# Radio Guide

Radio's Technology Resource

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October 2003

Volume 11 Issue 10


# Investigating Radio's Roots: What *Did* Marconi Hear?


**Guglielmo Marconi (1874-1937) at work in the wireless room of the yacht *Electra*.**

## *The World's Most Heralded Radio Failure*

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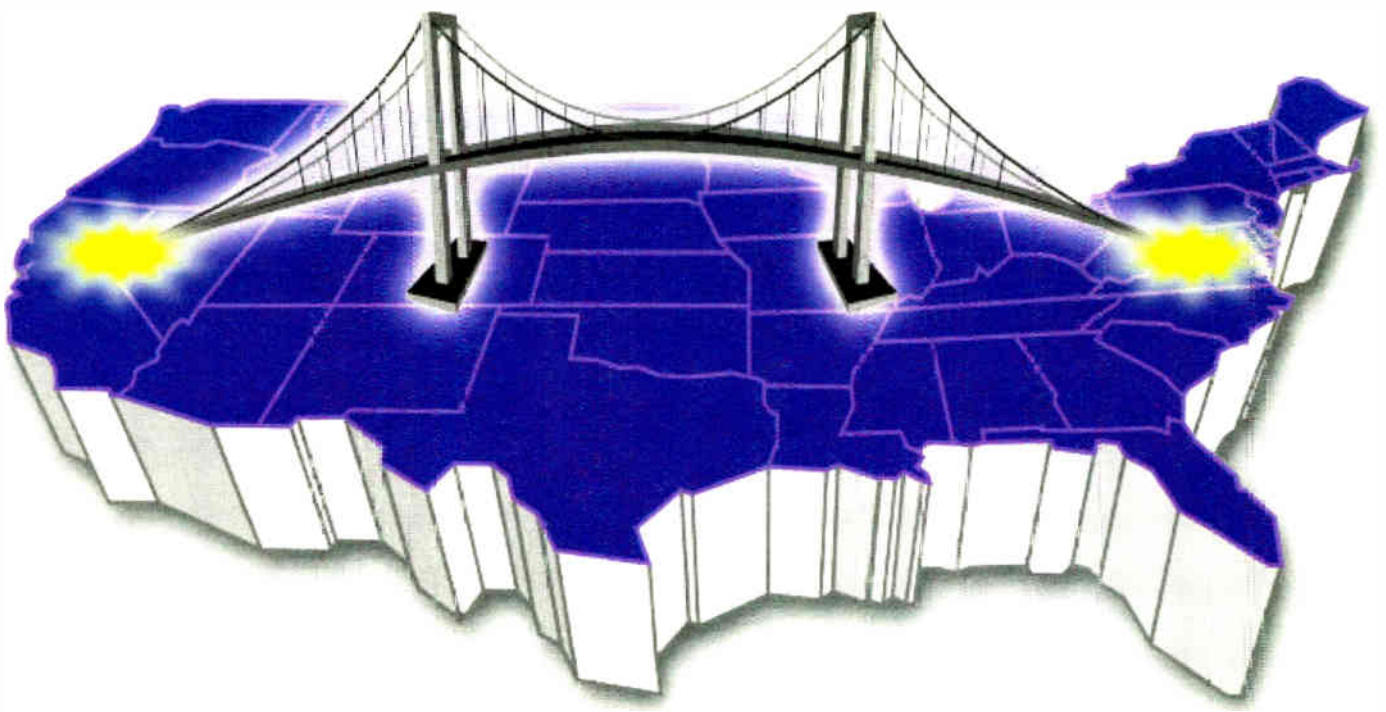

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# Columns & Articles


# Radio Guide

Volume 11 Issue 10
October 2003


## What Did Marconi Hear?

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For many, doubting Marconi's claim is technical heresy, but a few nagging details have never been validated.

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## Audio Processing – Part 10

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## WLW & VOA Honored

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## Fall Is In The Air

As we go to press, the fall Show Season is already underway. So many shows, so little time!

Of course, each one will lay its claim to being *the* important convention/show to attend. The NAB Radio Show in Philadelphia, the long running Madison Broadcaster's Clinic, many state association conventions, as well as regional and national SBE conventions. There is even an AES shoehorned in there.

While attendance at some of these has remained strong, others have suffered from the sheer number of shows, and the costs in getting there (which include having someone available at home for those emergencies). Many corporations have reduced travel budgets, and in some cases either discourage attendance, or actively tell their engineers not to go to some shows.

If it were just a matter of cost cutting in a difficult time, it would be easier to understand this mentality. But engineering seems an easy target for bean counters – engineers are told to do more with less. Although some SBE chapters have strong programs with manufacturers or reps displaying and discussing their products, serious continuing education, or even the opportunity to see, touch, and discuss new equipment seems for many engineers to be more a dream than reality,

One recent trend that appears to be helping is the "Road Show" concept. There are a couple of them already making their way around the country. Larry Bloomfield's annual "Taste of NAB," and the "Orban Road Show" are but two of them. While there is definitely a commercial aspect to these shows, they do bring the technology a lot closer to the working engineer.

What would you like to see in your area that would enhance your skills? Let us know. In turn, we can help the suppliers know better how to serve you. The address is editor@radio-guide.com

# Radio History

## What is This Thing Called Broadcasting

### *The World's Most Heralded Radio Failure*

by Donald E. Kimberlin, NCE

*[LANDIS, North Carolina - October 2003]* Much of today's world is blithely ignorant about the origins of the "wireless" devices that have such an impact on our life and society. On the other hand, educators and archivists have ingrained in their minds this "fact:" Guglielmo Marconi spanned the Atlantic Ocean with radio signals on December 12, 1901 at 12:30 PM Atlantic Standard Time. Marconi told the world he heard the Morse Code letter "S" transmitted from Poldhu, on England's Lizard peninsula, near Land's End.

That Marconi must have succeeded has long been taken as an article of faith and reinforced to succeeding generations by those presumed to hold the truth of the matter. Details are widely published and accepted, and the claimed feat has been memorialized with monuments and even commemorative stamps and coins. Indeed, for many, doubting the veracity of Marconi's claim is technological heresy.

**Marconi (far left) on Newfoundland**

#### WAS IT REALLY SO?

However, a few nagging details have never been validated. First, no one who could be called an impartial observer was present at the claimed feat. The only other person at the receiver in Newfoundland was George Kemp, Marconi's close personal assistant of several years. Second, Marconi himself could not state with certainty just how the signals could have reached the 2,100 miles across the Atlantic.

Furthermore, little was known then about radio wave propagation. Details like frequency, power level and antenna efficiency were not measurable at the time, and no detailed drawings or specification documents exist from which to reconstruct such facts.

This article does not claim Marconi to be a hoax. Indeed, Marconi probably did believe he heard the Morse "S" across the ocean. Still, there is now reason to believe Marconi heard something similar, but not the actual signal he wanted to hear.

#### EARLY DEVELOPMENTS

If it had not been for Marconi's Irish mother, Annie Jameson Marconi, radio and wireless likely would have followed a different path. When young Marconi succeeded in 1895 by sending a meaningful signal over a hilltop to his brother on the family estate in Bologna, it was Annie Marconi who realized her precocious son was onto something important. First, she sent her son to the Italian post office to offer his discovery.

However, in typical bureaucratic fashion, the teenaged Marconi got his first hard life lesson. Italian government employees hit him with the same questions that have daunted innovators since time began: "Who are you? What are your credentials? Who sent you here? Why should we pay attention to you?" and so on. They could well have kept matters to themselves, pushing any development in typical bureaucratic fashion.

When young Marconi described his reception to his mother, she decided to take him to England where the Jameson relatives (of Irish Jameson whiskey fame and wealth) had money and influence. Nevertheless, on arrival in England a skeptical British government customs inspector took one look at the youthful Italian, eyed his baggage full of electrical items, and asked "Are you a terrorist? Is this material for a bomb?" Marconi's mother is reported to have said at the time, "It's not a bomb as you understand it, but it will blow down walls between men." Such was the resolve forming in the Marconi mind.

Once in England, the Jameson influence did work, but not as hoped. Everyone seemed interested, but no one would join in the effort. Young Marconi was sent here and there to demonstrate endlessly, proving over longer and longer distances, and to try to overcome skepticism and denial at every turn that his innovation had practical value. Or, as he also found, whatever he sought to commercialize was something to which the government laid claim.

He finally found the government had no claim to merchant shipping on the high seas, and began to develop wireless for shipboard use. From that emerged the Marconi Wireless Telegraph Company, one of the few business entities Marconi would be able to retain as his own over many years. However, in those early years, it was not very profitable. Clearly something else was needed.

#### MARCONI'S NEED FOR SUCCESS

In 1901, at the end of five years of whirlwind development and demonstration, Marconi had gone through two rounds of family financing, and a refusal of the Jameson interests, to pour more money into young Marconi's seeming toy seemed ever more likely. Meanwhile, government subsidized wireless developers in other nations were making slow but steady progress. If Marconi did not have a "hit" – and a large one – soon, his budding empire might fail financially.

His wireless experimentation and shore station building placed him in close proximity to the then fabulously wealthy and successful submarine telegraph cable companies. In both England and Ireland, these had managed to evade government hegemony because their geographic reach and capital expense went beyond that of governments.

In mid-1901, when he found signals from his Poldhu transmitter in England were received very strongly at his Crookhaven marine station in Ireland, he realized sending international telegrams by radio was a business at which he could economically enter and undercut the submarine cable companies. Secretly committing 50,000 Pounds Sterling (approximately 3.1 million Pounds or 5 million US dollars in 2003 money) to his project, Marconi set about to build a wireless station on Cape Cod.

Even the forces of nature seemed against his endeavor. Winds at Poldhu and Cape Cod blew down the wooden antenna structures on both side of the ocean. A simpler replacement structure was built hurriedly at Poldhu and Marconi decided to try a last minute receiver rig with a long wire antenna flown from a kite in Newfoundland.

It was December, and frozen gales were blowing atop the barren bluff called Signal Hill overlooking St. Johns, the town where many of the transatlantic telegraph cables landed. Still, it was convenient for Marconi to send cablegrams back to Poldhu to coordinate the tests. (Of course, the cable company employees could read and report every action of this potential competitor to their superiors as well.)

In a small, unheated barren room of a derelict military hospital atop Signal Hill, Marconi and Kemp kept a listening watch with earphones on the schedule they set via cablegram to Poldhu. At Poldhu, Ambrose Fleming (later to become famous in his own right for inventing the thermionic diode vacuum tube) was keying the single Morse Code letter "S" on schedule.

#### THE MYTH DEVELOPS

After some days, no signals had been received. Failure seemed imminent. Marconi kept trying different arrangements of the few simple pieces of apparatus. Finally on December 12, he removed components that would have amounted to a low pass filter, and shortly after mid-day, he heard what he thought was a Morse "S" in the earphones.

From his account, it would seem what Marconi heard was an HF component or components of the Poldhu signal. If it could be assumed the path had been working previously, then higher frequency signals must not have been getting through the effective filters of the Newfoundland receiver. In other words, Marconi (and Kemp) must have heard some sort of "shortwave" signals that day.

Because everyone wanted to believe, a rationale developed a few months later. American physicist Arthur Kennelly theorized in early 1902 that perhaps Marconi had some signal reflected off an ionized layer in the upper atmosphere. (No one *really* knew how to calculate path losses nor what ionospheric "skip" propagation was.) Oliver Heaviside in England concurred with the Kennelly theory, and the rationale that Marconi *must* have heard some HF components was generally accepted.

Marconi and Kemp were certain they heard the three dots of Morse Code "S" that day. And the mythical theory has been taught as a canon of technology ever since. But no one has taken the time to see if indeed an HF radio path existed on the famous day.

#### A SECOND LOOK

Many years later, Marconi estimated the frequency of the Poldhu transmitter was somewhere in the range of the lower end of today's medium wave AM broadcast band. With what we know about lower frequency propagation today, any groundwave signal would have attenuated down to a few picovolts, a signal that would challenge even the most modern of receivers to pick up out of natural noise.

Using a photo of the Poldhu transmitter antenna, current-day antenna specialists confirm this, estimating it was a rather effective low-pass filter cutting off everything exceeding about 850 kHz. Thus, even if the Poldhu spark created all the spurs and harmonics we are told spark transmitters generated, only those signals below 850 kilohertz would have been radiated anyway. There would have been no HF "shortwave" components to "skip" across the ocean!

But over the years, the academic community has not taken into account a major fact about December 12, 1901: It was the lowest of "low days" for solar activity needed to create skywave "skip" transmission across the Atlantic on *any* frequency.

In fact, the sunspot count on that fateful day was zero, leaving the solar flux at its background level of 64. Try any of today's HF propagation programs to see if you could get a path between Poldhu and St. John's with a zero sunspot count. It would not work even if you did have a transmitter radiating some HF signals.

Furthermore, you can forget about "grayline" propagation, too. At 12:30 PM Atlantic Standard Time on 12/12/1901, neither a short path nor a long path "grayline" was in reach of Newfoundland, and it was only marginally approaching Poldhu.

Like the propagation issue, the grayline one can be readily seen by setting the clock of a grayline program to the famous day and time.

(Continued on page 6)

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# Radio History

## *The World's Most Heralded Radio Failure*

*Continued from page 4.*

### WAS MARCONI A HOAXER?

In a word: no. Lawyers tell us witnesses do not lie. They do, however, selectively use to their memories to create the story that suits their belief. It is the prime reason the Vatican runs such long and detailed investigations of claimed miracles; not because people want to hoax the church, but because they can believe so strongly they create a whole story out of distorted facts.

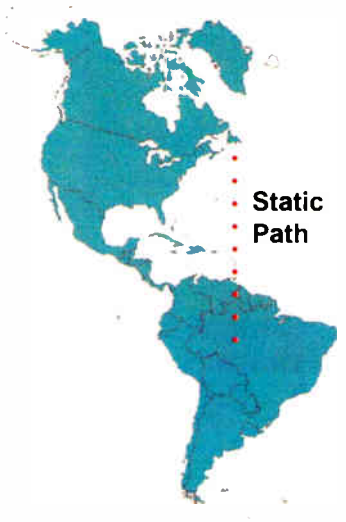
Here is a fact usually ignored by the perpetuators of the Marconi Myth: To conserve his dwindling resources, Marconi had Fleming purchase the largest *used* alternator available for Poldhu. Concerned and fearful of damaging this unit, they tuned its spark gap to the shortest possible duty cycle. This meant the sound of the Poldhu transmitter was *not* the characteristic "buzz-buzz-buzz" we are taught to expect of spark transmitters, but rather Poldhu produced a "click-click-click" like a wireline telegraph sounder.

The sound Marconi and Kemp were listening for was three clicks, not three buzzes! And three clicks were the sound they heard. But the three clicks could not have made the trip from Poldhu to Newfoundland. There simply was not a radio path for such signals between those two places on the planet on that day at that time! I do not doubt Marconi heard something. But it was not transmitted from Poldhu.

However, there was a source of "click" sounds existing on 12/12/01. It existed then, before then and exists to this day. It is the approximately 8 million lightning discharges occurring worldwide every day. At any given instant, there are an estimated 1,800 thunderstorms occurring around the world. We all have heard the crashes and sometimes clicks heard from lightning.

Moreover, the nature of lightning is of a rapidly pulsating spark producing noise from LF well up into the HF spectrum. (Indeed, we today notice "static" from lightning in VHF television channels 2 through 4, meaning up to 70 MHz or so.) This means we can expect and do find undesired HF artifacts of static propagating around the world to great distances, just as do desirable HF radio signals.

Such static heard on a "shortwave" receiver may have originated on the other side of the earth. More likely, the HF static crashes and clicks we hear are transiting some better, easier path. In terms of HF radio, those better, easier paths are north-south paths, not the east-west path Marconi was hoping to use between Poldhu and Newfoundland.




