get the best possible audio quality. One channel of good quality will be far preferable to two severely compromised channels. Again, it is technically possible and the receivers would support it but its performance cannot be ignored.

That is not to say there are not other possibilities. Well into the future, both AM and FM could migrate to all-digital broadcasts. This of course will depend on having enough digital receivers in the field to the point where stations would willingly turn off their analog signals.

The upside to this is that stations' digital capacity would be increased. Stations would surely increase their throughput in an all-digital mode and the signal would prove more robust since there would no compromise with an analog signal on the same channel. It is very possible that the AM system can go up to 40 kbps or more in an all-digital mode. That scenario would certainly make AM multicasting more attractive.

MONITORING AND RECEIVERS

Day-Sequerra is supporting multi-channel audio in its M2 and M4 station monitor receivers for station monitoring. But with multi-channel transmission being a relatively new application for HD Radio, other receiver manufacturers are playing catch-up.

Do not assume any HD Radio receiver available today will have that capability. Newer receivers such as the Kenwood black boxes do, but research those you are considering. How multicasting is received in the community will depend on the distribution and availability of multicast receivers.

Multicasting is sure to take off as consumer receivers become more widely available. The next several months will also see tabletop radios with multi-channel capability from multiple vendors. This is an exciting time for HD Radio and multicasting and commercial radio is clearly realizing the benefits and briskly moving forward.

Gary Liebisch can be contacted by email at gliebisc@harris.com

KVOD-FM Initiates Multicasting with Exgine Exciter

By Brian Galante

The first station to go on the air with Harris' FLEXSTAR HDX-FM exciter was KVOD in Denver. Brian Galante reports on the story behind the installation and of the first impressions of the KVOD's Chief Engineer about the new exciter.

November 9, 2005 marked an historic day for broadcasting when Colorado Public Radio station KVOD-FM, which offers a classical music format, launched its HD Radio broadcast using iBiquity Corporation's Generation 3 technology, also known as "Exgine."

Although many stations have already gone digital, this launch involved the new Harris FLEXSTAR HDX-FM exciter. As one of Harris' selected Beta Test sites, KVOD was the first station to go on the air with this exciter and is believed to be the first station to broadcast using Exgine technology.

STUDIO BASED MULTICASTING

Exgine technology allows radio stations to place the audio codec, multiplex function and AAS equipment related to multicasting at the studio. Previously, this equipment could only be housed at the transmitter site.

KVOD's sister station KCFR-AM, which offers an NPR news/talk format, provided the supplemental audio channel to demonstrate the station's multicasting ability. The results were demonstrated the next day at the Denver SBE meeting.

Radio broadcasters launching an HD Radio multicast have 96 kbps of bandwidth to slice up over two or more channels. KVOD elected to use 48 kbps each for both its main and supplemental program service, using a Harris NeuStar pre-codec conditioner for audio processing.

G3 DIGITAL WORKS FOR KVOD

The station was able to eliminate multipath annoyances in the process, a well-publicized technical issue in the Denver region. KVOD used the FLEXSTAR HDI-100 Importer and HDE-100 Exporter to "split" the digital signal and the FlexStar HDX exciter generated both the digital and analog signals – just one of many benefits pointed out by KVOD engineers.

"The multiple outputs of this exciter is a major advancement in this technology," said Bob Hensler, VP Engineering, Colorado Public Radio. "We are able to use separate ports to send the digital signal to the digital transmitter and the analog signal to the analog transmitter. Up until now we would have needed separate analog and digital exciters to achieve this feat."

George Cabrera, Harris lead design engineer on FlexStar, Allen Stewart, Dir of RF Engineering for Colorado Public Radio, and Gary Liebisch, Product Line Engineer at Harris.

KVOD's transmission facility equipment rack features a Harris FLEXSTAR HDX-FM on the top, Harris DEXSTAR exciter (no longer in everyday use) and a Harris Intraplex STLHDPlus.

The HD Radio portion of the broadcast is sent over a UDP (unidirectional protocol) IP LAN circuit using the Harris Intraplex STL over a T1 line. The analog portion of the signal was sent over the same T1 line using conventional Intraplex Enhanced apt-X audio cards.

G3 ALLOWS FLEXIBILITY

According to Hensler, the FLEXSTAR HDX-FM also facilitates redundancy by allowing the station complete flexibility in assigning signals to the outputs on demand. "We currently use our digital transmitter as our backup transmitter," he said. "If our analog transmitter fails, we can assign both analog and digital signals to the port usually reserved only for digital, and feed both signals to our digital transmitter at lower power."

Hensler also noted that the HDX-FM also offers a composite input that provides additional redundancy for KVOD's analog broadcasts. "We can also use our old analog STL composite as a backup main (analog) audio source and the FLEXSTAR exciter will switch to it automatically at loss of the AES signal," said Hensler.

The station uses an Optimod processor/stereo generator featuring an AES I/O connected at the studio to the Intraplex system and a composite output that is fed to the station's backup analog STL. Older exciter technology would have required AES conversion of the composite output plus a switch to transport the AES signal to the exciter from an AES converter instead of coming directly over the T1 circuit.

Colorado Public Radio's statewide two-channel network of in-depth news on KCFR and classical music on KVOD reaches 80% of the state's population. According to Arbitron's Spring/Fall 2004 data, nearly 375,000 people listen to the station each week. More than 90 percent of Colorado Public Radio's operating funds come from the private support of listeners, businesses, and foundations.

Brian Galante has been writing about broadcast industry topics for over eight years. He can be contacted at briang@pipecomm.com

Safety Guide

by Steve Davis,
Senior VP, Engineering
Clear Channel Radio, Inc.

Clear Channel's RF Safety Program

Clear Channel Radio is concerned about the safety of our engineers and employees, and we wanted to be certain that anyone who might be exposed to RF radiation in excess of the Public Maximum Permissible Exposure ("MPE") was fully aware of the risks, safety procedures, and all other issues related to spending time in such an environment.

Furthermore, as Richard Strickland correctly stated in his excellent article for ***Radio Guide*** (December 2005), merely fencing or otherwise restricting access to an area for "employees only" does not qualify that area as a "Controlled" area with regard to application of the RFR Rules. To qualify as a "Controlled Environment," the area must be covered by an RF Safety Program and all persons working in that environment must have been trained in the RF safety facts and procedures.

For these reasons, Clear Channel decided to provide RF Safety Training to all of our engineers.

A TRAINING PROGRAM

With so many to train, the only practical solution seemed to be a web-based one. We ended up contracting the folks at Site Safe to provide training via their PeopleSafe 4.0 program, available at www.ipeoplesafe.com

Of course, PeopleSafe is the not the only source of this sort of training. However, we have found the quality of the training to be excellent and they were willing to work with us to customize that training to meet our needs. Our entire engineering management team then went through the process, reviewing the curriculum and taking the tests ourselves, prior to purchasing a large number of licenses and asking our engineers to undertake the training.

There are 10 sections in the course:

1. Introduction to Non-Ionizing Radiation
2. Biological Hazards
3. Safety Factors
4. Standards & Regulation
5. Site Safety
6. Determining Compliance
7. RF Personal Monitors
8. Antennas
9. Compliance Solutions
10. Lockout/Tagout

TAKING THE TEST

When our engineers complete the training, they take an on-line exam. All in all, the whole process only takes about three to four hours.

The results are sent to them, their General Manager, and the Regional Engineering VP in charge of that region. They receive a "Certificate of Completion" in the area of RF Safety and are then certified to work in an occupational/controlled RF environment.

Employees other than engineers that may have need to access areas where the non-ionizing radiation levels are above the public maximum are also encouraged to undertake this training.

If a person fails the exam, they must go through the training again and can then retake it. The exam is not exactly the same every time though so the idea is not to get those taking it to merely memorize the correct exam answers but, rather, to truly understand the Rules, procedures, hazards and ideas surrounding this important safety issue.

Each of Clear Channel's engineers is now certified in RF Safety.

PREVENTING EXCESSIVE RF EXPOSURE

Clear Channel has also invested in a number of NARDA meters, at least one for each of our ten engineering regions. Our Regional Engineering VPs are trained in the use of these meters; they visit our sites and guide our engineers in making measurements and assessing the hazards. This is done regularly and also as part of our license renewal process. We also have some RF Personal Monitors where and as needed.

While all of our current engineers have completed the training, we will most likely offer this again next year for any new engineers or other employees who have not had the opportunity to go through it.

Steve Davis has been active in broadcast engineering for over 25 years. Clear Channel's Senior Vice-President of Engineering can be reached at stevedavis@clearchannel.com

Transmitter Shack

by Alan Alsobrook

What to Do When Your Transmitter Takes a Shower

It was a Sunday afternoon as I drove along in Northeast Florida, wondering what adventures the approaching Hurricane Wilma may bring. Sure enough, as I pulled into the house the phone rang.

An obviously exhausted engineer was on the other end explaining to me that the roof of his transmitter shack had leaked directly over the top of the transmitter. He estimated that at least a gallon of water had gone down the tube stack of the HT-10 transmitter.

I told him I would be there in a couple hours and we could get started on it. When I arrived the situation was exactly as described – the HT-10 was literally "dead in the water."

INSPECTION AND TROUBLESHOOTING

So where do you start? As far as I am concerned, once a transmitter has been wet the only thing you can do is shut off all power to it until a very detailed inspection and cleaning can be done.

The source of the problem was evident.

Next, if you have a camera (preferably digital), it is a very good idea to take lots of pictures as you progress. Remember: in a FM PA section the placement of each part, strap, and wire are often very critical. So it is very important to be able to put everything back exactly where it belongs.

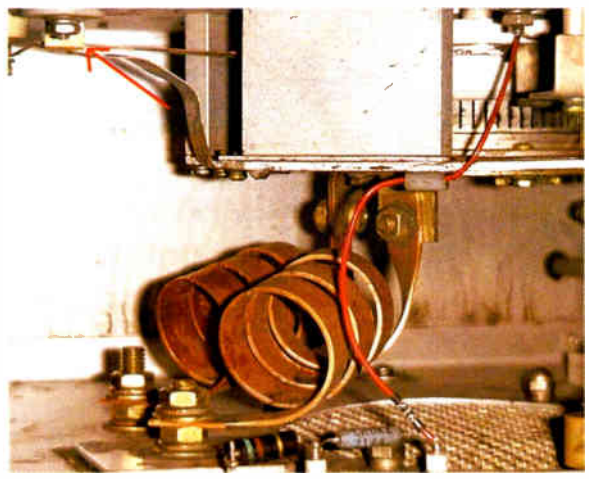
With transmitters such as this one that use Kapton for capacitors and/or insulators, the Kapton has a tendency to fail with the combination of moisture and dust. True to form, it did in this case with the plate blocking capacitor in an area very hard to see. Thus it becomes very important to disassemble and clean all Kapton assemblies. Upon disassembling I found this one was no exception, the plate-blocking capacitor had burned up.

The damage to the blocking cap was obvious.

In a previous "emergency fix," I had successfully gotten the transmitter back up by reversing one of the two sheets of Kapton, after cutting out the damaged (carbon tracked and conductive) section. I decided to try that in this situation.

A close inspection of the plate transformer was also required. It appeared the plate transformer had been out of the path of the falling water. Nevertheless, the AC in the room was cranked down to a cool setting to pull out any moisture that might be lurking in the plate transformer.

Another problem was found on the visual inspection under the tube deck. Two closely placed straps have – with the help of a dead mosquito – shorted together.

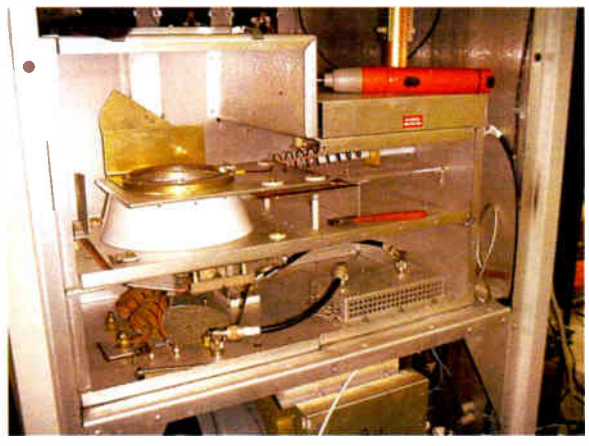


All it takes is a mosquito to gum up the works.

Once the mosquito's zapped carcass was removed and the strap was cleaned, it was carefully placed back into position. If we had any questions up to this point if a neutralization procedure would have to be done, the answer was now a definite yes.

PRELIMINARY TEST

With the PA Cavity all cleaned up and looking good again, it was time to start checking out the box to see what works and what was still broken.



It looks like it might be ready.

We closed it up, making sure the plate breaker was off, and then we turned the power back on. Then comes that first big step, hitting the Filaments On button. Oh-oh – the bias breaker tripped!