Similarly, the HF static we hear likely originates from one of Earth's three major lightning storm epicenters: Southeast Asia, Central Africa, or Amazonian South America. Hence, it is very likely Marconi heard that, too, because a brief look at the map shows Newfoundland is directly north of the South American lighting epicenter!

### SUMMING UP

So, the final answer is no, Marconi did not hear his Poldhu transmitter on December 12, 1901. What he most likely *did* hear were clicks from lightning originating in Amazonian South America, a place situated for perfect transmission of the shortwave components of lightning static to Newfoundland.

Marconi's claim also violates one of the principal laws of scientific reporting: He was never able to reproduce the results. In fact, it took several more years for Marconi to successfully make a reliable, reproducible wireless link across the Atlantic. To do so, he had to reduce the transmitting frequency twice, from the approximately 800 kHz of 1901, to attempts in the 100 kHz range – to finally build a link that operated at 30 kHz in 1906, using monstrous 300 kW transmitters at Clifden in Ireland and Glace Bay in Nova Scotia.

Marconi was no charlatan. He was no hoaxster. On 12/12/1901 he desperately needed a success, and on 12/12/1901 he honestly believed he had achieved it. Neither Marconi nor anyone at the time could have suspected there would be another "signal" sounding like the one he wanted to hear, much less where it would have come from or how it would get to Newfoundland.

We have since learned all those things and more about the nature and management of radio waves. For that, we owe Marconi eternal gratitude for the spread of industries and technologies his dynamism and efforts spawned in such a short time. If there had been no Marconi – if radio had developed at the hand of governments, which would have been its other course – it might have taken many decades more for us to reach the level of productivity, economy and convenience we all enjoy with "wireless" today.

**References:**

You can read more about how later technologists have analyzed Marconi's 1901 transatlantic radio attempt at:

http://www.telecommunications.ca/Edited_Manuscript.pdf "A Radioscientist's Reaction to Marconi's transatlantic Wireless Experiment - Revisited, by John S. Belrose, a leading radio investigator. This paper contains numerous excellent further references as well.

If you would like to see for yourself what the radio paths were like on December 12, 1901, download the excellent program W6Elprop, which is a Windows version of the rather famous Miniprop by the same author. Get W6Elprop free at: http://www/qsl.net/w6elprop/ (simply put in 0 for the sunspot count or 64 for the solar flux on 12/12/1901.

*Don Kimberlin is a NARTE Certified Engineer, based in Landis, NC. He has written on many technical topics, both current and historical, and loves to go hunting for history. You can reach him at donkimberlin@earthlink.net*

# Full Duplex

## What Else to Say to Get What You Want

*by George Nicholas*

*[CEDAR RAPIDS, Iowa – October 2003]* We are working our way through "The Ten Commandments of Change," suggested by Sam Deep and Lyle Sussman, authors of *What to Say to Get What You Want*. This time, we will finish six through 10, and provide some ideas on dealing with difficult people.

### COMMANDMENT 6: ADAPT YOUR APPROACH TO THE PERSON

If there is one chapter that makes this book worth $15.00, this is it! Just a show of hands, how many of you have to deal with a "difficult" person in your job? I thought so! This Commandment suggests we direct attention to the behavior we want to change. Difficult people tend to get the best of us because, during a confrontation, we often become self-centered and retreat. Or, we deal with every difficult person the same way, and assume all difficult people give us difficult problems.

Three basic strategies deal successfully with difficult behavior. First, concentrate on improving the behavior instead of protecting your ego. Take yourself out of the situation and focus on the problem, not the people involved. Letting the other person get under your skin is their way of "winning;" that will not happen if you refuse to let matters get personal.

Second, adopt unselfish attitudes, even if it feels counter-intuitive. Try to "kill with kindness." Even though the guy was – and remains – a jerk, if you are kind to him, he typically will respond in a less hostile mood. Acknowledge the validity of other people's feelings.

Notice, I did not say agree with them. You can still acknowledge the problem, but do not take a position. Doing so only perpetuates the problem. Third, understand the causes of, and how to respond to, the classic types of difficult behavior.

### COMMANDMENT 7: PROVIDE FOR DIGNITY AND SELF-RESPECT

Everyone has the need and the right to feel good about themselves. If we violate this, we fail to move others. Or we move them in unintended or unwanted directions. Belittling or degrading others may invite retaliation or sabotage. Rarely does one intend to violate this Commandment. But, a manager trying to improve performance of an employee often can push too hard and end up affecting the person's dignity and self-respect.

The typical reasons cited are: we do not respect ourselves; we have an inflated view of our own importance; we give lip service ("he promised – and he lied!") and we think in the short term. If you are guilty of violating this Commandment (most people recognize when they do it), examine the roots of your "dignity-robbing" behavior.

The simplest way to change is to adopt the Golden Rule and live it: "Do unto others as you would have them do unto you." These are very powerful words, especially when the majority of your co-workers believe in them. View others as an integral part of your success. Convince them you realize how important they are, that there are no "little people" in the organization, and your success is dependent on their success.

> THE SIMPLEST WAY TO CHANGE IS TO ADOPT THE GOLDEN RULE AND *LIVE IT.*

### COMMANDMENT 8: APPEAL TO SELF-INTEREST

Provide sensible reasons for people to change. How will they benefit? What are the costs – and consequences – of not changing? People move when they believe it is in their best interest to do so. The problem in getting someone to change is not that they refuse to move, it is that you have yet to figure out how to make the change appear to be in the person's best interests. Have we defined the situation inaccurately?

In appealing to another person's self-interest, think in *their* terms: "What's in it for *me*?" Realize their perspective is neither irrational nor obstinate, and until your desire to move the other person becomes stronger than their desire to maintain status quo, no progress is made. Recognize what needs motivate people and help them fill those needs. Before making demands, determine those needs. An ultimatum is used when no other strategy works, a last resort indicating a failure to communicate.

### COMMANDMENT 9: REJOICE AT SUCCESS

Be happy when other people change in response to your needs. Look for opportunities to acknowledge other's improvements. Praise performance. True, some people are uncomfortable giving praise, and some are uncomfortable receiving it. The solution is to "praise (or condemn) the deeds, not doers." The bottom line is to communicate when change occurs.

### COMMANDMENT 10: CUT YOUR LOSSES WITH REMORSE, NOT GUILT

Have realistic expectations of what you can accomplish in changing the behavior of others. Do not accept guilt for the failings of other people; instead, leave the responsibility for change with them. Give them enough time to change, but if they do not, distance yourself physically and mentally. This Commandment is really more for managers, but as an employee, you should be aware of these signs to recognize when you are in a dangerous area.

Those are the "Ten Commandments of Change." While you may not use all ten at once, utilizing some or all of them will help you to deal with others more effectively.

Would you like to know more about handling "difficult" people? In our next Full Duplex, we will highlight some of the more common types and give you tips on what to say – and avoid saying – to get what you want!

*George Nicholas operates George Nicholas Communications, specializing in technical and communication consulting throughout the US. You can contact him via Editor@radio-guide.com*

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# Planning Reliable Power Systems

## *Generators and Other Back-Up Power for Your Station*

*by Dana Puopolo*

*[SANTA MONICA, California - October 2003]* At one time or another, we have all experienced a loss of power due to storms, knocked down utility poles, etc. Last month we discussed the August blackout that knocked out power for over 50 million people in North America in dozens of cities. Other big blackouts include one in California a few years ago.

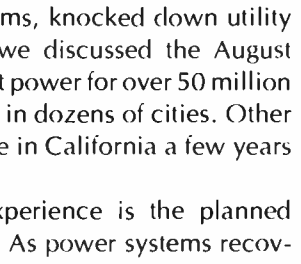
A new variety of experience is the planned (rolling) power blackout. As power systems recovered from the August blackout, planned blackouts continued for a week or more. A couple of years ago, in the midst of deregulation, a rash of them happened in California. Count on them becoming part of power supply planning even more in the future. How does a broadcast facility cope with power supply problems? Our goal is to provide some useful answers to help you plan ahead, before the power goes out.

### GENERATOR POWER

When we talk about power failures, the first thing that comes to mind for many is the emergency power generator. These come in an almost infinite array of sizes, shapes and fuel types. The most common is the small portable gasoline powered generator, ranging in size from 500 watts to about 10 kilowatts. The smaller models (in the 500 watt - 1 kW range) can literally be carried by one hand, are very light and inexpensive. Many stations use these for running PA amplifiers, RPUs, TVs at remotes, etc. They are also ideal for powering test equipment in a stationary vehicle.

Small generators can be very quiet. Many ham operators own these for emergency communications uses. Generally, these small units provide only 120 volt outputs. Larger generators will usually have both 120 and 240 single phase outputs (some even have 12 volts DC available for lights, charging batteries, etc.), but are heavier and bulkier, though some have wheels attached, making them easier to move. The noise outputs of these units can vary from whisper quiet to as loud as a loud lawn mower.

Most generators under 6 kW use single cylinder engines (one spark plug). Generally speaking, a 5 or 6 kW unit can run a small studio room (without air conditioning) or a 1 kW solid state AM transmitter or a 2.5 kW FM transmitter. Since these units are cheap (a 5 kW unit usually costs under $500.00 at a place like Home Depot), many stations have at least one on hand. They are good for the occasional loss of power, but are not designed for industrial back-up use. They also have small fuel tanks that need refilling quickly.



### MORE POWER

The next level of generator is the industrial grade unit. These vary in size from about 7.5 kW literally up to the megawatt range. They usually are three phase units, though single phase is also available. These units generally are electric start, as opposed to the "pull rope" start used on the smaller units described above. This allows them to be used in unattended locations such as a transmitter site. When installed with a properly configured power transfer switch (more on this later), the loss of utility power will start up the generator and transfer the load over to it without any human intervention. All this usually happens within a few seconds, so in many cases listeners will only hear a slight "glitch."

Many of the mid-sized generators run on diesel fuel, though natural gas, propane, gasoline and kerosene are also used. This type of generator is designed to run continuously for days, so most diesel and propane generators have external tanks, though many diesel generator fuel tanks are located in the base of the unit. Unlike the smaller units described above, most can also be fueled while the unit is in operation. Perhaps better, natural gas generators are connected to the utility gas feed, which means an unlimited supply of fuel is available (unless of course, this supply gets interrupted in some way; earthquakes for example have been known to damage buried gas pipes).

These generators are not cheap; a 15 kW unit –enough to power a couple of small studio rooms or the typical class "A" FM transmitter site minus tower lights – can cost upwards of $10,000 installed. The cost of a unit to run a class "B" or C" FM site or full studio can be several times more. Additionally, these types of generators actually require regular utility power even while not running, for engine warmth, glow plug warming, battery maintenance, etc.

### LOTS OF POWER

A final type of generator is known as a "primary power" generator. These units are designed for continuous use where utility power is not available like mountaintop locations, islands, etc. Usually these are installed in pairs with the second unit either another primary power unit or, in cheaper installations, an industrial type unit. The reason for this is essentially to have a back-up generator for the generator.

These units are usually on regular maintenance schedules, where the back-up generator is put on line while the main generator is taken down for service. In the case of paired primary power generators, it is common to cycle the units on a daily or weekly basis to even out wear and tear between both units. Again, these units can range in size from 7.5 kW up to the megawatt range – and they are very expensive.

An important aspect of any back-up installation is arranging a way to transfer power from the utility feed to the back-up (generator) feed. This is usually done with a transfer panel; these are available in both automatic and manual types.

Many older manned studios have a manual type of transfer switch where the operator must press a button to start the generator and then manually throw a switch to transfer the load over to the generator.

This is generally thought to be obsolete by 2003 standards, replaced by an automatic transfer panel that does both tasks without operator intervention. Of course, the purchase and wiring of a transfer panel can easily cost as much as a generator purchase and installation. This is due to the need to use a licensed electrician, permitting, etc.

### PLANNING AHEAD

If you are doing a studio build out, it makes good sense to plan ahead for an emergency generator even though you might not be installing one at first. Since powering the entire building is generally not cost effective, the back-up power systems normally power only certain mission-critical equipment in the building. To ensure the back-up power gets to this equipment, it all must be wired through a sub panel separate from the other station power wiring. It is much cheaper to do this during a build out then after the electrical wiring is already installed.

Similarly, at the transmitter site, the generator is used to feed the transmitter itself along with necessary racks for audio processing, remote control, STL, etc. On the other hand, most stations do not plan for powering tower lights with the generator. Lights – especially those on a directional array – can easily draw as much or more power than the transmitter. Instead, they simply call the FAA and report the tower lights out. (As an aside, remember it is your responsibility to always call the FAA whenever your tower lights are out for over 30 minutes. This means then they need to be called during any extended power failure. I wonder how many stations forgot to do just that during August's power blackout.)

In planning ahead, take the time to carefully analyze the loads you need to keep running during a power outage. Generally the on air studios need to be powered (including air conditioning, if you cannot open the windows). Since every studio is unique, studio power needs will vary from minimal (for a small booth) to substantial (for a studio designed for multiple people with lots of auxiliary equipment). Also, it is necessary to plan to power other key areas such as the rack area and the server room if a digital playback system such as Prophet, Scott, AudioVault, etc. is in use.

Just as important as having power is making sure the power that reaches your gear is clean. All digital equipment used for broadcasting (the various audio and file servers, remote controls, EAS, telephone system controllers, etc.) should be put on Uninterruptible Power Supplies (UPS).

You do not want these units to be damaged by voltage sags, power surges, disk failures, data losses, etc. Neither do you want any of these systems to lose their programming from an extended power failure – for example, some phone systems can take days to reprogram. The best way to prevent this is to plan for UPS power as part of the power system.

At the transmitter site, it is also prudent to use UPSs on the remote control system at least, so you can see what is happening, as well as having the ability to ... control. Also useful is putting some type of time delay on your transmitter to make sure it comes right back on (without any warm up time delay) if the power comes back on within 30 seconds.

Finally, in addition to auxiliary power, it is worth a brief mention that some stations opt for the use of an auxiliary site. A low power transmitter system close in, perhaps on the studio or other central building, will give at least some coverage while power is being restored.

Looking ahead, next time we will tie all these thoughts together to produce a viable backup power system.

*Dana Puopolo has been a broadcast engineer for over 30 years, building, operating and maintaining radio and television plants of all sizes. He can be reached at dpuopolo@usa.net*

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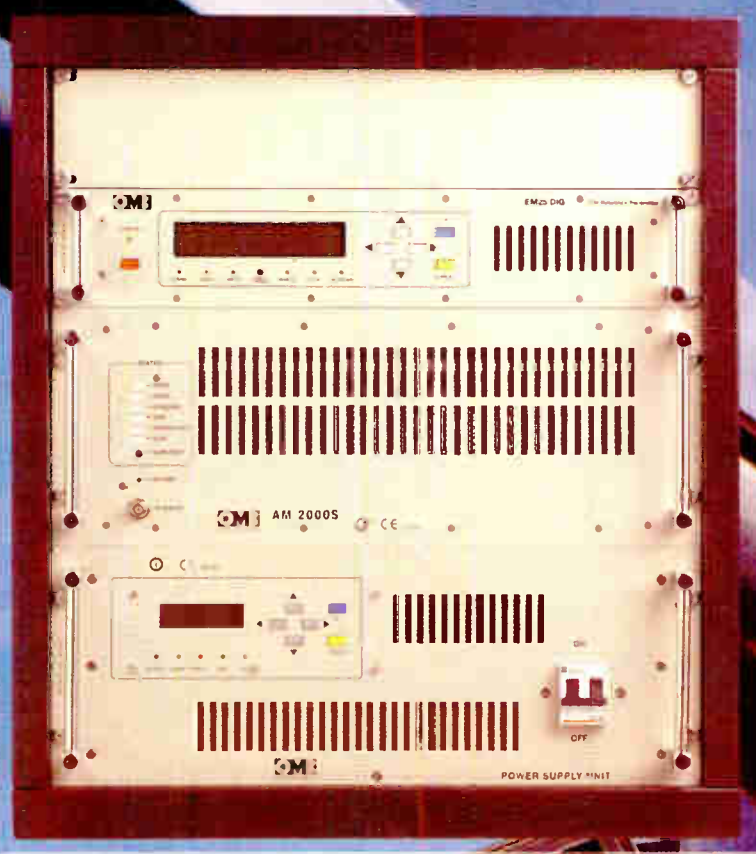


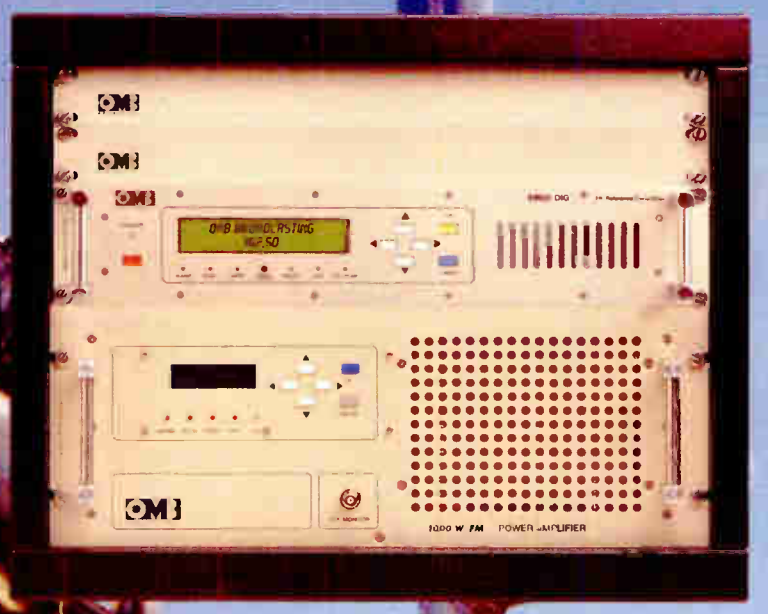


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# Audio Processing From the Ground Up

## *Part 10 – What is That Masked Audio?*

by Cornelius Gould

*[CLEVELAND, Ohio - October 2003]* This month we want to delve a bit into how audio data bit-rate reduction works by looking at how a couple of these systems work. Using some of the basic information available about them, we will see how standard audio processing can either hurt or help your cause in getting the best performance from them.

Some of this comes from speculation built on what I have been able to learn about the specifics of CODEC operation, and from observing what I see and hear. Why speculation? Although many of them seem to conceptually share some commonality one way or another, it is really hard to know *exactly* how the designers of the bit reducing codecs do what they do in exact detail because most of the technology behind any particular system is a closely guarded secret.

When faced with such unknown variables, I draw conclusions based on observations. I will warn you when my conclusions are of this speculative nature. If you have additional insight you want to share, feel free to contact me using the information at the end of the article to share your thoughts!

### MORE ROCK AND PIN

You may recall the rock and the pin from last month's article. Remember the analogy where we dropped a hypothetical rock and pin onto a table at the same time? We described how the sound of the rock hitting the table is much louder than that of the pin – so much so that we only notice the sound of the rock.

There are a couple things going on here. The first is pretty obvious: The loud bang of the rock drowns out the pin. The second is not necessarily so obvious. The audible frequency content of the pin hitting the table and those of the rock are close to each other. Actually, the rock makes a broad range of sounds that are basically in the middle of our hearing range, while the audible signals the pin gives off reside somewhere in a narrow range inside all the chaotic noise the rock makes as it hits the table. These two conditions make it virtually impossible to hear the pin in our scenario.

This analysis of the noise made by the rock and the pin sets up this month's discussion of how bit rate reduction using perceptual audio coding works. If you get lost, just refer back to the rock and pin analysis, and you will get the picture – or in this case, the sound!

We can start by examining a CODEC we all come in contact with on a daily basis in one form or another, and pick it apart: MPEG II layer III, or MP3 as it is more commonly known these days. While the exact "nitty gritty" details of exactly how this codec works are hard to find, there are some pieces of information out there that pretty much paints the picture needed to understand it. (By the way, digital audio that is *not* bit rate reduced is referred to as "linear." This is the quality of audio you get from CDs, DAT Machines, "uncompressed" digital STLs, etc.)

### INSIDE MP3

Much of the magic behind MPEG and many other CODEC's out there is performed by analyzing the audio spectrum looking for situations such as the one we described with the rock and pin. In the case of MP3, it splits the audio spectrum into about 500 bands of frequencies.

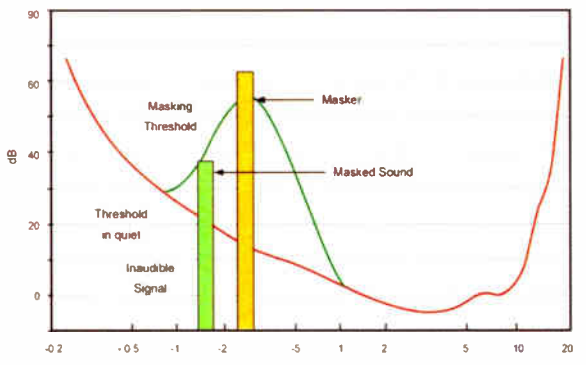
Using a sophisticated model of how the human ear works, the CODEC tries its best to find situations where there are signals present which can be removed because of what we call "spectral masking." In the case of the rock and pin, the frequency content of the rock acoustically "masks" that of the pin. With 500 bands of audio data, the MP3 CODEC tries to predict where these situations occur within the audio spectrum of everyday audio – including those of the rock and pin.

Another masking technique used (more than likely coupled tightly with spectral masking) is "level masking," where not just the frequency relationship of parts of the audio are taken into account, but the *level* at which certain sounds exist. Since humans typically notice the loudest sounds, most subtle (really quiet) sounds are not even heard. When there are loud "overbearing" sounds present, we "lock into" those and basically ignore (for a moment) those quiet sounds.

With that basic overview in mind, we can simply say the perceptual CODEC uses researched models of human hearing written into a form of software. The CODEC uses these models to interpret what the frequency data from the 500 bands of audio and level masking means to a human listener, and then determines what data to remove in the least objectionable manner.

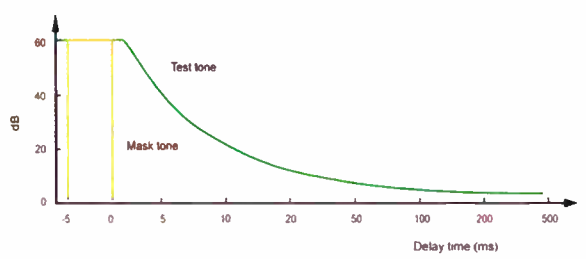
### MASKING AND DIGITAL STLS

Perhaps we ought to stop a moment and consider what this means for audio processing. Often those of us heavily into audio processing are approached by folks who have connected the "final output" of their audio processor (the stage just before feeding the FM Stereo generator) to the input of their coded STL system, and wonder why folks like me cringe at that thought.




The acoustic masking principle in the frequency domain. Here the masker at 300 Hz causes the 150 Hz signal to be inaudible.

A key point: Audio destined to feed an FM stereo generator is generally peak clipped, with much more density than the source material. This causes several problems.




The masking principle in the time domain. For some time after the removal of the masking signal, other signals falling below the curve are inaudible.

1) The perceptual coder removes program content to fit the physical restrictions of a transmission system that can only hold a fraction of the data needed to pass linear digital audio. The bit-reducing technology will typically end up removing *vital* information needed for modulation control. As we learned earlier, even adding a filter to the final output of an audio processor without very careful design consideration will completely upset the tight peak control necessary to maintain legal modulation.

2) The audio generally looks nothing like the any "real world" source material because it is pre-emphasized for broadcast – and then run through a peak clipper. The CODEC will have a hard time determining what to remove since its reference is human listening to normal audio, not audio set up to feed a transmitter.

The resulting audio is full of nasty peaks which must be clipped at the transmitter, usually by a composite clipper. This adds additional distortion, and lost loudness as the clipper will not be able to evenly clip some of the bizarre peaks coming from incorrectly "coded" audio. The result is a very harsh sounding high end on air, and other odd anomalies not heard on the program source material.

### A BETTER PLAN

What is the proper way to feed a bit-rate "compressed" digital STL system? First, feed it something as close to program from the board as possible, yet with a level as close to full scale zero as possible (without overloading the analog to digital converters on the input). The reason for this is because at lower audio levels, most CODECs will remove more audio information since it is assumed the listener never would hear the missing audio at those lower levels.

Look what happens when the CODEC is working with audio that is averaging much less than full scale: The audio processor sitting downstream from the CODEC will "turn up" this audio to full level, and reveal some audible artifacts the CODEC assumed to not be audible. The main audio artifact from overall low audio levels is typically heard on the higher frequencies. Production people have quite accurately described this artifact to me over the years as "watery treble."

Another side effect comes from what I presume is a form of digital noise (or hiss) reduction on the higher frequencies during the encoding process, producing an audible effect of "jingling noises." This side effect is best heard on cleanly recorded acoustic guitar solo material.

Such material seems to reveal some kind of process used to "smooth out" digital noise in the higher frequencies by digitally filtering "background" high frequency energy. It also seems to show that this process removes most (but not all) of the harmonics that the CODEC calculates to be acoustically masked from our hearing by the fundamental notes of the instrument. The harmonics left over no longer have any relation to their original sounds, so they sort of "pop through" as an occasional jingling noise heard in place of the missing harmonics.

I learned some of this from my Sony Minidisk recorder, which uses a form of bit-reduction to do what they do on those tiny discs. For the best quality, the manual suggested recording your levels as high as possible without overloading the input of the deck. And I must say, this rule seems to apply across the board for coded audio technology. Hence, the higher the level you feed the CODEC, the more these side effects I mentioned diminish.

So, what does this mean for the broadcast audio chain using a compressed STL? It means you will need a device that can preserve the original characteristics of your program audio source and allow you to run consistent high levels of audio into your STL system, to keep the CODEC in its "sweet spot." Units such as the Orban transmission limiter, or similar products come to mind for this task.

We will have more on this topic at our next meeting.

*Cornelius Gould has built his own audio processors and wants to share his knowledge. Corny is the Chief Engineer for WJCU-88.7 FM, Infinity Broadcasting, in Cleveland, Ohio. You can reach him at: cg@radiocleveland.com*

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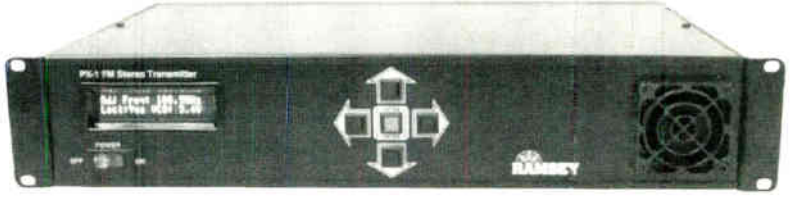

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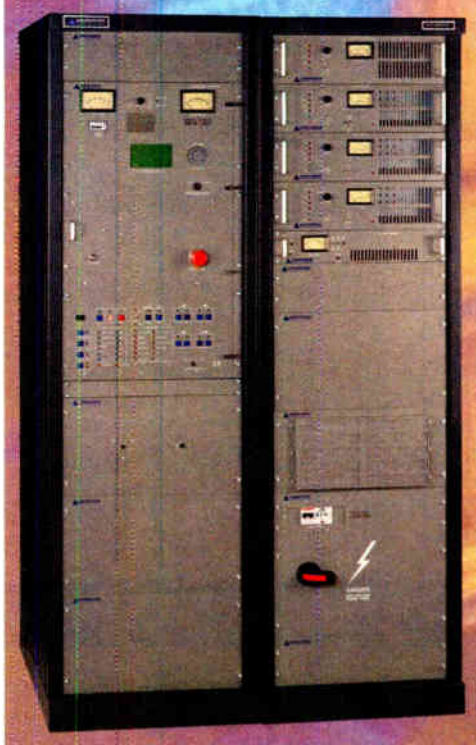

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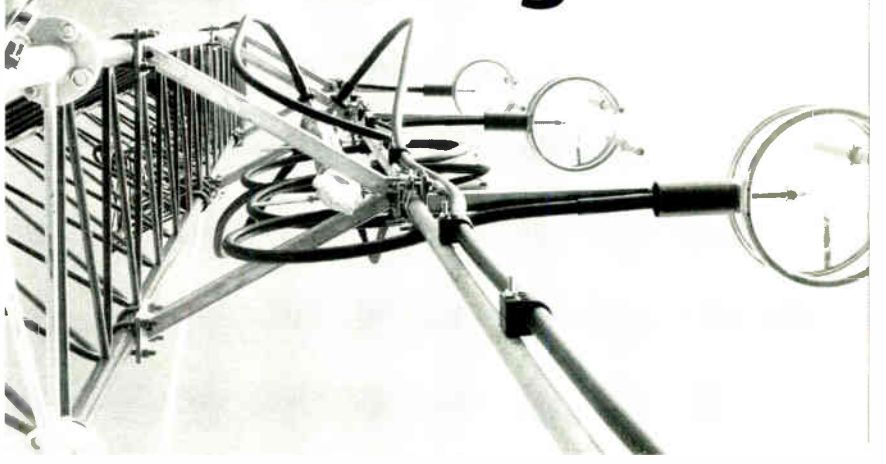

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# The Air Chain

## Automation on a Tight Budget: OtsDJ

*by Donna Halper*

*Back in May Donna Halper detailed some of the considerations in choosing an automation system when the budget is tight. This month, Donna returns with a closer look at one of the programs frequently mentioned in her interviews: OtsDJ.*

*[QUINCY, Massachusetts - October 2003]* There are two basic misconceptions about OtsDJ (formerly called Ots Juke DJ). One is that Ots stands for the initials of something. Actually, it is the last name of the two executives of the Queensland, Australia-based company – CEO Adam Ots and VP Steve Ots. (I assume they are related, but when I asked, I was told this information could not be divulged.)

On the other hand, the company will gladly offer plenty of information about its products, and that leads to the other misconception about OtsDJ: Some people still think OtsDJ is mainly useful for club jocks and is not appropriate for radio stations. But as it turns out, there are a number of radio stations using this system for their automation stations in 52 countries.

And, that is not a recent development, according to Steve Ots. Via e-mail, he said, "Even from the first version, OtsDJ has attracted both the DJ market and the radio station market. The usage has been fairly equal, due to key technologies in mixing and dynamics processing being very important to both markets. In the radio area, OtsDJ is used by webcasters, community stations, commercial stations, and 'in-house stations' for background music purposes ... [and] even though we are based in Australia, our largest markets are actually in the USA and UK."

### WHAT IT IS

For those who have never heard of this product, the FAQ on their website (www.otsdj.com) states, "OtsDJ is a breakthrough application that allows DJs, radio stations and music lovers to manage, play and mix, pre-recorded music in a manner never before possible with a standard Windows PC. OtsDJ heralds a new age in DJ mixing/radio automation software, bringing the power to mix into the hands of music lovers, and allowing professionals to focus on the more important areas of creativity which distinguish them from the rest."

While that may sound like advertising hype, OtsDJ users are very loyal, and based on their comments to me they agree 100% with what the website says. "SuperSport," a Massachusetts-based webcaster, told me OtsDJ really appealed to him because he only had a limited budget but needed a lot of features. "I selected it because it was simple to use and did an awesome job of mixing the tunes, while having features such as compression, scratch-effect, playlist, and scheduling to name a few. For very reasonable dollars and a rather simple ramp-up, the OtsDJ software was for us! In addition, it does a great job of mixing the tunes on its own without much fuss, and does it very well."