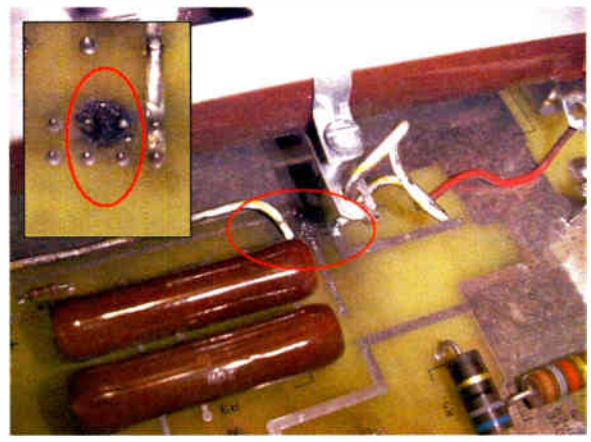
Upon investigating this problem I found the bias rectifiers had become shorted and open somewhere in the melee of water splashing and sparks flying. My guess was that the "mosquito zapper" allowed the screen voltage to cross over into the bias circuit and take out the bridge rectifier.

The diodes used in this circuit, 7,500 V at 500 mA according to the parts list, will have to be ordered. At this point it looks like we would have to take a day off to wait for parts. The Kapton and diodes are ordered.

MORE TROUBLESHOOTING

Once the parts arrived, it was time to finish this project. We started by installing the new Kapton plate blocking material.

But wait! Was our first visual inspection not good enough? Over on the auxiliary board where the diodes are located, a burned spot was clearly visible in between the wire contact points and another burned spot is found all the way through the PC board ... and clearly carbonized and shorted on the other side.



This could be a problem!

The spot at the contact block was bad; the board had been heavily carbonized completely through. This area of the board would now be conductive and continue to short unless something was done.

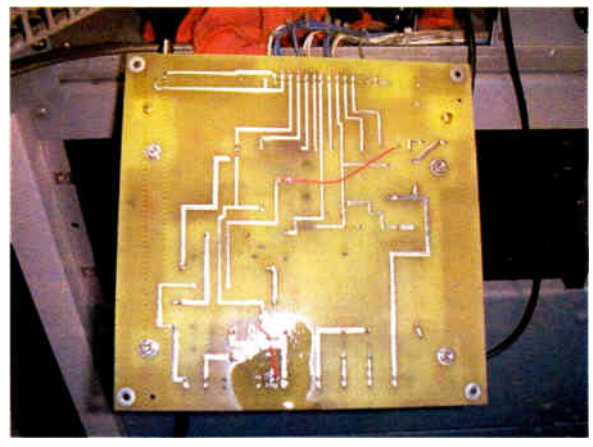
I decided the best course of action would be to cut out the burnt area. A Dremel works quite well for this but I only had a drill with me so the drill was what we used. The contact blocks had to be removed for surgery to begin. Once that was done I started by drilling small holes above and below the burnt area in undamaged circuit board.

Then I pulled the drill bit down from the upper hole to the lower hole, using it like a saw. The drill bit was moved around in the area removing as much of the burned material as possible. The result was a definite air gap between the two terminals that had shorted together through the carbon.

MORE BURNS TO CLEAR

On to the next burned area. This time I decided a different repair was the better course of action. The second burn was across the surface of the board between where a wire was soldered and a trace running next to it. The trace was open for about one cm in the burn area, with the board surface being carbonized.

This time I decide the best action was to relocate the trace away from the wire connection. I grabbed the burned-off ends of the damaged trace and pulled each end of it back several inches out of the burnt area. Then the area was cleaned up as good as possible and a nice coat of Krylon 1302 Electronic crystal clear was sprayed into the area.



Moving a damaged trace away from the board.

By removing the trace, I removed any reason for the arc to try to continue progressing through the board. Adding the Krylon would help seal and insulate the board. After the diodes were replaced and the contact blocks were reinstalled that area also received a couple quick shots of Krylon.

(Continued on Page 20)

Transmitter Shack

by Alan Alsobrook

Continued from Page 18

READY FOR ACTION

At this point the station's chief engineer and I felt the repairs were complete and it was time to start bringing the transmitter back to an operational status. I usually do not like to move too fast and wind up with more problems, so I brought it up to a "Filament On" state and let it sit like that for a while – it was time for a dinner break.

After dinner it was time to verify neutralization; any time you do this much work in the PA cavity you should plan on this procedure. Following manufacture's guidelines we went through the neutralization process and found that we had 29 dB of neutralization. Since Harris specifications state anything better than 25 dB was good, we left it alone. That made me happy and the transmitter was shut down again and fully reassembled.

Because this site had no dummy load, and the exciter was tied into the antenna, we had to shut everything down and reconnect the antenna for the final test.

THE FINAL TEST

With everything set and the antenna reconnected, we were ready for the "Big Test." I reached over and hit the "Plate On" button while the station's chief engineer got ready to dive out the door. However, no "bang" happened and the transmitter came up just fine.

Success!

With just a few minor adjustments to the tuning and loading, the HT-10 was back on the air at full power. The station engineer and I leaned back to enjoy our success.

CAREFUL STEPS YIELD GOOD RESULTS

Any time a tube-type transmitter decides to take a shower, you really have to take your time bringing it back up.

Since transmitters seldom get good and clean from the shower, you usually will end up having to give it a sponge bath as well. Otherwise major problems can occur.

Transmitters that have high voltage in them attract a fine black dust to the high voltage areas. Once this dust absorbs moisture it becomes a short path. Thus the high voltage areas need to be carefully cleaned prior to trying to turn the unit back on. Be prepared to use plenty of alcohol and rags to accomplish this cleaning; I also used about fifty swabs cleaning the tube socket of this unit.

In this case the transmitter was in a climate-controlled site and we were able to set the AC unit to a cool position for a few days to help remove any residual moisture from the transmitter.

Hard at work cleaning the PA compartment.

As many engineers in the hurricane areas have found out, these same rules also apply when you have a transmitter that goes off for a few days under high humidity conditions.

Unfortunately, I had one go into catastrophic failure when I did not give the air conditioning enough time to dry everything out after losing site power for approximately five days during Hurricane Francis. I got in a hurry to get back in the air and when I hit the "On" button – BOOM!

Alan Alsobrook is a CRSE, AMD and contract engineer based in St. Augustine, FL. A local volunteer Fire Chief, he sees lots of water – but prefers it not to be in a transmitter building. Alan's email is: aalso@bellsouth.net

Radio War Stories

by Phil Alexander, CSRE, AMD

Adventures in the AM Field

(Confessions of an AMD in the Trenches)

Part 1 – The Call

Except for the author, the characters in this plot shall remain nameless and the situation described is really a fictionalized synthesis of several similar ones. However, this – or something like it with a less happy ending – probably happens more often than any of us would like to think.

The call came from a fellow who was CE for a small group of stations (primarily FM's) that had one directional and one non-directional AM in his group.

After the greetings and usual get-acquainted chat, the phone conversation got down to business with, "Well, we sorta have a problem with our AM monitor points on the directional. They aren't acting like they should."

HOUSTON, WE MAY HAVE A PROBLEM

I had several replies at the ready, just tempting to be used, but my first cup of morning coffee was nearly empty and my mood was improving. So I said nothing about the monitor points forgetting to read their scripts, or asking the name of their latest production, or any of the other biting replies that came to mind.

Instead, I started with my usual questions: "OK, can you give me the basics? Can you tell me what kind of pattern you have, and describe the problems?"

The station had a "simple" little three tower in-line day pattern with different day and night constants and a fourth tower added for use at night. It is fair to say that "simple" was not an accurate description of the night operation. It was many things, but simple was not one of them.

OUT OF BOUNDS

The nighttime monitor points were significantly above limits and this was not the first time. As we discussed the station's history, I learned that someone we will call Joe Blowhard had charged a substantial sum for "cranking" their phasor to get the monitor points within limits only a few months before.

After a discussion and agreement about commercial terms with the station's GM, we put the station on our schedule for an inspection and evaluation of their antenna array a few days later.

In preparation for the trip, I downloaded the information about their patterns from the FCC Audio Division AM Query page and reviewed their design. This one was not remarkably different from many others, but the night pattern was designed with very deep minima – definitely what I would call a "tight" pattern.

WHERE TO START?

When we arrived at the site, the CE was ready to "get cranking" – which is to say that he had his field intensity meter ready to go the "worst" monitor point and an eager "when do we start" look on his face.

"The Proof is around here somewhere."

He seemed a bit disappointed when I said we probably should begin with a review of the license and the last full directional Proof of Performance. He muttered something about paperwork and after pointing to the license hanging in a frame on the side of a rack next to the transmitter he began rummaging through a closet in the corner of the transmitter room, looking for the proof.

The license was an old one with great details about each of the monitor points. And there were pictures – at least that much was there. The last full DA proof was over 20 years old, done when the night operation was added to the existing daytimer along with the little wooden "outhouses" at the tower bases containing the antenna couplers.

The phase monitor was an older Potomac AM-19 model built for a six-tower array, rather than the four-tower system the plant had.

OUT BY THE TOWERS

During my inspection outside the transmitter building, I saw the phase sampling loops on the towers were the fixed type, but looked old and very weathered. Inside the coupling houses, I found a surprise.

The original couplers were the common "shelf" construction of the 1960's, but they had been turned 90° so they fit into one corner of the shelter with a newer, but similar, unit in the other corner of the back wall for the nighttime pattern.

The RF contactor of each coupler was located on the newer panel, which apparently had been built for this configuration. In an apparent effort to save money, the old tower base current ammeters and switches had been moved to the new panels and two of the towers had double ammeters with old manual knife switches used to select the meter before using the meter with the usual "pull" switch.

EVIDENCE OF REPAIRS

There were two RF chokes on the walls of each shelter and solid-state flashers wired to replace the original mechanicals still mounted on the towers. Some of the couplers showed obvious signs of capacitor replacement and several coils had scratches from quite a bit of trial and error work with the straps.

As I carefully examined the phase sampling lines I was surprised to find that, although each length was different, records confirmed these lines were temperature stabilized. Apparently they had been replaced, at the time of the night conversion in the 1980's, with half inch stabilized Heliax® including isolation coils at each tower.

In other words, except for the questionable weather deterioration of the sampling loops, the phase sampling system complied with the regulations (Section 73.68) for phase sampling system construction today. Perhaps this was not quite the total disaster I feared.

DOCUMENTS IN HAND

Returning to the transmitter building, I asked: "Did you find the last full Pproof of Performance?"

The CE handed me three files saying it must be one of them. I leafed through the original proof, a partial proof done in conjunction with corrective action following a failed FCC inspection and, at the bottom of the stack, the full Proof of Performance done at the time the nighttime operation was added and the phase sampling system rebuilt. It included the full non-directional proof and both day and night directionals.

"Fine," I said, "I can read this while you guide us on a tour of the monitor points."

"Ah, er, well, OK, I guess we can do that," was his reply. I gave him a quizzical look, and he continued by saying, "OK, if that is the way you want to do it, but Mr. Blowhard has fixed things three times in the two years I have been here and he has never gone to the points. I always go to a point and phone in the readings while he cranks the phasor."

I tried to smile as I said something about that being an "interesting" method.

TIME TO HIT THE ROAD

While he drove us out to the first point, I followed the directions on the license and was puzzled when we crossed a main road and turned before entering a shopping center. The directions indicated we should continue straight through the center and find the monitor point about a mile beyond it.

This road does not go where it used to go.

When I questioned the CE about it, I learned the road actually did not go through the shopping center or the apartments built behind it, but that a small detour was necessary. He assured me the road was unchanged beyond the apartments. I explained it might be a good idea to look up Section 73.158 and read the last paragraph of the Regulation.

After a short detour, we were again on the same road that ended at the shopping center and the copy of the topographical map in the proof did indicate we were going to the correct location.

MONITOR POINT ONE

At the first monitor point, the field strength did not exceed the daytime limit. However the reading taken with the antenna of the field intensity meter turned perpendicular to the radial was only about 5 dB less than the reading oriented toward the station. Obviously, there was re-radiation from something nearby.

The landmark was the concrete gatepost of a farmyard about 50 yards from a road intersection. On the intersecting road was a line of rather new looking utility poles about 60 feet tall supporting what appeared to be primary power distribution lines. We switched to the night power and pattern and found the reading significantly above the limit. The CE did not seem too concerned, so I asked him about it.

"Oh, that usually happens, but it will come down when we get the other points in line. That is what has always happened in the past," he explained.

I asked him to drive to the next point on the same radial as indicated by the topo map from the Proof of Performance. It was located at a crossroads about a half-mile ahead.

A "LIGHT" TURNS ON

The readings at that location compared closely with the proof and were, in fact, a bit low for both day and night. Furthermore, the difference between incident and off-axis signals was more than 30 dB, in other words, in the lower third of the next meter range below our measurements.

Readings at this monitor point should be more useful.

The CE asked why I was taking measurements with the meter "crosswise" to the station at each location so

(Continued on Page 24)

Radio War Stories

Continued from Page 22

Adventures in the AM Field

(Confessions of an AMD in the Trenches)

Part 1 – The Call

I explained that for accurate measurements we needed to know if the signal was "clean" or "garbage" – whether we were measuring the signal radiated from the station or that signal plus reflections.

I then explained the directional characteristics of loop antennas and let him try the procedure himself, cautioning him to minimize the reading with meter orientation before switching to a lower range of the FIM attenuator.

As we traveled from monitor point to monitor point that afternoon we found various degrees of reflections in the readings and soon the CE was checking the quality of the points himself.

A "RELOCATED" POINT

Near the end of our circuit, we came to a point that simply did not agree with the description. The photo of the original monitor point appeared to be agricultural land while we were at the edge of an industrial park development. More importantly, we were on the west side of the road but the description said the point was on the east side.