### HAPPY USERS

These enthusiastic comments were not just typical of webcasters. Said Phil Alexander of Broadcast Engineering Services and Technology, "I like OtsDJ because it is easily used by inexperienced personnel and can function either fully automated, or as live assist with equal ease. In the full auto mode, it sounds better than most inexperienced board ops, thanks to a very robust segue capability." Steve West of Airchexx.com echoed those sentiments. "It's the best automation for the price I've ever found, complete with onboard processing. OtsDJ is pretty much crash proof and the audio is rock-solid, even with some of the worst quality MP3s."

Clarence Jones, who owns and operates WSHG, a low power FM in South Carolina, is still running an earlier version of OtsDJ, and it still works well for him. "I have used it 24/7 for about a year and a half. I have 1700 songs programmed into it."

Another fan of OtsDJ is Gary Francis, assistant PD and afternoon announcer on WCAP-AM in Lowell, MA. He said, "I was looking for something for my oldies show, the "Saturday Night Sock Hop" at my Ice Cream Shop. As I tried to manage more and more songs over the past 10 years, it became way too complicated. At one point, I had nine CD cases – over 540 CDs – and I was trying to program the show (including requests) manually, using books sorted by artist and title.

OtsDJ solved my problems. I could load up a bunch of music, and it became much easier to manage all those songs efficiently. OtsDJ is so easy to use, and it's very reliable. It will run 24 hours a day totally unattended – just tell it to load another file. At WCAP, we are using it 12 hours a day, but it can be started anytime you want, using time commands."

**Gary Francis' Ice Cream Studio**

The announcers and PDs with whom I spoke told me the system will accommodate large numbers of songs, liners, commercials, etc with no difficulty. Gary Francis estimated he now has over 4000 songs in the system, and he plans to expand it further.

Users told me they liked the fact that OtsDJ has a scheduling and logging module included. Says Steve Ots, "The Scheduling & Logging module is tightly integrated into the OtsDJ design, thus making it evermore powerful than an external scheduler. Although it requires a learning curve like that of any scheduling software, it is surprisingly simple once the initial learning has been achieved. Surprising, as it allows a level of customization and automation which is extremely powerful and virtually unlimited.

"For example, to set up a basic webcasting station which plays 6 category types of songs, interspersed with some station IDs and jingles, on the same hourly format repeated with intelligent rotation is really quite easy. Yet, once setup you can leave it for 6 months without touching it, and it will faithfully keep rotating the songs intelligently."

### ROOM FOR IMPROVEMENT

Of course, nothing is perfect, and OtsDJ users expressed a few complaints, although some of these issues have already been addressed in new versions. For example, users were once restricted to a proprietary Ots file format. Explained Gary Francis of WCAP, "Until recently, everything had to be in MP3 or WAV and then converted to OTS, which compressed it." But since March of this year, OtsDJ now supports WAV or MP3 files directly, as well as using the Ots format, giving the user more flexibility.

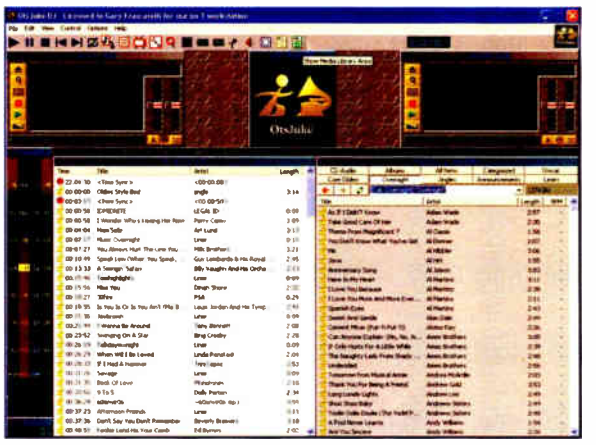
Another complaint from several stations was that OtsDJ only has two play decks. Steve Ots responded "[t]he two decks don't pose a limitation to many, but for those who it does, there are plans for more decks." But says Steve West of Airchexx.com, "...[I]f Ots Corp would incorporate a third play deck, [OtsDJ] would be the perfect automation solution, given the price, compared to [other automation systems like] Scott Studios."

Although one user commented "OtsDJ doesn't seem to like Windows 2000 very much." When I asked Steve Ots about this, he disagreed. "The OtsDJ support for Windows 2000 works perfectly well according to our own internal testing and sources. If you have received some feedback from a user or two, it is more likely to be a system-specific issue." There was bug causing problems with Windows XP, but that too has been resolved.

And speaking of resolving problems, users remarked to me that customer support is very good, even if it is done via e-mail due to the company's Australia location and the difference in time zone. Ots also provides a user-forum where issues can be discussed; Steve monitors it and responds to user queries. The URL is: http://jumpinjeff.net/

As for future upgrades, Steve told me "[t]he next major update [will] include "Automatic Beat Mixing" technology. Although a key feature for DJs, it will be useful to radio stations who wish to have beat-mixed segments too." The capacity for mixing is already something Ots users said they like, and the company is proud of what the system can do in that regard. "The most popular thing that makes OtsDJ unique for the radio market is the amazingly accurate mixing technology. Where with other packages you must manually set "aux" points, taking hundreds of hours, OtsDJ sets advanced mix points all automatically with a 99% accuracy rate, and better results than the human ear can usually achieve."

For those who want to try out OtsDJ, a working demo can be downloaded from the company's website. Gary Francis of WCAP said the demo had some clicks and static, but the actual version has audio that is "clean as a whistle, in fact, it makes our AM sound like we have FM quality audio. The highs and lows are pristine. The compressor built into the program keeps all the audio balanced, and there is also a DJ setting where you can adjust it if you want to."



OtsDJ will run best on a Pentium, and according to Steve Ots, runs well on any Windows 95, 98, ME, 2000 or XP. The OtsDJ website notes "Cyrix chips do not function too well, due to their relatively weak floating point capabilities. You can use a Cyrix CPU, but it will have to be fairly high-end, ie. a P300 or above." The system also requires a soundcard with a DirectSound or WDM driver, and does best with 64 MB or more of RAM.

Prices vary, depending on how many features you need. There is a version for DJs and one for radio stations. The lowest advertised price for a basic system is $99.95. According to the Ots website, among the features the radio station system offers are auto mix-point detection, an integrated dynamics processor and hourly clock scheduling.

There was a time when OtsDJ was mainly purchased by club or mobile jocks; that market segment is still a sizeable one, with many satisfied users. But these days, there are a growing number of users who work at radio stations in such formats as Oldies, Adult Contemporary, and Country. Based on what they told me, the OtsDJ has won them over. It offers an excellent solution for stations on a limited budget that want professional sounding automation.

*Donna Halper is a programming consultant based in Quincy, Massachusetts. She lectures at Emerson College, and has written extensively on many aspects of broadcasting. Donna can be reached through her website at www.donnahalper.com*

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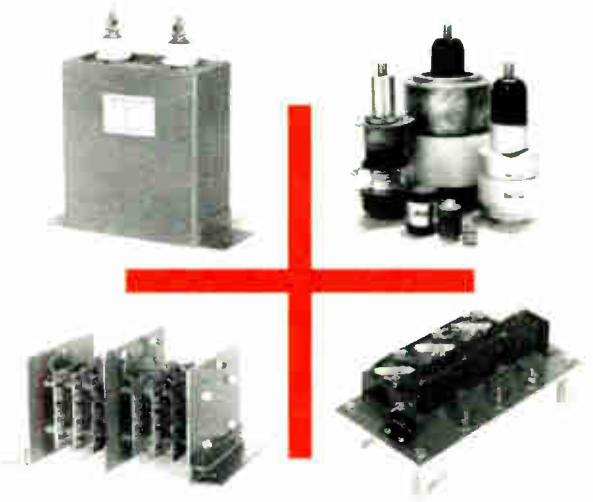

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# Antenna Topics

# Detuning Problems

*by Ron Nott, VP Engineering, Nott Ltd.*

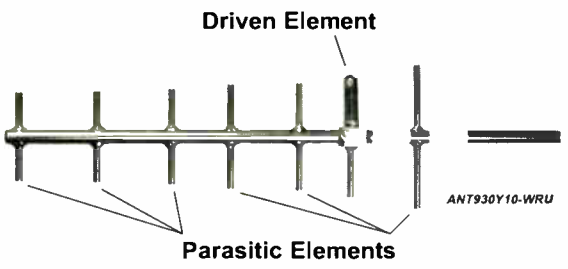
*[FARMINGTON, New Mexico - October 2003]* Recent issues of Radio Guide contained an excellent three part series on detuning by Bix Bixby. It was very thorough in explaining the problems and how to address them to the satisfaction of the FCC. This article addresses some common misconceptions, experiences and practical applications of detuning.

Not long ago, I was speaking with a station manager who believed the problem caused by a nearby cell phone tower was that telephone messages would somehow get into the station audio. This is completely wrong; the problem is with the shape of the station coverage pattern.

A non-directional AM station is supposed to have a pattern that is as nearly circular as possible. While ground conductivity will have an effect (especially further from the antenna), the surrounding environment of man-made structures and wires should not. Furthermore, a directional AM station has a specific pattern shape that likewise should not be affected by such objects. In some cases, they can cause the pattern to go out of tolerance, violating FCC rules.

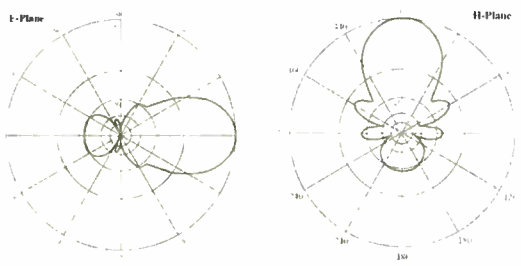
## THE PROBLEM

A tall structure placed in the near field of an AM station will function as a *parasitic re-radiator*. To explain this term, take a look at a VHF or UHF Yagi antenna that is the one that looks similar to a fish skeleton. The typical yagi has only one element that is connected to its transmission line while all the rest are *parasitic re-radiating elements*.




Each element on a yagi is designed to a specific length and spacing (at the frequency of interest) in order to shape the pattern of the antenna. Each parasitic element intercepts part of the energy from the driven element and then re-radiates it with a time delay that will add energy in the desired direction and minimize energy in the opposite direction.

Similarly, a tall structure built within the near field of an AM antenna will intercept part of the AM energy and then re-radiate it with a time delay. Depending on the distance and dimensions of the structure, it will distort the effective field radiated from the AM antenna in the same manner the parasitic elements of a Yagi antenna do, thus warping its pattern shape.




**Yagi Parasitic Elements Affect Radiation**

Notice that I said structure in the preceding paragraph, rather than tower. While communication towers are the most common offenders, anything within the near field can have this effect. This includes water tanks, smokestacks, steel framework within tall buildings, bridges, power line towers and anything else with enough effective height. The effect worsens with height, particularly when the structure exceeds about 45 electrical degrees at the AM frequency.*

However, do not ignore wooden power poles. While they may be electrically short, many of them have ground wires connected to a static drain line atop the poles, which can provide top loading that is *miles* in length. Poles in the near field of an AM antenna can have a very complex effect on the pattern.

One directional station in Albuquerque had been out of tolerance for years, operating in the augmented mode. Several years ago, Chief Engineer Mike Langner and I began to cut (temporarily, of course) wooden pole ground wires one at a time, each time checking the field intensity monitor point in the deepest null.

After cutting five or six wires and improving the null each time, we then cut one that made the situation worse. It turned out the electrical distance and pole top loading combined to add radiation in the undesired direction, rather than diminish it. Obviously, we hooked that one back together. Later, Mike acquired a large number of ferrite beads and strung them on the offending ground wires, reconnected the wires and then weatherproofed the beads. The directional pattern is now in tolerance. (There is now a product on the market that eliminates all the bead stringing and weatherproofing.)

In his series, Bix pointed out the Rules specifically directed at broadcasters, but do not despair. Technology is in existence to fix almost anything. For example, in some congested areas where real estate is virtually unavailable, it has been possible to place a tall FM tower in the center of a four tower directional array and, with careful engineering and proper installation, successfully detune it. It can be done.

## DETUNING

How is a structure detuned? There are two modes, both of which resonate the structure and a wire skirt suspended from it. The most common mode is parallel resonance within a circuit composed of the inductance of the structure metal and the skirt wires, which then is resonated with a capacitor across it near the base. When thus detuned, RF current is minimized within the structure. (This current causes the re-radiation mentioned previously and minimizing it eliminates the re-radiation.) Our experience indicates this is the most common mode, but some structures are detuned in the series resonant mode.

In series resonance, RF current within the circuit is maximum, but the current in the skirt wires is exactly out of phase and equal in amplitude with the current in the structure. The result is that the fields radiating from the two sources (skirt and structure) are cancelled.

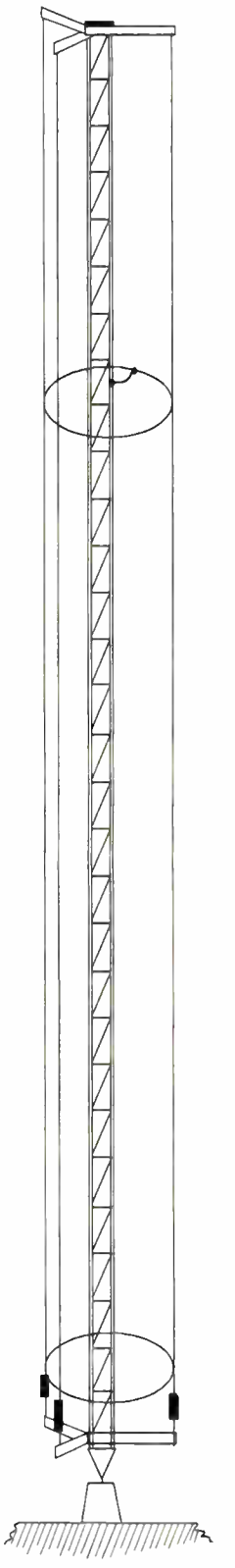
So we install a detuning skirt on the structure and resonate it, either series or parallel. Is that all there is to it? As far as eliminating the re-radiation, yes. However, in the case of a parallel resonated system current is minimum, but voltage is maximum, so bear in mind that substantial RF voltage can develop across the detuning capacitor, causing the lower ends of the skirt wires to become quite hot, especially when the detuned structure is near a high power station. It is probably not enough to be fatal, but may cause RF burns and a person on the tower could jump from the shock and this can be very dangerous.

In the case of a series resonated detuning system, the RF current may become quite high. We have had instances where capacitors with high RF current capacity had to replace the original capacitors because they were burned out from the high current. This is quite unusual, but you should be aware of it.

## STABILITY AND MEASUREMENT

Ted Schober, a consulting engineer, once pointed out to me that a quarter wavelength skirt should be avoided. This is because in a high Q circuit, it may become quite unstable and the tuning may change with changing seasons and weather – the reactance can swing from inductive to capacitive, ruining your detuning efforts. For best stability, a skirt should be no more than about 70 electrical degrees high. This forces the input to be inductive, allowing detuning to be successful with nothing more than a variable capacitor.

For tall towers, we suggest installing two or more skirts, one above the other with a space in between them. Bear in mind that with a properly detuned system, the portion of the tower within the skirt will effectively disappear. If a space of, lets say 30 or 40 degrees is placed between the lower and the upper skirt, it will appear to be simply a length of iron floating in the air. It will be too short to have any significant RF current induced into it, so it will not re-radiate.



To properly detune a structure requires the use of a quality field intensity meter. However, a simple current sensor can be made with a toroidal current pickup, a diode detector and an RF filter. A DC voltmeter measures the voltage from this device. When parallel resonant, voltage is minimum. When series resonant, voltage is maximum.

However, this simple device should not be the final determiner of detuning. The FIM should always be used for this purpose. The detector can remain in the detuning housing for future reference. If a significant change is noted, it can be verified with the FIM.