When I asked what happened here, I was told the road had been relocated, or at least that was the explanation given the CE when he originally was shown the monitor points.

As this point was in a primary lobe and close enough that the tops of the towers were visible, we could see the "point" was not on the radial in line with the towers. Indeed, the real point we were seeking was inside a secured, gated compound, through which the radial passed. RF knows few boundaries, but roads do.

We drove to a gate in the fence with a secure code box in front of it. I expected to hear a hidden speaker squawk but nothing happened. The gate did not move and there was no sign of life except for a few vehicles parked in the lot at the front.

As we were debating what to do next, an armed guard strolled out the front door of the nearest building, walked to the gate, and asked, "Is there something I can do for you gentlemen?" the same way a traffic officer might ask for a license and registration. I asked the guard if it might be possible for us to take readings in the parking lot. He referred the question to his boss via his radio.

NEARLY BUSTED

We were asked to wait, and a few minutes later a golf cart rolled up from inside the facility with a fellow wearing a major's gold oak leaves on his guard uniform lapels. It quickly developed that we would not be admitted inside the fence and the main reason Major "Smith" wanted to see us was to learn why we were interested in his facility.

"The point is somewhere back there, behind that fence."

After a careful explanation of who we were, what we were doing and a demonstration of the field intensity meter, I inquired what department of the government controlled the facility only to be met with a stony, "I'm sorry sir, you are not authorized to have that information."

I thanked the Major for his time and we left. From the appearance of the microwave antennas on a tower behind the main building in the compound and their orientation, I suspect we may have stumbled into a Homeland Security outpost. But no matter what it was, it was clear this was another monitor point that needed moving to a better location.

FINDING A GOOD POINT

The next point outward on the radial was directly under a power distribution line. The CE stepped out of the car, made a quick measurement as I watched, and said, "If I did that right, this point is garbage."

He was correct, so we tried the next one beyond only to find it was equally useless. The third point had been taken about a mile further out and it, too, was "wired" with what appeared to be a small aerial telephone cable. When the CE asked if the wires meant it was another bad site, I explained how points that looked clear could give poor results and points that had heavy wires almost above them could have good incident to reflected signal ratios. "You never know until you read the meter," I said.

After jumping out and reading the meter, he said, surprisingly, "Hey, I've got a good reading here. It is a little bit higher than the proof value, but not by much, and when I swing the meter it's dropping 23 dB lower."

We marked the point on the map, confirmed its GPS coordinates and, since this would be a replacement for the last monitor point of the tour, we returned to the transmitter. There, I gave the CE the bad news that the Rules required reducing nighttime power to keep the highest monitor point within limits.

SET THE POWER AND MEET THE GM

He was halfway out the door, FIM in hand, when I said, "No, we do this with a calculator." Clearly, he did not understand.

Explaining that field strength changes directly in proportion to common point current, we calculated that we would have to lower the common point by just over 14% To be safe, we rounded up to 15% and reduced the kilowatt to 703 Watts.

Then, I said, "OK, guys, time to clean our boots. I have a feeling the real work is about to begin." My part-time assistant got the stiff heavy brushes from the back of the vehicle while I put my boots in a bag and took good shoes out of another. Cleanly shod, we headed for the studio.

When we arrived, the receptionist informed us "Mr. Carpet" was waiting in his carpeted office and was anxious to know what we had found. "Please go back to his office now. He has been bugging me all afternoon wanting to know if you were here yet, so I told him as soon as you pulled into the parking lot."

REALITY TIME

The three of us, the CE, my part-time assistant and I trooped into the GM's office. He invited us to take seats and tell him all about how I fixed the antenna.

I explained it really was premature and that more data would be necessary before we could make a complete report. Then the CE chimed in with "But there is a problem with the night pattern and we had to cut the power to 700 watts to be legal."

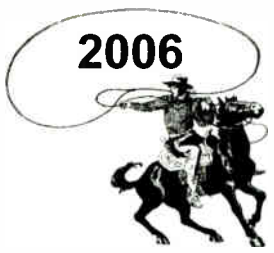
The GM scowled in my direction and asked, "Is this true? Is there no way we can operate at our normal kilowatt at night?"

To which I answered, "Not legally," while thinking to myself he was very reasonable, he did not demand we increase to full power immediately.

His next question was, "How quickly can we go back to our thousand watts?"

Will the manager agree to have Phil make the proper repairs or will he demand a "quick fix?" Stay tuned for next month's installment.

Phil Alexander is a consultant based in Indianapolis, IN. When not chatting with strange Majors, he can be contacted at dynotherm@earthlink.net



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***

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 13-14, 2006
Lansing, Michigan
www.michmab.com

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

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

Email your dates to: radio@rconnect.com

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

34th Annual SBE22 Broadcast & Technology Expo
September 26-27, 2006
Verona, New York
www.sbe22.org

2006 Broadcasters Clinic
October 24-26, 2006
Madison, Wisconsin
www.wi-broadcasters.org

BOS-CON 2006 Boston SBE Regional Convention
October 25-26, 2006
Marlborough, MA
www.bos-con.com

SEA-CON 2006
Fall, 2006
Seattle, Washington
www.sea-con.org

SBE Certification Exam Dates

Exam Dates	Location	App. Deadline
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 February 1st is Delete Day for Unbuilt Facility Licenses

The FCC will implement its Universal Licensing System (ULS) Automated Termination process starting February 1, 2006. The Commission reminds licensees to file their construction notifications and, where appropriate, requests for extensions of construction deadlines in a timely manner.

The Commission encourages licensees that have met their construction deadlines, but have not yet submitted construction notifications to use the additional time to submit the required notifications along with a request for waiver.

Specifically, licensees that have met their construction or coverage requirement in a timely manner, but have failed to submit the required notifications, should file an FCC Form 601, Schedule K, together with a request for waiver of the Rule section that requires timely filing of the notice. The FCC also encourages every licensee to review and, to the extent necessary, update its administration information in ULS, such as the address of record, contact information, telephone number, and e-mail address for each station license by filing an FCC Form 601.
http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-05-3143A1.pdf

171 FM Construction Permits Up for Grabs

Due to the effects of the Hurricane season, the FCC Auction Number 62 scheduled for last November will instead open on January 12th. During this auction the FCC plans to deliver 171 FM Construction Permits around the country to the highest bidder, including 30 that were offered but not sold in the previous auction.

In a Public Notice issued late in December, the Media Bureau and the Wireless Telecommunications Bureau identified 214 applicants found to be qualified to bid in the auction. The full text of the Public Notice can be found at:
http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-05-3204A1.doc

At the same time the government is said to be spending close to $1 Billion to migrate a number of frequencies used by governmental agencies so that the spectrum can then be auctioned to cell phone companies and other users under Congress' Commercial Spectrum Enhancement Act, passed just over a year ago.

CBS Decides to Call its Radio Division CBS Radio

In case you have not been following the latest ownership stories, the number 2 radio company in the US, Infinity Broadcasting, is being rebranded as CBS Radio. CBS Radio will be part of the unit's marketing slogan "Broadcast ... HD ... Streaming ... On-Demand," which is actively being promoted on its stations. CBS Radio will continue to be run by Joel Hollander, who will continue to report to CEO Les Moonves.

"In reclaiming the CBS Radio name, our division will embrace that strong legacy of quality and leadership while at the same time look towards the future, leveraging our great brands, talent and market-leading positions as we forge new ground in distribution, content and technology," said Hollander. "It's only natural that we'd want to use the CBS Radio name to re-brand our radio stations, which will continue to innovate and redefine our industry much as they have throughout the last 75 years."
www.cbsradio.com/releases/view_release.php?date=/051214

Sirius Passes 3 Million Subscriber Mark

Sirius Satellite Radio recently surpassed the 3 million subscriber mark and expects to finish the year strongly. Sirius sells more than 120 channels of commercial-free music, talk shows and other programming to subscribers.

The company recently agreed to a multimillion deal with Howard Stern. Rival XM has more than 5 million U.S. subscribers. According to MediaPost, "expectations have grown that it [satellite radio] will become more of a sponsorship or advertising phenomenon" rather than remain subscription-based.
http://www.shareholder.com/sirius/ReleaseDetail.cfm?ReleaseID=182568&cat=&newsroom=

XM is Voice Controlled

XM Satellite Radio and VoiceBox Technologies announced a multiyear alliance to bring voice control to the satellite service. Drivers will be able to issue voice commands to their radio to search through XM's 160 channels as early as mid 2006. XM announced that it had chosen VoiceBox's technology because it worked accurately in noisy environments. The technology is designed to let users control electronics with free-form conversational language, the companies said.
http://news.com.com/Voice+control+coming+to+XM+radio/2100-1025_3-6012127.html

XM and Neural Audio Introduce 24 Hour 5.1 Surround Sound

XM Satellite Radio will broadcast select XM music channels in 5.1 Surround Sound, marking the first time that a radio company has broadcast in 5.1 Surround Sound twenty-four hours a day. The new offering of 5.1 Surround on XM is called XM HD Surround, which provides content with six discrete channels of digital full fidelity audio powered by Neural Audio technology.

Beginning in March 2006, XM will broadcast the free-form music channel Fine Tuning (XM Channel 76) and the classical pops music channel XM Pops (XM Channel 113) in XM HD Surround. XM will also broadcast a variety of special shows and live music performances at the XM studios in XM HD Surround. XM manufacturing partners such as Denon, Onkyo, Pioneer Electronics (USA) Inc., and Yamaha will introduce home audio systems capable of playing XM HD.

Surround powered by Neural Audio this year. "XM is the first radio company – satellite or terrestrial – to broadcast 5.1 Surround Sound on the radio 24 hours a day," said Hugh Panero, XM President and CEO. "Terrestrial radio stations are just starting to convert from analog to digital. XM has been broadcasting in digital format since the day we launched in 2001, and now we are taking another leap forward with the introduction of 5.1 Surround in partnership with Neural Audio." Home audio systems enabled with Neural Surround will deliver the full surround experience of XM HD Surround. These broadcasts can also be heard on any existing mono, stereo, or matrix style receiver.
www.xmradio.com/newsroom/screen/pr_2005_12_28.html

HD Radio Alliance Launched

Called the HD Digital Radio Alliance, the group's charter focuses on coordinating the rollout of HD Radio, including coordinating the programming formats of multicast channels, working together to secure automotive design "wins" and to lower receiver price points, and to jointly market HD Radio, in partnership with receiver manufacturers and retailers. Initial members include Bonneville International, Citadel Broadcasting, Clear Channel Radio, Cumulus, Emmis Communications, Entercom, Greater Media and Infinity Broadcasting (now CBS Radio).

Serving as the Alliance's oversight management committee are Clear Channel Communications president and CEO Mark Mays; Greater Media president and CEO Peter Smyth; and Infinity chairman and CEO Joel Hollander. The members have agreed to coordinate programming on their HD Channels to create a diversity of formats on the new digital channels. HD2 channels will be locally programmed in each market. HD2 programming will initially be commercial-free.

A Reuters news story reported that Mark Mays, CEO of Clear Channel, said he expected some HD radio receivers to sell for as low as $99 as early as 2007. The group is expected to announce launch dates and specifics on programming early this year. Member companies will also devote more than $200 million in commercial inventory on their own stations in 2006 to promote HD digital radio and the new HD2 multicast channels.

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

FCC Focus

by Bruce Eisen

Keeping Your Station Free from Indecency Hassles

Indecency is back in the news. Actually, it never really left, but this summer's devastating hurricanes with their implications for broadcast stations and some massive telecommunication mergers seemed for a while to have blunted what had become the FCC's chief regulatory concern.

FCC FOCUS MAY RETURN

Perhaps Howard Stern's impending move to non-content regulated satellite radio will further diminish FCC indecency action, but I do not think so. Powerful members of Congress are pushing for new legislation that even could be applied to media other than broadcasting.

Meanwhile, the FCC has published a new form (Form 475B) that can be used by the public for filing complaints relating to obscene, profane and indecent material.

Presumably, the new form will make the complaint process easier for listeners and viewers because it includes information required by the FCC to sustain such complaints. This new form can be filed either electronically, by e-mail, or by letter to the FCC Enforcement Bureau. Talk about user-friendly regulation!

ASKING FOR COMPLAINTS

But wait, there is more. The FCC has, in conjunction with its new complaint form, established several innovative web pages that address the issues of obscenity, indecency and profanity.

One such site can be found at www.fcc.gov/cgb/consumerfacts/obscene.html. It contains everything anybody ever wanted to know about the legal definitions of obscene and indecent broadcasts. These are, of course, matters about which broadcasters have been achingly aware for a significant period of time. So, while the website effectively addresses a number of restrictions, it really breaks no new ground.

However, dig a little further and you can access the Enforcement Bureau's newly updated website at http://www.fcc.gov/eb/bccomplaints/opic.html. With this recent addition to the FCC's informational electronic database, the agency has significantly ratcheted up its war on indecency by literally inviting audiences to file complaints alleging the broadcast of objectionable material.

To my recollection, the FCC has never before put out for public consumption this kind of easy inducement to snipe at radio and TV stations. The FCC is prohibited from monitoring programming to insure there is no violative content – that is censorship – but the website asks others to do it for them.

WATCHING THE POLITICAL WINDS

It should not astonish anyone that the FCC would provide such a tool to audiences. The trade press remains chock full of indecency articles.