Bix did an excellent job in his series, and here we have attempted to explain the mechanisms employed and some pitfalls to be avoided if you are faced with parasitic radiation. While it is the responsibility of a newcomer (such as a cell phone company) to perform before and after measurements and then install the detuning apparatus (FCC terminology) if necessary, a station owner and engineer should in good conscience be aware of potential problems and communicate with the owner of the new structure(s).

If they do not want to cooperate, my opinion is that station management should notify their FCC field office. If questions arise later, they can at least say "we tried to tell you." In our experience, the big cellular companies accept their responsibilities well and act on them, but you should watch out for the small operators. They do not want to spend a dollar more than required.

** To determine electrical length (or height) of a structure, divide 2732 by your AM frequency. The result will be the length of one electrical degree in feet. If you see a new tower near your transmitter site, estimate its height and divide it by the length of one electrical degree. The result will be the height of the structure in electrical degrees. (Do not forget: a quarter wave is 90 electrical degrees.)*

---

*Ron Nott operates Nott Ltd. in Farmington, NM, where he provides a wide array of tower systems and services. Contact Ron at ron@nottltd.com.*

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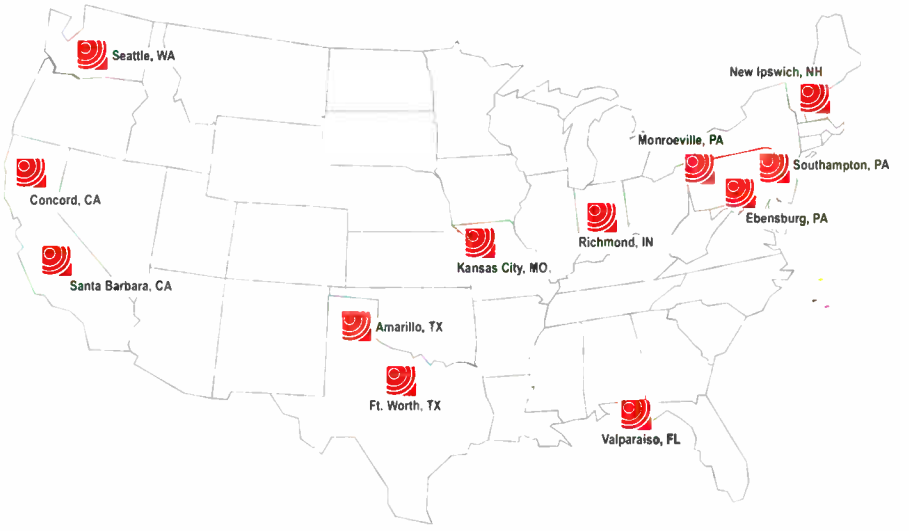


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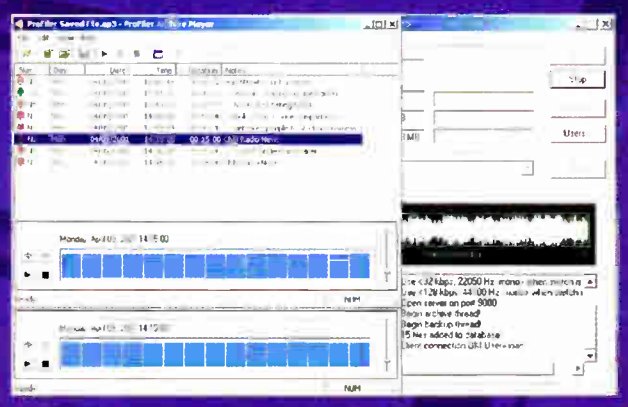

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# FCC Focus

## NOV: Day of Atonement

*by Ken Benner, NCE*

*[TUCSON, Arizona - October 2003]* Last month we shared an NOV (Notice of Violations) resulting from a real station visit by agents from a regional FCC office. This month, in response to numerous requests from RG readers and our beleaguered Editor, we offer suggestions on what to do should an NOV end up on your desk.

However, before we get into the nitty-gritty of all this, let me share with you the point of view I explain during a typical Alternative FCC Inspection. Is a visit from the FCC really "Big Brother at work," as some would imply? Do we have to worry ourselves into a panic when they find numerous violations and immediately call our legal consul to "get us out of this mess?" My answer is: "Absolutely not!"

### FRIEND OR FOE?

During my years of active broadcast employment, the most welcome person that could visit my operation was the FCC Inspector. I kid you not! Furthermore, I made it a point to be on a first name basis with as many of them as possible. To this day I would not hesitate a moment to pick up the phone and call any of several FCC staffers for suggestions. They help me and I am able to occasionally explain something for them. They are just as human as you or I.

A few weeks ago I was inspecting a station that had absolutely no business being on the air due to very serious technical problems. Their signal on the air was just plain awful. I felt I could not issue them a certificate of compliance under the Alternative Inspection Program, but for the life of me I could not find an appropriate Rule to avoid issuing a certification. (Just try to find something in the Rules addressing maximum noise level for the aural portion of a TV signal.)

Sometimes broadcasters occasionally forget they are granted a broadcast license to "serve the Public Interest, Convenience and Necessity" (PICON) of the community for which they are licensed. Instead, some managers fantasize on the ill-conceived notion that a license is simply a means to print money – i.e., the louder the better; more automation equals less expense; a smaller staff means a better bottom line; and less maintenance also means a bigger bottom line.

I explained my situation to a long time FCC Inspector and valued friend in Denver. He advised me there was no Rule addressing the unique situation for this station and thus I had no choice but to certify the station as "compliant."

### A DIFFERENT ATTITUDE

On the other hand, there is a classic example of professional dedication to PICON in Valdez, Alaska. Operated by recent NAB Crystal Award Winner, Laurie Prax, the prime focus of KVAK AM/FM is serving the people of Valdez, by covering the local sports events, city council meetings, church, club, school civic activities, and all the while providing a most entertaining mix of carefully selected music and local banter that the people of Valdez not only enjoy but cherish.


**Laurie Prax, Owner/GM KVAK AM/FM proudly displays both her NAB 2003 Crystal Award and her FCC AIP Certificates.**

As a result, sales are automatic and Laurie and her staff have an absolute fun-loving ball running the operation. "Build a better mouse-trap & the public will beat a path to your door – serve the public with good radio and sales will do the same!" You can quote me if you wish.

### DEALING WITH THE NOV

Now, back to the business at hand: What to do if the FCC visits you, and a week later by certified mail comes a list of NOVs, followed by a moment of panic as we realize we have got to address things promptly or, as stated in the NOV, we could face a hefty fine.

Remember, I am not a lawyer and the following is not to be construed as professional legal advice but rather a good faith effort on behalf of our friends and colleagues in broadcasting. Once again, as we did last month, we have carefully changed identifying items to protect the guilty.

First of all, *fix, correct and repair everything listed in the NOV as quickly as possible*. Second, tell the truth to the FCC. Explain clearly what you did to correct each item listed, or what you are doing right now to remedy matters. Anyone who has been through this will tell you dissembling will only bring more trouble than you want or need. So, just tell it like it is...

TO: Mr. Gustov Von Kleppen, Resident Agent
Federal Communications Commission
Uglyville Resident Agent Office
Uglyville, TX 00000-0000
December 29, 2002

RE: Notice of Violations
Released: December 25, 2002
Enforcement Bureau File # EB-88-AN-4566

Dear Mr. Von Kleppen:

Holy Smoke Broadcasting, Inc. operators of AM Broadcast Station ABCD in Purdyville, Texas respectfully responds as follows to the referenced Notice of Violations (NOV) found during your visit to our station on December 25, 2002. Each item is addressed in the order in which they appear on our NOV:

2.a. Our misplaced station license was located at our corporate headquarters. We now have it properly placed in a loose-leaf binder in the control room, with a copy in the Public File as required CFR 47 73.1230(a) &(b) and 73.3526.

2.b. Our failure to properly log failed test of the EAS system during the periods referenced was due to the maternity leave of our assistant Chief Operator and vacation of our Chief Operator. This has been remedied by appointment of our General Manager to serve as tertiary Chief Operator who will henceforth review all EAS activities in accordance with CFR 47 11.35(a)(1)& (2).

2.c. Our failure to transmit required weekly tests as indicated was due to illness of our traffic supervisor during those weekly periods of Nov. 23 and Dec. 20. She has recovered and her assistant has been trained in the proper logging of required weekly EAS local origination of EAS tests in accordance with CFR 47 11.35(a), 11.61(a), 73.1820 and 73.1840.

2.d. Our EAS system has been adjusted to "auto-forward" during all periods of unattended operation to permit immediate re-transmission of the Required Monthly Tests as well as certain significant transmissions including the Presidential Address, all of which are now being properly logged.

2.e. Our EAS encoder system has been programmed to include the proper location codes for the state and counties in our service area in accordance with 47 CFR 11.51(k).

2.f. Our EAS monitor decoder input #2 source has been changed to the station listed as our secondary monitoring assignment in our state plan and the FCC Mapbook as required in CFR 47 11.52(d)

2.g. In accordance with 47 CFR 11.61(a)(2)(i)(A) of the rules we are conducting and properly logging our transmitted tests of the EAS header and EOM at least once each week and on random days and times.

2.h. Henceforth all operators are required to sign our daily logs and to initial and date each subsequent entry attesting such entries, corrections or additions is indeed an accurate representation of what transpired in accordance with 47 CFR 73.1800(a).

2.i & j. Our Chief Engineer, Boris Voltaire is designated Chief Operator, our Secretary/Traffic Director, Gertrude Finkelstien is designated Assistant Chief Operator and the undersigned General Manager, Mogul Von Bigbucks as Tertiary Chief Operator. These assignments are now properly posted under my signature in the Control Room loose leaf binder along with our license and other documentation including a comprehensive Policy Manual detailing the responsibilities of all personnel as recommended by our legal consul, Confusem, Conem, Bilkem & Milkem, LLP so as to be compliant with 47 CFR 73.1350.

2.k. The improper transmitter output power observed by FCC Inspectors, Von Kleppen and Svendsen was determined to be the result of an out-of-calibration thermo-couple RF ammeter at the base of our tower. This meter has been replaced with a calibrated toroid RF ammeter meter, and its reading compared with the power output meter on the transmitter, as required under 47 CFR 73.51 (a)(1)&(2).

2.l. The inoperative meters have been replaced with new meters from the factory, and our remote control system is being calibrated on a weekly basis and carefully logged in the technical log, in accordance with procedures fully explained in our Operations Manual, as part of our newly defined policy for good engineering practices so as to be in compliance with 47 CFR 73.1350(a), (c)(1)&(2), 73.1215 and 73.1820 as suggested recently by Alternative FCC Inspector, Ken Benner.

2.m., n., & o. Separate Public Files are now being maintained for both our AM and FM operations by using the format recently described in the prominent broadcast publication Radio Guide, the files now include as separate folders: Applications, Authorizations, Citizen Agreements, Contour Maps, Ownership Reports, Political, Non-Candidate/Issue Advertisements, EEO File, Public and Broadcasting, Letters from the Public, Investigative Material, Issues-Program Lists, Donor Lists, Time Brokerage Agreements and Local Announcements. The files also include an easy to understand informational sheet to provide members of the public with instructions and purposes of the file as well as a means of serving requests from the public received by mail, e-mail, fax or telephone-voice. Thus, we believe we are now fully compliant with 47.CFR 73.3526. *[Editor's Note: This method for public file maintenance is available from the Radio Guide Website at www.radio-guide.com]*

We are grateful for the professional dedication of FCC inspectors Von Kleppen and Svendsen, and welcome a possible return inspection to verify our dedication to regulatory compliance and in the future will continue to dedicate every possible resource in our commitment to serve the public interest, convenience and necessity with applicable FCC regulatory compliance.

Sincerely yours;
Mogul Von Bigbucks, General Manager
Boris Voltaire, Ch. Engr./Ch. Operator

Again, I need to emphasize that I am not a lawyer, and this should not pre-empt any advice from your attorney. However, as you can see, just sending a prompt, straightforward response to the FCC is the best way to deal with any communication from them. Ensure your facility is in harmony with the Rules and Regulations, and you will have smooth sailing through any inspection, whether under the AIP or with a regular FCC Inspector.

*Ken Benner really does like broadcast attorneys! An active inspector in the AIP, Ken resides in Tucson, Arizona. Ken can be reached at bennerassociates@aol.com.*

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| 50 kW | 1985 | Continental 317C2 |
| 50 kW | 1986 | Nautel AMPFET 50 |

**FM Transmitters**

| | | |
|---|---|---|
| 2.5 kW | 1978 | Collins 831D2 |
| 3.0 kW | 1996 | QEI Quantum |
| 3.5 kW | 1985 | BE FM 3.5A |
| 5 kW | 1982 | Harris FM5K |
| 10 kW | 1980 | Harris FM 10K |
| 10 kW | 1991 | QEI FMQ10,000B |
| 20 kW | 1977 | Harris FM20K |
| 20 kW | 1982 | Harris FM20K |
| 20 IW | 1989 | QEI FMQ20,000B |
| 25 kW | 1997 | CCA - Single Phase |
| 25 kW | 1980 | CSI T-25-FA *(amplifier only)* |
| 30 kW | 1984 | BE FM-30 |
| 40 kW | 1978 | 2-RCA BTF-20E1 *(combined)* |
| 50 kW | 1982 | Harris Combiner*(w/auto exciter-transmitter switcher)* |

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## From the Transmitter Shack

# The Backup Transmitter That Didn't

by John Stortz

*[Not everyone has the luxury of a back-up transmitter. On the other hand, when you do have a back-up, why does it always seem that when you most need it, the back-up transmitter is feeling a bit cranky? Did it get lonely out there at the transmitter shack, waiting for attention? In any event, many an engineer will sympathize with John Stortz' experience. All he wanted was a little "back-up" from his back-up, what he got was the Agony and the Ecstasy!]*

*[TAMPA, Florida - October 2003]* I guess the worst is over now. But, what a day it was! I am not superstitious, and do not recall superstitious people ever mentioning the 13th as a bad day, unless it falls on a Friday. But Thursday, the 13th of March, sure made for a bad day this year at WKES.

The week's project was to replace our old CCA transmitter with a new Broadcast Electronics FM-30T. While we moved the old Main out and installed the shiny, new BE, we put our "ol' trusty Sparta" on the air. Unfortunately, "ol' trusty" turned out not to be not quite so "trusty." She failed us just short of our goal.

It happened about 4 PM on that Thursday. We were working on the external interface connections for the new transmitter when I heard a "thud." It was the plate contactors on the back-up dropping out.

### "OOPS!"

The Sparta would not go back up. Eventually, we found the problem in the external interlock. It was drive-time and we were off the air. The root cause was not immediately obvious, so after verifying the transmitter was still connected properly to the antenna, we bypassed the external interlock with a short piece of wire inserted into the interlock relay socket.

Relief broke out. We were back on air! Ten minutes later, I discovered a wire had come off a terminal in the Sparta external interface circuit. Deciding it was important to return the external interlock circuit to normal ASAP, my assistant made a second bypass loop. I pulled that first jumper out and inserted the relay. It energized immediately, and we were on air. Hooray!

There was one slight problem: The front panel door was open. On several other occasions I had successfully closed an open interlocked door without leaving the air by closing the door very quickly (OK, yes, I slammed it), so the circuit was not interrupted long enough for any relays to drop out. Unfortunately, this time it did not work. Not only did the high voltage turn off, but a resulting surge appeared to have taken out our IPA tube, caused a rectifier module to short, tripped a 30 Amp, 3-phase breaker, etc.

### OFF AGAIN, ON AGAIN

Another frustrating distraction: The transmitter applied high voltage as soon as filament voltage was applied in "remote" mode – bypassing the normal 30-second delay. It did not do this in "local" operation, so we set the problem aside for another time and pressed ahead. Suspecting the IPA tube, we changed it. Of course, the rebuilt tube did not have the same internal capacitance characteristics, and rushing to get back on the air, at first we adjusted the coarse tuning in the wrong direction.

Finally, installing our last spare rectifier and fresh IPA tube, we were once again on air, this time with a slightly more cautious "Hooray!"

I began to calibrate the remote metering, which was indicating about 3% high; I tweaked the remote control unit and down went the meter. Oops. Too far! So I tweaked the remote metering up. Nevertheless, down went the meter. I tweaked the metering up some more, and yet *down* went the meter! I checked the transmitter meters and was horrified to discover the meters were *indeed* going down! It turned out to be a leaking tube, so off went the transmitter for one last tube change!

Once again, the interelectrode capacitances did not agree too well, and it took a couple of tries to get this second rebuilt tube to resonate properly. In the end, we did get the transmitter running, and our cautious "hooray" was replaced with a kind of *"please!"*

### APPARENTLY NOT

As I stood there for a moment, watching ol' Sparta humming along, I suddenly noticed one of the non-illuminated counters was being illuminated by a light flashing inside the PA cavity. So down we go again!

This time, we found a piece of Teflon (used to isolate the RF Loading coil from the front panel tuning mechanism) had begun to burn up. Unfortunately, no substitute was available. Worse, despite many hours of seemingly unrelated failures, the total effect was merely to distract us from working on the new transmitter. The new FM-30T should have been finished by then.

After completing the external interlock circuit, we fired it up on the air for an initial test, and all went well. What a relief! We had planned a grand official presentation of the new transmitter to our audience during the Manager's Report, at noon the next Tuesday. Instead of that grand entrance, our new transmitter was thrown on in haste late Thursday night. Fortunately, it has run solidly from its hurried inauguration until now, with no real problems.

By the way, we had ol' Sparta on the air last week at a full 25kW for a while. But such is the life of a broadcast engineer: You never know what will happen next!

*John Stortz is the CE of Moody Bible Institute's WKES, Lakeland, and WKZM, Sarasota, FL. He can be reached at jlstortz1@juno.com*

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## SBE National View

# The EFD Project

## *(Engineer Friendly Documentation)*

by David Baden,
Chairman, SBE EFD Committee

Engineer Friendly Documentation (EFD) is an XML (Extensible Markup Language) based "technical documentation" standard proposed by the Society of Broadcast Engineers. As a self-describing language syntax the EFD-XML is a set of data descriptions defined by broadcast engineers to be specifically relevant to broadcast engineers, so they can easily find information they need.

The goal of EFD is to facilitate the migration of technical information to an efficient and standardized platform, defining a common technical documentation content "model." With this consistent model, EFD documents can provide simplified and valid specification comparisons across multiple manufacturers' product lines – a common structure for all broadcast relevant data.

### HOW IT WORKS

XML is a self-describing domain-specific markup syntax which can separate data structure and content from the presentation of data. The ability to separate data from presentation allows for the possibility of XML becoming the standardized mechanism for the exchange of data as well as a universal document translation platform. This allows EFD to be portable to all forms of Web devices, from PCs to PDAs, and serve multiple needs: a printed data sheet, a catalog page, a website display, a real-time internet data stream of product technical specifications to an engineer's PDA.

Information exchange systems can be separated into two main camps: commercial interests which generally serve a relatively narrow demographic according to the nature of the data and the system of delivery, and standards organizations systems which attempt to address the broader concerns of a much larger audience through widely available delivery systems.

The planned EFD system will fall somewhere in between. It will address the end user concerns for consistent and complete technical specs while using a web delivery system approved by major standards organizations. The EFD is intended to provide a consistently level playing field whereby all the manufacturers will observe the rules of content, making everyone (regardless of status in the industry) equal. This opportunity can serve to elevate a small manufacturer's product line to full status in the marketplace.

### EFD SPECIFICATIONS

The EFD XML specification is divided into two XML files, EFD_1.XML and EFD_2.XML. Specific vendor contact information is stored in the EFD_1.XML file. "Vendor" is defined in the EFD as the organization, individual or company using the EFD as a technical documentation standard. Vendor contact information includes street address, phone numbers, e-mail address and Web URL for the main office as well as for multiple sales and technical support offices.


The EFD_2.XML file contains information on specific products and/or services offered by the vendors. One EFD_2.XML file must be completed for each product or service the vendor offers. The EFD_2 product information file contains specific data on products including model names, inventory identifiers, pricing, revision histories, technical specifications and physical specifications.

The Society of Broadcast Engineers plans to provide access to the EFD master database at the sbe-efd.org web site. The site will allow users to search a listing of EFD compliant vendors and product information, with vendor or product matches returned to the users rendered as an HTML page or as an XML data stream.

### ADVANTAGES

The EFD committee is working to implement a vendor-passive system on its website. Utilizing on-line RSS/RDF (Rich Site Summary/Resource Description Framework) readers, a vendor site can update available product sheets as it necessary, and the centralized SBE catalog will note new material available in its next indexing session for the site. With RSS/RDF a central SBE EFD "product aggregator" can have a listing for possibly several thousand vendors, if they are willing to participate.

The other big advantage with RSS/RDF is that when the vendor updates their own Website, the EFD main site need only check in to find the changed content; there is no requirement for the vendor to publish two versions of the information. The vendor only needs to register RSS documents ("channels") and keep those updated.

The integrity of the data on the master EFD web site will be protected by an authentication server, allowing the exchange of electronic certificates between the main site and vendor sites before any exchange of information. Users seeking EFD data can be assured information is coming from the vendor to whom it is attributed. Vendors can be assured they are the only ones allowed to modify or add to their data.

There is a real value for manufacturers who choose to use the EFD format. Reviewing databases and departmental file exchange issues in particular, with EFD participation as your goal, may actually serve as a catalyst for new efficiencies, and for resolving other related information exchange system concerns. Other areas of impact will be in technical writing, documentation, engineering, customer service and marketing departments.

However, obtaining full return value on the investment of time and resources for manufacturers to migrate to the EFD will be dependent upon a broad, industry wide awareness and acceptance of the EFD Format. For more information, or to become involved in the EFD project, visit the EFD website at http://www.sbe-efd.org.

*David Baden is with Radio Free Asia.*

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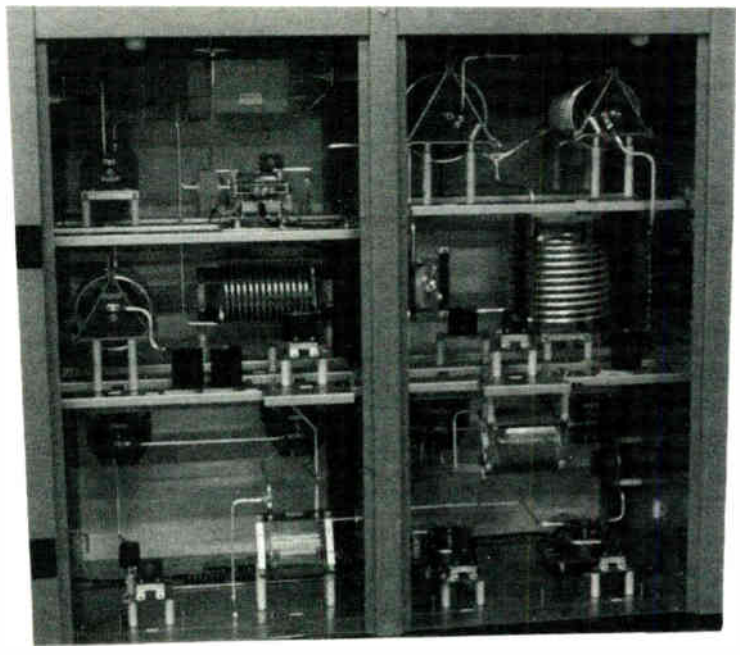

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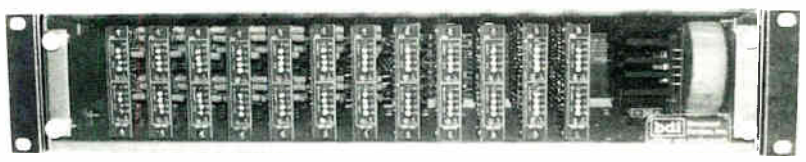

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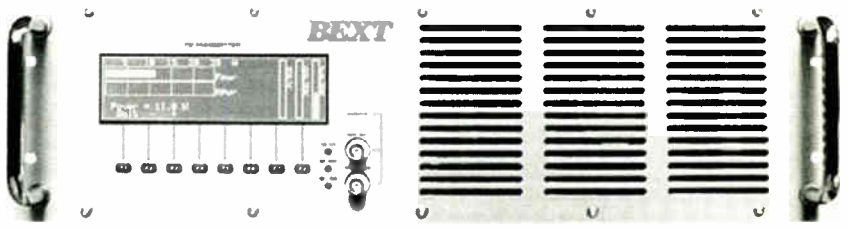


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Equipment Reports From Radio Guide Readers

# Field Report

# A User Report on the Continental 816R-6C 30kW FM

*by Don Niccum*

*[ROSWELL, New Mexico - October 2003]* KBIM-FM is a Class C station on 94.9 MHz with an effective radiated power of 100 kW, licensed to Roswell, New Mexico. Antenna space is leased on the KBIM-TV tower, and our 12 bay antenna has a center of radiation of 1650 feet above ground level. Needless to say, it has a killer signal. So when my cell phone rang at 1:00 AM on May 3, 2003, informing me KBIM-FM was off the air, I had no way of knowing this was just the start of a major repair and upgrade project.

**High Atop 1750' of New Hardline at KBIM**

Upon arrival, I tried the usual steps to get the transmitter to come back up, but it refused to cooperate. Further inspection focused on a VSWR fault, which led to an overhaul of a 1750 foot, 3-1/8 inch hard-line (including replacement of all the line hangers) and a tweaking of the antenna tuning. After the work was finished on the transmission line and antenna, it was decided to replace the KBIM transmitter with a new one. (When the blower contactor failed and the transmitter did not remove plate voltage, toasting the PA cavity, it was decided we had expended enough energy and time on that transmitter, so we rented a 2.5 kW Continental transmitter to get us back on the air.)

## COMPARISONS

We evaluated three transmitters from three different manufacturers. Although our TPO is 23 kW, we wanted headroom, so we decided to pursue a 30 kW model. We looked at both solid state and tube transmitters.

The transmitter would be located in our leased section of a building shared with two television transmitters, diplexers, high voltage supplies, microwave relays and paging equipment, thus we did not have any extra space.

The solid state transmitters we looked at consisted of 10kW cabinets combined together. I did not really have room for the combiner plumbing and the price difference between solid state and tube raised some eyebrows in the ownership department.

We continued the process by deciding what we wanted in a transmitter. Ease of operation and maintenance were the top priorities; factory technical support was next. I talked with other engineers and drew from my own personal experience with technical support departments over the years. The price of the transmitter was not a big factor as the two transmitters to which we narrowed our selection were comparatively priced.

Reliability was another factor. This particular site is 90 minutes away, with no backup, reliability was critical. When all factors were weighed and compared, the owner of the station decided on the Continental 816R-6C 30 kW transmitter. We ordered the transmitter through Don Jones at RF Specialties of Texas in Amarillo.

## PREPARATION STAGE

Don threw in a factory training session and we paid extra for a Continental field service technician to come to the site, inspect the installation and commission the transmitter into the newly reworked transmission line and antenna. (In my opinion, this was money well spent.) Don went to the transmitter site with me and we made a list of everything needed to make this installation as smooth and professional looking as possible in the space available. Don even made a plywood template of the transmitter footprint so we could make sure the transmitter would fit in the space available. The Continental fit the space neatly with a bit of floor space to spare, plus it was not as tall as the old transmitter so it would be easier to redo the exhaust plumbing.

Once the transmitter was built, my wife (a local contract engineer) and I traveled to the Continental facility in Dallas and met with Bret Brewer and Richard Garrett of Continental. After a nice tour of the facility, we went to the testing bay and Richard gave us what was probably one of the best one day instructional sessions I have ever been through. We went through practically every component in the transmitter. After that, we were invited to play with the transmitter. As they told me, "if you are going to break it, break it here!" The most I was able to do was get a door fastener out of whack. We covered troubleshooting and Richard made sure I was familiar with the tuning procedures.

## INSTALLATION

When the transmitter finally arrived at the site, two movers moved it off the truck on a pallet jack and had it in place in the building within 30 minutes. We took our time installing the transmitter. I wanted to make sure everything was covered. We reworked the electrical and air handling. The internal harmonic filter gave us the opportunity to install new 3-1/8" hard-line from the transmitter output to the transmission line input across the room.

**Continental 816R-6C Transmitter**

*Notice the space between the transmitter and hood.*

We opted to replace the transmitter exhaust with a new system using 16 inch ductwork and an assist fan in a hood placed eight inches above the transmitter. We felt we needed the eight inches of space above the transmitter to allow the exhaust to have somewhere to go should the assist fan fail, and because of the high winds for which the site is noted. (These winds have a tendency to get into the ductwork and cause shutdowns.)

The Continental transmitter is what I would consider to be a solid transmitter. I like the soft start feature that does not slam plate voltage to the tube but brings it up slowly. Another good feature is how the transmitter adjusts both the plate and screen voltage when adjusting power. As a result, the PA tuning does not get out of whack when we adjust power and the efficiency stays steady instead of going to you know where.

The positively pressurized cabinet helps keep dust and dirt out of the transmitter cabinets. The transmitter uses only one tube, a 4CX20000E that – with good filament regulation – should last a minimum of two to three years at our TPO. In a pinch, the transmitter will also run on a 4CX15000A until you can get a new 4CX20000E. We were assured good quality rebuilt tubes should have no problem in this transmitter.

Remote control hookup was a snap, with no kneeling on the floor to make connections. Access is on a chest level swing out panel just inside the power supply rear access panel. The IPA modules can be removed in a matter of minutes if necessary and the transmitter will run with one module removed. If you experience a total IPA failure, it is easy to patch around and get perhaps three to five kW TPO. We had a choice of exciter location: either in the transmitter center cabinet or in a rack. We opted for rack mount and Continental provided the extra length cabling necessary.

## FINAL TESTS AND ON THE AIR

Once the installation was complete, Richard Garrett of Continental came to Roswell to inspect the installation and put the transmitter on the air. We then shut down the Continental 2.5 kW transmitter and proceeded to connect the new transmitter into the transmission line. Richard turned the transmitter on and tweaked the tuning. Due to differences in the line voltage at the transmitter site, the transmitter initially would only do 90 percent power.

Retapping the screen supply transformer quickly took care of this, and we were on the air at full licensed power. (The placement of the screen transformer taps had the side benefit of making it impossible for the operators to increase the transmitter power to any level over 105 percent.) After watching it for about an hour, it was back to town and lunch.

Since it was placed on the air, the Continental transmitter has done nothing but run and run. I had to reduce power once for tower work and it did not complain. Just for the heck of it, while it was on low power, I played with the tuning to see if it had changed. It had not. No difference between high and low power. About a week after it went on the air, a severe thunderstorm hit the site. The lights blinked but the transmitter did not.

By the way, this is one of the quietest air-cooled transmitters I have been around. I am now able to use the telephone next to the transmitter with no problems. (With the other transmitter, I had to use the phone in the old living quarters due to the noise.)

At the moment, I am unable to think of anything major about this transmitter that I would change. I do wish the filament adjust was not behind an interlocked panel, but that is minor. The large fan pressurizing the cabinets is a bit close to the 200 amp breaker for my taste but the mounts for the fan are substantial so that should not be a problem. The only place in the transmitter that looks like it might be a pain to work on is the compartment below the PA tube.

Everyone at Continental Electronics and RF Specialties of Texas bent over backwards to make sure this purchase and installation was as painless as possible. There were some transportation problems when the transmitter shipped, but they were not the fault of Continental or RF Specialties.