Now Chairman Martin has flexed his muscles by offering to Congress a way to attack indecent programming on cable television in addition to traditional broadcast facilities, a measure which, of course, drew a very harsh response from the cable industry.

But while cable companies may ultimately avoid increased content regulation by adopting an "a la carte family menu," radio and television licensees continue to be strapped with the ongoing need to carefully monitor their broadcasts to insure that no indecent slip-ups occur.

WHAT IS BEING SOUGHT

That may be tough enough under the best of conditions. But now anyone who thinks he or she has seen or heard an indecent broadcast is encouraged to complain to the agency and to provide this specific information via its new website:

1. Describe what was actually said or depicted during the broadcast.
2. Set forth the date the alleged violation occurred.
3. Specify the call sign of the station involved.

This seems a fairly innocuous request for a minimal amount of information that a complainant must put before the FCC to allow the staff to decide whether or not a broadcast was indecent.

On the other hand, a review of the numerous cases decided by the agency over the past five or six years shows that many complaints from the public were dismissed because of a complainant's failure to provide the kind of information which the website now routinely solicits.

SHOULD STATIONS WORRY?

So, one asks, has the playing field been made any less level since the FCC has gone the extra mile to help the public to better take on radio and television stations in an attempt to keep the airwaves "clean?"

Frankly, I do not think so. Although the agency's websites may result in an increased number of better documented complaints, at this point in time no radio or TV broadcaster should be without a thorough knowledge of the "do's and don'ts" of indecency.

Moreover, the questions raised have been so well vetted that it should not matter whether a station originates from a major or a small market, whether it is a TV or radio licensee, or whether its format is talk, country music, Spanish and Latin music, or urban music.

A little good sense applied by a station's on-air staff and some direct intervention by managers should be enough to neutralize any FCC attempt to spread its indecency net even further.

(Continued on Page 30)

We're all talk.

And all action, too.

All talk and no action? That certainly doesn't describe any radio station we've ever seen. With guest interviews, news and traffic feeds, live reports and listener calls to juggle, a talk studio is one of the most active places on the planet. Seconds count, and there's no room for mistakes.

That's why we created Status Symbols® for the Telos TWOx12 Talkshow System. Instead of flashing lights to decipher, there's easy-to-understand picture icons that give talk pros the information they need with just a glance. What caller's next? Who's screened, and who's just holding? With Status Symbols, you'll know instantly. And only Telos has them.

TWOx12 has lots more benefits. Like Digital Dynamic EQ, for uniform caller audio despite less-than-perfect lines. Twin DSP-powered hybrids for quick, no-hassle conferencing. A unique Dual Studio Mode that lets you use your 12-line phone system like dual six-line systems for extra flexibility. And TWOx12 is the world's only talk show system that can work with either POTS or ISDN lines to deliver exceptional caller clarity. Impressive? You'd expect no less from the company that *invented* the digital broadcast hybrid.

Is TWOx12 the perfect union of word and deed? Thousands of broadcasters worldwide think so. Why not see for yourself?

Telos
AUDIO | NETWORKS

12 lines, two digital hybrids, and superior audio performance. Desktop Director controller features handset, speakerphone and headset jack. Drop-in controls available for popular consoles.

New Call Controller has Status Symbols, DTMF pad and recorder controls (like Desktop Director), but lets talent use their favorite wireless phone or any standard handset for call screening.

Status Symbols show exactly what's what. Intuitive icons show calls locked on-the-air, which hybrid they're on, who's next in queue and more. So much better than a panel of blinking LEDs.

Assistant Producer enables talk show production via LAN or WAN. Status Symbols, Caller ID support, instant messaging and caller database are just a few benefits. Supports touchscreens, too.

FCC Focus

by Bruce Eisen

Continued from Page 28

MAKE A REGULAR REVIEW

There are a few basics that you and your staff should discuss periodically; they should be considered with the help of communications counsel.

It is unlikely that any broadcaster will engage in "obscene" conduct. That is "off-the-chart" material that can be aired at no time. We all have a fair idea of what it encompasses or we have reviewed the United States Supreme Court definition with its slippery reference to "contemporary community standards." It is hard core porn.

We pretty much know what profane means as well. Some words by themselves are so objectionable that the government will penalize their use. But it is the question of "indecency" that causes most of the problem.

DEFINING INDECENCY

Indecency, unlike obscenity, has a "safe harbor." No station can broadcast any indecent content from 6:00 AM to 10:00 PM, local time. That is the period of the day that the FCC and the courts say children most likely may be in the audience.

So you would think that sanitizing programming during these hours would be a relatively easy thing to do. Not so, as we have repeatedly learned.

The FCC is supposed to "determine the context" of an alleged indecent broadcast, to examine whether or not it is "patently offensive." These are largely subjective terms fraught with legal difficulties. If "context" is determinative, then offensive material often falls short of the indecency definition even if it appears to be superficially actionable.

DETERMINING CONTEXT

This "context" argument is one that is the most difficult element to measure and the item that leads to most disputes with the Commission.

The FCC has said in a number of cases that matters of context involve a host of potential factors and the interplay of these factors will vary depending on the circumstances presented in any given case. Courts have found, for instance, that it is not sufficient to know simply that explicit sexual terms or descriptions were used in a broadcast. And the FCC has observed that all of the possible contextual factors that might bear on an evaluation cannot simply be cataloged and applied mechanically.

This leaves a lot of wiggle room for broadcasters to argue that an allegedly indecent broadcast did not violate the FCC's Rules because of the context in which it was delivered.

Notwithstanding this wide definition, the FCC has ruled in a number of cases against the licensee, finding that the context of the broadcast made the material aired indecent. Some people have urged that using context "opens the flood gates" and allows the use of "vulgarities and obscenities that violate the indecency Rules."

Earlier this year, that is exactly what the American Family Association argued, noting that then-FCC Chairman Michael Powell had recommended that the multiple instances of the "f-word" in the airing of the film "Saving Private Ryan" was not indecent.

It is clear that these kinds of questions remain open and, perhaps, they will never be fully resolved.

EXPENSIVE TALK

Technically speaking, indecent material contains sexual or excretory material that does not rise to the level of obscenity. The FCC has imposed very significant monetary sanctions for violations of its indecency restrictions.

On its website, it proudly announces that in 2004 it imposed monetary sanctions for indecency violations "for an aggregate total of $3,658,000" and that some entities "chose to settle claims against them and made voluntary payments to the US Treasury, totaling $7,928,080."

This whole area of regulation remains a messy quagmire. I do not mean to sound condescending, but this is an area that really calls for skillful legal advice in drafting station policy.

BE PROACTIVE

Because many indecent comments arise as ad-libs or unrehearsed riffs, it is absolutely essential that all on-air staff be carefully apprised and regularly brought up-to-date on the law of indecency. This should be done through memorandum, staff meetings and one-on-one personal discussions as needed. If a firm and well-drafted policy is in place there is a far better chance that violations will not occur.

If the possibility of a violation has occurred, stations should still contact their communications attorneys to determine whether or not the incident is likely to be actionable. Sometimes, measures can be taken to forestall the use of those FCC websites and the filing of complaints.

This is truly one area of communications law that cannot be left to non-lawyers. In this regard, I disagree with Justice Potter Stewart's observation when trying to explain "hard-core" pornography, or what is obscene. The Justice famously recited that "I shall not today attempt further to define the contents of material I understand to be embraced ... but I know it when I see it."

There is too much danger for non-lawyers to assume they are qualified to monitor the law simply by using their eyes or ears. The cases are diverse enough and subtle enough to require close legal scrutiny. A short conversation now with your Washington communications attorney can save you a lot of trouble and expense later.

Bruce Eisen, of Kaye, Scholer, has been a communications attorney for some 20 years. You can reach him at: beisen@kayescholer.com

"Some people don't like change. Change doesn't much care."

"I guess being the very first station to use Ethernet for audio routing has made WEGL a little famous! Someone's always on the phone: 'Tell me about your Axia system. What's the real story?'

"The real story is that two years ago, when our our old analog consoles began to fall apart, we put in an Axia IP-Audio network and SmartSurface. And I've never had a single reason to regret that decision.

"Sure, I was skeptical at first. But audio-over-Ethernet technology is compelling! Other companies just use CAT-5 to carry audio using proprietary protocols. Axia uses standard Ethernet to build a true network with uncompressed digital streams *plus* machine logic and program-associated data. No one else does that! I was a little concerned about dropouts and QoS problems, so we went to the Axia factory and assembled a network ourselves. It was easy to do, and it just *worked*. We were sold.

"The jocks took to the new board like fish to water. Show Profiles are their favorite part, since they can all have custom board setups. Some like their headphone levels blasting, some don't. Some like the mic on the left side, others on the right. I've got one guy who brings in his vinyl records every week for an oldies show; he's the only one who uses the turntables but when he loads his profile, they're ready to go.

"There were a few little bugs, but we had the very first surface! Axia support gave us new software right away and our problems were solved. Two years later, I'm more impressed than ever. I recommend Axia one-hundred percent.

"Since the first studio was installed, we've added a new production and interview studio, and we plan on building three more studios. It'll be all Axia — all the way to the transmitter."

— Marc Johnson, Chief Engineer, WEGL-FM
Auburn University, Auburn, Alabama

AXIA
A TELOS COMPANY

www.AxiaAudio.com

Operations Guide

by Bob Burnham

How to Syndicate Your Own Radio Show

Part 4 – The Logistics of Distribution

Although this series was originally planned to run only one or two parts, we are pleased to offer yet another chapter from Bob, largely due to reader feedback.

The technology that makes syndication even possible is exactly the same as that in daily use at hundreds of stations which originate their own programming, handle play-by-play sports or feature other types of remote broadcasts.

In the previous installments of this series, we looked at some of the raw tools that are needed to generate a broadcast-worthy piece of audio, touching on the associated real-world costs and risks. We tried to make it clear that it was not advisable to use equipment of lesser quality than that of the stations you hope will broadcast your programming.

In fact, it should be of *better* quality. The overriding philosophy is: "Start clean with good microphones and keep it clean throughout, followed by: Do not smash the audio to 'smithereens' with over-processing."

MOVING AUDIO THE OLD WAY

The path your program takes to reach its final destination depends on the very nature of the program itself.

Originally, the radio networks started out on phone lines realizing that, while "live" and adequate for voice, most music programs suffered a noticeable quality loss.

Other types of programs lent themselves well to a pre-packaged and pre-recorded format. Many of the top rated dramas and comedies were sent out on large 16" transcription discs and the Bing Crosby radio show would pioneer reel-to-reel tape for distribution. Sometimes, these programs were "bicycled" from one station to the next.

A typical syndicated program was shipped on tape or disc in the 70s into the 80s.

Over time many other programs – featuring content from agricultural to religious or music formats such as "beautiful music" – were sent out on tape as well. (Older radio folks will recall this also provided for many an audition tape.)

Legendary Top 40 broadcaster Casey Kasem originally used the more "modern" vinyl LP format. The program I hosted in the 1980s (mentioned in a previous article) used standard cassettes, which was then satellite up-linked from a central distribution point.

In the 80's and 90's CD distribution became common.

"Wild! About Broadway," another popular series was hosted by successful New York businessman, Elliott Kanbar, was sent to individual stations, pre-recorded in groups of programs. Produced from the heart of Manhattan, Kanbar's passion for Broadway music came across remarkably well in this format (few hosts could pull off making a show sound as "live" on tape as Elliott could).

Any show not having any time-sensitive elements, not requiring live listener interaction, and hosted by someone completely passionate about the show can easily be pre-recorded and offered in 26- or 52-week chunks as a distribution option. CD's make such distribution easy and economical.

CONTEMPORARY METHODS

Such distribution, however, does *not* work well with many other types of programming today. One major disadvantage is the cost of distribution increases dramatically as the number of affiliate radio stations grows.

Radio is also a very "immediate" medium; the very meat of most talk shows is caller interaction. Radio stations also would much rather lift a program off a satellite feed than to manually load CDs into their automation system.

"Mailed-in" shows just will not cut it for a "Hot Talk" format or even the smaller market AM stations who devote a substantial portion of their day to satellite-fed programming. The live call-in talk show or interactive on-demand request show is what keeps radio interesting. It is live satellite distribution that makes it possible and affordable for stations to feature this type of programming, whether it is Rush or Kim Komando's computer show.

My on-air career in full-service AM radio faded out in the 1980s; it could be said my on-air demise was actually caused by the proliferation and success of satellite-fed programming. I stayed in the business by migrating to the technical side of radio, installing satellite receivers that brought national programs from all over into even small communities.

What are today's choices for program delivery for prospective syndicators?

ALL YOU NEED IS LOVE

The Beatles are credited with one of the very first major satellite broadcasts – of their song "All You Need is Love" – during the 1960s. For someone today looking for an economical way to instantly distribute a radio show, perhaps the theme might be "All You Need is the Internet."

Of course, by "Internet feed," we are not talking about the home-computer-hobbyist level. The Internet is already choked with basement-based radio stations as well as licensed broadcasters streaming their AM and FM transmissions for public consumption.

Services like live365.com make it possible for anyone anywhere who pays their monthly fee to "broadcast" a live show on the Internet. However, their fee goes up as more bandwidth is consumed and listenership increases (much the same as sending CD recordings to individual radio stations).