I would also like to note that the temporary 2.5kW transmitter was rented from Continental. This agreement for renting the transmitter was made well before the decision to purchase an 816R was made, although the superior customer service we received when making arrangements to rent this transmitter and getting it on the air may have swayed our decision a bit.

The bottom line is this: Would I purchase another Continental transmitter? Yes – in a heartbeat. Oh yes ... my cell phone? Like the transmitter, it has been a lot quieter.

*Don Niccum was Chief Engineer of KBIM AM/FM, when he planned and installed the new transmitter. He can be contacted at donn@dfn.com*

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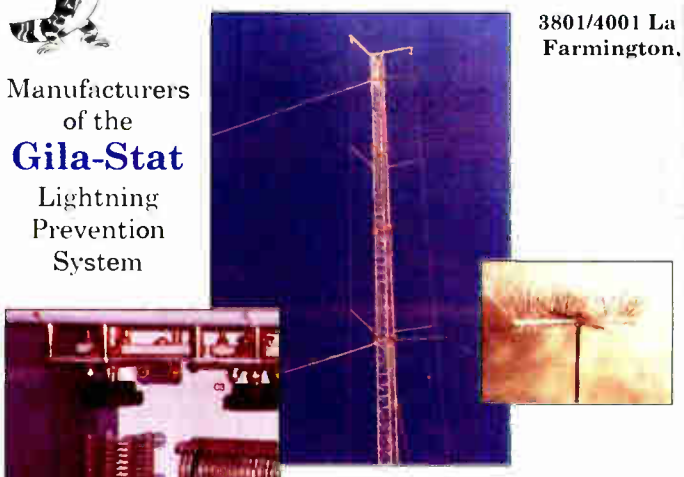

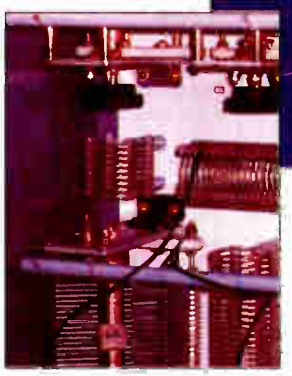

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Answers to Your EAS Questions

# EAS Q&A

by Clay Freinwald with Barry Mishkind


*[SEATTLE, Washington – October 2003] Clay has been receiving a lot of questions from folks in the field, so this month, we will catch up on a number of these concerns.*

**Q** - We recently installed a Dayton multiple channel receiver package for our EAS system. However, when we monitor the receivers with our Endec, the volume levels are all over the place.

**Clay** - Interestingly, I recently had the same experience. The Endec should have the same levels on all inputs; this is critical for unattended operation. I generally look for about one volt as measured on a Simpson 260. If the levels are not the same going in, they will not be the same coming out.

The Dayton package does not produce the same levels on their fixed level outputs. I considered building pads to compensate, but in the interest of time I simply used the 'loudspeaker' outputs, adjusting the levels as needed. Dayton acknowledges this was an oversight on their part. You may contact them for a fix, or just use the speaker outputs to drive the Endec.

## FILTERS AND UNKNOWN EVENTS

**Q** - I have installed four Sage Endecs. During a recent AMBER Alert two of them worked and two did not. What could be the problem?

**Clay** - The Sage is a complex device, especially in the area of programming. This equipment is not something you just install in the program line, supply audio from monitored sources, plug in and turn it on and forget. Sage uses little programs called "filters" to determine how the unit will respond upon receipt of various messages. For example, a news-oriented format might want all possible alerts, while a rocker might only want the "heavy stuff." You will easily spend a full day programming these units to suit your station's needs.

**Q** - There has been some recent discussion about forwarding unknown events. What should a station's policy be for an EAS message when the tape says "unknown event?"

**Clay** - The short answer: I would not forward any unknown event. I would simply log it.

The longer answer: This can happen if your decoder has not been upgraded to include the new Event Codes. If you have the latest codes, do a little digging and determine the source of the message. Then contact them to find out what happened. It could be the source is not sending a proper Event Code, or technical problems have corrupted the data. TV stations have a special problem as their EAS decoders often drive character generators to automatically create a crawl. Having a crawl stating "there is an unknown event" is just not very useful.

## AUTO-FORWARDING

**Q** - Should we just put our EAS Box in Auto-Forward and let it pass through everything we receive?

**Clay** - An Emergency Manager would applaud that action, while a Program Director or General Manager might deem it unacceptable. I would suggest you sit down with your PD and show him a list of Event Codes. Explain to him their meaning, and how important they are in getting out a Public Warning via your station. The goal is to come to an agreement about the participation level of your station with the EAS. Then program your box accordingly.

**Q** - Do you have any recommendations on what codes to relay?

**Clay** - Yes. Here are some Event Codes I feel should be the basis of a station's participation.

1. CAE - This is the AMBER Alert. Not much explanation needed here. There are a number of reasons why this one is a 'must do'

2. CEM - This is a Civil Emergency message – sources of this are likely to be Law Enforcement or Emergency Management.

3. EVI - This is an Evacuation Immediate message – the sources are the same as a CEM, the big difference here is the urgency of the matter.

4. TOR – If you are located where there are Tornados, broadcasting a Tornado Warning is a must.

I think you get the idea.

**Q** - Other than AMBER (CAE), is anyone using the new event codes?

**Clay** - I cannot speak for the entire country. However, the Seattle area recently had a failure of a part of the 911 system. The local government involved sent a 911 failure Event Code (TOE). To everyone's delight, it was received by many broadcasters and was on the air rather immediately. Several TV stations used the EAS message as their cue to get the news department involved. There are other such new event codes. Hopefully everyone has upgraded their equipment by now.

## SBE AND EBS

**Q** - Exactly what is SBE's role with EAS?

**Clay** - Although the SBE really has defined no formal role, historically it has been heavily involved with EAS.

The SBE has been involved in Rulemaking via comments filing with the FCC using its base of technical experts to help guide the process. The SBE started an EAS educational process with its "EAS Primer," and has followed it up with numerous articles in various publications, and EAS training sessions around the country. Additionally, there is the electronic communications work of the SBE-EAS Web Site, the remailer – and let us not forget the EAS Q&A in Radio Guide.

**Q** - Where have these EAS Training sessions been conducted?

**Clay** - I started doing these here in Washington State when we rolled out our EAS plan back in 1997. Later I was asked to go outside the state. Some of the locations I have visited include Lincoln (NE), Kansas City, Tampa, Syracuse, and Phoenix.

**Q** - Will you come to our area?

**Clay** - Sure. However, as I am a volunteer, I have no budget for travel. So those inviting me must pay the cost of these sessions.

**Q** - What does this cost and what are your fees?

**Clay** - I charge no fee. I only ask my cost of airfare and lodging be paid by the inviting party.

**Q** - Typically how long is your presentation?

**Clay** - Due to the volume of materials I have – and allowing for Q&A – these have taken about 6 hours. I have vowed in the future to make this a daylong event.

**Q** - How would we arrange for you to come to our area?

**Clay** - Just send a message to me at k7cr@wolfenet.com and I will give you all the information.

**Q** - You mentioned the SBE has an email list dealing with EAS issues.

**Clay** - Yes, sbe-eas@broadcast.net. You are welcome to subscribe. It is a great resource in dealing with issues involving EAS. The SBE-EAS Committee also uses this site as a means of conducting the work of the Committee. In some cases we may ask that discussion, and of course voting, be restricted to committee members. And I will let you in on a secret. Many of the questions you read about in this column come from that remailer.

**Q** - Do I have to be an SBE member to subscribe?

**Clay** - No, this is not a requirement. However - I certainly encourage broadcast engineers to join the SBE.

**Q** - I am not an SBE Member, is there any problem with me using the EAS portion of the SBE Web site for EAS information?

**Clay** - By all means, please do so. I try to keep the EAS portion of the SBE Web Site, www.sbe.org, up to date. You will also find access to the back issues of this EAS Q&A. And, I am certainly open to any and all suggestions as to addition content you would like to see on the SBE EAS site.

## HOMELAND SECURITY, FCC AND EAS

**Q** - Is the Department of Homeland Security going to change EAS activity at the radio station level?

**Clay** - One would need a good crystal ball and a fresh set of batteries to answer this question. The FCC has created its own office of Homeland Security within the Enforcement Bureau, headed up by long time staffer Jim Dailey. As of this writing the full scope of the plan is not clear. Certainly MSRC and other organizations have been challenging the FCC, Homeland Security – or whomever will listen – to take a leadership role regarding EAS. Time will tell whether or not this will result in changes.

**Q** - Is the FCC planning more EAS Rule changes, or more bluntly, planning to require us to spend more money for new equipment?

**Clay** - Again, at this date, I have no idea. Certainly there are many groups making recommendations for changes. Must of these suggestions involve organizational and leadership issues. But like most FCC actions, we all get plenty of notice. NPRMs (Notices of Proposed Rule Making) require a process to be followed.

**Q** - Who really speaks for radio broadcasters when it comes to FCC EAS changes.

**Clay** - As is the case with all FCC rule-making, everyone has an opportunity to have their say. In this last go-around, several broadcasters, owners, managers, engineers etc. filed comments. Certainly the Society of Broadcast Engineers watches these matters very carefully. Should the FCC propose some changes, the SBE-EAS remailer will come alive with comments and discussion. You are welcome to be a part of that.

## NEW RECEIVERS

**Q** - I have heard someone came out with a TV set able to turn itself on in the event of an emergency?

**Clay** - You are speaking about the new RCA Alert Guard TV, produced by Thomson. The set has a built in NOAA Weather Radio receiver and takes advantage of NOAA's desire to become an "all hazards warning system." For more information about this product, check out the Thomson (no "P") web site; it's their model 27V570T. I hope this is just the start of a new series of home entertainment equipment.

**Q** - Are other consumer devices like this in the pipeline?

**Clay** - I would hope so. Right now an NWR Receiver is just about the only thing you can purchase to wake you in the middle of the night in case of an emergency. The newer models are really quite good; some permit you to program them to respond to specific situations or locations. When EAS was first rolling out there were promises of radios and TVs able to turn themselves on in an emergency. Thus far the choices are limited. I commend RCA/Thomson for taking this step.

**Q** - We have been hearing more and more about EM Net. Is this system catching on and is it really as good as they say?

**Clay** - Currently, eight or ten states have announced they are going to put this system to work. Several more are strongly considering it. While I really do not want to go on the record as advocating a specific product, it appears from the number of states moving in their direction that they likely have a good product. For more information you can view their Web Site at www.comlabs.com.

**Q** - Can you give me the name of someone now using this system ?

**Clay** - Contact Dale Gehman. Dale works with the state of Pennsylvania Association of Broadcasters, which has deployed EM-Net. Dale's email address is: dgehman@pab.org. Dale is also a member of SBE's EAS Committee.

*Clay Freinwald, Senior Facilities Engineer for Entercom in Seattle, is Chairman of the SBE's EAS Committee as well as chair of the Washington State SECC. He welcomes your questions about EAS at k7cr@wolfenet.com*

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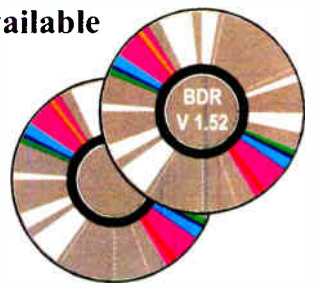


The **Broadcaster's Desktop Reference** (BDR) is an ongoing effort to provide useful tools, information, and history of interest to broadcasters. A work in progress – it seems something new is added almost every month.

Among the resources already available, you'll find: Barry's Radio Utilities, The Continental Electronics E-Slide, RF Specialties Toolkit, Tom Osenkowsky's Toolkit, Bob Carpenter's AM and FM/TV database viewer, Top Ten Lists, EAS paper sources, some project schematics, several files and pictures of broadcast history.

To make the CD even more valuable, when you are at the transmitter site, we have added the FCC and EAS checklists, and some equipment manuals. And this is not the end ... more is planned.

You will find most of the CD contents are listed at: www.oldradio.com/latest.htm

The proceeds from this CD are going to be put into improving the next edition of the CD, and supporting Oldradio.com and its efforts to document and display the history of our industry.

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Thanks for your support of OLDRADIO.COM – Barry M.

# WLW and VOA Honored With Historical Markers

*by Barry Mishkind*

*[CINCINNATI, Ohio - October 2003]* This summer, two historical markers were unveiled in Mason, Ohio, to recall and honor two of America's most famous broadcasting stations. On September 18th, a plaque honoring the WLW Blaw-Knox antenna was unveiled, joining one already nearby to honor the VOA Bethany Relay Station.

Set in motion by Michael O'Bryant, a resident of Mason, and a member of the Mason Historical Society, the markers were installed as part of Ohio's Bicentennial celebration. The ceremony was attended by State, county and local officials, members of the Historical society and the public. Mason Mayor John McCurley was present; there was even a resolution in honor of the unveiling from Ohio Governor Taft.


Charles Stinger, retired Crosley Engineer and VOA Bethany Chief, Mayor John McCurley, and Bob Miller, announcer for the "Everybody's Farm Program," (broadcast seven days a week from the Crosley Farm across the road from the WLW transmitter site). *Courtesy: David Snyder*

## DISTINCTIVE ANTENNA

Although the new marker is entitled "Blaw-Knox Antenna," and was designed to honor the distinctive diamond shaped tower, its text also recalls the history of WLW itself, including its time as the superpowered 500 kilowatt blowtorch during most of the 1930s.

Ironically, it appears the shape of the tower was coincidental. According to some historians, it was at WLW and WSM that engineers decided to stack two self supporting antennas to take advantage of better insulators that could accept the weight of a tall vertical tower. Indeed, both WLW and WSM later had to reduce the height of the tower, as the design created difficulties with skywave cancellation. Nevertheless, the diamond shape has taken on a special cache over the years.

I spoke with David Snyder, long time supervisor for VOA Bethany when the plant was decommissioned in 1994 after more than five decades of service. He kindly supplied some pictures of the ceremony and the markers to *Radio Guide*. In speaking with him, it was clear that a lot of folks worked hard to get this recognition accomplished.