Traditional radio stations are still where the real listeners are and these are still the stations you want to reach. While you cannot reach them over the Internet with any degree of quality or reliability using only a store-bought computer, new technology now lets you use the Internet for a *private link* to your final distribution points.

BASIC TELCO FEEDS

Practicality and related costs have all impacted the various methods used to convey audio to its destination. Reliability and quality, however, should always be the at the top of a priority list for a show that is fed "live."

In its simplest form – if you have only one affiliated station – your method of transmission need not be any more complex than a remote broadcast type feed, fed directly to that station. It in fact, it is possible to use dial-up (or POTS – Plain Old Telephone Service) lines to feed broadcast-quality audio if a digital codec or analog extender is used.

Long before the digital age, Comrex Corporation invented a technology to extend the frequency range of a standard telephone line by shifting the lower frequencies into the limited range normally available on a voice-grade line. Many stations used this equipment for remote use as a backup to a RPU (Remote Pick-Up) transmitter. The audio was passable for AM broadcast in the 1970s.

A Comrex frequency extender.

The next generation of analog extenders used two or more lines, which shifted and split the frequency range into multiple bands. The disadvantage was that if one of your lines "dropped," the audio instantly sounded horrible. Another disadvantage was that for the most part these devices were strictly unidirectional. If you needed return audio, it had to come from another device.

FIXED LOOPS

In some locations, the phone company will rent you a "nailed up" equalized "loop," which was exactly the same technology many stations used as studio-to-transmitter links for decades. Many still use them or keep them as backups to their STL transmitter or T1 link.

The cost of the loop is determined by the grade of the line and the distance from point A to point B. The advantage of a fixed loop is that no special equipment is required, making it attractive in some situations. However, unless your studio is real close to the distribution point this type of transmission is not practical today

For one thing, sending raw analog audio into phone company equipment means your transmission goes just one direction. Additionally, you are completely at the mercy of the phone company in terms of both audio quality and reliability; the number of technical personnel available today to service these connections is minimal compared to those assigned to digital networks. Finding someone to troubleshoot complex circuits is difficult, to say the least.

Some digital products will work on these circuits, but the disadvantages of equalized loops generally outweigh these advantages.

MULTIPLE DESTINATIONS

On the other hand, anything more than a station or two (especially if growth is expected) necessitates feeding to a central distribution point – which today is most often a satellite uplink service where you rent time on one of their transponders.

Getting the audio from you to the distribution point is handled by the most efficient method; it works whether the uplinker targets broadcast stations or is one of the two satellite radio companies reaching listeners/subscribers directly. A benefit of this mode is that regardless of how many listeners or stations you reach now or in the future, your operating costs for distribution will not increase.

The most common method of connecting to the distribution point for the last ten years has been via an ISDN (Integrated Service Digital Network) connection using an analog to digital modem or "codec" (encode-decode). However, the phone companies in many areas are making ISDN service as hard (or harder) to arrange than the traditional loops.

THAT INTERNET OPTION

We mentioned earlier about how the Internet was becoming more and more useful for this sort of distribution. Next month we will discuss how this may be just the solution to your needs and a super product to make it happen.

Bob Burnham has been providing engineering and syndication services for broadcasters for many years. Contact Bob at bburnham@specshoward.edu

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 with 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 .

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

BROADCAST tools

Ph: 360.854.9559 • Fax: 360.854.9479

support@broadcasttools.com • www.broadcasttools.com

INNOVATIVE PROBLEM SOLVING TOOLS FOR BROADCAST

Manufactured with Pride in the USA

Tech Tip

by Richard Rudman

Quick RF Plumbing Solution

When you are making emergency AM RF repairs involving transmission lines, would it not be great to be able to go to Home Depot, Lowes, or any good full service hardware store and buy the parts to make almost any flange type coax connector you need?

Consider the benefits. No floor pacing while waiting for FedEx or UPS to show up. Even better, you are not paying for emergency connectors as if they were made of gold.

A NEED ARISES

A situation came up with one of my clients where we had to build a pass/notch filter for a new solid-state transmitter that refused to work into the existing two-tower DA phasor. A new phasor network was already on order, but delivery was months away.

The mission: Get the new transmitter on the air so the site power bill would not no longer go into heating a bank of resistors every night.

Building the temporary filter design involved providing new terminations of 7/8" and 1/2" foam-filled line. I have often looked at the bright copper and brass fittings in hardware stores and mused that they might be used in some way to make coax connectors. The time had come to find out.

SHOPPING FOR HARDWARE

With some short pieces of transmission line in hand, I surveyed the available hardware at my local outlets. I found out that there were some copper and brass fittings that just might work.

For the 7/8" line, I bought copper tubing to 3/4" pipe thread adapters and a section of copper tubing to fit inside the tubing end of the connector. This provided a snug fit for the copper jacketed coax. For the 1/2" line, I found a 1/2" hose connector to 1/2" pipe thread connector that looked promising.

How do you adapt 3/4" pipe to a flange that could be solidly bolted and grounded to the filter network? I had to leave the world of brass and copper for that. But, as I reminded myself, this is temporary, and everything would be indoors.

SUITABLE SUBSTITUTES

Pipe floor flanges found in hardware store electrical departments were the answer I chose. They come in a variety of pipe thread sizes including 3/4" and larger. I bought the cast iron variety, but they are available in brass at specialty home or office decorator supply houses that are not always open in the middle of the night.

If you have a little time, I found a source on-line called the Hardware Hut:
www.thehardwarehut.com/catalog-product.php?p_ref=6739

The smallest size they offer is one inch, so some added copper fitting creativity would be involved to adapt from the copper tubing or hose connectors that actually secure the copper coax jacket.

PUTTING IT TOGETHER

Some details: for the 1/2" adapter to the flange, I had to use an iron 1/2" to 3/4" adapter. I know these are available in brass, but even full service hardware stores run out of stock.

Back at the site, I cut slots in the copper tubing adapter, the copper tubing section for the 7/8" adapter, and the 1/2" brass hose adapter so I could mechanically secure and provide a good RF ground to the copper coax jacket. I used standard automotive stainless steel hose clamps for my makeshift connector. All grounding surfaces were filed and deburred.

The flanges were bolted to a section of predrilled angle bracket. I drilled mating holes in wide copper ground strap for bolts.

A usable 1/2" adapter from the hardware store.

THE PROBLEM IS SOLVED

After assembly and tuning, we checked the effectiveness the new connectors and their grounding by using heavy clip leads to look for any changes to the filter's tuning. We saw no changes.

This emergency work-around could well apply to larger coax sizes up to three inches for AM service. I will let you know if the future takes me back to hardware land with a section of larger line.

A custom-built 7/8" adapter.

This project brought back a lot of memories of ham radio Field Day activity, including not having all the right connectors on hand and the strange but effective things we came up with to get on the air!

Richard Rudman has had radio in his blood since his youth. After four decades, he still enjoys the challenges of radio engineering. Contact Richard at rar01@earthlink.net

VoxPro®

Your Short/cut™ Alternative in 2006

See Why People Are Switching

www.audionlabs.com

Available at your favorite broadcast equipment distributor

fanfare

FT-1AP

Some call it

"The Ultimate Translator Receiver"

Why? Because it has so often brought 'iffy', as well as downright 'useless' translator sites to fully airable signal. Add to that, the FT-1AP's established record of reliability, and extraordinarily low maintenance and you have a receiver that will pay for itself many times over with service visits you won't have to make; not to mention a signal that will maintain your listener's attention. In other words, "It leaves you alone to do more important stuff."

The FT-1AP features our acclaimed, high resolution, analog, FM tuner, and state-of-art, digital control system which maintains tuning accuracy at all times, even after power failure. Included also is adjustable Composite Output and +10dB audio (XLR) outputs. To further enhance the FT-1AP's versatility, it offers optional, level- adjustable, Carrier Sense(to assist in meeting FCC regs); an RS232, Serial I/O port, and a gain-adjustable, stereo headphone outlet.

The FT-1AP(FM-only) and FTA-100P(AM/FM model) are available direct or through your favorite equipment dealer.

fanfare Electronics, Inc.

1-800-268-8637(U.S. & Canada)

6509 Transit Road, Unit H-1
Bowmansville NY 14026

Voice - 716-683-5451
Fax - 716-683-5421

Email "proinfo@fanfare.com"

Website: "www.fanfare.com"

"Designing receivers that broadcasters can rely on"

Bay Country Broadcast Equipment

Buy • Sell • Trade

Your #1 Source for Quality Used Radio Broadcast Equipment

View our latest list of equipment on-line at:

www.baycountry.com

Or call and we will fax it to you.

All equipment sold with a 15 day return guarantee.

Turn Your Excess Gear Into Cash

Fax or email your list to us and we will respond with our offer promptly. We only buy good working equipment with traceable serial numbers.

Fax Your List Today – 443-596-0212

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)
7117 Olivia Rd, Baltimore, MD 21220

Member BBB

BEXT

FROM THE TALL TO THE SMALL

FM & TV Transmitters
Solid State or Tube
Antennas & Combiners

20 Years of Service
Asistencia en Español
24 Hour Support
2 Years Warranty

www.bext.com
Tel 619 239 8462
Fax 619 239 8474
bext@bext.com

NEW
EXCITERS/TRANSMITTERS
w/stereo generator & audio limiter,
field programmable FSK ID keyer, all built-in!

Jerry Miller
1938-2005

"Learn, Earn, Return"

Jerry Miller, the former Chief Engineer of WCCO Radio in Minneapolis died on December 6, 2005 as a result of ALS (Lou Gehrig's Disease). Among the many people affected by his passion and professionalism is Cole Grace, who shares some of his memories about Jerry.

Jerry and I last saw each other on Good Friday, 2004. I pulled off my tie, knowing we needed to spend some time together after several years apart. I called him from the car and asked if it would be OK to stop in – but I already knew the answer.

Though our paths had not crossed in some time, Jerry and Dee welcomed me into their home like another son. He was especially proud of the broadcasting museum he had put together in his home and he went through the history of transcription disks, old consoles, tubes, and microphones he had collected. Radio never left him and he never left radio.

THE MAKING OF A RADIO ENGINEER

Jerry Miller was the son of a Greek stowaway from Corinth and a Norwegian immigrant mother who ran a small vegetable stand in South Minneapolis. While growing up, Greek was the primary language at home. Jerry once commented that the only thing that spoke clear English in his house was the radio – and the hours he spent in front of it in the 1940's developed into a lifelong passion and lifestyle.

Shortly after graduating from High School in Minneapolis, Jerry received his amateur radio and First Class FCC licenses that allowed him to begin a half-century career in Twin Cities radio engineering.

When he finally retired from WCCO Radio in 1996 he had been there 32 years, many of them as Chief Engineer. It has been said that while in charge of the WCCO plant, he may have overseen the longest uninterrupted time of transmitter operation in the nation. Completely redundant transmitter operations were in place including a machine shop, living facilities, and a generator capable of 30 days of non-stop transmitter operation. "It's just the way you do things," he would say.

A RADIO LIFE

Jerry never lost the magic of radio – it always carried a fascination beyond the technology, accounting procedures, egos and consolidations. It was also his mission; it is safe to say he thought radio was a simple thing that touched lives through emotions.

In a conversation with Engineer Ken Benner, Jerry said, "All the engineering technology doesn't mean a thing without good program content. It's about content, localism and personalities – making people laugh, cry, to be informed and confident. You see, engineering is simply the means of delivering the mail – it's about credibility."

Jerry Miller at his 2002 Hall of Fame induction.

While lamenting that broadcast philosophy has changed to "chase the money," Jerry felt "We need to have fun, laugh and have a good rapport with our listeners. Yep that's it, you've gotta be a part of it all – serve the public good radio and the public will serve you – 'CCO proves that to this day."

Ken told many that Jerry's attitude of a good life, giving "something" back, was expressed often in his three word motto that folks should "Learn, Earn, Return."

DEDICATED TO RADIO AND FAMILY

He carried this attitude with him after leaving WCCO by conducting FCC Alternative Inspections throughout at least 11 states. He was a strong, early proponent of the Society of Broadcast Engineers and always encouraged fellow engineers to bring professional expertise and professionalism to radio engineering. In 2002, he was inducted into the Pavek Museum's Radio Hall of Fame.

Jerry's love for radio was eclipsed only by this love for his family. He always took pride in his family – many times we would sit in his office and point to pictures of his family on a vacation to his adopted home country of Greece.

After learning of his father's illness, his son Jim said, "My father has now lost the voice that was never heard in broadcasting. As a radio engineer he made it possible for others to say the things that informed, amused and enlightened us (sometimes.) Now I find myself talking for him and about him.

"I will say this, not because it is something that a son is expected to say, but because it is something that I believe with all my heart: my father is the best man I have ever known. When he could talk, he would strike up a conversation with anyone he met, and would be genuinely interested in what they had to say.

"He could charm a room full of people with his earnest enthusiasm and humor. He was always asking provocative questions – looking to stir peoples' imagination and intellect. He was a philosopher, a dreamer and a visionary – labels I hadn't associated with engineering.

"I would say his success in his professional life was less about the technical, and more about the personal. Communication is about people more than the medium. He was a communicator. That is how he will be remembered. The technical advances that he oversaw and the FCC inspection guidance that he gave are all wonderful things, but I will remember him as the smiling man on the picture in the Radio Hall of Fame. That is not 'some engineer' – that is my Dad."

MAKING IT HAPPEN

Though dyslexic, Jerry never considered himself at any disadvantage. Like anything else he approached, he simply rolled up his sleeves and found a way to get things done. Even though he knew very little about carpentry, he bought a book with pictures and diagrams and built the house him and his gracious wife Dee shared for over 30 years.

We ended up in the place any good engineer loves – his basement workshop – where we spent hours talking about radio – the good and bad times from 11 years working together – and looking at his Da Vinci-like penciled diagrams describing how things work. We spent plenty of time crying together. I felt fortunate to be with him.

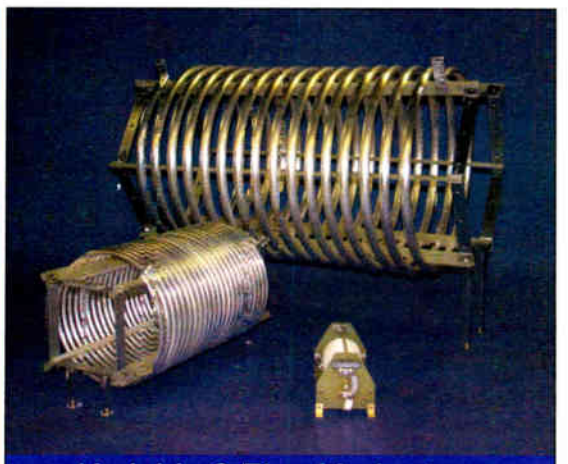
Radio is a tough business – it is human nature for us to dwell on the bad days and struggles. To that I can only say: find a person with passion, who overcomes obstacles, spends time both learning and teaching, who looks for the good in everything you do, and cares deeply about others. You then will have an idea of the impact Jerry Miller had on those he met. He will be missed.

Cole Grace may be reached at email: colegrace@juno.com

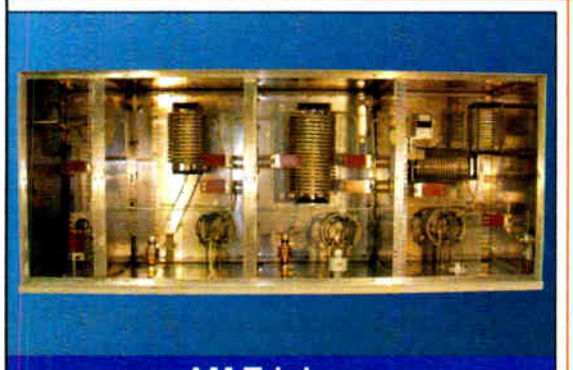
AM Antenna Solutions

Components to Complete RF Systems

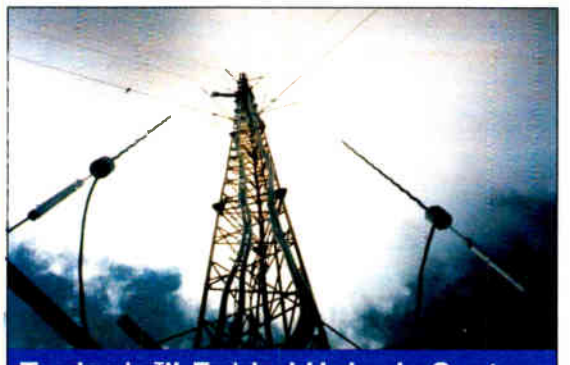
High Power ATU



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

No, we didn't put AM transmission on a low carb diet.

But we packed a ton of AM power into a transmitter half that size.

Designed for the demands of both analog and digital transmission, the 4MX 50 is based on BE's patent pending 4M Modulation™ — boasts unparalleled 88% typical efficiency into a small footprint with a price to match. All 32 power amplifiers each with their own power supply are hot pluggable and can be removed and replaced while the transmitter remains on the air. Dual low voltage power supplies allow full operation with no loss of power or service even if one should go offline. Local operation, diagnostics and status are controlled via a 15" XGA graphical user interface and remotely via IP. Power levels from 150 watts to 50 kW meet all your power level needs, day and night. Contact BE for details.

Broadcast Electronics Inc. • 4100 North 24th Street, Quincy, Illinois 62305-3606
Telephone: (217) 224-9600 • Fax: (217) 224-9607 • E-Mail: bdcast@bdcast.com

Broadcast Electronics and the BE logo are registered trademarks of BE. 4MX and 4M Modulation are trademarks of Broadcast Electronics.

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

The Worst I've Ever Seen

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

Just a Fun Drive in the Mountains

It does not take rain, snow or ice to make a mountain transmission-site road dangerous. Just the typical angles of ascent and descent and the tight "switchbacks" normally are enough to make a careful driver pay close attention. If the road is in poor repair, with major erosion issues, it is time to slow down even more.

However, sometimes a nice clear day can create a sense of overconfidence, which can quickly lead to danger. Throw in a driver in a hurry on an unfamiliar site and things quickly could lead to something like this:

Something does not look quite "right."

Robert Reymont, of Double R Consulting in Mesa, AZ, was on his way up Tucson Mountain with Mike Irby when he was informed the road was "blocked" ahead. Reymont was kind enough to share these pictures with us.

Fortunately, they already knew the driver had managed to get out safely. But all you can think of when you see something like this is "how close this came to a real catastrophe." Realizing the car managed to flip and yet stay on the roadway brings words like "very fortunate" to mind.

Fortunately, the car came to a rest on the road.

Indeed, a few more feet to the left and the car would have gone several hundred feet down the side of the hill – a very sobering situation for anyone. Or, if there had been just a little more erosion on the side of the road, there might not have been enough surface to allow the car to stay on the road.

We do not know what this driver's boss said when he was told the story. But it is a reminder to all of us who have to drive those mountain roads (and trails) that we need to be alert. When conditions are poor or unfamiliar, we should slow down.

A related issue is when we find ourselves on a road that has eroded or otherwise deteriorated to an unsafe condition. We should take the time to get a message to the site owner, so they are on notice that repairs need to be made. It could save our lives or that of someone else.

This sort of looks like a turtle on its back.

Overall, as we make our way to the various transmitter sites, a key thought here is for us all to – as that famous "Hill Street sergeant" used to say – "be careful out there." *– Radio Guide –*

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

Tool Guide

Test, Tools, Tips and Applications

RWC1000K Real World Cable Certifier

The use of CAT5e cabling is increasingly becoming common for many types of broadcast equipment, as well as other systems within a typical facility that the broadcast engineer is often tasked with installing and maintaining and CAT6 is evolving to common usage as well.

One of the challenges of utilizing this technology is accomplishing certification to guarantee that cables and systems are operational to specification, preferably during the installation process. (A general "rule of thumb" is that almost half of initial digital system problems are cabling related and there has been considerable evidence in broadcast installations to verify that as true.) If you have shopped for Network Certification Equipment, you may have been put off by the price tag which can typically be several thousand dollars. No longer.

The Byte Brothers™ RWC1000K Real World Certifier should be on your test equipment list. It is a compact and very versatile tool, providing complete testing and recording of both cable and system performance parameters.

Projected Performance (Level 1) tests include Length, Opens, Shorts, Split Pairs, and Wire Map (internal pairing), plus sophisticated Crosstalk (near end or far end), Propagation Delay, Skew (timing between pairs), and perhaps most importantly Speed projection that defines the cable performance as CAT3, CAT5, CAT5e, or CAT6.

All setup and test parameters are displayed on a built in LCD Display with navigation controls to scroll through the numerous functions available. The unit will hold in memory the results of up to 250 individual tests which can later be exported to Excel and printed out with graphs documenting the entire performance of each and/or selected cables.

Confirmed Performance (Level 2) testing capabilities allow the RWC to be inserted in the circuit under test. This allows total system testing, including not only the Operability and Attenuation of the cables, but the Throughput (both advertised and negotiated port speeds) and Data Signal Strength of hubs, switches, routers, PC's, etc., as well.

So how does it work? The unit is basically a high speed TDR (Time Domain Reflectometer) with 1 nanosecond resolution. Level 1 testing utilizes the Main Unit with internal signal generator and a Remote (probe/termination) Unit attached at the far end of the cable under test. In operation, this is similar to an analog Toner and Probe configuration and in fact the units can also be utilized in that capacity but with digital signaling. Level 2 testing utilizes data generated by the system under test as measured by the Main Unit, and supports Gigabit speeds. All testing meets IEEE/ISO/IEC 802.3 standards.

The product comes with a Zippered Case, Instructional DVD, Users Manual, Documentation Pad to manually record test results, "Passed" Certification Stickers for placement on tested cables, and 9V Batteries. Additional Documentation Pads and Certification Stickers are readily available. Given the hours of troubleshooting that this can prevent, and/or the system diagnostics assistance that it can provide, plus the added value of providing full documentation records of performance, at a cost under $600 this is one piece of test equipment that none of us should overlook.

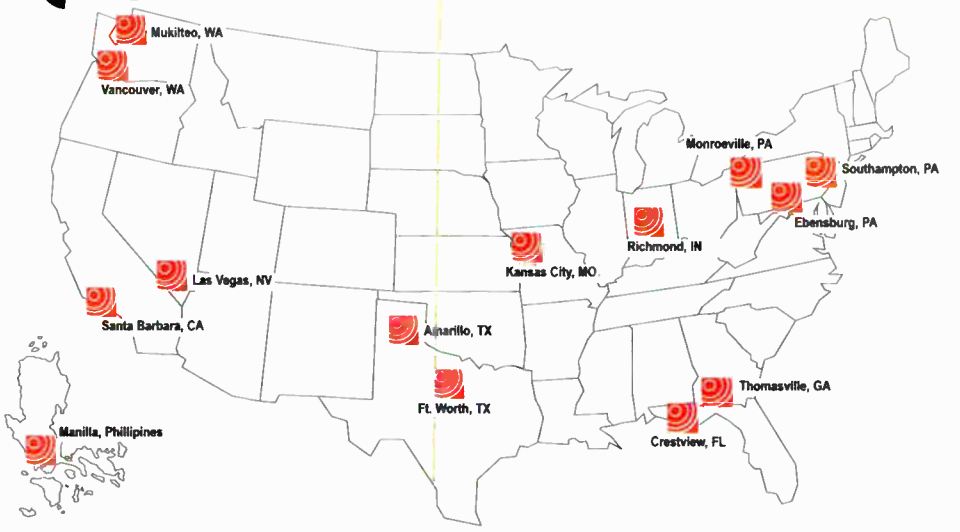
The Byte Brothers™ Real World Certifier

Consultant Guide

Radio Consulting Engineers

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

RF Specialties® Group



Hi, thanks for reading our ad.
Most sporting events are off and running.
The RF Specialties Group has the remote equipment you'll need to do a bang up job covering the games.
Microphones, Sports-Headsets, Mixers, POTS, ISDN, Marti RPU equipment and the list goes on.

Give us a call!

The call is free and you'll discover, RF Specialties is your ticket to a perfect Sports Season.

WELCOME! RF Specialties of Georgia with offices in Thomasville, GA and Crestview, FL.

RF is Good for You!

Visa and Mastercard are welcome.
Offices Independently Owned and Operated.

www.rfspec.com

Sam Lane	Santa Barbara, CA	1-800-346-6434
Bill Newbrough	Las Vegas, NV	1-888-737-7321
Bob Trimble	Vancouver, WA	1-800-735-7051
Walt Lowery	Mukilteo, WA	1-425-210-9196
Don Jones	Amarillo, TX	1-800-537-1801
Wray Reed	Ft. Worth, TX	1-888-839-7373
Chris Kreger & John Sims	Kansas City, MO	1-800-467-7373
Rick Funk	Richmond, IN	1-888-966-1990
Ed Young	Monroeville, PA	1-866-412-7373
Dave Edmiston	Ebensburg, PA	1-866-736-3736
Harry Larkin	Southampton, PA	1-888-260-9298
Alan Slaughter & Chris Hall	Thomasville,GA	1-800-476-8943
Bill Hoisington	Crestview, FL	1-850-423-1418
Ed Edmiston	RF Specialties of Asia (Manila, Phillipines)	+63-2-412-4327

Shively Labs®

FM Antennas and Components

Quality HD signals require quality components.

A Division of Howell Laboratories, Inc.
Bridgton, ME 04009 USA
(207) 647-3327 (888) SHIVELY
sales@shively.com

- An Employee-Owned Company -

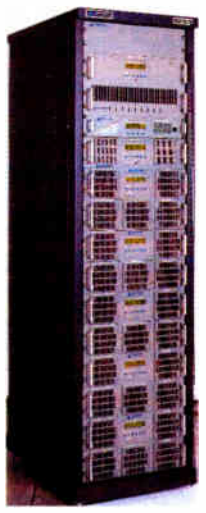
www.shively.com

Gear Guide: AM, FM, IBOC Transmitters & Exciters

Armstrong Transmitter

FM2000B – Solid State FM Transmitter

www.armstrongtx.com • 315-673-1269



The Armstrong's Series "B" Solid State FM transmitters feature exceptional quality and reliability. Built for the real world these RF Workhorses are designed with maximum redundancy.

Armstrong uses a building block approach to its Series "B" with the FM2000B amplifier in various multiples to achieve higher powers. The FM10000B for example consists of five FM2000B amplifiers externally combined , exciter and driver contained in a single cabinet.