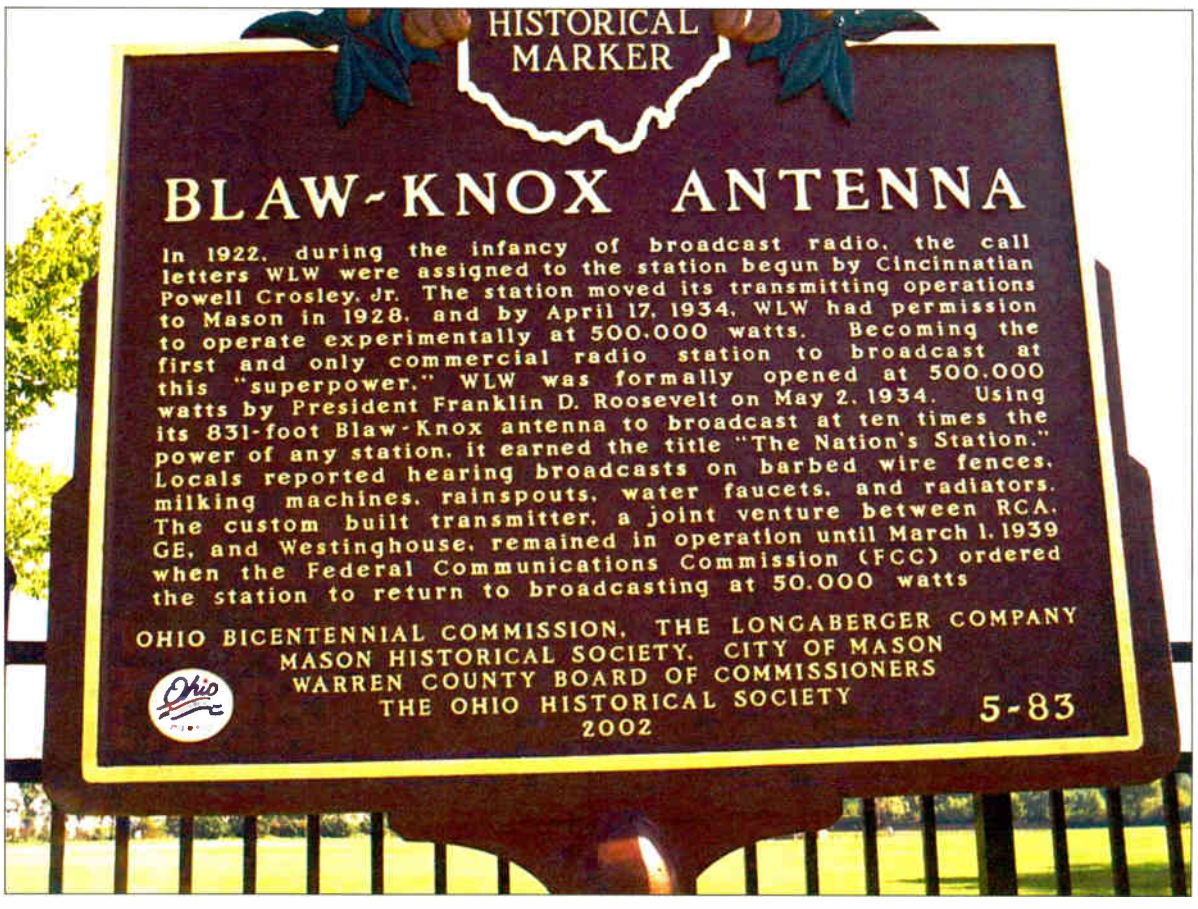
The VOA marker was dedicated earlier this year, and notes that there were six 200 kilowatt transmitters on the site, using a directional array of 24 towers to broadcast into countries such as Germany beginning in 1994, and continuing throughout the Cold War, and afterward. The content was said even to have gotten the attention of Hitler himself. In 1995, the land and VOA building were given to West Chester Township to build a museum.

Snyder pointed out that the Collins shortwave transmitter, designated #6, was still sitting in the VOA building, which is being converted to a radio museum. The West Chester Amateur Radio Club has had dozens of volunteers working on restoring the transmitter, which has received the official call sign WC8VOA.

In addition to the VOA items, the museum will house the Jack Grey collection of Crosley radios, the Heritage Media Office, and more. (Grey was Crosley Chief Engineer in the 40's and 50's according to Snyder, and developed the largest collection of Crosely radios in existence.) The museum is already open for visitors, and will continue to be enhanced in the coming months. Tours and other information can be obtained by calling 513-758-7305.

WLW also had an international reputation, as befits a station who boasted a mammoth 500 kW transmitter. As noted earlier in the year, WVXU-FM has released a two CD collection of broadcasts aired by WLW between 1921 and 1941. Entitled "Cincinnati Radio: The Nation's Station," it can be purchased from the station at www.wvxu.org, or by calling (800) 230-3576.


**Marker at the Former VOA Bethany Relay Station**
*Courtesy: David Snyder*




**Blaw-Knox/WLW Marker**
Courtesy: David Snyder

# Tips From the Field

## Cheap Safety When Around AC

*by Gary Peterson*

*[RAPID CITY, South Dakota - October 2003]* Would you pay $20.00 to avoid a shock or frayed nerve endings that result from burning a chunk out of a screwdriver? If so, you want to get the Fluke VoltAlert and carry it with you. This inexpensive tester works great for locating energized wires in junction boxes, without removing wire nuts. It will even locate breaks in conductors.

There is a VoltAlert in each of my tool cases. Before working inside any hardwired equipment, I use this magic marker-sized gizmo to look for any components or wiring that might still be energized with AC. (To test the VoltAlert, all you do is hold it next to an AC outlet and verify that it lights up.) The batteries in it seem to last almost shelf life.

I bought the VoltAlert after seeing a batch of them on the counter at the local electronic jobber. They had just come in. The business carries Fluke products, among others. I probably bought one of the first ones they sold. At the time I could envision some of its potential (pun intended) uses, but certainly not all. The $20 price tag was attractive, too.


### PUT RIGHT TO USE

I just could not get over how handy it was. I had taken over an old transmitter site and the wiring for the air handling system was undocumented; there appeared to be plenty of abandoned wiring. The Fluke VoltAlert voltage detector allowed me to identify all of the conductors that were in use when thermostats were adjusted and unlabeled switches were operated. All this without unscrewing wire nuts in junction boxes, to expose bare copper – and with the site operational. It saved a lot of time and inconvenience in getting the system documented and labeled.

The VoltAlert has saved me from another potential (this time, no pun intended), possibly fatal, shock in an FM transmitter. Opening the three-phase disconnect (closed delta) only de-energized two legs. It turned out some insulating material had broken and left one blade closed. After opening the back door on the transmitter, the VoltAlert quickly identified the electric field from the still-hot wire.

From that experience, I now use the VoltAlert (after verifying its operation with a nearby outlet) to scan the wiring inside each and every transmitter, prior to my working on it. I have used it to check fuses in disconnects, without poking around with a V.O.M.

As you likely have experienced with a V.O.M., holding two probes inside a disconnect switch and keeping the meter from falling is not only inconvenient, it is a potential safety hazard. In fact, V.O.M.s have been known to blow up if set to the wrong range (current or resistance instead of voltage) late at night when tired.

### MUCH SAFER

On the other hand, the VoltAlert can be used with just one hand (keeping the other one in one's pocket), which provides a much safer situation for the engineer.

Recently, I was dismantling an old Gates BC-50C. I thought every bit of the AC to this rig had been decommissioned. Nonetheless, I scanned the wiring harnesses with the VoltAlert, before chomping into them with big diagonal cutters. Wow! There was still hot wiring in there! I tracked down the hidden source of AC and eliminated it. I bet that saved me from another surprise. The VoltAlert allows one to follow AC through a fat bundle of wires and locate the breakout points, very easily.

As ubiquitous as 120 VAC and up is, it tends to show up in the darndest, unexpected places. If a person does not enjoy shocks and scorched tools, the VoltAlert goes a long way toward achieving that goal. I have even used it to quickly locate a failed bulb in a series string of Christmas tree lights. This one, and other brands of similar devices, cost around $20 – I would gladly pay a lot more than $20 anytime to keep my hands and tools safe.

I have friends who deal with electricity, and since discovering the VoltAlert, I have given them VoltAlerts for Christmas presents. I am led to believe that they all see regular use. There are two models of VoltAlert: the 1AC detects line voltage from 90VAC to 600VAC; the 1LAC detects voltage from 24VAC to 90VAC.

That is good. I hope to have my friends around for a long time.

*Gary Peterson, K0CX, is Corporate Engineer, Triad Broadcasting Co., LLC in Rapid City, SD. He can be reached at kzerocx@rapidcity.net*

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## Finding a Neat Case

*by Steve Johnston*

*[BOISE, Idaho – October 2003]* One of the problems for any engineer taking tools from site to site is keeping those tools protected, neat, and in good order. All too often, in the commotion of racing from one job site to another, everything from tools, to wire, to test sets end up just thrown in a box in the back of the truck. Eventually, even the most expensive and important tools can end up in pretty sad looking shape.

One of the tools I take on the road is my venerable Simpson 260 multimeter. It was important to me to find a case to protect it and keep it handy. While there are many cases available in different stores, finding one that fit perfectly was not easy.

However, I eventually spoke with the folks at "The Pouch" and for only $20.00, I was able to have a custom case designed and delivered to me. This is something quite useful that I wanted to share with my fellow Broadcast Engineers.

### CUSTOM PRODUCTION

"The Pouch" manufacture protective Neoprene cases for cell phones, laptops, handheld 2-way radios, PDAs, etc., in a wide range of colors. I asked them to design a similar product to protect the Simpson 260 multimeter. The result is an excellent case made of cushioned Neoprene that is not much bigger than the meter itself, although there is room for storing the test leads as well.

Previously, I have had great success with cell phone and handheld cases that I have purchased from "The Pouch" And, I can report that I really like the case they made for my Simpson 260. Figuring other Broadcast Engineers might be interested, I told the company that they should keep the pattern ready for more orders.

Disclaimer: I do not have any financial relationship with this company, nor will I make any money on these covers. It all started as personal project; I just wanted a nice case for the Simpson 260 I take on the road, and these guys did a good job for a reasonable price.

**Contact Info:**
http://www.thepouch.com/
Phone: 800-727-6824
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*Steve Johnson is Director of Engineering and Operations at Boise State Radio in Idaho. He can be reached at sbjohnston@boisestate.edu*

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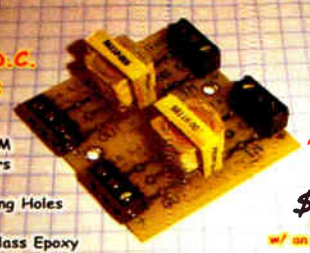

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**Audiometrics PW-100A**, stereo rack power amp. $125

**Tascam TSR-8**, 8 track 1/2" reel-to-reel recorder. $550

**Tascam 42B**, mastering 1/4" reel-to-reel recorder. $500

**Technics SP-15**, direct-drive turntables on cherrywood bases. $250 ea

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**Marti** HRC-10B Transmitter Combiner, MTS-2 Receiver Splitter, (4) PG-2B Jumper Cables
**Modulation Sciences** SCA-186 Sidekick 92Khz.
**Orban** 787A/U Programmable Mic Processor
**Sage Endec** EAS Alerting System
**Scala** MF950B Miniflector STL Antenna
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**Mike Patton** – ***Owner***
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www.michaelpatton.com mike@michaelpatton.com
Office: 225-752-4189 Fax: 225-756-3343
Cell Phone: 225-266-9745

## Transmitters & Antennas

Harris FM-1, 1kW, 90.9 MHz – Phase-Tek, 5kW, 90.5 MHz
CCA 2.5G, 2.5 kW, 91.3 MHz – CSI, 5kW, 88.1 MHz
CCA FM3000, 3kW, 92.1 MHz – Harris MW10B, 10kW, 1040 kHz
Collins 20V, 1kW, 980 kHz – Dieelectric 5-bay w/radomes on 88.1
Jampro 3-bay w/radomes on 99.5 – Phelps Dodge 3-bay on 92.1
Dielectric 1-bay w/radome on 90.9

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**Date Book**

## Radio Conference Guide

List your Convention or Gathering Here
Email: radio@broadcast.net

**SBE Chapter 9 & AZ Bdcstrs** – October 14 – Phoenix
www.broadcast.net/~sbe9

**SBE National Conv.** – October 14-15 – Madison, WI
www.wi-broadcasters.org

**Broadcasters Clinic** – October 14-16 – Madison, WI
www.wi-broadcasters.org

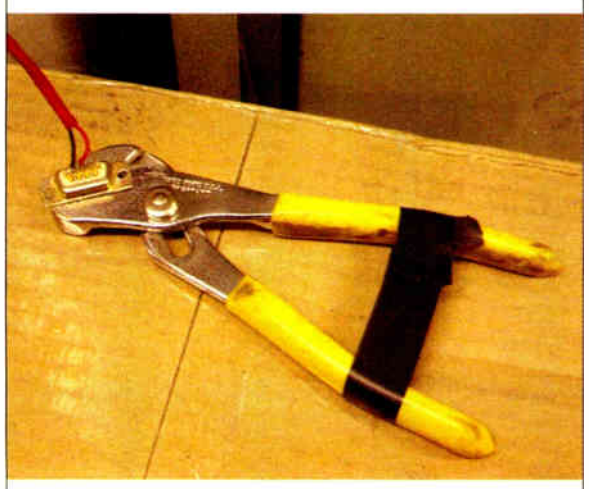
**Bos-Con SBE Regional** – October 28-29 – Boston
www.sbe11.org

**PAB Engineering Convention** – Oct 30 - Hershey, PA
www.pab.org

**CBI Convention** – November 6-9 – Dallas
www.collegebroadcasters.org

## Radio Guide

*Photo Tech-Tips*



"A Pincher ... in a Pinch"

From: Stuart Engelke – WWDJ, New York

*So how about it? Send in your photos to Radio Guide at: radio@broadcast.net*

## "Field Notes"

*Comments From Our Readers*

**From: Lewis Downey, Chief Engineer KUER Radio, University of Utah**

Cornelius Gould's articles in the **Radio Guide** are the most informative and understandable I have ever encountered about audio processing. I'm looking forward to future installments. Keep it up, and thanks.

**From: John Sampson – Leominster, MA**

I can't begin to tell you how much I've enjoyed Cornelius Gould's articles on processing in **Radio Guide**. He's taken some of the mystery out of the so called black boxes that make stations squeak out louder, cleaner audio.



## Radio Guide Ads: Oct-03

| Advertiser - Page | Website |
|---|---|
| Armstrong Transmitters - 11 | www.armstrongtx.com |
| Avcom-Ramsey - 11 | www.ramseyelectronics.com |
| BEXT - 21 | www.bext.com |
| BDR - 25 | www.oldradio.com |
| Broadcast Connection - 19 | www.broadcastconnection.com |
| Broadcast Devices - 21 | www.broadcast-devices.com |
| Broadcast.net - 25 | www.broadcast.net |
| Broadcast Software Intl. - 3 | www.bsiusa com |
| Broadcast Tools - 13 | www.broadcasttools.com |
| Conex Electro Systems - 19 | www.conex-electro.com |
| D&H Antennas - 13 | www.dhsatellite.com |
| Econco Tubes - 19 | www.econco.com |
| Electronic Mfg. - 23 | www.rectifiers.com |
| Energy Onix - 2 | www.energy-onix.com |
| ERI - 5 | www.eriinc.com |
| Henry Engineering - 2 | www.henryeng.com |
| Inovonics - 5 | www.inovon.com |
| JK Audio - 7 | www.jkaudio.com |
| Kahn Communications - 11 | none |
| Larcan FM Translators - 7 | www.larcan.com |
| Lightner Electronics - 7 | www.lightnerelectronics.com |
| Micro Communications - 23 | www.mcibroadcast.com |
| New Dimension - 25 | www.newd mensioncard.com |
| Not Ltd. - 23 | www.nottltd.com |
| OMB America - 9/11 | www.ombamerica.com |
| Omnia Audio - 16 | www.omniaaudio.com |
| Orban - 32 | www.orban.com |
| Peter Dahl - 13 | www.pwdahl.com |
| Phasetek - 21 | www.phasetekinc.com |
| Prophet Systems - 31 | www.prophetsys.com |
| RF Specialties - 15 | www.rfspec.com |
| SCMS Inc. - 13 | www.scmsinc.com |
| Sine Systems - 23 | www.sinesystems.com |
| Superior Broadcast - 15 | www.superiorbroadcast.com |
| Telos - 17 | www.telos-systems.com |
| TFT - 15 | www.tftinc.com |
| Tieline - 5 | www.tieline.com |
| Transcom - 19 | www.fmamtv.com |

## Raymond Benedict Elected SBE President

INDIANAPOLIS, Ind. - September 12, 2003 - Votes were tabulated September 11 for the 2003 election of officers and the Board of Directors of the Society of Broadcast Engineers (SBE).

Elected president of the Society is Raymond C. Benedict, CPBE. Benedict is Director of Spectrum Management for Viacom, Inc. in Washington, D.C. Benedict has served the Society as Vice President, Secretary and Board member.

The newly elected Officers and Directors will assume their offices on Wednesday, October 15 during the SBE Annual Membership Meeting in Madison, Wisc. The meeting is part of the SBE National Meeting, held in conjunction with the Broadcasters Clinic presented by SBE Chapter 24 and the Wisconsin Broadcasters Assoc.

**Tubes**

## New Tubes From Econco

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| 4CX7500A | 4CX10,000D | 4CX15,000A |
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**Email:** rrmoorejr@aol.com
**Website:** www.mooretronix.com

**Transmitter Parts**

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