This design philosophy gives the user the maximum redundancy available in a Solid State Transmitter. Each 2000B amplifier has three power supplies sharing the load, however only two are required to easily achieve full power output. So if a power supply should fail you maintain full transmitter power output.

Complete system status is available, as is individual amplifier status. Each Series B transmitter, is HD Radio Compatible has VSWR foldback and optional power factor correction is available which guarantees the best overall efficiency.

Bext

Lex 50 and Lex 100 – FM Exciters

www.bext.com • 888-239-8462

The new slimline models have joined the Bext family of FM Radio Exciters. Previously available only in the 30 W power level under the name Lex 30, Bext is releasing new slimline, one rack space Exciters: The Lex 50 and Lex 100.

Among their features are: Stainless steel cabinet for maximum sturdiness and durability; directly programmable; frequency agile; LCD Display for all functions and readings; built-in stereo generator (can be bypassed for MPX or mono operation); audio limiter (user controllable) to control absolute maximum deviation; excellent audio specifications; built-in, user programmable FSK ID Keyer (for translator operation only); USB port for direct PC or modem connection; remote control ready; proportional auto-foldback of output power in the event of excessive VSWR; built-in low pass filter; 120/220 V AC or 24 volts DC operation; record low power consumption.

Broadcast Electronics

FXi Series FM+HD Radio – FM Exciters

www.bdcast.com • 217-224-9600

From its introduction in 2003, BE's FXi Series has set the standard by which HD Radio exciters are judged. Reliable and field-proven, they are fully embedded solutions using Direct-to-Channel RF frequency generation for superior RF and audio performance. Available in 60 and 250 watt versions, the FXi Series provides FM analog, HD Radio and FM-plus-HD Radio operation, with real-time mode change.

The plug-in Exgine card modulates the HD Radio OFDM carrier for implementation of HD2 multicasting. Upgrading HD Radio systems involves installing modules, not replacing the entire exciter. The FXi Series incorporates functions to facilitate point-to-multipoint HD Radio distribution systems, as well as boosters and translators. An AES output decoded from the HD Radio Codec stream, built-in delay and integrated GPS receiver option are more reasons the FXi Series exciters are the most versatile available.

Broadcast Electronics

E Series – Solid State AM Transmitters

www.bdcast.com • 217-224-9600

Using a patented power module design, the E Series solid-state AM transmitters from BE offer unsurpassed power economy and the most efficient performance. Cooler operation temperature extends transistor life. Two models are offered – the AM 2.5E operating up to 2,750 watts and the 5.5 kW AM 5E.

The E Series design includes redundant power supply and plug-in RF power modules. Maximum audio quality can be achieved at all power levels. An RF output matching network is built in so no external matching components are needed. Other features include integrated voltage regulation from 196 to 252 VAC, built-in stereo modulation monitoring, and a built-in output matching network.

Both E Series models are HD Radio™ compatible and provide a full range of metering, status and remote control functions. As with all BE products, the E Series provides many years of trouble-free operation.

Continental

816HD Upgrade – for 816R Series FM Trans.

www.contelec.com • 800-733-5011

Continental recently unveiled what is being considered the "most elegant" solution for HD Radio™ broadcasting. Low-level combined FM+HD using a single transmitter for higher power levels than were previously possible.

For their customers, with TPO levels from 10 to 18kW or combined for TPO levels to 35kW they are offering upgrades for all 816R "C" Series FM Transmitters. This allows broadcasters using these transmitters the opportunity to upgrade to HD broadcasting for much less than the cost of a complete transmitter or other IBOC implementation option. The field upgrade includes a Continental HD signal generator and will require Continental Engineering to be on site for approximately three days.

This solution eliminates the requirement for: second HD transmitter, lossy combiner systems, second antenna, tower crews, etc. required for most other proposed HD systems. 816HD Transmitters can also be purchased new and factory tested for FM+HD.

Energy-Onix

ECO – Grounded Grid FM Transmitters

www.energy-onix.com • 518-758-1690

The most popular FM transmitter in the Energy-Onix product line continues to be their one-tube, grounded grid ECO transmitter. These transmitters offer reliability, power line efficiency, attractive prices and relatively low tube costs.

They sell one ECO transmitter every day and have hundreds of satisfied customers. They will shortly be experimenting with the application of DRE encoders to produce multiple digital, mono and stereo programs.

By the end of July they expect to have a quantity of systems in the field. If they perform as predicted, expect a number of non-interfering, multi-program Energy-Onix FM stations on the air with DRE by the end of the summer.

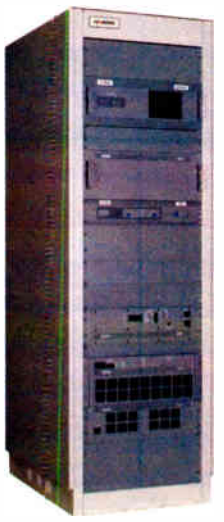
The DRE system requires no change in the station's existing analog transmitter, antenna, STL or processor. All that is required is a three foot length of RG-58U between the encoder and the SCA input to the exciter.

Gear Guide: AM, FM, IBOC Transmitters & Exciters

Harris

Mini-HDC – Low Power FM Transmitters

www.broadcast.harris.com • 800-622-0022



Harris recently announced extension of its MINI-HD line of low power FM transmitters to common amplification.

The new MINI-HDC was shown at NAB 2005. Previously available only as an HDS (digital only) product, the new HDC line will allow stations with 600 watts or less of analog FM power to implement HD Radio™ in a single rack footprint.

Harris MINI-HDC is available in four analog TPO power levels: 75, 150, 300, and 600 watts. Digital power is 1% of rated analog power. The product may be configured with either the Harris DIGIT or the Superciter analog exciters.

All models of MINI-HD (C and S versions) include a 3-year warranty on the RF power amplifier and power supply.

Larcan USA

25W-5kW FM Series – 25W FM Transmitter

www.larcan.com • 303-665-8000

Their FM Transmitter Series delivers exceptional audio performance and reliability – within an all-inclusive compact design.

Developed and built with the same renowned LARCAN design and quality of their television broadcast products, their FM solutions combine proven transmitter technology with rugged performance and superior RF output. A compact design with clear and consistent results – Larcan's FM transmitter series is the best choice for broadcasters looking for the ultimate in made to measure FM broadcast solutions.

- Extensive Power Range – Power Levels from 25w to 5kW
- Superior Audio Performance – Wideband Operation
- Rugged, Modular Design – Proven Reliability
- Field Tuneable – Fully Synthesized
- FCC Certified

Nautel

M50 – Direct-to-Channel Digital FM Exciter

www.nautel.com • 207-947-3693

The M50 FM exciter integrates seamlessly with the NE IBOC signal generator for IBOC transmission in fully digital or hybrid modes.

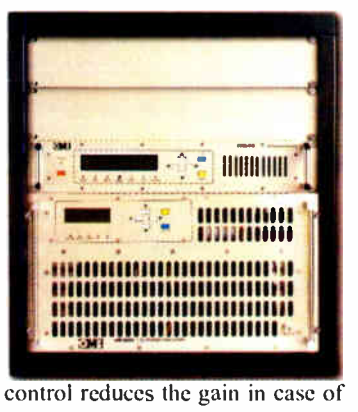
Direct-to-Channel modulation gives superior signal reproduction and eliminates analog up conversion. The M50 utilizes digital adaptive pre-correction that constantly corrects the output spectrum. The ability to adopt to power level and VSWR variations ensures emission mask compliance without the need to adjust correction look up tables. A built-in programmable time delay on all inputs is ideal for HD Radio audio bypass or synchronous applications.

A built-in DSP generator interpolates AES/EBU digital data or L & R analog audio to produce a digital stereo composite signal. Dual SCA generators and RBDS/RDS coder are also built in. The M50 is frequency agile and six programmable preset audio source, power and frequency configurations are selectable via local or remote control.

OMB

EM-2000 – FM Solid State Transmitter

www.omb.com • 305-477-0973



The EM-2000 is a 2,000 watt FM transmitter made up of the EM-25DIG (or EM-20/30) exciter and the AM2000 FM amplifier. The AM2000 includes eight independent 300W high-efficiency MOSFET-Technology amplifying modules, fed by two independent switching power supplies.

The EM-2000 includes an output low pass filter, EMI filters and an internal transient suppressor. The LCD display shows the amplifier parameters: supply voltages, modules currents, forward, reflected and input power, power loss in the internal unbalance load and temperatures.

All events and alarms are stored in the amplifier control system memory. An Automatic gain control reduces the gain in case of excessive driving power. The EM-2000 also has a Smart temperature protection and a Reflected power protection built-in, which reduce the output power when a dangerous level is detected, and stop the amplifier if the power reduction is not enough.

Besides, Analog Telemetry, Digital RS-232 telemetry and remote control are included.

PTEK

FM250E – LPFM Transmitter

www.ptekpower.com • 408-448-3342

In mono operation the FM250E features an audio input impedance of 600 ohms balanced, and audio input level of +10 dBm for 75 kHz deviation.

Mono audio frequency response is +/- 0.5 dB, flat or 75 microsecond pre-emphasis, 20 Hz to 15kHz, with a THD of 0.15% max. The 20 Hz to 15 kHz FM S/N Ratio is 70 dB min., below 75 kHz deviation at 400 Hz. Asynchronous AM S/N (AM Noise) is 60 dB RMS. Synchronous AM S/N Ratio is 57 dB below carrier reference.

In wideband operation the input is composite unbalanced 10k with an input level of 1.25 V RMS for 75 kHz deviation (SCA unbalanced 10k). The FM250E features direct carrier frequency modulation to 100 kHz deviation, with a wideband amplitude response of +/-0.5 dB from 20 Hz to 100 kHz.

The FM250E's rated power output is 250 watts, with frequency range of 87.7 to 108 MHz, in 200 kHz steps. Frequency Control is phase-locked-loop frequency synthesis from a high stability master oscillator, with a frequency stability of +/- 1.2 kHz.

Output Impedance is 50 ohms with an "N" female connector VSWR limit is 1.5:1 for full power. Harmonic attenuation is 70 dB, minimum.

Transmcom

Used AM/FM Transmitters and Exciters

www.fmamtv.com • 800-441-8454

Transcom Corporation offers used transmitters and exciters for AM and FM radio. They can offer great savings as well on new cable, antenna and accessories. Currently they are featuring these late model Harris FM transmitters:

- A 2005 Harris Z16 HD, configured for HD (IBOC) radio. This nearly new solid state FM Transmitter comes complete with the Harris Dexstar Exciter. This transmitter will be returned to Harris Corporation for retuning and testing at your frequency.
- A 1991 Harris HT20, 20 kW FM Transmitter with 2nd Generation Digit CD Exciter, on its current frequency.

All of these transmitters are complete and in excellent working condition, per manufacturer's specifications, including instruction manual, schematics and spare parts as made available by previous user(s). Please see our ad on page 34 of this issue for more on our current inventory, or visit our website, www.fmamtv.com.

Service Guide: Radio Equipment Products and Services

ECONCO

Rebuilt Power Tubes 1/2 the Cost of New!

Se Habla Español

ECONCO

Se Habla Español

Tel: 800-532-6626 Web: www.econco.com
Intl: +1-530-662-7553 Fax: +1-530-666-7760

ECONCO

TRANSMITTING CAPACITORS

MICA-VACUUM-CERAMIC

SURCOM ASSOCIATES, INC.
(760) 438-4420
LINK@SURCOM.COM

Silver Plating Powder

Silver Plate On-The-Job with Cool-Amp!!

Cool-Amp	Conducto-Lube
Silver plating powder	Silver based lubricant
*Maintain your RF frequency	*Reduce resistance
*Keep your PCBs cool	*Prevent power interruptions
*Increase conductivity	*Prevent data errors
*Minimize power loss from corrosion & oxidation	*Prevent power failure

Ph: 503-624-6426 Fax: 503-624-6436
www.cool-amp.com 60 years customer satisfaction! email: sales@cool-amp.com

RF PARTS COMPANY

From Milliwatts to Kilowatts℠

Eimac • Amperex • Svetlana • M/A-Com
Motorola • Toshiba • Philips • Mitsubishi
Se Habla Español • We Export

800-737-2787
760-744-0700 Email: rfp@rfparts.com
www.rfparts.com

AM Ground Systems Co.

Ground System Construction,
Evaluation & Repair

1-877-766-2999
www.amgroundsystems.com

BAUER TRANSMITTERS, INC.

www.bauertx.com

BAUER - ELCOM BAUER - SPARTA - CETEC
Re-Manufactured
Bauer Transmitters Available
AM/FM – 2.5 kW to 25 kW
www.bauertx.com paul@bauertx.com
915-595-1048 Fax: 915-595-1840

Now Available! New Sections!

The updated 2004 version of Eimac's *Care & Feeding of Power Grid Tubes* Handbook is now available.

Contact Richardson Electronics today for your **FREE** copy.

Eimac

Richardson Electronics
Engineered Solutions

Toll Free 800-882-3872
630-208-2200
Internet: broadcast.rell.com
E-mail: broadcast@rell.com

DA HOOK — DA GAP

Safety Grounding Hook — **Lightning Dissapation Gap**

Solid Brass Hook & Hardware
Fiberglass Rod Handle
#10 Copper Cable & Alligator Clip

Available with Horn or Ball Gaps
Patented (#5,661,262)
Hot Adjust Mechanism

Wilk Science and Technology Inc.
1112 North Grove Avenue, Oak Park, Illinois 60302
Telephone & Fax: (708) 524-8588

D&C Electronics Co.

- New Tubes -

We have the alternatives for all your needs, at the lowest prices, direct from our stock!

EIMAC, SVETLANA, PRO-TEK®, EEV, and many others.

352-688-2374 or 800-881-2374

VISA & MASTERCARD Accepted

Chris Scott & Associates

Visit our website
www.scott-inc.com

Ph: (270)781-5301
Fax: (270)781-1232
Bowling Green, Kentucky

NRSC Loop Antenna

AM-FM Notch Filters

CCA PARTS & SERVICE

V&J Electronics

Can supply all parts, schematics, and manuals for CCA, CSI, Sintronic, and Visual transmitters. Field service and complete rebuild transmitters available.

Call Van or Jerry Meier: 770-907-2694
Fax: 770-907-2694 – 24/7 Service
COD, Visa, Master, Discover, NET-15/30
www.ccaelectronics.net

DCS — DIVERSIFIED COMMUNICATIONS SYSTEMS

"SERVING BROADCASTERS SINCE 1981"

BROADCAST EQUIPMENT REPAIR
Audio/RF Equipment - AM/FM Transmitters
Free Consultation/Loaners Available
www.divcomm.biz
814-756-3053 • rpogson@aol.com

Around the County

Around the Country

Around the World

George Whitaker
Owner

www.mikeflags.com

Practical Radio Communications
Arlington, TX

OWN A LPAM STATION!

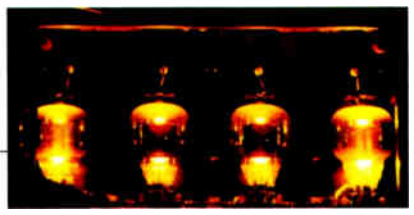
LICENSE FREE!

- 1-2 Miles Range Possible
- FCC Part 15 Type Accepted
- Best sound in the business!

Tel 919-362-9393 Fax 919-367-0607 Visa\M/C
http://www.am1000RANGEMASTER.com
sales@am1000RANGEMASTER.com

Service Guide: Radio Equipment Products and Services

Final Stage



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

Radio Guide Ads: January - 2006

Advertiser - Page	Website
AM Ground Systems - 19	www.amgroundsystems.com
Armstrong Transmitters - 38	www.armstrongtx.com
Audion - 35	www.audionlabs.com
Autogram - 38	www.autogramcorp.com
Axia - 31	www.axiaaudio.com
Bay Country - 35	www.baycountry.com
Belar - 21	www.belar.com
BEXT - 35	www.bext.com
Broadcast Devices - 11	www.broadcast-devices.com
Broadcast Electronics - 37	www.bdcast.com
Broadcast Software Intl. - 3	www.bsiusa.com
Broadcast Tools - 33	www.broadcasttools.com
Broadcast Warehouse - 20	www.bwbroadcast.com
CircuitWerkes - 17	www.circuitwerkes.com
CKE - 13	www.rectifiers.com
Comrex - 7	www.comrex.com
Conex Electro Systems - 37	www.conex-electro.com
Continental - 15	www.contelec.com
D&H Antennas - 23	www.dhsatellite.com
Dielectric - 13	www.dielectric.com
Econco Tubes - 23, 44	www.econco.com
Energy Onix - 2	www.energy-onix.com
ERI - 5	www.eriinc.com
Fanfare - 35	www.fanfare.com
Freeland Products - 11	www.freeland-inc.com
Gorman Redlich - 15	www.gorman-redlich.com
Harris - 48	www.broadcast.harris.com
Henry Engineering - 2	www.henryeng.com
Inovonics - 1, 5	www.inovon.com
Jampro - 36	www.jampro.com
JK Audio - 9	www.jkaudio.com
Kintronic Labs - 9	www.kintronic.com
Larcan - 25	www.larcan.com
LBA Technology - 37	www.lbagroup.com
Lightner Electronics - 21	www.lightnerelectronics.com
Micro Communications - 23	www.mcibroadcast.com
Moseley - 16	www.moseleysb.com
NAB - 47	www.nab.org
Nautel - 28	www.nautel.com
Nott Ltd. - 10	www.nottltd.com
OMB America - 23	www.omb.com
Omnia - 39	www.omniaaudio.com
Orban - 48	www.orban.com
Peter Dahl - 21	www.pwdahl.com
Phasetek - 13	www.phasetekinc.com
Prophet Systems - 27	www.prophetsys.com
PTEK - 19	www.ptekpower.com
Pristine - 25	www.pristinesys.com
RAM Broadcast Sys. - 17	www.ramsyscom.com
Radio Systems - 27	www.radiosystems.com
RCS - 30	www.rcsworks.com
RF Specialties - 41	www.rfspec.com
Satellite Lynx - 15	www.satellitelynx.com
SCMS Inc. - 19	www.scmsinc.com
Shively Labs - 41	www.shively.com
Sine Systems - 10	www.sinesystems.com
Telos - 29	www.telos-systems.com
TFT - 34	www.tftinc.com
Tieline - 5	www.tieline.com
Transcom - 34	www.fmamtv.com

From Our Readers

Dear RG:

The Tool Guide article on page 40 of the December issue of **Radio Guide** says that MCM stands for "Mill Circular Mill," which is only partially right. It's an ancient misnomer of an abbreviation that really translates to "thousand circular mils."

A circular mil, contrary to the next sentence, has nothing to do with square millimeters – it's not even a metric measure. It's actually the area equivalent to a circle whose diameter is 0.001 inch.

Scott Johnson

Radio Guide replies:

You are right, Scott. A few years ago the NEC changed the designation from MCM to kcmil. However, the term MCM still seems to be the first choice among many electricians and electrical supply houses.

Practically speaking, the terms MCM, kCM, and kcmil all mean the same thing: one thousand circular mils. And you are correct – it is *not* a metric measurement.

For example, a wire diameter of 750 kCM or 750 kcmil is identical to the older expression of 750 MCM in which the first "M" stands for one thousand.

Dear RG:

I love what you've done with Radio Guide and had to tell you. There are more and more articles I want to read, and so much good information. Keep up the great work.

My only complaint is with the snail's pace at which the post office delivers **Radio Guide**.

Steve Tuzeneu – Manager/Engineer
WNEB-WVNE

Radio Guide replies:

Unfortunately the USPS delivery system is occasionally a bit erratic. We can assure you that all **Radio Guide** issues are mailed out at the same time.

Check out our website, www.radio-guide.com, where we post a complete PDF of each issue. These PDF's are identical to print versions we mail each month.

KinStar AM Antenna Approved for US Markets

According to Kintronics, due to its size the KinStar low profile antenna does not require any special painting or lights to be in compliance with FAA requirements.

The KinStar low-profile antenna requires five or nine vertical supports that may be wooden utility poles or guyed, lattice masts depending on the frequency of operation and a 120-radial quarter wave ground system. To achieve the desired efficiency it is necessary to have sufficient land area to accommodate a full 120-radial quarter-wave ground system.

KinStar technology utilizes a large cross-section multiple-element vertical commoned feed with extensive symmetrical horizontal top loading to achieve a low-Q load impedance, which is atypical of low profile antennas. This is the key to achieving wideband performance for the new digital audio broadcast technologies that are now being implemented worldwide.

Based on its review of KinStar field tests and submitted reports, the FCC will not routinely require the submission of a proof of performance, current distribution measurements or a formula for the vertical plane radiation characteristic for non-directional AM stations that implement the KinStar antennas.

Field tests and computer modeling indicate that the antenna produces an essentially omnidirectional radiation pattern in the horizontal plane. The developers' tests also show that the KinStar antenna meets the minimum efficiency for Class B, C and D stations. Applicants may only specify the KinStar antenna for nondirectional use.

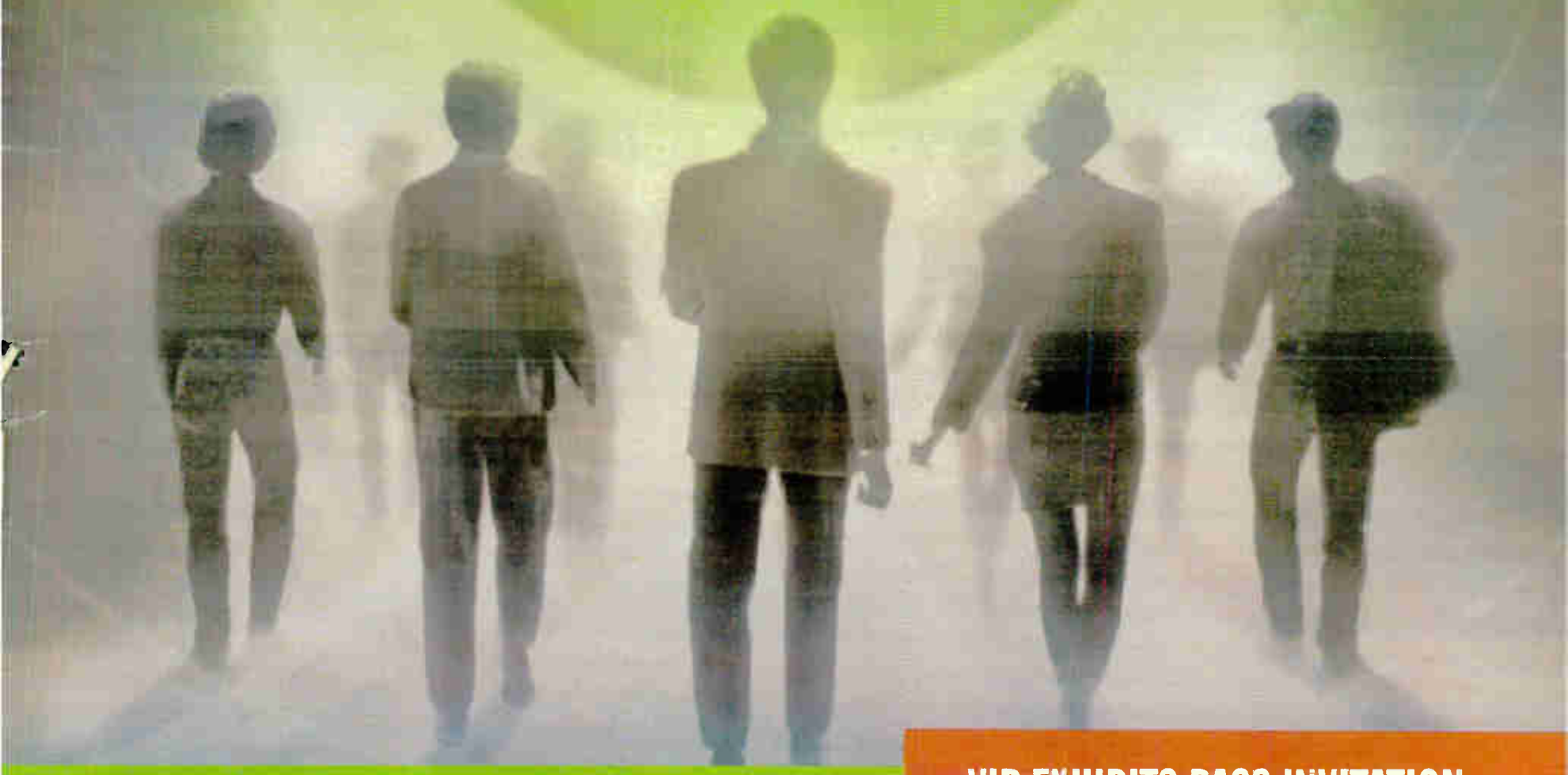
"The fact that the FCC has adopted the new KinStar technology without requiring additional new measurements is a clear indication that all of our data and computer modeling results were able to be duplicated and verified," said Tom King of Kintronic Labs.

The KinStar antenna was named "One of The 100 Most Technologically Significant New Products of The Year," in 2003 by Research & Development.

Kintronic Laboratories
Phone: 423-878-3141
Web: www.kintronic.com

IMMEDIATE FUTURE

IMMEDIATE EDUCATION IMMEDIATE INSPIRATION IMMEDIATE INNOVATION



YOUR FUTURE STARTS HERE. In the fast-paced world of electronic media, only NAB2006 delivers the technology, training and business strategies that today's industry leaders need to stay on top.

More than 100,000 visitors from 130 countries come to experience comprehensive business and technology insights and innovations covering every aspect of audio and video content production, management and distribution across all forms of media.

When it happens in the World of Electronic Media, it happens here first.

VIP EXHIBITS PASS INVITATION

Register today to take advantage of this exclusive NAB2006 offer — **valued at $150!**

1. Go to **www.nabshow.com** **2.** Select Register Now
3. Select VIP Exhibits Pass **4.** Enter Source Code: **MA37**

NOTE: This pass is valid for free admission to the NAB2006 Exhibit Hall if used to register **before April 19, 2006. After April 19,** registration must be made on-site at the Las Vegas Convention Center and a processing fee of $20 will be applied.

NAB2006

THE WORLD'S LARGEST ELECTRONIC MEDIA SHOW

CONFERENCES: APRIL 22-27
EXHIBITS: APRIL 24-27
LAS VEGAS CONVENTION CENTER
LAS VEGAS, NEVADA USA

WWW.NABSHOW.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